MILLS & REEVE

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23 October 2024

Dear Sirs

Outer Dowsing Offshore Wind (the trading name of GT R4 Limited) ("ODOW")

Proposed Outer Dowsing Offshore Wind Farm Order (the "Project" and "the Order")

Written Representation (Objection) on behalf of T.H. Clements & Son Limited ("T.H. Clements")

Mills & Reeve are retained by T.H. Clements and, further to submission of a Relevant Representation on 13 June 2024, have been instructed to make this Written Representation maintaining T.H. Clements **objection to the Order**.

This Written Representation has been prepared in conjunction with the following experts appointed by T.H. Clements:

- Mr Phillip Wright of Wright Resolutions Limited (soil expert);
- Mr Iain Gould, Associate Professor of Soil Science at the University of Lincoln (soil expert);
- Mr Damian Pawson of Sweco UK (air quality expert); and
- Mr Daniel Jobe of Brown & Co. (surveyor).

Appendices 1-4 to this Written Representation set out the qualifications and relevant experience of the above experts.

This Written Representation builds upon T.H. Clements' Relevant Representation (RR) **[RR-067]**.

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1 Overview of T.H. Clements business and operations

1.1 T.H. Clements is a leading producer of high-end Brassica vegetables and supplies approximately 20% of the Brassica vegetables sold in the UK.

1.1 T.H. Clements has an annual turnover of approximately £80 million currently and is expected to achieve an annual turnover of circa £100 million within the next three years.

1.2 T.H. Clements farms approximately 10,000 acres of rural land in Lincolnshire, including a significant proportion of the land affected by the proposed Project's onshore cable route, as explained below.

1.3 T.H. Clements has spent decades building its business and has significant contracts with leading retailers, including Tesco plc.

1.4 Tesco plc. is a demanding retail customer which expects T.H. Clements to adhere to a service level of 98.5%. This high bar of expectation means that T.H. Clements are required to supply no less than 98.5% of the vegetable produce requested by Tesco on time and to specification. Failure to adhere to that service level would put the contract at significant risk.

1.5 As part of the service level requirements, Tesco has exacting standards. These include a product specification ("Product Specification") which details the size, quality, flavour, appearance and shelf life that Tesco expects each type of vegetable to conform to. There are also very strict rules/requirements regarding defects, such as contamination by foreign bodies (stones, dust), discolouration, damage and the presence of insects, moulds or disease.

1.6 Defects are generally unacceptable and will result in the rejection of product if outside agreed tolerances, save that in very exceptional circumstances, such as when Sahara sand storms lead to widespread, unavoidable deposits of sand on crops, very limited soiling may be tolerated.

1.7 T.H. Clements has a dedicated team of Quality Assurance personnel whose role it is to ensure that each delivery meet's each customer's specification, and to identify and remove any non-conforming product.

1.8 Any product rejections (whereby product doesn't meet the customer's specification), or shortfalls (where product supplied is less than the quantity ordered), would be detrimental to the achievement of the customer's required service level. As noted above, Tesco's requisite service level is 98.5%, which is reviewed monthly and is used to monitor and track supplier performance.

1.9 In the case of Cauliflower, for example, once the white curd is exposed i.e. near to maturity, dust/wind-blown soil can easily settle into the ‘cracks’ between the florets. If it then rains, this dust/soil is pushed further into the structure of the Cauliflower, which even consumers would find hard to remove. Similarly, dust/wind-blown soil can easily ‘land’ between the layers of Cabbages and Leeks as they grow, which can lead to them having a gritty texture. The growth stage of the crop is important, as if the edible portion of the vegetable has not developed the risk of contamination is lower. The nearer to harvest the crop is, the higher the risk of contamination and product not being suitable for harvest and sale.

1.10 It is also well known that soil contains bacteria, some of which are pathogenic and have the potential to make consumers ill. As explained further below, it is not possible for T.H. Clements to try to remove soil/dust contamination because washing vegetables impacts their shelf life, as well as their appearance, contravening service level requirements meaning they will not be accepted by retailers. Whilst product packaging and general consumer guidance recommends that vegetables are washed thoroughly before use, as a responsible food producer, T.H. Clements has a duty to protect its product from contamination, and to protect its consumers from illness. Any potential risk that can be avoided, should be. It is not acceptable to place contaminated product into the market place, and T.H. Clements would risk prosecution and fines from Environmental Health & Trading Standards if food safety and consumer protection requirements, such as those set out in section 14 of the Food Safety Act 1990, were not upheld.

1.11 Crop losses at field level due to dust/soil contamination could result in significant quantity shortfalls against orders. Crops contaminated by soil/dust would be rejected by customers, such as Tesco. Rejections and shortfalls are viewed very negatively by T.H. Clements customers, including Tesco, as compliance with the agreed product specifications is required to ensure consumer satisfaction. T.H. Clements service level (performance) is compared to that of other suppliers, and poorly performing suppliers would be at risk of losing business and/or not being awarded new business.

1.12 As a supplier to Tesco, T.H. Clements is responsible for ensuring that all products supplied are manufactured and packed in accordance with Tesco’s Product Specification, technical policies and codes of practice. This restricts the procuring of product from third party suppliers unless they are fully compliant with customer policies and codes of practise.

1.13 The Tesco Product Specification and supplier declaration documents set out the required Environmental, Social and Governance (ESG) standards which THC must be and are compliant in themselves (i.e. Red Tractor, LEAF), and which any third party supplier must be compliant with. T.H. Clements are not allowed to source product from third parties that are not ESG compliant.

1.14 All of the above leads to the requirement for T.H. Clements to be one of the "World's best" growers. Underpinning T.H. Clements ability to achieve this, is the quality of land that it farms (please see below for more detail).

2 Quality of land farmed by T.H. Clements

2.1 The land that T.H. Clements farm (through which the proposed Project's onshore cable corridor is routed) comprises part of the Lincolnshire Fens, which are renowned as some of the very best food growing soils in the Country and indeed the World, largely comprising Agricultural Land Classification (ALC) Grade 1 land. To put this into context, only 7% of the land in the UK is Grade 1 ALC land, and over 70% of this Grade 1 land is in Lincolnshire around the Wash.

2.2 The very best soils (commonly referred to as 'silts') are located to the south and east of the town of Boston (where T.H. Clements farm) and to the North East through Friskney to Wainfleet.

2.3 Being permeable, when in good structural condition, these silts are able to absorb and store a significant amount of water, which makes them excellent soils for growing the very best vegetable crops. Their easy working qualities, including the absence of stone, further supports optimal root and therefore crop growth, with associated high marketable yields. It is because of the silts that T.H. Clements are amongst the "World's best" growers of brassica and root vegetables.

3 T.H. Clements interests in the land included in the proposed Order

3.1 T.H. Clements farm a significant amount (approximately 753 acres/304ha) of land over which ODOW seek temporary possession and/or permanent compulsory acquisition powers for the Project ("Order Land").

3.2 To enable T.H. Clements to confirm exactly which plots of the Order Land it farms as owner-occupier, tenant, or under another agreement with a landowner, T.H. Clements' appointed land agents, Brown & Co, asked ODOW to provide the base mapping/shapefiles for the Order Land Plans (**ODOW Application Document 2.5**). ODOW originally declined that request and after a number of further requests only shared the shape files with Brown & Co on 23 October 2024, meaning that they could not be reviewed in time for Deadline 1 and submission of this Written Representation. The information below is therefore provided on the basis of an eye only comparison of the Land Plans and T.H. Clements land ownership/occupation plans and is as accurate as possible in the circumstances. Should any corrections need to made to the information below after review of the shape files, then these will be provided along with the Written Representation Summary by 27 November (in line with the Rule 8 letter):

Order Land Plots owned by T.H. Clements

3.2.1 T.H. Clements own the freehold interest in the following Order Land Plots:

(i) 29-009, 29-010, 29-011, 29-012, 29-013, 30-001, 30-002, 30-003, 30-004 and 30-006.

Order Land Plots owned by a Director of T.H. Clements, over which T.H. Clements Limited have a Farm Business Tenancy

3.2.2 Christoper Clements (Director of T.H. Clements) owns the freehold interest in the following Order Land Plots:

(i) 26-013, 26-015, 26-016, 26-017, 30-005, 30-007 and 30-008

3.2.3 Barbara Clements owns the freehold interest in the following Order Land Plots:

(i) 32-009, 32-010, 32-011, 32-012, 32-013, 32-014 and 32-015.

Order Land Plots occupied and farmed by T.H. Clements on an annual rolling basis

3.2.4 T.H. Clements occupy and farm the following Order Land Plots, the freehold interest in which is owned by third parties:

(i) 30-012, 30-013, 30-014, 30-015, 30-016, 32-003, 32-004, 32-005, 32-008, 32-009, 32-010, 32-011, 32-020, 32-021, 32-022, 32-023,32-024, 32-025, 32-026, 33-001, 34-017, 34-018, 34-019, 34-020, 34-021, 34-022, 34-024, 35-004, 37-002, 37-003, 37-005 and 37-006.

Order Land Plots farmed by T.H. Clements on a rotational basis

3.2.5 T.H. Clements farm the following Order Land Plots on a rotational basis (i.e. they farm these Plots in rotation with other famers who grow other types of crops, such as cereals), the freehold interest in which is owned by third parties:

(i) 33-017, 33-018, 33-019, 33-020, 33-021, 33-022, 33-023, 33-024, 33-025, 33-026, 33-027, 33-028, 33-029, 33-030, 33-031, 33-033, 33-034, 33-035, 33-036, 33-037, 34-017, 34-018, 34-019, 34-020, 34-021, 34-022, 34-024, 35-004, 37-002, 37-003, 37-005, 37-006, 37-012, 38-007, 38-008, 38-009, 39-001,39-002, 41-003, 43-005.

3.2.6 The Order Land Plot numbers, rotational arrangements and freehold owners are shown in the table below:

Plot Nos.	Details of rotational farming arrangement	Owner
33-017, 33-018, 33-019, 33-020, 33-021, 33-022, 33-023, 33-024, 33-025, 33-026, 33-027, 33-028, 33-029, 33-030, 33-031	During each 6 year rotation period, T.H. Clements farm this land for 4 years, and the landowner farms it for 2 years. T.H. Clements grow a single crop of brassica vegetables/potatoes on this land during each year that they farm it. The landowner grows wheat on this land during each year that the landowner farms it.	J Woods
33-033, 33-034, 33-035, 33-036, 33-037	T.H. Clements grow a single crop of brassica vegetables or potatoes on this land every other year (biannually). Wheat is grown on this land biannually by the landowner (when T.H. Clements are not growing vegetables or potatoes on it).	M Skipworth
34-017, 34-018, 34-019, 34-020, 34-021, 34-022, 34-024, 35-004	T.H. Clements are currently growing brassica vegetables on this land. This year (2024) is the first year that T.H. Clements have grown crops on this land. It is anticipated that going forward, T.H. Clements will farm (grow crops on) this land biannually in rotation with the owner, who will grow wheat.	B Bush
37-005, 37-006	T.H. Clements are currently growing brassica vegetables on this land. This year (2024) is the first year that T.H. Clements have grown crops on this land. It is anticipated that going forward, T.H. Clements will farm (grow crops on) this land biannually in rotation with the landowner, who will grow wheat.	B Bush
37-002, 37-003	T.H. Clements are currently growing brassica vegetables on this land. This year (2024) is the first year that T.H. Clements have grown crops on this land. It is anticipated that going forward, T.H. Clements will farm (grow crops on) this	B Bush

Plot Nos.	Details of rotational farming arrangement	Owner
	land biannually in rotation with the landowner, who will grow wheat.	
37-012	During each 6 year rotation period, T.H. Clements farm this land for 4 years, and the landowner farms it for 2 years. T.H. Clements grow 3 crops of brassica vegetables on this land during a 2 year period (6 crops in total during the 4 years of the 6 year rotation period that they farm the land). The landowner grows wheat and potatoes on this land during each year the landowner farms it.	J Fowler
38-007, 38-008, 38-009, 39-001, 39-002	During each 6 year rotation period, T.H. Clements farm this land for 4 years, and the landowner farms it for 2 years. T.H. Clements grow 3 crops of brassica vegetables on this land during a 2 year period (6 crops in total during the 4 years of the 6 year rotation period that they farm the land). The landowner grows wheat and potatoes on this land during each year that the landowner farms it.	J Fowler
41-003	During each 5 year rotation period, T.H. Clements farm this land for 2 years, and the landowner farms it for 3 years. T.H. Clements grow 3 crops of brassica vegetables on this land during the 2 years of the 5 year rotation period that they farm the land). The landowner grows onions and sugar beet on this land during each year that he farms it.	Robert Oldershaw
43-005	To date, T.H. Clements have grown a single crop of brassica vegetables on this land once (during 1 year) in every 5 years.	J Ulyatt

Order Land Plots farmed by T.H. Clements on a contractual basis

3.2.7 T.H. Clements farm the following Order Land Plots under a contract farming arrangement with the third parties who own the freehold interest in them:

(i) 27-001, 27-002, 27-003, 27-004, 27-005, 27-006, 27-007, 27-008, 27-009, 27-011, 27-013, 27-014, 27-015, 27-016, 27-017, 27-018, 27-019, 27-020, 27-021, 27-022, 27-023, 27-024, 27-025, 27-026, 27-027, 27-028, 27-029, 27-030, 28-001.

Presumed ownership of subsoil of part width of highway or drain

3.2.8 T.H. Clements are the presumed owner of part of the following Order Land Plots on the basis of the 'ad medium filum' rule (the rebuttable presumption that the owner of the land abutting either side of a highway, or a watercourse (drain), owns the subsoil up to the middle of that highway or watercourse):

(i) 30-004 (part width of highway/access splay) and 30-006 (part width of drain)

3.2.9 Christoper Clements (Director of T.H. Clements) is the presumed owner of part of the following Order Land Plot (comprising part width of highway) on the basis of the 'ad medium filum' rule:

(i) 30-008

3.2.10 Barbara Clements (former Director of T.H. Clements) is the presumed owner of part of the following Order Land Plots (comprising part width of drain) on the basis of the ad medium acuae rule:

(i) 32-009 and 32-010

4 Grounds of objection

4.1 Alternatives (routing of onshore Export Cable Corridor ("ECC"))

4.1.1 Paragraph 8 of the Department for Communities and Local Government's *Guidance related to procedures for the compulsory acquisition of land* under the Planning Act 2008 ("the CA Guidance") states that *"the applicant should be able to demonstrate to the satisfaction of the Secretary of State that all reasonable alternatives to compulsory acquisition (including modifications to the scheme) have been explored".* As such, it is necessary for ODOW to be able to demonstrate that alternatives to the use of compulsory acquisition powers, such as negotiating voluntary agreements with landowners, have been fully explored (i.e. that reasonable attempts to reach agreement have been made), but also that the chosen route of the ECC, and location of the Project's onshore substation (ONss)), can be robustly justified when compared to alternative routes/locations and the likely resulting physical, environmental and socio-economic impacts on them.

4.1.2 As explained above, the land that T.H. Clements farms is affected by the ECC. Three main ECC route options are analysed in Chapter 4 of the Environmental Statement (Volume 1 Site Selection and Consideration of Alternatives and Table 4B.1 in Annex A, (ODOW Application Document Reference 6.1.4) and the Volume 2 (Figures) (Application Document Reference 6.2.4.1). Figure 4.20 sets out the three main options and quantitative analysis of them is provided principally in Table 4B.1 of Annex A.

4.1.3 The first option ('Option 1', indicated by a blue line on Figure 4.20) originates at the landfall location at Wolla Bank, south of Anderby Creek, and follows a southerly direction, to the east of Burgh Le Marsh and Wainfleet All Saints, before crossing agricultural land to the south of the A52. The ECC then passes to the south of Boston, crossing the Haven, River Welland and A17. This appears to be the 'Wolla Bank-Weston Marsh' option in Table 4B.1 of Annex A.

4.1.4 The second option ('Option 2', indicated by a purple line on Figure 4.20) originates from the landfall point north of Anderby Creek and takes a more northerly direction to the northwest of Burgh Le Marsh. The ECC then runs parallel to the Boston to Friskney rail line before passing around the north of Boston, and circumnavigating the town in an anticlockwise direction. This option then joins the ECC of Option 1 to the north of Fosdyke. This appears to be the 'Boston Northern Option' in Table 4B.1 of Annex A.

4.1.5 The third option ('Option 3', indicated by a green line on Figure 4.20) follows the same route as Option 2 until it reaches Spilsby, at which point the ECC turns southeast to circumnavigate Boston in a clockwise direction. This option runs to the west of the Hobhole Drain before joining the ECC of Option 1 to the north of Fishtoft. This appears to be the 'Boston Southern Option' in Table 4B.1 of Annex A.

4.1.6 Although Table 4B.1 (in Annex A) has now been updated through an erratum, it remains poorly laid out and without a clear methodology. There remain errors within it.[1] Notwithstanding ODOW's response **[PD1-71, p.397 of 481]**, the underlying

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[1] By way of example only: under Archaeology and Cultural Heritage (page 5 of 11 of the Erratum) an absolute value of 1 is ranked the same as an absolute value of 0 where, 1 indicates the presence of a heritage asset and 0 means no heritage assets. Under Water Resources and Flood Risk (page 8 of 11), Statutory Main Rivers the same number of rivers and length of rivers are ranked differently.

analysis is somewhat crude, detailing only the number of sensitive assets, or areas that have a sensitivity, without considering what the impacts would be and how serious they might be or weighing as between the rankings. In fairness, ODOW acknowledge this by stating that given the stage the work was undertaken at using the number of sensitive receptors that could be affected was an appropriate proxy of potential future impact. The problem is, though, the failure to engage further where problems are indicated.

4.1.7 Of particular note and concern to T.H. Clements, is the fact that ODOW make no distinction in their analysis between different grades of Best and Most Versatile land ("BMV"); the different grades are equally weighted. ODOW's response on this point does not engage with T.H. Clements point – each grade given the same weight in the analysis despite the grades existing to identify differing levels of importance of agricultural land **[PD1-071, p.38 of 481]**. As such, ODOW's analysis does not properly reflect the likely impacts on agriculture and BMV.

4.1.8 Choosing Option 2 (the purple route) would significantly reduce the amount of Grade 1 ALC land affected by the Project, and the majority of the Grade 1 ALC land that would be affected by this alternative route does not comprise the very top-quality silty soils situated to the east of the A52 public highway.

4.1.9 Much of the land that would be affected by the Option 2 route is within the 'Downholland and Wallasea' soil series which, while sharing some characteristics of the best soils (being deep and stoneless silty clayey soils), are not capable of growing vegetable crops back-to-back in the way that the toft silts affected by Option 1 are. While the soils within the 'Downholland and Wallasea' series can be more difficult to work/farm than the silts, they tend to reinstate well post construction. Such soils also, being less fragile than the ALC Grade 1 silts, can better support machinery and there is therefore less risk of farm machinery sinking through them to deep levels. The Viking Link and Triton Knoll schemes were constructed through similar soils in recent years with the reinstatement being largely successful.

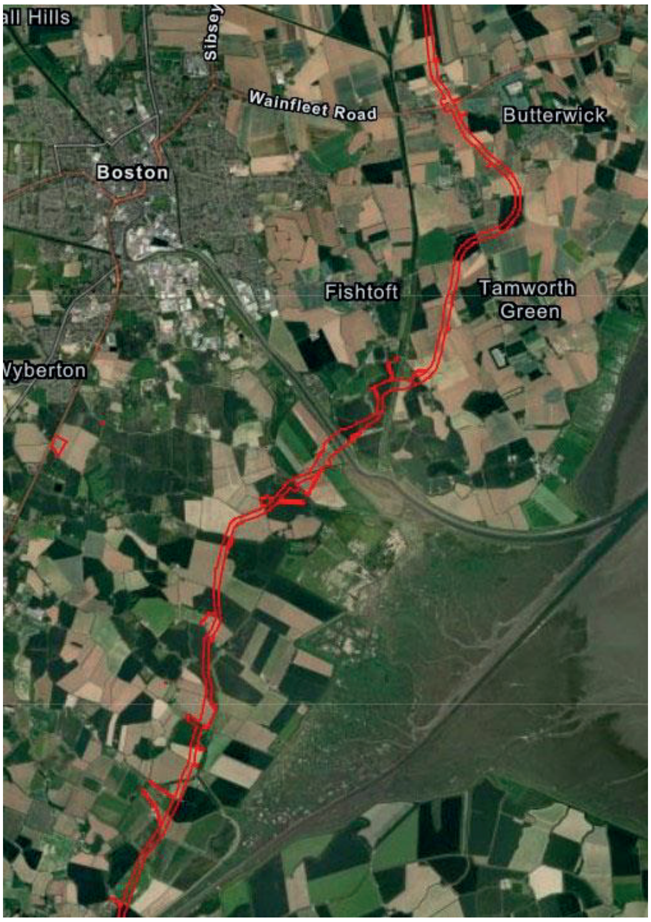
4.1.10 While Option 2 is slightly longer than Option 1, it would affect less Grade 1 ALC land, result in significantly less crop loss, and in doing so would ensure that the highest quality, productive farmland and associated businesses is/are properly protected from adverse impacts (please see below for further detail regarding adverse impacts on soils and, in particular, silts).

4.1.11 For the reasons set out above, it does not appear that the alternative routes for the ECC have been properly considered so as to enable ODOW to robustly justify their decision to proceed with Option 1.

4.2 Adverse impacts on farming during construction of the proposed Project

Nature of the soils comprised in the land that THC farm and proposed to be used for the cable route for the Project

4.2.1 T.H. Clements farms land across Lincolnshire. However, the soils within the proposed stretch of cable corridor (working width) shown on the aerial view below are of particular significance:



4.2.2 The soils along this stretch of the proposed cable corridor (working width) are deep, predominantly fragile silty, and coarse silt loam soils. These soils have drainage managed by ditches, pumps, and installed field drainage pipe schemes. The soils are at regular risk of machinery “falling through” (after becoming bogged down - often to significant depth) as a result of normal farming practices employed when growing vegetable crops intended for fresh supermarket sale in the UK. Please see the following sections for further detail.

Predominant soil types

4.2.3 The predominant soil types affected by the proposed cable route in the following locations (shown on the above map, and detailed in ***Appendix 5***) are as follows:

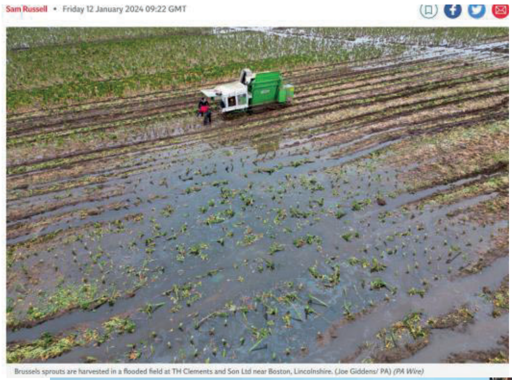
(i) WISBECH: Deep stoneless, calcareous, coarse, silty soils and is flat with low ridges and at risk of wind erosion locally. Groundwater levels are usually controlled by ditches or pumps.

(ii) TANVATS: Deep stoneless, fine and coarse silty and clayey soils and is flat. Groundwater levels are usually controlled by ditches or pumps.

(iii) ROCKCLIFFE: Deep stoneless silty and sandy soils and is flat. It is variably affected by groundwater depending on the artificial underground drainage systems in place.

4.2.4 As explained above, the predominant soils in this area of Lincolnshire are deep, and stoneless with unsupportive, fragile and deep silt based characteristics. Where the soil is at moisture saturation level, i.e. nearing a "liquid" state, this increases the risk of 'running'/movement of the soils, hence their being referred to colloquially as 'running silts'. All the soils in this area of Lincolnshire are deep, which results in an increased risk of machinery 'sinking' into / dropping through, the soil profile until 'grounded' by the chassis being in contact with the ground surface, as explained in further detail which follows.

4.2.5 Fields being farmed for vegetable crops intended for supermarket fresh produce sale need to be accessed at various times including when the soil condition is wet, and consequently very vulnerable to damage. Such soils are also prone to surface waterlogging at wetter times of year. To avoid significant crop loss (and mitigate against the yield, quality, and delivery penalties imposed by retailers), significant surface waterlogging is addressed immediately by digging deep channels (also referred to as 'trenches') to move such water off the surface and into surrounding watercourses. Such channels can often exceed depths of 1m below the ground surface, depending on distances involved.



Above, left: T.H. Clements harvesting in a waterlogged field – the foreground area has been harvested. Above, right: Surface waterlogging compromises crop quality and consistency. Here, surface water is routed into an adjacent ditch (not in the picture) by digging deep channels by excavator (pictured) to allow it to flow off the field

4.2.6 It is noteworthy that the proposed depth of the Project's onshore cables stated as being 1.2m below ground surface level. ODOW specify a maximum working depth for farming operations of 0.75m above cables buried at a depth of 1.2m, without needing permission from ODOW and specialist supervision. This maximum depth is significantly shallower than the depths of potential interference and damage as a result of the carrying out of routine farming practices (further detail on this is included in the following sections). Additionally, the interventions used by farmers (including extracting machinery where bogged down, digging trenches, and associated deep soil loosening) which would be needed for soil repair do not appear to have been considered as part of the proposed mitigation for the Project.

<u>Potential contamination and degradation of high quality, highly fertile top-soil within T.H. Clements farmed plots during construction of the Project</u>

4.2.7 As explained above, the silty soils within T.H. Clements farmed plots (through which the Project's onshore cable corridor is routed) are largely unique to this particular area of Lincolnshire. They are deep, predominantly fragile, silty and coarse loamy silts. They are highly fertile and productive for agricultural farming, comprising a shallow layer (approximately 300-700mm deep), or layers of highly fertile ‘topsoil’, below which is a ‘subsoil’ or relatively sterile ‘running silt’ which, whilst it has reduced fertility, provides a reserve of water. The relatively complex nature of these soils can increase variability within the topsoil zone which can include differing textures (a silt loam with variable sand content), and differing organic matter/nutrient levels.

4.2.8 These soils are delicate, and susceptible to structural change, particularly following heavy rainfall. Effective, and unrestricted drainage of these soils is therefore of paramount importance.

4.2.9 During the proposed construction phase for the Project, ODOW propose to strip the topsoil and subsoil in this location and store it in soil bunds. This will enable installation of the underground electricity cables. The storage bunds will be susceptible to weed growth and contamination, and, during the stripping and reinstatement phases, there is a high risk of the topsoil and subsoil being mixed. This risk would be particularly acute should the appointed contractors not to be cognisant of the unique nature of the soils. Any mixing of the topsoil and subsoil will change the nature of the topsoil from its status as existed before the construction phase. Subsoil is primarily a reservoir for water, as opposed to the fertile topsoil having high nutrient holding capacity and stability afforded by organic matter and biological activity. Dilution of the topsoil by the subsoil, therefore, as a result of mixing, would compromise crop growth, and consistency, and as a result, crop quality and marketable yield.

4.2.10 The variability within the topsoil (as evidenced in Foxholes Field – see **Appendix 5**) included differing texture, and organic matter levels from the soil surface down to 0.7m.

4.2.11 This is important, as both differing layers of topsoil contained high volumes of crop roots which will access water and nutrient from these zones. The upper layer (in Foxholes field this was down to 0.4m) of this topsoil zone is regularly inverted (ploughed) and is likely to contain a high proportion of nutrient available to the crop. This is due to plant residues remaining after harvest, including discarded crop (falling outside the standards required) which are mixed into this upper layer by cultivation and ploughing. In turn, this provides nutrition to the following crops as it decays. Such relatively shallow nutrient is more immediately available to plants as their roots develop. In turn, this can influence crop growth, and maturity.

(i) Routine Tillage below this plough level by loosening and similar non-inversion operations provides a good structure for root growth, and water permeability (to help drainage). This tillage creates a secondary layer of “Topsoil” below the upper layer, which sits on top of the relatively more sterile subsoil below.

(ii) Not differentiating such topsoil zones (by stripping the entire topsoil as one layer) therefore will result in mixing upon reinstatement, which risks degrading the nature of the uppermost topsoil zone present. TH Clements anticipate that such degradation would:

(iii) Result in a marketable yield loss in this area of the field of up to 40%.

(iv) Lead to crop inconsistencies (affecting maturity) which, at the most severe, would write off these areas when harvesting takes place. The severity of this will depend on many factors including crop type, the growing season, and weather.

4.2.12 Soil quality may also be compromised as a result of field conditions during cable installation. When soils are wet, for example, they have reduced mechanical strength, and are more vulnerable to damage by compaction when they are moved, or trafficked. The soils on land used to construct haul roads and construction compounds would likely be compromised by compaction. In such cases, crop consistency (quality) issues may occur as a result which could take many seasons to overcome. This is because soil loosening operations only create fissures in compacted soil, Over time, the action of growing roots and other biological processes open up, and stabilise these "fissured zones", leading eventually to a situation of well aggregated, stable, and porous soil which is then capable of supporting the crops being grown

4.2.13 Notably, the Outline Soil Management Plan submitted with the DCO application (**ODOW Application Document 8.1.3**) is a high level document. T.H. Clements does not currently have any confidence that the special nature of the silts (soils) in this location of Lincolnshire have been properly understood and assessed by ODOW such that the mitigation measures are sufficient to prevent soil quality from being compromised. Particular concerns include:

(i) **Running Soils (section 3.2)** acknowledges that "Digging in this material becomes difficult because the fine sandy material can 'run' into the excavation, so that the excavation becomes wider but no deeper"… "The Construction of trenches in these materials will require detailed engineering design and process to ensure that suitable construction methods and mitigations are in place". No explanation is given as to how ODOW consider it will be possible to ensure the stability of trenches via engineering methodology particularly given the depths of current drainage systems and the fact that the storage of soil in close proximity to trenches would put increased pressure on already unstable soils and likely result in collapse Section 3.3 acknowledges the predominance of unstable soils is exactly where the top quality soils (those farmed by T.H. Clements) are located.

(ii) **Haul Road (Section 4.4).** Where running soils are involved, the use of aggregate material to create haul roads (as proposed) is unlikely to create stability so as to prevent soils from 'running' under the pressure created by the movement of construction vehicles. There is no detailed consideration of this issue.

(iii) **General Soil Handling Principles (Section 5.1).** Soil handling methodologies based on industry recognised principles for the handling of running silts are notably absent. Liquid soil conditions were, for example, found at 0.9m depth in a field being harvested by T.H. Clements on 4 June 2024. Such conditions require cessation of construction as a matter of principle. If such conditions exist at depth in a normally drier time of year, it is difficult to understand how the proposed Principles can be met; more-so during wetter times of the year. The opportunities for moving soils only in a dry and friable condition are extremely limited, and there is a high risk of construction machinery becoming 'bogged down' at wetter times.

(iv) **General Soil Handling Principles (5.1).** The soil is generally sub-divided into "Topsoil" and "Subsoil". This is also described in 5.7 (soil stripping). Detailed examination of the profile in Foxholes Field (see **Appendix 5**) showed the presence of two layers within the Topsoil zone to 0.7m. It is not clear how, or if, any distinction is planned to be made in this respect. The applicant has not clarified that this situation can exist on these silt loam soils, or how to address it.

(v) **Management of "Running Sand" (Section 5.2).** The location of running sand channels, which can be relatively narrow, is likely to require a closer investigation density than one per 100m. Soil variability is evidenced by differential sinkage of roads installed over such soils including the A16 and others to the East and South of Spalding, and the A1101 either side of Wisbech. The following picture is typical of such a road where differential sinkage is clear at distances of circa 20m or less apart.

Above: differential sinkage on the A1101 Wisbech Road running on underlying Wisbech Association soil

Additionally, the depth of "soil" is defined as 1.2m (see **paragraph 4.3.1 far below**). This, in practice, may vary.

(vi) **Adverse weather (Section 5.3).** The third bullet point in paragraph 47 states that "*If sustained heavy rainfall (eg. >10mm in 24 hours) occurs, soil handling operations must be suspended. Soil operations must not restart until the ground has had at least one full dry day, or an agreed moisture criteria of the soil can be met".* At soil running depth, infiltration of such defined "heavy rain" could take far longer (2 or more days), depending on the moisture status before the rainfall, and the field drainage status.

(vii) **Adverse weather (Section 5.3).** Paragraph 48 states that *"When a rainfall event forces the suspension of soil handling operations, the active strip should be stripped to the basal layer (i.e. measured topsoil depth) before cessation of works".* It is unclear how the need for such soil movement then complies with the requirements in

paragraph 47.

(viii) **Drainage (Section 5.6).** Paragraph 63 states *"…several post construction design techniques will be considered dependant "[sic]" on individual landowner requirements"*. In the case of the land farmed by T.H. Clements, reinstatement to pre-construction standards is required, for example, to allow for jetting of pipes on a routine basis – refer to detailed comments on pages 17 to 22, and **Appendix 6**.

(ix) **Soil storage (Section 5.8).** The proximity of storage bunds to trenches (see first point above) on these unstable soils, means that the risk of running is a concern. Also, paragraph 74 states that *"Topsoil can be stored on either topsoil (of the same type) or on subsoil".* Topsoil stored on subsoil increases risk of contamination (mixing) of these during subsequent soil reinstatement. The high vegetable crop quality standards required of T.H. Clements rely on soil consistency – including maintaining the topsoil in its pre-construction state

(x) **Stockpile Maintenance (Section 5.9).** Paragraph 78 explains that soil stored for over 6 months will have a cover crop sown to protect against erosion, minimise soil nutrient loss, and maintain soil biological activity. Concerns in respect of this proposal include:

(a) Soil stored for less than 6 months, which will not have a crop cover, will be highly vulnerable (in the case of the silt loam soils in question) to erosion by wind and water.

(b) A cover crop sown onto stored subsoil will have compromised (by virtue of delayed, less vigorous, or reduced plant populations) establishment (i.e. the initial stage of germination and growth) due to the poor nutritional content of the subsoil – a key reason not to mix this with topsoil as outlined in previous points.

(xi) **Reinstatement (Section 5.10).** Paragraph 94 states that "For the land in agricultural use before construction this means that the soil is brought as close as reasonably practicable to the physical state it was before construction". The exacting standards of crop quality and consistency required of T.H. Clements rely on all aspects of the soil condition (physical, chemical and biological) being optimal to ensure crop marketable yield is not compromised. All field areas involved in construction therefore are at risk of non-compliance to meet the standards required. It is not known how long (if at all) such a reinstatement process will take. Further detailed consideration will be needed.

<u>Potential contamination of high quality, highly fertile topsoil with stones</u>

4.2.14 As explained above, the Lincolnshire Fens are renowned as some of the very best food growing soils in the Country and indeed the World, being characterised by a number of factors including the complete absence of naturally occurring stone.

4.2.15 Stoneless soils are of significant benefit to farmers growing vegetable crops, as they allow uniform growing throughout the soil profile (allowing the growth of, for example, straight root crops), and minimise the amount of crop rejection by retailers, who are often unwilling to purchase (or will only purchase at a significant discount), vegetable crops that have been distorted by stone-on-root contact. Stoneless soils therefore give growers confidence that they will be able to produce the quality of crop that their consumers require.

4.2.16 A number of underground electricity cables have been installed across Lincolnshire in recent years. The large-scale linear infrastructure schemes known as 'Triton Knoll' (the Triton Knoll Electrical System comprising the onshore connection for the Triton Knoll Offshore Wind Farm) and the 'Viking Link' (the UK onshore element of the National Grid Viking Link Interconnector scheme), for example, both utilised a stone haul road within (along) the construction (cable installation) 'working width' to facilitate movement of machinery and materials in changeable ground conditions, whilst minimising compaction. Comprising of crushed stone and installed directly onto geo-textile laid on top of the subsoil, the haul road is designed to prevent the crushed stone from being integrated into the underlying and adjacent soils, and to allow easy removal of the haul road material prior to restoration and reinstatement of the topsoil.

4.2.17 In practice, however, the use of geo-textiles has not prevented stone transferring off the side of the haul road during use and mixing with the soils adjacent. This is due in part to insufficient geo-textile width being used or low-quality material. In addition, haul road removal creates significant levels of contamination of sub-soils as the mechanical movement of stone leads to tearing and failure of the geo-textile layer which deposits stone on unprotected and inevitably trafficked and disturbed sub-soils. Removal of this stone is either by excavator which results in additional sub-soils being removed or alternatively by hand.

4.2.18 Unfortunately, both of these methods of 'making good' are fallible. Hand picking stone left on subsoils has not been wholly effective with a percentage being left behind that is either buried through the haul road removal process or missed due to being stone/soil mix. The alternative approach of removing a layer of subsoil beneath the haul road to 'catch' any stone contamination results in large quantities of subsoil being removed, lowering field levels and resulting in drainage problems. Any stone that is left behind will naturally make its way through the topsoil to the surface of the land in subsequent years, as a result of usual farming practices, reducing the quality of root crops (by deformation caused by root-on-stone contact).

4.2.19 The need to remove stone by hand is a time-consuming burden, which rests with farmers for years following the completion of construction and 'restoration' of land by promotors.

4.2.20 **Appendix 7** to this written representation, includes (with permission from the various farmers) a) a list of farmers whose land was affected by the Triton Knoll and Viking Link schemes, and who attest to the description of residual stone contamination and its consequences set out in paragraphs 4.2.16 to 4.2.19 (above); b) the contents of an email exchange between one of those farmers and Daniel Jobe of Brown & Co which the farmer has asked that we include; c) photographs provided by another of those farmers showing stone contamination left post construction of the Viking Link project; and d) newspaper article extracts, including from the Lincolnshire Free Press dated 22 October 2024 entitled "Farmer puts out warning after his land is 'decimated' by cables".

4.2.21 Section 8.1.5.6 (paragraphs 222- 228) of Chapter 3 (Project Description) of the ES (**ODOW Application Document 6.1.3)** discusses the haul road. Paragraph 222 states that *"the haul road, typically 6.8m wide (Plate 8.1)* (see above) *(and up to 9m at passing places) including verges and drainage channels (where required)* ***will extend the entire length of the Project onshore ECC and 400kV cable corridor (except where the Project has committed to not construct a haul road, such as in locations where trenchless techniques will be adopted)…****It will be utilised throughout the installation of the export cables and 400kV cables and for the duration of the onshore ECC construction activities."* We note that paragraph 190 of Chapter 3 of the ES states that *"Installing the onshore cable ducts and export cables is anticipated to take up to 42 months.")*

4.2.22 Paragraphs 226 to 228 of Chapter 3 of the ES states that:

"The haul road will comprise a maximum thickness of 1m (average 0.6m) of suitable aggregate placed on top of a heavy-duty terram membrane or similar where required. The exact specification of the road will be determined upon the appointment of a principal contractor at detailed design stage.

Depending upon the ground conditions, it may not be necessary to undertake works to construct the designated haul road. Where the ground is sufficiently firm enough it may be acceptable to use significantly less granular sub-base material. Consideration will also be given to alternatives such as a specialist trackway if appropriate. The final decision will depend upon ground conditions and the contractor's preferred construction strategy and will not be confirmed until the detailed design stage.

> *Any aggregate and/or geotextile membrane installed will be removed, and the land reinstated upon completion of the construction phase.”*

4.2.23 It is notable that reference is made to “suitable aggregate material” but there is no assessment of the impacts attributable to the types of aggregates which may be used. Type 2 aggregate for example is typically made from crushed rock and has a higher dust content than Type 1 aggregate.

4.2.24 Constant use of a haul road constructed from “suitable aggregate” by large vehicles and equipment, particularly in wet conditions, could lead to crushed limestone, stones and rock being washed, or otherwise transported (by vehicle wheels, or on other vehicle components) onto the adjacent land (outside of the ‘working width’) contaminating the top soil of adjacent fields.

4.2.25 Stone contamination is a very significant concern to T.H. Clements as, for the reasons set out above, it would have a direct adverse impact on their ability to grow top quality vegetables on the plots of land affected, which in turn would be likely to result in a higher percentage of crop rejections by retailer customers, associated financial losses and unnecessary food waste.

4.2.26 We note that paragraph 227 states that, “*Consideration will also be given to alternatives such as a specialist trackway if appropriate.”* The use of aluminium trackway would remove the requirement to use aggregate (stone), ensuring that there is no residual stone left on the land post construction. The use of aluminium trackway (or equivalent) should at least be secured in replacement of aggregate in the Code of Construction Practice.

<u>Contamination of and damage to growing crops by dust from construction activities</u>

4.2.27 The RR identified the contamination of, and damage to, growing crops by dust from construction activities as a potential impact from construction activities as a potential impact of the Project **[RR-067, pp.14-15]**. The RR stated that there is a “…*direct significant risk that, as a direct result of the Project construction activities, T.H. Clements will not be able to fulfil its retailer contracts and could incur significant penalties and potentially lose these strategically important contracts, which it would struggle to regain once lost”.*

4.2.28 Subsequent to submission of the RR, T.H. Clements commissioned a detailed dust deposition study to assess the potential for growing crops within land owned by T.H. Clements to be adversely impacted by fugitive dust emissions from the phased construction activities relating to the proposed Project.

4.2.29 The study was completed by Damian Pawson, a Technical Director of Air Quality at Sweco. Damian benefits from over 18 years of professional experience, having graduated from Lancaster University in 2006 with a First Class Honours degree in Environmental Science and is a Full Member of the Institute of Air Quality Management (MIAQM). Damian has extensive experience in completing dispersion modelling studies for large-scale opencut mining projects where deposition of dust was a primary concern, requiring detailed analysis of dust emissions sources and the development of emissions inventories with reference to best practice international guidance (see **Appendix 4** for Damian's CV and bio).

4.2.30 The comprehensive detailed technical report that has informed this summary of potential dust deposition impacts on T.H. Clements' land is presented in **Appendix 14** to this Written Representation.

Sensitivity of Land Farmed by T.H. Clements

4.2.31 In fulfilling significant contracts with leading retailers, T.H. Clements is required to meet stringent minimum quality requirements, in line with the General Marketing Standard (GMS)[2], applicable to each type of vegetable.

4.2.32 With respect to dust soiling (deposition), the minimum quality requirements within the GMS states that products shall be "…*clean, practically free of any visible foreign matter*"[2], subject to allowed tolerances.

4.2.33 Further to this, T.H. Clements customer specifications adopt a zero tolerance approach to visible dust on produce, deeming it unacceptable for purchase. Exceptions may be allowed for natural disasters/weather events, such as the episodic atmospheric transport and widespread deposition of Saharan dust over the UK. In such events, a temporary specification may be applied, but this provides no guarantee that the produce would be accepted by the customer.

4.2.34 Given that the dust likely to be generated by the Project's activities will be associated with the disturbance of topsoil and subsoil layers within the onshore cable route corridor, deposited dust is likely to be dark in colour. Therefore, the Brassica vegetables may present a surface that will provide a contrast to the deposited dust (e.g. white cauliflower curd, light green leaves of cabbage and

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[2] Commission Implementing Regulation (EU) No 543/2011 of 7 June 2011 laying down detailed rules for the application of Council Regulation (EC) No 1234/2007 in respect of the fruit and vegetables and processed fruit and vegetables sectors; Consolidated text: Annex I; Part A General Marketing Standard (accessed via https://www.gov.uk/guidance/comply-with-marketing-standards-for-fresh-fruit-and-vegetables)

Brussels sprout, white/green parts of leek). This could result in deposited dust becoming visible at low levels of deposition.

4.2.35 The shape and form of Brassicas are such that any deposited dust could accumulate / be retained within various parts of the crop as they grow (e.g. layers and leaves of cabbage, leek, Brussels sprout; surface of cauliflower curd; surface of broccoli floret). The potential accumulation of dust would not only increase dust visibility but could also lead to discolouration / spoiling of the vegetable such that it does not meet GMS[3] minimum requirements.

4.2.36 The Brassicas grown on T.H. Clements' land are subject to differing growing seasons, maturation periods, and are harvested at varying times throughout the year. As such, T.H. Clements' land has the potential to be sensitive to dust deposition throughout all months of the year.

Identifying a Dust Deposition Assessment Benchmark

4.2.37 In this study, a benchmark represents a dust deposition rate, expressed as mass per unit area per unit time (e.g. grams (g)/m²/month). Areas where dust deposition are above this benchmark are considered to have the potential for visible dust accumulation.

4.2.38 An annual dust deposition benchmark would not be appropriate for this study, as crops are grown and harvested at different times throughout the year. Therefore, the dust deposition benchmark needed to consider shorter-term periods (i.e. daily and/or monthly) to align with farming activities and recognise the potential for visible dust to accumulate on crops over short timeframes.

4.2.39 In the absence of statutory dust deposition standards in the UK, a range of national and international guidance and best practice documents were reviewed to establish an appropriate benchmark for this study[4].

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[3] Commission Implementing Regulation (EU) No 543/2011 of 7 June 2011 laying down detailed rules for the application of Council Regulation (EC) No 1234/2007 in respect of the fruit and vegetables and processed fruit and vegetables sectors; Consolidated text: Annex I; Part A General Marketing Standard (accessed via https://www.gov.uk/guidance/comply-with-marketing-standards-for-fresh-fruit-and-vegetables)

[4] Environment Agency (July 2013) Technical Guidance Note M17: Monitoring Particulate Matter in Ambient Air around Waste Facilities; Scottish Government (1996) Planning Advice Note 50: Controlling the environmental effects of surface mineral workings. Available online: https://www.gov.scot/publications/planning-advice-note-pan-50-controlling-environmental-effects-surface-mineral/; Federal Ministry for Environment, Nature Conservation and Nuclear Safety*; First General Administrative Regulation Pertaining the Federal Immission Control Act (Technical Instructions on Air Quality Control – TA Luft) of 24 July 2002;* New South Wales Environmental Protection Authority (2022) *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales;* Queensland Government (October 2024) *Environmental Protection Act 1995 Guideline: Application requirements for*

4.2.40 In the UK, a "custom and practice" dust nuisance guideline of 200 milligrams (mg)/m^2/day is widely adopted for general dust deposition. This is acknowledged by the Environment Agency[5] as being limited in that it is "…*simply a custom and practice yardstick and it was never based on actual dose-response data*…", being referred to as a "…*complaints likely guideline for receptors located in residential areas and outskirts of towns*", as per Vallack and Shillito (1998)[6]

4.2.41 In Germany, TA Luft[7] assigns a higher deposition guideline value of 350 mg/m^2/day for the "…*protection against significant nuisances or significant disadvantages due to dustfall*…".

4.2.42 Both UK and German guideline values are not wholly applicable to this study, given the rural location of T.H. Clements' land and the sensitivity of the crops to dust deposition, as dictated by the GMS minimum quality requirements[8].

4.2.43 However, the Vallack and Shillito (1998)[9] study, which is the paper referenced by the Environment Agency[10], also suggested a "*complaints possible*" guideline range for "*open country*" of between 80 mg/m^2/day and 100 mg/m^2/day. This implies that dust may become visible at lower deposition levels.

4.2.44 Similarly, whilst the Scottish Government's Planning Advice Note 50 (Para. 28, Annex B)[11] references the above UK and German guidelines, it recognises the potential for dust to become visible at much lower levels of deposition:

"…*guideline values in the range 200 - 350 mg/m^2/day have been variously used for mineral sites. It should be noted that the nature of deposit can influence strongly the perception of nuisance. For example,*

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activities with impacts to air v5.03; New Zealand Ministry for the Environment (2016) *Good Practice Guide for Assessing and Managing Dust;* Vallack HW and Shilito DE (1998), Atmospheric Environment, Vol 32 (No.16) pp.2737-2744.

[5] Environment Agency (July 2013) Technical Guidance Note M17: Monitoring Particulate Matter in Ambient Air around Waste Facilities.

[6] Vallack HW and Shilito DE (1998), Atmospheric Environment, Vol 32 (No.16) pp.2737-2744

[7] Federal Ministry for Environment, Nature Conservation and Nuclear Safety*; First General Administrative Regulation Pertaining the Federal Immission Control Act (Technical Instructions on Air Quality Control – TA Luft) of 24 July 2002*

[8] Commission Implementing Regulation (EU) No 543/2011 of 7 June 2011 laying down detailed rules for the application of Council Regulation (EC) No 1234/2007 in respect of the fruit and vegetables and processed fruit and vegetables sectors; Consolidated text: Annex I; Part A General Marketing Standard (accessed via https://www.gov.uk/guidance/comply-with-marketing-standards-for-fresh-fruit-and-vegetables)

[9] Vallack HW and Shilito DE (1998), Atmospheric Environment, Vol 32 (No.16) pp.2737-2744

[10] Environment Agency (July 2013) Technical Guidance Note M17: Monitoring Particulate Matter in Ambient Air around Waste Facilities.

[11] Scottish Government (1996) Planning Advice Note 50: Controlling the environmental effects of surface mineral workings. Available online: https://www.gov.scot/publications/planning-advice-note-pan-50-controlling-environmental-effects-surface-mineral/

black coal dust which has a high contrast with its background may cause complaints if deposited at a rate in excess of only 80 mg/m^2/day."

4.2.45 In Australia, the New South Wales Environmental Protection Authority (NSW EPA)[12] has established a criterion of 2 g/m^2/month for maximum 'project-only' contributions and 4 g/m^2/month for the maximum total including background deposited dust. This equates to 65 mg/m^2/day and 130 mg/m^2/day, respectively. NSW EPA state that these criteria "…*must be reported as the 100th percentile*" (i.e. maximum monthly deposition).

4.2.46 Queensland Government[13] references a guideline value of 120 mg/m^2/day, which sits within the ranges established by NSW EPA.

4.2.47 In New Zealand, the Ministry for the Environment good practice guide[14] sets a recommended guideline of 4 g/m^2/month, which aligns with the upper value given by the NSW EPA. However, this document also references that the nature of dust may also be relevant, such that visible soiling can occur at lower deposition rates, stating that "…*some highly sensitive residential areas may find deposition rates of 2 g/m^2/month (above background levels) objectionable and offensive…*".

4.2.48 In this study, the potential for annoyance / nuisance is not being assessed *per se*. T.H. Clements are required to provide produce that is, as a minimum, "…*clean, practically free of any visible foreign matter*". Failure to meet this requirement is likely to result in the affected produce being rejected, resulting in reduced harvested yields and associated revenue losses.

4.2.49 Therefore, the benchmark(s) for this assessment needs to be sufficiently stringent to recognise the sensitivity of the growing fields and the nature of the Brassica crops. As this study focusses on the Project-only dust contribution from construction activities, the benchmark(s) should align with the more stringent deposition criteria referenced above.

Dust Deposition Benchmarks applied in this Assessment

4.2.50 Based on the above review, there is agreement across national and international guidance that visible dust can accumulate at

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[12] New South Wales Environmental Protection Authority (2022) *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*.

[13] Queensland Government (October 2024) *Environmental Protection Act 1995 Guideline: Application requirements for activities with impacts to air v5.03*

[14] New Zealand Ministry for the Environment (2016) *Good Practice Guide for Assessing and Managing Dust*.

relatively low rates of deposition, particularly where the dust is dark in colour and the receiving surface presents a contrast.

4.2.51 Considering the nature of the Brassica crops and the stringent minimum quality requirements for visible matter, the following benchmarks were adopted for this assessment:

(i) **Daily dust deposition benchmark: 80 mg/m^2/day**

(ii) **Monthly dust deposition benchmark: 2 g/m^2/month**

4.2.52 These benchmarks were compared to the results of the dust deposition modelling completed as part of this study, focussing on the Project contribution only. In addition, it was also important to assess the frequency at which these benchmarks might be exceeded within T.H. Clements' land (e.g. number of days and/or months per year that the benchmarks are exceeded, if at all).

4.2.53 In this study, an exceedance frequency of **120 days or more per year** (compared to the daily benchmark) or a frequency of **four or more months per year** (compared to the monthly benchmark) is considered to represent a ***high risk*** of dust accumulation on T.H Clements' land.

4.2.54 In practice, visible accumulation could occur over much shorter timescales, due to the sensitivity of Brassica crops, the time of year (i.e. crop maturity), and variations in the intensity of dust emissions. As such, a modelled exceedance frequency of 30 days or more per year, or one month or more per year, cannot be completely disregarded.

4.2.55 However, in the context of the limitations and assumptions for this study – as set out in detail **Appendix 14** (Section 5, *Technical Report: Dust Deposition Modelling*) and summarised in **paragraphs 4.2.90 to 4.2.115** below – on the balance of probability, a modelled exceedance frequency at or above 120 days or four months (i.e. 33% of the year or more) indicates a high likelihood that the impacted area of land will experience visible dust accumulation (termed as 'high risk').

4.2.56 Overall, the above frequency thresholds are considered appropriate to highlight the risk of visible dust accumulation on T.H. Clements' land without being overly conservative. As such, the likelihood of deposited dust impacting T.H. Clements' ability to produce crops in line with customer requirements could be assessed.

Overview of Assessment Methodology

4.2.57 A detailed account of the assessment method, which included development of a dust emissions inventory and dust deposition modelling for the Project construction activities, is provided in **Appendix 14** (Section 4, *Technical Report: Dust Deposition Modelling*).

4.2.58 Information contained within the Applicant's Environmental Statement and associated documents, as per Project's Examination Library[15], was relied upon. Additional information was requested via an email submitted by Brown & Co. (on behalf of T.H. Clements) to the Applicant on 5 July 2024. A record of the requested information and the Applicant's response, where applicable, is given in **Table 1 below**.

4.2.59 Where the requested information was not provided by the Applicant and/or not contained within the Application Documents, justified assumptions were made in completing the dust deposition assessment, as cross-referenced in **Table 1 below**.

[15] Planning Inspectorate website for ODOW Project Documents and Examination Library accessed via https://national-infrastructure-consenting.planninginspectorate.gov.uk/projects/EN010130/documents

Table 1: Additional information request submitted by T.H. Clements to the Applicant in relation to the proposed Project

Requested Information (issued via email dated 5 July 2024)	Applicant's Response (dated 23 July 2024)
Shapefiles (GIS format) of the proposed Project's onshore cable route, including Order Limits boundary and locations of temporary accesses, construction compounds, in addition to the proposed trenches, haul road alignment, and storage bunds within the 80 m working width corridor.	Shapefiles of the latest Order Limits and Works Plan were provided by the Applicant. Further information on locations of proposed trenches and spoil bunds was not provided. Applicant stated "…*this information is not available at this stage and will be subject to FEED and detailed design*…" Haul road alignment was not provided in requested format, but Applicant provided reference to the indicative alignment (as depicted on Figure 3.4 of Application Document 6.2.3 Chapter 3 Project Description Figures; Examination Library Reference App-089).
Volume of material to be excavated along the onshore cable route, proportioned according to topsoil and subsoil, focussed on the land parcels of concern.	Applicant stated "…*we are checking internally to see if this information is available at this stage and will revert in due course*…" A further follow-up request for this information was issued to the Applicant on 7 August, but no response had been received at the time of writing this report (October 2024). Material volumes calculated based on data / assumptions detailed in Table 4-4 of **Appendix 14** (Pages 24-29, *Technical Report: Dust Deposition Modelling*).
Average width of topsoil and subsoil storage bunds along the onshore cable route.	Applicant stated "…*The indicative cross section can be found in the Project Description on the PINS website*…" However, Plate 8.1, Page 93 of Application Document 6.1.3 Chapter 3 Project Description; Examination Library reference APP-058 does not contain indicative measurements of soil bund widths. Assumed widths of soil bunds calculated based on data / assumptions detailed in Table 4-4 of **Appendix 14** (Pages 24-29, *Technical Report: Dust Deposition Modelling*).
A construction programme, including provisional dates for incremental excavation and backfilling of trenches along the onshore cable route over the land of concern, by land plan reference	Applicant confirmed that this cannot be provided at this stage. Applicant stated "…*At this point in time as outlined previously to the LIG, we cannot confirm this level of detail until we have a contractor appointed for construction activities and have developed a construction programme*…" Approach to phasing and associated limitations and assumptions summarised in **paragraphs 4.2.63- 4.2.67, 4.2.90 – 4.2.93, and 4.2.112** below. Further details in Section 4.2.1 and Section 5 of **Appendix 14** (Pages 24-29, *Technical Report: Dust Deposition Modelling*).
In the absence of a detailed construction programme, provide an estimate of the average number of days over which construction and reinstatement activities would take place in any given land parcel.	Applicant confirmed that this cannot be provided at this stage. Applicant stated "…*We can't provide you with an estimate or average at this point in time due to not having a construction programme. In keeping with our consultation to date, we will keep you and your clients fully informed and we will release this information as soon as it is available*…" No further update provided by the Applicant at the time of writing this report (October 2024). Approach to phasing and associated limitations and assumptions summarised in **paragraphs 4.2.63- 4.2.67, 4.2.91 – 4.2.94, and 4.2.112** below. Further details in Section 4.2.1 and Section 5 of **Appendix 14** (Pages 24-29, *Technical Report: Dust Deposition Modelling*).

Study Area

4.2.60 The spatial scope of this study was determined based on the locations of fields farmed by T.H. Clements that are near to the proposed Project Order Limits. The section of the Order Limits included in the study area equates to approximately 48,300 m in length. The study area extent is shown in **Figure 1** of **Appendix 14**.

4.2.61 The study area captures segments 5 to 14 inclusive of the onshore cable route corridor, as shown in Figure 3.3.1 of Application Document 6.2.3 (**Examination Library reference APP-089**). All construction activities included in the dust deposition modelling were assumed to occur within a 'typical working width' of 80 m within the Order Limits (Para. 32, page 22 of Application Document 6.1.3 Chapter 3 Project Description**; Examination Library reference APP-058).**

4.2.62 For clarity, the land owned by T.H. Clements that falls within the Order Limits was excluded from the study area, given that it would not be possible to farm this land (i.e. no crops present to be impacted by deposited dust).

Proposed Project Construction Phasing

4.2.63 The onshore cable route construction will comprise five phases (Para. 188, Page 84 of Application Document 6.1.3 Chapter 3 Project Description; **Examination Library reference APP-058**):

(i) Pre-construction works

(ii) Enabling works

(iii) Cable infrastructure installation

(iv) Cable installation

(v) Reinstatement works & demobilisation

4.2.64 Since the pre-construction works will be non-intrusive (Paras. 195-198, Pg. 85-86 of Application Document 6.1.3 Chapter 3 Project Description; Examination Library **reference APP-058**) and cable installation works will not include particularly dusty activities (Para. 256, Pg. 100 of Application Document 6.1.3 Chapter 3 Project Description; Examination Library reference APP-058), this study focuses on the potential dust emissions from these three phases:

(i) Enabling works

(ii) Cable infrastructure installation

(iii) Reinstatement works & demobilisation

4.2.65 The construction period for the above phases is anticipated to take up to 42 months (Plate 11.1, Page 117 of Application Document

6.1.3 Chapter 3 Project Description; **Examination Library reference APP-058**).

4.2.66 However, the main construction compounds and temporary access roads are expected to be in use for up to 36 months (Tables 8.2 and 8.3, Pages 87-88 of Application Document 6.1.3 Chapter 3 Project Description; Examination Library reference APP-058). The Applicant also assumes that 100% of the haul road will remain in place for up to 36 months in any one location, except for the section between the A52 and the Landfall compound (outside the study area) (Para. 257, Page 101 of the same document).

4.2.67 Based on this and given the study area does not cover the full onshore cable route, the dust emissions inventory and modelling assumed that each of the three construction phases will last up to 12 months, totalling 36 months. This study also assumed that the haul road will be in use for the entire duration of these phases.

Dust Emissions Inventory

4.2.68 Dust emissions for each identified construction activity were calculated by multiplying an emission factor (a value that represents how much dust is typically produced by that activity) by the rate at which the activity is carried out over time, such as:

$$Dust\ Emission\ (kg/year) = Activtiy\ Emission\ Factor\ (kg/tonne) \times Activity\ Rate\ (tonnes/year)$$

4.2.69 The relevant **construction activities** were identified based on information from the relevant Project application documents, as outlined in **Table 2** (below).

4.2.70 The activity-specific **emission factors** were calculated using equations referenced in United States Environmental Protection Agency (US EPA) AP-42[16] guidance and Australian National Pollutant Inventory (NPI) Emission Estimation Technique Manuals (EETMs)[17].

4.2.71 There is a lack of UK-based or European Environment Agency (EEA) dust emission factors for the activities included in this study.

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[16] US EPA AP-42 Compilation of Air Emissions Factors from Stationary Sources, Fifth Edition, Volume 1 accessed online via: [redacted]

[17] Australian Government Department for Climate Change, Energy, the Environment and Water NPI EETMs accessed online via: [redacted]

However, both EEA[18] and New Zealand guidance[19] cite the use of AP-42 and NPI emission factors when completing a detailed analysis of emissions from construction. The emission factors published by both are acknowledged as "*…the most widely used and extensive data on emission factors*" [20].

4.2.72 US EPA AP-42 factors are frequently used in developing emissions inventories in the UK, including the National Atmospheric Emissions Inventory (NAEI)[21]. Furthermore, both AP-42 and/or Australian NPI factors have been cited in UK-based dust assessments[22,23].

4.2.73 The emission factor equations used in this assessment are detailed in Table 4-3 of **Appendix 14** (Page 18, *Technical Report: Dust Deposition Modelling*).

4.2.74 The use of these emission factors represents a precautionary approach, such that the total dust emissions derived in the inventory for this study may be overestimated. This is because the typical environmental conditions for which these factors were derived (i.e. warmer, drier climates in Australia and the USA) differ from the more temperate climate of the UK.

4.2.75 To minimise uncertainty, all efforts have been made to use emission factors that rely on local and site-specific variables, rather than adopting a universal 'default' emission factor. These variables, along with associated assumptions, are provided in Table 4-3 of **Appendix 14** (Pages 19-22, *Technical Report: Dust Deposition Modelling*) and summarised in **paragraph 4.2.101** below.

4.2.76 The **activity rate** for each construction activity, along with the data sources and assumptions, are detailed in Table 4-4 of **Appendix 14** (Pages 24-29, *Technical Report: Dust Deposition Modelling*). Where possible, data and assumptions specific to the Project and

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18 European Environment Agency (2023) *EMEP/EEA air pollutant emission inventory guidebook 2023: Technical guidance to prepare national emission inventories (NFR 2.A.5.b Construction and demolition)*

19 New Zealand Ministry for the Environment (2016) *Good Practice Guide for Assessing and Managing Dust*.

20 New Zealand Ministry for the Environment (2016) *Good Practice Guide for Assessing and Managing Dust*.

21 NAEI Emissions Factors (28 May 2024), accessed October 2024: [redacted]

22 Wolf Minerals (July 2013) *Hermerdon Mining Waste Facility Environmental Permit Application EPR/FB3639RK/A001, Dust Risk Assessment and Management Plan Appendix 4B-4: Dust Dispersion Modelling* (available online via: [redacted]

23 London Borough of Ealing (May 2006) *Detailed Assessment of Particulate Matter* (Accessed online via: [redacted]

local area have been applied to ensure the robustness and validity of the inventory, in line with the reasoning set out in the above paragraph.

Table 2: Dust-generating activities included in emissions inventory

Phase	Activity included in Inventory	Document Reference / Assumption
Enabling Works	Topsoil	Paras. 66-69 and 76, Pages 20-21 of Application Document 8.1.3 Outline Soil Management Plan; Examination Library reference APP-271.
	Transfer of stripped topsoil to soil bund areas	
	Bulldozer movements	Table 26.3, Page 3 of Application Document 6.3.26.3 Appendix 3 Construction Plant List; Examination Library reference APP-216.
	Installation of haul road aggregate	Para. 226, Page 91 of Application Document 6.1.3 Chapter 3 Project Description; Examination Library reference APP-058.
	Heavy goods vehicle (HGV) movements on haul road (wheel generated dust)	Para. 147 and Table 27.28, Pages 65-66 of Application Document 6.3.26.3 Appendix 27.1 Transport Assessment; Examination Library reference AS1-086.
	Grading of haul road	Table 26.5, Page 4 of Application Document 6.3.26.3 Appendix 3 Construction Plant List; Examination Library reference APP-216.
	Wind erosion (exposed topsoil bunds & exposed areas following topsoil strip)	Assumed based on above Enabling Works activities, which will create exposed areas of soil at risk of wind erosion.
Cable Infrastructure Installation	Excavation of subsoil (cable trenches)	Para. 229 and Plate 8.1, Pages 92-93 and Table 8.5, Page 98 of Application Document 6.1.3 Chapter 3 Project Description; Examination Library reference APP-058.
	Transfer of subsoil to soil bund areas	Para 76, Page 21 of Application Document 8.1.3 Outline Soil Management Plan; Examination Library reference APP-271.
	HGV movements on haul road (wheel generated dust)	As per ‘Enabling Works’.
	Backfill of subsoil to cable trenches	Para. 232, Page 93 of Application Document 6.1.3 Chapter 3 Project Description; Examination Library reference APP-058.
	Wind erosion (exposed cable trench ‘pits’; exposed topsoil & subsoil bunds; exposed surfaces)	Assumed based on above Cable Infrastructure Installation activities, which will create exposed areas of soil at risk of wind erosion.
Demobilisation & Reinstatement	HGV movements on haul road (wheel generated dust)	As per ‘Enabling Works’.
	Backfill of topsoil	Para. 260, Pages 101-102 of Application Document 6.1.3 Chapter 3 Project Description; Examination Library reference APP-058.
	Haul road aggregate strip	Para. 228, Page 92 of Application Document 6.1.3 Chapter 3 Project Description; Examination Library reference APP-058. Table 26.13, Page 8 of Application Document 6.3.26.3 Appendix 3 Construction Plant List; Examination Library reference APP-216.
	Transfer of stripped aggregate	
	Bulldozer movements	
	Wind erosion (exposed areas, excluding reinstated trenches and bunds)	Assumed based on above Demobilisation & Reinstatement activities.

Dust Control (Mitigation) Factors

4.2.77 The above section defines the approach taken to develop a dust emissions inventory *without dust control* measures being in place. An uncontrolled emissions inventory is likely to represent an overly precautionary assessment, particularly as the Applicant has submitted an Outline Air Quality Management Plan (Application Document 8.1.2; Examination Library reference APP-270) and Outline Soil Management Plan (Application Document 8.1.3; **Examination Library reference APP-271**).

4.2.78 To provide a balanced assessment, an emissions inventory *with dust control* measures was developed for comparison with the uncontrolled inventory. The dust control factors, sourced from US EPA AP-42 and/or Australian NPI EETMs, were applied based on the proposed dust control measures for the assessed construction activities.

4.2.79 The dust control factors included in the '*With Dust Control*' emissions inventory are detailed in Table 4-5 of **Appendix 14** (Page 31, *Technical Report: Dust Deposition Modelling*).

4.2.80 The use of these control factors optimistically assumes that all mitigation measures will be put in place and effective from the beginning of each activity. Additionally, these measures are assumed to be applied consistently throughout the entire duration of the activity. The below paragraphs provide an example to explain why this might be an optimistic assumption.

4.2.81 A key dust source during construction is likely to be wind erosion of the topsoil and subsoil bunds. A control efficiency of 40% (*NPI EETM*)[17] has been applied to wind erosion from soil bunds and other exposed surfaces within the Order Limits. This is to align with the proposed 'seeding' of exposed soil bunds (Paras. 78-82, page 22 of Application Document 8.1.3 Outline Soil Management Plan; Examination Library reference APP-271).

4.2.82 The 40% control factor assumes that this level of control applies for the duration of exposure (i.e. 12 months in each phase). However, paragraph 78 of the Outline Soil Management Plan states "…*where soil is to be stored for over 6 months it will be covered or sown over the top and sides with an agreed seed mix to protect the soil against erosion*…". Additionally, paragraph 218 of Chapter 3 Project Description (Page 90 of Examination Library reference APP-058) states that "…*subject to the time of year/weather conditions, stockpiles may be required to be covered until the seeding has germinated and to prevent windswept particles*". Accordingly, it is not clear that this form of mitigation is proposed always to be applied.

4.2.83 The soil description of the Wisbech Association soils[24] farmed by T.H. Clements, for example, specifically refers to these being "…*at risk of wind erosion locally*". This refers to the soil when in a natural state, not in raised bunds. which will dry out and be at even greater levels of risk as a result.

4.2.84 This is supported by an analysis of soils in a field within the study area conducted by soil experts Dr Iain Gould (University of Lincoln) and Philip Wright (Wright Resolutions Ltd) on 4 June 2024. They noted that the soils lack strength/cohesion, which could make soil bunds very loose, erodible, and susceptible to wind erosion. Furthermore, the subsoil is unlikely to be sufficiently cohesive or nutrient-rich (lacking in organic material) to support vegetation cover as a means of reducing wind erosion potential.

4.2.85 In the absence of details regarding when and where soil stockpiles will be covered and seeded, as well as the germination period and effectiveness of the seeding, a consistent control efficiency of 40% is considered to be potentially optimistic.

Dust Emissions Inventory Summary: Without & With Control Measures

4.2.86 The dust emissions inventory for both '*Without Dust Control*' (i.e. no mitigation) and '*With Dust Control*' (i.e. with mitigation) is summarised in Table 4-6 of **Appendix 14** (Page 32, *Technical Report: Dust Deposition Modelling*). The total mass dust emissions were calculated on a 'per year' basis in each construction phase for the Order Limits in the study area.

4.2.87 In each phase, the main contributing emission activities were calculated to be wind erosion from soil bunds and/or exposed areas, and wheel-generated dust from construction vehicle movements on the haul road. This applied to both the '*Without*' and '*With*' dust control inventories.

Atmospheric Dispersion Modelling

4.2.88 Dust deposition modelling was undertaken using the US EPA regulatory-approved AERMOD dispersion model. AERMOD is widely recognised by UK statutory bodies such as Defra and the Environment Agency as a valid tool for assessing air quality impacts, including dust deposition. The model is particularly useful for assessing how pollutants (dust) spread and settle over time, considering local weather conditions, such as wind speed and direction, temperature, and atmospheric stability.

4.2.89 Details of the modelling methodology are provided in Section 4.3 of **Appendix 14** (Pages 35-43, *Technical Report: Dust Deposition*

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[24] Cranfield University 2024. *The Soils Guide.* Available: www.landis.org.uk. Cranfield University

Modelling). A summary of the key model inputs and parameters are provided below:

(i) **Study area:**

(a) The modelled study area was the same as the area depicted on Figure 1 of **Appendix 14** (*Technical Report: Dust Deposition Modelling*).

(ii) **Meteorological data:**

(a) Five years of hourly weather data (2019-2023) were obtained for a 4 km x 4 km grid square centred near Freiston, Lincolnshire. These data are representative of weather conditions throughout the study area. Year 2021 was selected as an appropriate year for use in the model.

(iii) **Modelled dust emissions:**

(a) The activities in the emissions inventory were modelled in AERMOD, based on their location within the cable route corridor, which aligned with a typical 80 m working width inside the Order Limits. Two model scenarios were run to align with the dust emissions inventory, namely:

1) **Scenario 1: '*Without* Dust Control'**

2) **Scenario 2: '*With* Dust Control'**

(b) The annual mass emission totals were converted to a 'per second' emission rate for input to the model based on the modelled source dimension for each activity. The dust emission rates were distributed evenly across each modelled source.

(c) A summary of the modelled emission rates and source characteristics is provided in **Table 3** below. An overview of the modelled dust emissions sources configuration is depicted in **Figure 3** of **Appendix 14** (*Technical Report: Dust Deposition Modelling*).

Table 3: Summary of dust emission rates and source parameters modelled in AERMOD ('*Without*' vs '*With*' dust control)

Phase	Activity Type	AERMOD Source	Modelled Dimension	Modelled TSP Emission Rate (g/m²/s)	
				'*Without* Control'	'*With* Control'
ENABLING WORKS	**Topsoil strip**	Area	3,381,000 m²	1.10 x 10^{-6}	1.10 x 10^{-6}
	Transfer of stripped topsoil to soil bund areas			3.01 x 10^{-9}	1.05 x 10^{-9}
	Bulldozer movements			9.23 x 10^{-7}	9.23 x 10^{-7}
	Installation of haul road aggregate			6.26 x 10^{-10}	2.19 x 10^{-10}
	Grading of haul road			4.89 x 10^{-7}	2.44 x 10^{-7}
	LOADED HGV movements on haul road (wheel generated dust)	Volume line	Equivalent to lengths of each discrete onshore cable route segment included in model.	75.45 g/s*	37.73 g/s*
	UNLOADED HGV movements on haul road (wheel generated dust)			48.53 g/s*	24.26 g/s*
	Wind erosion: Topsoil bunds	Area	2 x 258,405 m² (one bund either side of ''typical 60 m wide permanent corridor')	9.17 x 10^{-5}	5.50 x 10^{-5}
	Wind erosion: Other exposed areas	Area	3,381,000 m²	6.24 x 10^{-5}	3.75 x 10^{-5}
CABLE INFRASTRUCTURE INSTALLATION	**Excavation of subsoil (cable trenches)**	Area	3,381,000 m²	5.08 x 10^{-9}	1.78 x 10^{-9}
	Transfer of subsoil to soil bund areas			5.08 x 10^{-9}	1.78 x 10^{-9}
	Backfill of subsoil to cable trenches			5.08 x 10^{-9}	1.78 x 10^{-9}
	LOADED HGV movements on haul road	Volume line	As per 'Enabling Works'	75.45 g/s*	37.73 g/s*
	UNLOADED HGV movements on haul road			48.53 g/s*	24.26 g/s*
	Wind erosion: Subsoil bunds	Area	2 x 258,405 m² (one bund either side of ''typical 60 m wide permanent corridor')	7.74 x 10^{-5}	4.64 x 10^{-5}
	Wind erosion: Topsoil bunds			9.17 x 10^{-5}	5.50 x 10^{-5}
	Wind erosion: Exposed cable trenches	Area	3,381,000 m²	1.21 x 10^{-5}	1.21 x 10^{-5}
	Wind erosion: Other exposed surfaces			2.63 x 10^{-5}	1.58 x 10^{-5}

Phase	Activity Type	AERMOD Source	Modelled Dimension	Modelled TSP Emission Rate (g/m²/s)	
				'*Without* Control'	**'*With* Control'**
DEMOBILISATION & REINSTSTEMENT	**LOADED HGV movements on haul road**	Volume line	As per 'Enabling Works'	75.45 g/s*	37.73 g/s*
	UNLOADED HGV movements on haul road			48.53 g/s*	24.26 g/s*
	Backfill of topsoil	Area	3,381,000 m²	3.01×10^{-9}	1.05×10^{-9}
	Haul road aggregate strip			2.29×10^{-7}	2.29×10^{-7}
	Transfer of stripped aggregate			6.26×10^{-10}	2.19×10^{-10}
	Bulldozer movements			6.15×10^{-7}	6.15×10^{-7}
	Wind erosion: Exposed areas (excluding reinstated trenches and bunds)	Area	3,381,000 m²	9.05×10^{-5}	5.43×10^{-5}

Notes:

* Volume line emissions represented as a 'g/s' emission rate in AERMOD, with emissions distributed evenly along the entirety of the line source. Emission rate presented in table represents total emission rate along cable route length included in the model. Each cable route segment (5-14 inclusive) was input as a discrete volume line source to enable segment-by-segment dust emissions from HGV movements on the haul road to be proportioned accordingly.

(iv) **Time-varying emissions:**

(a) The core working hours for the proposed Project construction period are 7am to 7pm, Monday to Saturday (Para. 146, page 64 of Application Document 6.3.26.3 Appendix 27.1 Transport Assessment; Examination Library reference AS1-086).

(b) Therefore, all modelled emissions sources, except for wind erosion sources, were 'active' during working hours only (7am-7pm; Mon-Sat) for all weeks of the year. For all other times, including Sundays, emissions from these sources were assumed to be zero.

(v) **Modelled dust particle sizes**

(a) In modelling dust emissions, AERMOD allows the input of location-specific particle size information. For this study, information compiled by Dr Iain Gould (University of Lincoln) and Philip Wright (Wright Resolutions Ltd) were provided and used, based on analyses (i.e. 'particle size distribution' and 'hand texturing' of soil samples) completed in June 2024 within a field inside the study area.

(vi) **Modelled receptors:**

(a) A total of 3,779 discrete receptor points was modelled within the fields owned by T.H. Clements in the study area, representing some 1,388 hectares of land. These receptors were modelled at varying resolutions up to a maximum distance of 1 km from the Order Limits. The receptors were concentrated within the fields closest to the Order Limits (i.e. within 500 m), given the potential for maximum dust deposition to occur at these locations

(b) The receptor locations are depicted on **Figure 3** of **Appendix 14** (*Technical Report: Dust Deposition Modelling*).

(vii) **Model outputs:**

(a) Dust deposition was modelled at all receptors during each phase of construction. The modelled dust deposition outputs were expressed as dust mass deposited over a unit area per unit time (i.e. g/m2/day and g/m2/month) to align with the assessment benchmarks (as above).

(b) A summary of the modelled dust deposition outputs for each discrete receptor in the model is provided in **Table 4** (far below).

(c) The modelled maximum dust deposition impacts across all land owned by T.H. Clements within the study area were analysed, along with the corresponding frequency of exceedances, in each phase of construction.

(d) The modelled frequency and spatial extent of exceedances were used to assess the likelihood of deposited dust adversely impacting T.H. Clements' ability to produce crops in line with customer requirements.

Table 4: Summary of dust deposition model output format

Phase	Model Period*	Output Units*	Output Value*	Benchmark*	Additional Model Output*
Enabling Works	24-hours	$g/m^2/day$	Maximum in year	80 $mg/m^2/day$	No. of benchmark exceedances in year (out of 365 days)
	Monthly	$g/m^2/month$	Maximum in year	2 $g/m^2/month$	No. of benchmark exceedances in year (out of 12 months)
Cable Infrastructure Installation	24-hours	$g/m^2/day$	Maximum in year	80 $mg/m^2/day$	No. of benchmark exceedances in year (out of 365 days)
	Monthly	$g/m^2/month$	Maximum in year	2 $g/m^2/month$	No. of benchmark exceedances in year (out of 12 months)
Demobilisation & Reinstatement	24-hours	$g/m^2/day$	Maximum in year	80 $mg/m^2/day$	No. of benchmark exceedances in year (out of 365 days)
	Monthly	$g/m^2/month$	Maximum in year	2 $g/m^2/month$	No. of benchmark exceedances in year (out of 12 months)

Notes:

* Applicable to model outputs for '***Without Dust Control***' and '***With Dust Control***' model scenarios.

Limitations and Assumptions

4.2.90 A detailed collated account of the limitations and assumptions applicable to this study is provided in Section 5 of **Appendix 14** (*Technical Report: Dust Deposition Modelling*). A summary is provided below.

Construction Phasing

4.2.91 A construction programme with details on phasing, dates, and approach to incremental excavation and backfilling of cable trenches was not available at the time of assessment (see **Table 1 above**).

4.2.92 Based on provisional information included within the Project Description (Application Document 6.1.3 Chapter 3 Project Description; Examination Library reference APP-058), this assessment has assumed that the *Enabling Works*; *Cable Infrastructure Installation*; and *Reinstatement & Demobilisation* phases will each require up to 12 months (i.e. combined total of 36 months) and that the haul road will remain in use throughout all three phases.

4.2.93 On this basis, the results of each of the three construction phases were considered separately (i.e. not combined or considered cumulatively). This approach ensured that no double-counting of dust emissions occurred.

4.2.94 In reality, construction is likely to be progressed in sections along the cable route corridor, which means that some activities from the *Cable Infrastructure Installation* and *Demobilisation & Reinstatement* phases are likely to overlap before moving to the next section (Paras. 189-192, page 84 of Application Document 6.1.3 Chapter 3 Project Description; **Examination Library reference APP-058).**

Construction Activities

4.2.95 All potential dust-generating activities were identified from a review of the relevant Application Documents, as per **Table 2 above**.

4.2.96 The activity rates for each of the identified construction activities were derived, where possible, based on project-specific information and/or information specific to the study area to minimise uncertainty in the development of the dust inventory. Where required, appropriately justified assumptions were made, as summarised in **Table 5 below**, with a detailed account provided in Table 4-4 of **Appendix 14** (Pages 24-29, *Technical Report: Dust Deposition Modelling*).

4.2.97 The activity rates used in developing the inventory were applied on a ‘per year’ basis given the approach adopted to construction phasing (i.e. assumed 12 months per phase).

4.2.98 The emissions inventory for wheel generated dust from haul road HGV movements was based on average daily movements across an assumed 42-month construction period (Paras. 146-147 and Table 27.28, Pages 65-66 of Application Document 6.3.26.3 Appendix 27.1 Transport Assessment; Examination Library reference AS1-086). The table of AADT movements (Table 27.28) also includes the “*maximum daily trip generation*”, which equates to a significantly higher number of HGV movements.

4.2.99 The maximum AADT data were not used in this study to avoid an overly precautionary assessment, given the assumptions applicable to construction phasing, with emissions calculated based on a 12-month period for each phase. However, the maximum HGV movements on the haul road would be likely to generate significantly higher levels of dust relative to the average movements, albeit over relatively shorter periods of time.

Emission Factors for Dust Generating Activities

4.2.100 The dust emission factors applied in this study were derived using equations referenced in the US EPA AP-4216 and Australian NPI EETMs17. As noted, these factors represent a precautionary approach because the typical environmental conditions for which these factors were derived differ relative to the UK.

4.2.101 To reduce uncertainty, local data and relevant assumptions were applied when deriving the emission factors, including:

(i) Wind speed and rainfall statistics based on five years of hourly weather data representative of the study area.

(ii) Representative soil information (moisture content, silt content, bulk density, particle density) provided by soil experts, Dr Iain Gould (University of Lincoln) and Philip Wright (Wright Resolutions Ltd), based on local in-situ surveys completed in June 2024, though it is acknowledged that the values provided will vary throughout the study area.

(iii) A moisture content of 15% for potential haul road aggregate was assumed, ensuring the dust emissions factor was not overly conservative (i.e. 15% likely to be high for aggregate; a higher moisture content results in a lower dust emission).

(iv) A representative silt content of 9% for potential haul road aggregate (e.g. MOT Type 1), which assumes that soil dust of a higher silt content will not settle on the haul road and be re-suspended. (i.e. potentially optimistic in that dust emissions could be higher than modelled).

(v) The assumption that all HGV movements will be completed by a 20 tonne tipper (*Volvo FM420 8x4 Tipper*).

(vi) For open cable trenches, a 50% dust control factor was applied in the '*Without dust control*' inventory to reflect the natural sheltering effect of having exposed surfaces below ground-level.

4.2.102 In terms of general soil handling, the Applicant has stated in the Outline Soil Management Plan (Para. 39, page 50, para. 50, page 19, and para. 67, page 21 of Application Document 8.1.3; Examination Library reference APP-271) that "…*where practicable, soils will only be moved when they are in a dry and friable condition*…". The emission factor equations for soil excavation, transfer, and backfilling activities incorporate a 30% moisture content for both topsoil and subsoil.

4.2.103 The 30% value was based on sampling completed on 4 June 2024 by Dr Iain Gould (University of Lincoln), which found the subsoil to be moist at the time of sampling. Dr Gould noted (email dated 17 July 2024) that "…*a working topsoil would be less than this*…", with soils in the study area described as "…*lacking strength/cohesion*…", such that it "…*could make stockpiles very loose and erodible*…" as the moisture content reduces.

4.2.104 Therefore, applying a 30% moisture content for topsoil and subsoil to these activity equations likely provides an optimistic estimate of dust emissions (i.e. higher moisture content leads to lower dust emission), specifically within the context of the above soil handling principles.

Dust Control (Mitigation) Factors

4.2.105 The '*With Dust Control*' emissions inventory was developed as outlined in **paragraphs 4.2.77 to 4.2.85** above. The assessment optimistically assumed that all mitigation measures will be implemented effectively from the start of the activity and consistently applied throughout its duration to maintain control efficiency.

4.2.106 Given the nature of the soil and handling principles described above, the efficacy of measures such as watering during soil excavation, loading/unloading, and seeding of soil bunds may be limited. An analysis of subsoils typical to the study area, completed by Dr Iain Gould (University of Lincoln) and Philip Wright (Wright Resolutions Ltd) in June 2024 and September 2024, suggests that the subsoil is unlikely to be sufficiently cohesive or nutrient-rich (lacking in organic material) to support vegetative cover as a means of reducing wind erosion potential.

4.2.107 However, the potentially reduced efficacy of such control measures has not been accounted for in the assessment, maintaining an optimistic assessment of total dust emissions.

4.2.108 It was deemed appropriate to ensure a level of optimism (i.e. promoting lower emissions) was preserved in this study to balance the precautionary (i.e. promoting higher emissions) use of emission factors derived from US EPA AP-42[16] and/or Australian NPI EETMs[17]. This ensured that the model outputs would be less likely to skew towards either an over- or under-prediction.

Atmospheric Dispersion Modelling

4.2.109 Although AERMOD is a well-validated model, its predictions may not always completely align with real-world conditions. This is because there can be uncertainties linked to emission factors, weather data used in the model, as well as the simplified way it represents how the atmosphere works. In this study, information specific to the Project and local area have been used to minimise these uncertainties as far as possible.

4.2.110 It is rare to have enough observational data to fully validate model results in a statistically meaningful way. This applies to this study, given the absence of local dust monitoring data to compare against and that the Project has not started.

4.2.111 The model simulates dust particle suspension, transport, and deposition based on generic assumptions about particle size distribution (PSD), wind speed, and surface characteristics, which may not always reflect local realities. However, this study has utilised:

(i) Hourly meteorological data representative of the study area.

(ii) Representative PSD from sampling of soil undertaken on 4 June 2024 within a field adjacent in the study area (source: Dr Iain Gould, University of Lincoln).

(iii) Given that the exact specification and composition of the haul road cannot be determined at this stage, the PSD data were assumed to apply to the haul road emissions sources in AERMOD.

4.2.112 In the absence of location-specific construction activity information, the dust emission rates for each activity were evenly distributed across the respective modelled areas within a typical 80 m working width inside the Order Limits. However, wheel generated dust emissions from the haul road were proportioned according to the HGV movements in each discrete segment of the cable route, as per Table 27.28 of Page 66 of Application Document 6.3.26.3 Appendix 27.1 Transport Assessment (Examination Library reference AS1-086).

4.2.113 A limitation of the modelling approach is that it may not fully capture the fluctuations in dust levels caused by the 'stop-and-start' nature of construction, overlapping of construction phasing, equipment uses, and vehicle movements. This limitation is driven by the nature of construction activities and availability of information specific to each phase and activity. For example, intense emissions over short periods and prolonged periods of inactivity are not captured, which could lead to occasional under- or over-predictions of dust deposition.

4.2.114 Not all the dust-generating activities included in the model are likely to occur continuously over a twelve-month period along the entire length of the Order Limits. For this reason, the annual dust deposition flux was not assessed as a model output.

4.2.115 Modelling dust emissions in isolated phases, using averaged emission rates across the Order Limits provided a suitable approach for assessing dust deposition over shorter time periods (24-hour/monthly). This ensured that the assessment accounted for varying weather conditions and associated fluctuations in dust deposition throughout the year.

Table 5: Collated limitations and assumptions applicable to the proposed Project dust emissions inventory

Parameter	Limitation	Assumption	Reference
Topsoil depth	Topsoil depth "…*is to be determined*…" (Para. 66, page 20 of Application Document 8.1.3 Outline Soil Management Plan; Examination Library reference APP-271).	Topsoil depth of 0.3 m.	Dr Iain Gould (Soil Expert), University of Lincoln, email on 17 July 2024 confirming that a "…*working assumption with agricultural soils would be a topsoil depth to ~30cm*…"
Topsoil / Subsoil parameters	No specific data on topsoil and subsoil bulk density.	Bulk density of 1.4 g/cm^3, applicable to both topsoil and subsoil.	Provided by Dr Iain Gould, University of Lincoln, via email on 17 July 2024. Dr Gould noted that bulk density is likely to vary across the study area, but this value is considered to be representative for topsoil and subsoil.
Number of working days per year	Specific number of available working days per year not stated.	Number of available working days per annum assumed as: 365 days – 52 Sundays – 8 Bank Holidays – 24 miscellaneous days = 281 working days (12 hours/day) = 3,372 working hours.	Core working hours: Para. 146, page 64 of Application Document 6.3.26.3 Appendix 27.1 Transport Assessment; Examination Library reference AS1-086. Number of 'miscellaneous days' assumed to occur at an average of two per month by Damian Pawson (Technical Director, Sweco) to account for unforeseen cessation of works and to avoid overly pessimistic estimate of dust emissions.
Haul road aggregate composition	No specific data on bulk density of aggregate.	Typical bulk density for MOT Type 1 aggregate of 1.6 t/m^3.	Lincolnshire County Council Highway and Flood Authority (March 2021) Development Road and Sustainable Drainage Specification and Construction: March 2021 Edition
	No specific data on silt content (%) of aggregate.	Silt content for MOT Type 1 aggregate of 9%.	
Loaded & Unloaded HGV movements on haul road	No specific data on proportion of loaded and unloaded HGV trips. Type of HGV to be used.	Assumed that half of trips will be loaded, and half will be unloaded. Assumed that 20t tipper (*Volvo FM420 8x4 Tipper)* will be used for HGV trips.	Para. 51, page 22 and para. 146, page 65 of Appendix 27.1 Transport Assessment (Examination Library reference AS1-086) states that "…*the two-way HGV movements assumes a vehicle arriving at a construction access…unloading and departing at the same access*".

Parameter	Limitation	Assumption	Reference
Grader speed	No specific data relating to grader speed.	Assumed average grader speed of 9 km/h.	Specification for *JCB Vibratory Roller VM166D* [redacted]
Topsoil / Subsoil bund placement	No specific information on placement of soil bunds within onshore cable router corridor.	Assumed that soil bunds will be placed either side of the 'typical 60 m wide permanent corridor' and will run entire length of corridor.	Plate 8.1, page 93 of Application Document 6.1.3 Chapter 3 Project Description; Examination Library ref. APP-058.

SWECO

Dust Deposition Modelling: Results & Analysis

4.2.116 The results of the dispersion modelling study, both '***Without***' and '***With***' dust control measures, were reviewed in each modelled construction phase period. A comprehensive review and analysis are presented in Section 6 of **Appendix 14** (Pages 49-58, *Technical Report: Dust Deposition Modelling*).

4.2.117 The extent of maximum dust deposition exceedance areas in each phase, in addition to the exceedance frequency, are visualised in Figures 5 to 28 in **Appendix 14** (*Technical Report: Dust Deposition Modelling Appendix B*). However, a select number of these are replicated in **Appendix 13 (Dust Deposition Plots)**, as referenced below.

4.2.118 The main outcomes of the analysis are presented here, within the context of the below benchmarks and exceedance frequency thresholds identified for daily and monthly dust deposition:

(i) Daily dust deposition benchmark **= 80 mg/m^2/day**
   (a) Exceedance frequency threshold: **120 days or more per year**
   (b) Monthly dust deposition benchmark **= 2 g/m^2/month**
   (c) Exceedance frequency threshold: **4 months or more per year**

4.2.119 A summary of the model results within the context of the above criteria are presented in **Table 6 below**, based on the modelled maximum dust deposition rate and the exceedance frequency.

Table 6: Summary of model outputs for *Without* versus *With* Dust Control scenarios for daily and monthly dust deposition across T.H. Clements's land (Units: Hectares)

Phase	Scenario	Summary of T.H. Clements' land area exceeding benchmark (ha):			
		Max Daily*	>120 days/year**	Max Monthly*	>4 months/year^^
Enabling Works	WITHOUT CONTROL	944	196	342	219
	WITH CONTROL	395	85	170	97
Cable Infrastructure Installation	WITHOUT CONTROL	691	188	309	220
	WITH CONTROL	346	94	171	107
Demobilisation & Reinstatement	WITHOUT CONTROL	367	77	151	88
	WITH CONTROL	220	26	66	33
Benchmark		**80 mg/m^2/day**		**2 g/m^2/month**	

Notes:
* Exceedance area based on modelled maximum dust deposition impact against relevant benchmark
** Area predicted to exceed at a frequency of 120 days per year or more
^^ Area predicted to exceed at a frequency of four months per year or more

Summary of Modelled Maximum Dust Deposition

4.2.120 In each phase and in both the '***Without***' and '***With***' dust control scenarios, the exceedance area based on modelled maximum dust deposition consistently exceeds **100 ha** of T.H. Clements' land. This applies to both the daily and monthly modelled deposition fluxes, except for the maximum monthly deposition in the '*With Dust Control*' scenario, where the exceedance area is 66 ha.

4.2.121 When focussing on the '***With Dust Control***' scenario and modelled maximum daily deposition, the exceedance area ranges from **220 ha** (*Demobilisation & Reinstatement*) to **395 ha** (*Enabling Works*). The maximum daily deposition exceedance area in the *Enabling Works* phase is depicted on **Figure 13.1** within **Appendix 13.**

4.2.122 In the same scenario, the equivalent maximum exceedance area for monthly deposition ranges from **66 ha** (*Demobilisation & Reinstatement*) to **171 ha** (*Cable Infrastructure Installation*). The maximum monthly deposition exceedance area in the *Cable Infrastructure Installation* phase is depicted on **Figure 13.2** within **Appendix 13.**

4.2.123 In each phase, the main dust-generating activities relate to the wind erosion sources (soil bunds and exposed areas, in addition to wheel-generated dust (HGV movements on haul road). Whilst the HGV movements are modelled to be consistent throughout each phase, there is a distinct reduction in wind erosion sources in the *Demobilisation & Reinstatement* phase, due to the reinstatement of subsoil and topsoil within the Order Limits. This explains the clear decrease in maximum exceedance areas reported in this phase.

Summary of Dust Deposition Benchmark Exceedance Frequency

4.2.124 When changing focus to the modelled exceedance frequency, it is evident that the area of T.H. Clements' land subject to an exceedance frequency of equal to or above 120 days (compared to the daily benchmark) and 4 months (compared to the monthly benchmark) are of a similar magnitude.

4.2.125 In the '***With Dust Control***' scenario:

(i) Daily benchmark exceedance frequency $\geq$120 days per year;

(a) A ***high risk* of visible dust accumulation is predicted across 94 ha** (*Cable Infrastructure Installation*); **85 ha** (*Enabling Works*); and **26 ha**

(*Demobilisation & Reinstatement*) of T.H. Clements' land, respectively.

(b) The daily benchmark exceedance frequency plot for the *Cable Infrastructure Installation* phase is shown on **Figure 13.3** within **Appendix 13**.

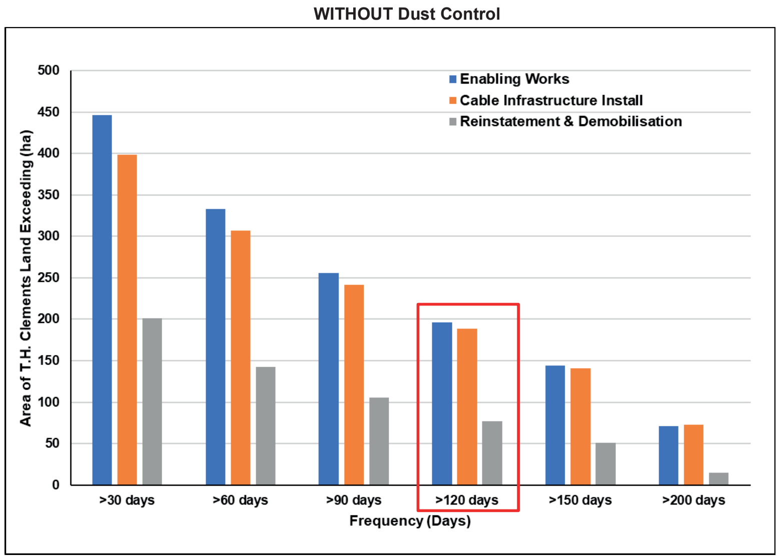
(ii) Monthly benchmark exceedance frequency $\geq$4 months per year;

(a) A ***high risk* of visible dust accumulation is predicted across 107 ha** (*Cable Infrastructure Installation*); **97 ha** (*Enabling Works*); and **33 ha** (*Demobilisation & Reinstatement*) of T.H. Clements' land, respectively.

(b) The equivalent monthly benchmark exceedance frequency plot for the *Cable Infrastructure Installation* phase is shown on **Figure 13.4** within **Appendix 13**.

4.2.126 The same level of agreement between the daily and monthly exceedance frequencies is evident in the '***Without Dust Control***' scenario, but with the modelled exceedance area being at a notably greater magnitude (see **Table 6 above**). This is exhibited on **Plate 1 below** (daily dust deposition: '*Without'* vs '*With'* control) and **Plate 2 below** (monthly dust deposition: '***Without***' vs '***With***' control).

Plate 1: Frequency of daily benchmark exceedances per year against area of T.H. Clements' land ('*Without* Dust Control compared to '*With* Dust Control')



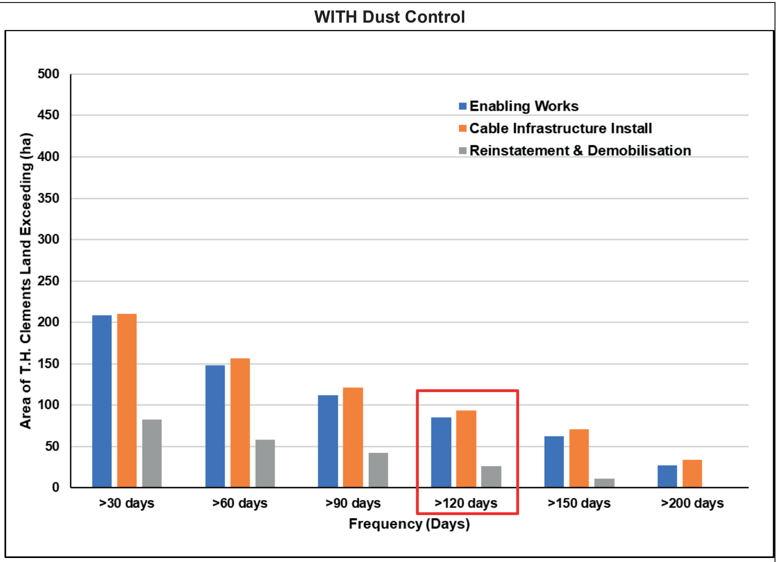
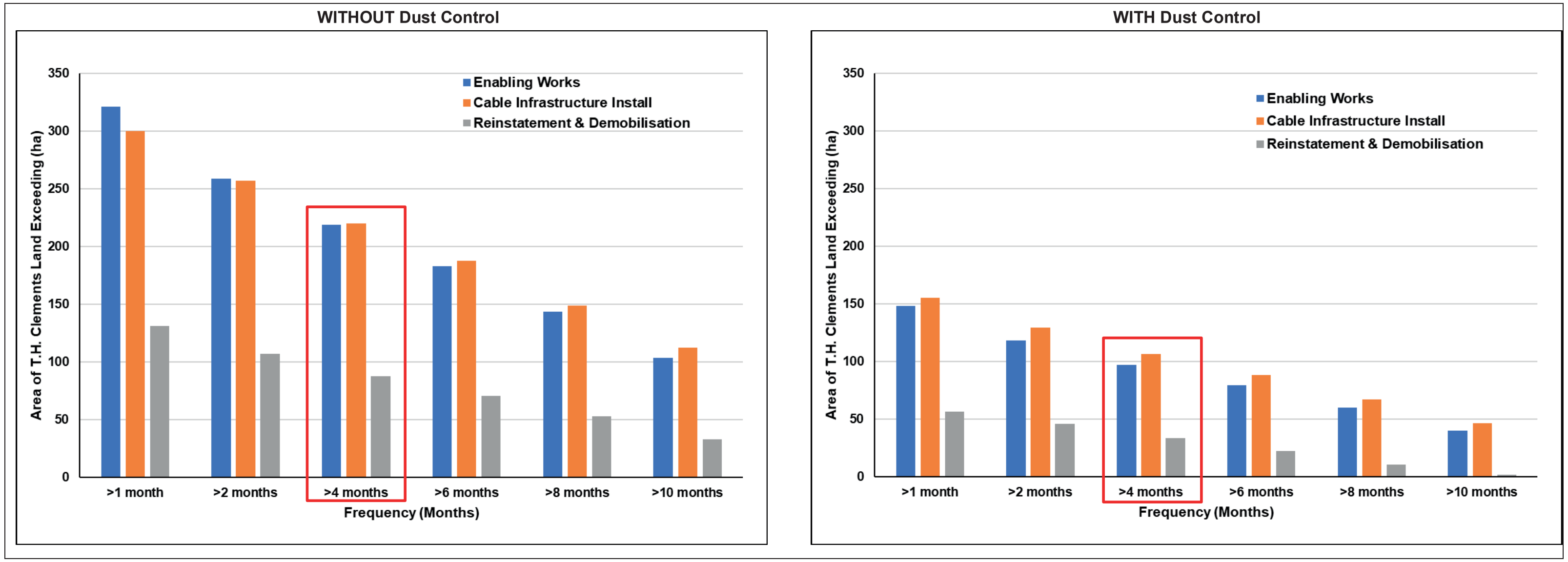


Plate 2 Frequency of monthly benchmark exceedances per year against area of T.H. Clements' land ('*Without* Dust Control compared to '*With* Dust Control')



4.2.127 For the reasons detailed in the 'Limitations and Assumptions' section, it is appropriate that the conclusions of this assessment focus on the '***With Dust Control***' scenario, given that the '***Without Dust Control***' results are likely to represent an overly cautious prediction.

4.2.128 However, with reference to **paragraph 4.2.54 (above**), the thresholds applied for defining a 'high risk' of visible dust accumulation are relatively lenient (i.e. >120 days or >4 months) and the application of dust control factors is potentially optimistic (see **paragraphs 4.2.80 to 4.2.85 above**). Therefore, it is possible that the impacted area of T.H. Clements' land will be of a magnitude that is between the upper ('***Without Dust Control'***) and lower ('***With Dust Control***') modelled outcomes presented in **Table 6 above**.

Conclusion on Dust Contamination

4.2.129 The assessment has demonstrated that **a significant area of T.H. Clements' land would be at high risk of receiving dust deposition at a rate and frequency that could lead to visible dust on growing Brassica crops**.

4.2.130 This risk is particularly relevant during the *Enabling Works* and *Cable Infrastructure Installation* phases of construction, especially on land closest to the Order Limits. Therefore, **T.H. Clements' ability to produce crops in line with customer requirements is likely to be compromised in these areas**. The affected areas extend materially beyond the red line of the Project.

4.2.131 As explained above, T.H. Clements customers have very exacting quality standards and will not accept vegetable produce contaminated by dust. It would not be possible for T.H. Clements to try to remove the dust contamination as washing vegetables impacts their shelf life, as well as their appearance, contravening service level requirements meaning they will not be accepted by retailers.

4.2.132 There is therefore a significant risk that, as a direct result of the Project construction activities, T.H. Clements will not be able to fulfil its retailer contracts and could incur significant penalties and potentially lose these strategically important contracts, which it would struggle to regain once lost.

Severance

4.2.133 During construction of the proposed Project it would not be possible to farm the land occupied/being utilised for that purpose by ODOW (i.e. the 'working width', construction compound areas and temporary accesses). T.H. Clements are concerned that, as a result of the occupation/use of the 'working width', compound areas and temporary accesses, parts of fields that they farm that are not directly affected by the working width, compounds and accesses (i.e. land out with the Order land) may become inaccessible or be too small to farm by itself.

4.2.134 Order Land Plots 27-015/27-019; 27-021; 27-027; 27-030; and 29-013/30-002) will result in severance and it would be impractical to farm the retained areas of land during the Project's construction phase due to their small size, shape and high headland percentage (i.e. the parts of fields where farm machinery turns/changes direction whilst undertaking cultivation, harvesting etc.).

4.2.135 While shapefiles for the Land Plans have not been made available to T.H. Clements, they estimate that the amount of growing land sterilised will be in the region of 85 acres.

4.3 Adverse impacts on farming during, and following operation of the proposed Project

Insufficient cable burial depth

4.3.1 The 'standard' depth at which ODOW intends to install the majority of the onshore cable (i.e. 1.2m to the protective tile above the cables, save where trenchless construction techniques are used to 'cross' obstacles such as roads and water courses at a greater depth) is insufficient to enable normal farming practices to safely resume post construction, for the following reasons:

(i) Location (depth) of field drainage systems – As explained above, the soils along the stretch of the cable route that T.H. Clements farm are deep, predominantly fragile silty, and coarse silt loam soils. Being permeable, these soils are able to absorb and store a significant amount of water, which makes them excellent soils for growing the very best vegetable crops. While these soils are highly permeable, drainage of excess surface water is managed by way of underground field drainage systems comprising networks of pipes, and associated pumps feeding into ditches/watercourses.

(ii) Field drainage systems are usually installed in excess of 1.2m deep (depth from ground surface to installed pipes). ***Appendix 8*** provides typical examples, with measurements. Silty soils are also particularly susceptible to structural change, and have a tendency to move/shift, especially during periods of heavy rainfall (hence their often being colloquially being referred to as 'running silts' as noted above). As such, the depth of burial cover of underground features, including potentially underground electricity cables, can change.

(iii) If the proposed ODOW cable burial depth is only 1.2m from the surface of the land, the cables would very likely cut through, or potentially even pass above, existing underground drainage systems. This would seriously compromise the existing field drainage systems installed at these depths, and likely result in:

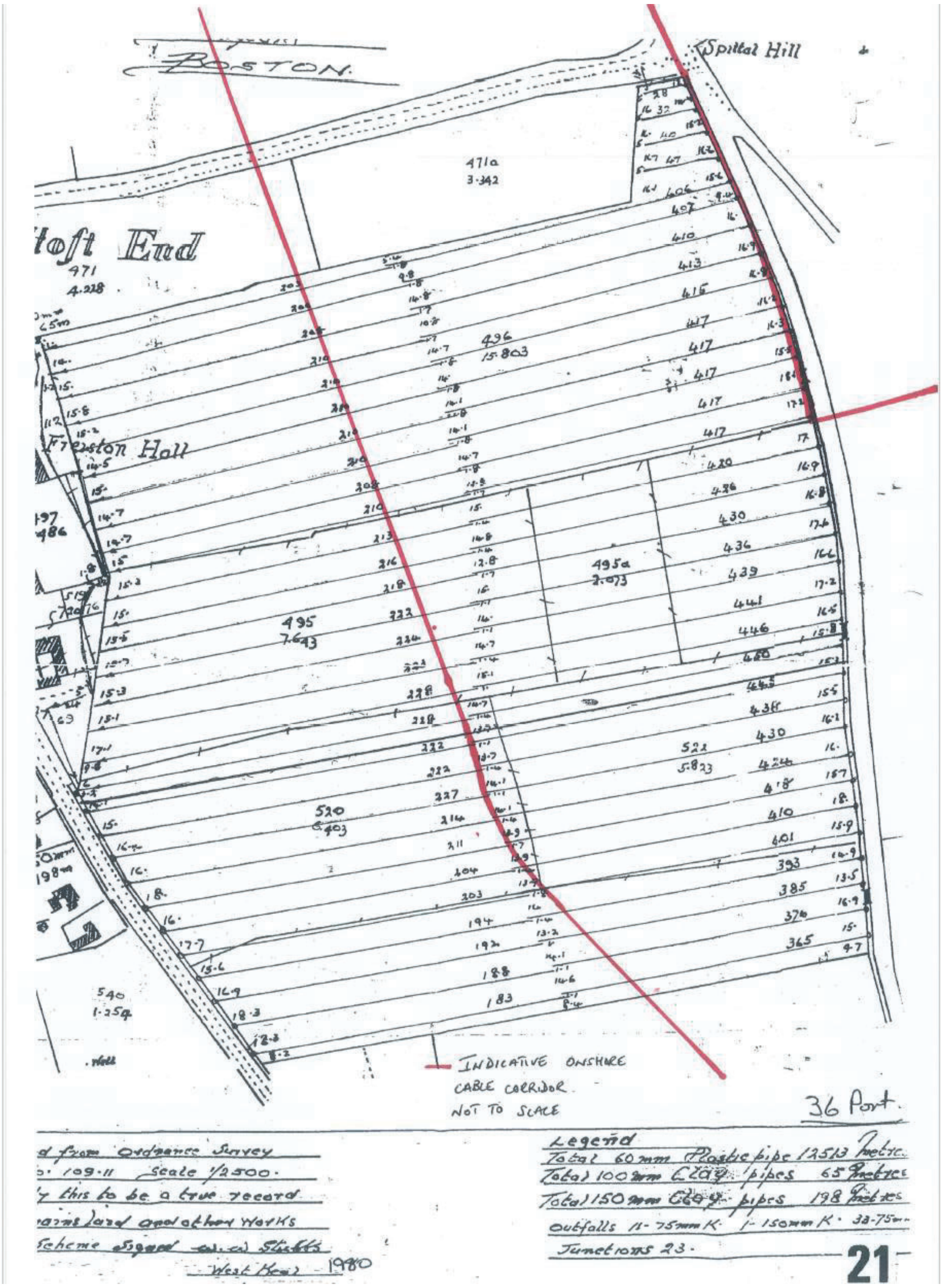
(a) serious technical and health and safety challenges for ODOW to manage. It should be noted that soils examined on 04/06/2024 (within a field in close proximity to the ODOW cable route and at that time being harvested by T.H. Clements) had moisture levels at, and below depths of 0.9m, which were above the typical liquid limit (see ***Appendix 9***). Consequently, the field would have drains (pipes) that are running with water – even at this point in the season. Severing such pipes would cause local waterlogging when cable trenches were dug. This could render the trench walls unstable, at best, and at worst, liable to cave in.

(b) the need for completely new drainage schemes to be installed where existing drainage pipes cannot be reinstated to their original state. This could be due to the cables being buried close to drainage depth and the drainage pipes being severed and needing to be replaced. Any diversion of a drainage pipe (upwards, downwards or to the side of its initial location) will result in soil particles (silt especially) being deposited at these deviations. Ultimately, such deposits can only be removed by frequent maintenance, either by jetting the pipes (see ***Appendix 6***) or excavating the ground adjacent to expose, and then clear, the blocked pipes. The upshot of this, is the need to remediate issues directly resulting from the installation of the ODOW cables, in close proximity to them.

(c) the need to render any remaining, severed pipes incapable of transmitting water. Perforated pipe would need digging out, otherwise water channelled by such upstream pipes (in effect, doing their job) is led to the vicinity of the cable run (where they are severed) – making this area wetter, and more susceptible still to damage by farm, or construction machinery sinking through. Please see the section following for more information on the risks associated with sinking farm machinery.

4.3.2 Where existing drains are cut through (severed) in order to install cables, reinstatement must ensure full functioning of the drainage system is restored. If this were not possible, water table depths would be affected, and as a direct result, the soil strength and support capability (for all future field operations) would be compromised. Clearly, where existing drainage systems are cut through (severed) by cables running at similar depth, appropriate restoration to maintain drain grades and drain spacings (which determine water table depth, and effectiveness of the drains themselves) cannot be achieved.

4.3.3 The following drainage map of Foxholes Field (owned and farmed by T.H. Clements) is provided by way of an example of a single field along the route. It shows the estimated position of the proposed cable route (the limits of the route taken are outlined in red):



[Above: Foxholes Field owned by T.H. Clements. The proposed cable route is estimated from the data currently available, shown in red]

4.3.4 The cable route cuts through almost all Eastwardly running drains (of which there are at least 29) installed in Foxholes Field as shown. Clearly these will all need reinstating (at the project reinstatement phase) with pressure tight, unrestricted, straight joints each side of the cable run to avoid risk of the area above, and around the cable zone becoming wetter through seepage of water from any blocked pipes back into the surrounding soil.

4.3.5 The drain depth (see ***Appendix 8***) in Foxholes Field runs almost exactly at the proposed ODOW cable depth (allowing for local field variability and the gradient from the outfalls). This will result in severance of these drainage pipe runs, which it will not be possible to restore in direct alignment. Joined pipe runs which are not in direct alignment cannot be jetted effectively (see ***Appendix 6***), increasing the likelihood of blockages occurring along the entirety of the reinstated pipe runs, and compromising the overall effectiveness of the drainage system.

4.3.6 It is therefore unclear how the current, effective drainage system can be reinstated after the ODOW cables are installed, if the depth of the drains and the proposed cable depth (at 1.2m) are similar.

(i) Unless the existing drain/pipe paths can be maintained, it will not be possible to jet them out (see ***Appendix 6***) along their full length across the field.

(ii) Where drains cannot be jetted, the risk of blockage by silt is high. Blockages then lead to water building up, and seepage of water ahead of the blockage back into the surrounding field. Such build-up leads to local waterlogging, and a significantly increased risk of farm machinery becoming bogged-down in exactly the places where the cables have been installed.

(iii) Installing an underground main drain (intersecting, and joining the cut drainage pipes) parallel with an underground electricity cable would render the jetting of such joined pipes impossible. **This is a totally unacceptable situation as far as agricultural drainage practice is concerned on these high silt content soils.**

(iv) If the proposed cable depth (1.2m) were to be used, installing an entirely new drainage system above the installed cables would be practically unworkable , as a drain pipe depth of less than 1m would be too shallow for effective water table management. Clearly, the safest and most practical option is to bury the cables deeper, below the existing field drains. Using pressure-tight, stepless joints would enable the replacement drainage pipe sections to be installed above the cable, replicating the current pipe directions, and depths, which can then be regularly, and effectively jetted for future maintenance. This would reduce the risk (depending on cable depth) of sinking farm machinery accidentally coming into contact with the cables.

4.3.7 In open correspondence dated 03/04/2024 (reference OuterDowsing/22000094/LG), ODOW's appointed land agents, Dalcour Maclaren, acknowledged that T.H. Clements would not be able to continue to farm land were the ODOW cables to be buried at insufficient depth. They indicated a commitment to bury the cables at a minimum depth of 300mm below the existing operational field drainage to address that issue: "My client will endeavour, wherever practical, to install the cables at a minimum depth of 300mm below the existing operational drainage". If, for whatever reason, this is impractical for the Contractor, TH Clements would consider that such a situation then also makes it impractical for them to farm this high silt content land for vegetable and root crops, due to the compromised field drainage resulting. Soils with restricted, or compromised drainage are more vulnerable to compaction (soil strength, and the capability to support machinery is directly related to moisture content – wetter soils are mechanically weaker). Increased levels of compaction can occur at any depth where soils are mechanically weaker. Water table depth reduces where drainage is compromised, requiring more time for the soil to dry to sufficient levels to allow effective cultivation can be carried out. In turn, this reduces the windows for cultivation, compromising crop establishment and timeliness. When supply of vegetables is required to rigorous timescales, any compromise which limits the ability to establish a sequence of crops through the year must be avoided. Effective drainage is therefore key.

Waterlogging of land and 'sinking' of farm machinery

4.3.8 As noted above, while the soils along the stretch of the cable route that T.H. Clements farm are able to absorb and store a significant amount of water, and a certain amount of excess water can be successfully managed by way of underground field drainage systems, during periods of heavy rainfall (which are increasingly frequent), the fields comprising of silty soils can become waterlogged and surface waterlogging must be promptly addressed by T.H. Clements to ensure the preservation of growing crops.

4.3.9 Digging deep channels/trenches (down to 1m or more in depth from the original surface of the land) to allow the standing water to run off into surrounding watercourses/ditches is the accepted method of mitigating the effects of water logging on growing crops. ***Appendix 10*** refers to typical trenches dug for this purpose, and the reasoning behind it.

4.3.10 It is vital to T.H. Clements' business that trenching and other deep soil interventions are made as soon as waterlogging occurs to avoid damage/deterioration, and ultimately loss of, growing crops.

4.3.11 Should the ODOW cable be installed at a depth of only 1.2m, the trenching operations could not be safely completed by T.H. Clements, which would result in damage/deterioration, and ultimately loss of, growing crops.

4.3.12 Furthermore, it is not uncommon for farming machinery to 'sink' into (become bogged down in), and have to be retrieved from, silty soils, particularly during periods of heavy rainfall. In those circumstances, deep, intensive soil movement is required to extract the machinery and repair the damage incurred. The depth of the soil affected is often well in excess of 1m below the surface of the ground when harvesting machinery becomes bogged down, sinking down to the axles. The spraying machinery operated by T.H. Clements also has a high potential to sink through the soil (under wet conditions) to depths (from the ground surface to the wheels) **in excess of 1.2m. Loads imposed by sunken spraying machinery can exceed 9 tonnes per axle at depth**. Furthermore, these sprayers can have a "high ride" capability to increase their ground clearance (and therefore their potential sinkage depth) up to 2m. High clearance can help passage across potato and Brussel sprout crops (having high crop canopies) usually between August through to January, at which times ground is potentially at, or beyond, its water absorption capacity and therefore most vulnerable to sinkage risk.

*Above: Agrifac sprayers of the type used by TH Clements 'bogged down'– see **Appendix 11** for further details*

*Above: typical harvesting machinery operated by TH Clements shown 'bogged down'/sunk– see **Appendix 11** for more detail*

Appendix 11 and Appendix 12 give greater detail behind the above examples of harvesting and spraying machinery.

4.3.13 Consequently, the proposed cable burial depth of 1.2m below ground surface level will be far shallower than the depths of routine farming practices (especially when those practices are undertaken in a wet season, when machinery will be susceptible to sinking) as outlined. This would put the installed cables at high risk of damage and farm machinery operators at high risk of physical harm.

4.3.14 The potential for movement of silty soils, due to natural erosion and ground shrinkage, and consequent risk of reduced depth of cover over the cables, would exacerbate an already significant health and safety risk to T.H. Clements. Monitoring changes to ground levels would require detailed, and regular surveying of the large areas impacted by the cable. Without this, it would not be possible to know the exact depth of the cables at any point in the future.

4.3.15 In order to retain the ability for T.H. Clements to safely farm these highly productive fields post construction of the proposed Project, the cables would need to be buried at appropriate depths which the appointed cable installation contractor is confident will allow usual farming practices to be safely carried out. This includes making an allowance for the fact that farming machinery may sink to depths of at least 1.2m, and up to 2m below the surface of the land. In the light of ODOW's proposal to bury cables at a depth of just 1.2m, TH Clements are extremely concerned as to how the Contractor would propose to achieve this. These concerns are further increased in the light of the running soils present along the proposed route, and their instability at such depths also being the case during the construction phase.

<u>Adverse impact of electromagnetic radiation and heat from the cables on the soil and its microorganisms</u>

4.3.16 T.H. Clements has invested heavily in soil management, to ensure that the soil it farms is of the highest quality, which includes creating a healthy environment for soil microorganisms. T.H. Clements are particularly concerned about the adverse impact that electromagnetic radiation and heat emanating from buried cables could have on the quality and productivity of the soils on the land it farms.

4.3.17 There is emerging scientific evidence *(Mahadeven A & Young, G:* ***Electromagnetic Radiation from Electronics does affect Plant Growth****. JEI v3, #1 (2020)* [redacted]*)* that electromagnetic radiation (EMR) can compromise the growth of certain plants.

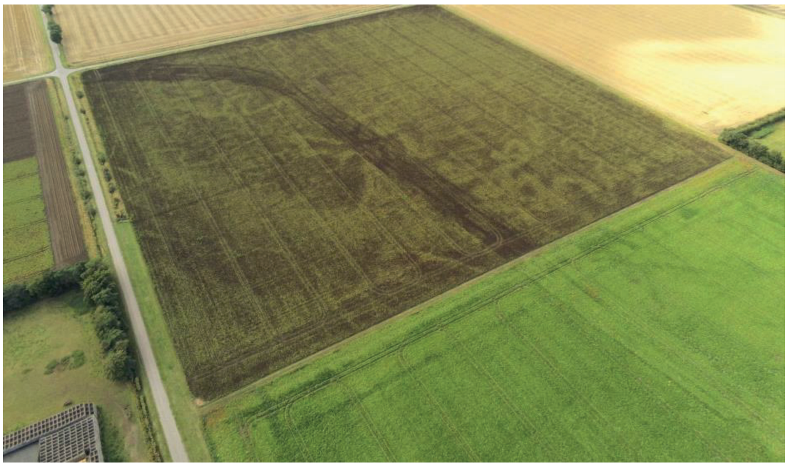
4.3.18 Other evidence (Ignatavičienė, I., Vyšniauskienė, R., Rančelienė, V. et al. ***The effects of electromagnetic radiation of extremely low frequency on growth parameters and nucleotide substitutions in L. minor clones****. Acta Physiol Plant 46, 47 (2024).* [redacted] shows some types of electromagnetic radiation can stimulate growth.

4.3.19 Review papers have commented *"Electromagnetic radiation from various sources, such as power lines, wireless communication devices, and even sunlight, can affect plant growth, development and overall agricultural productivity"* (***Enhancing sustainable plant production and food security: Understanding the mechanisms and impacts of electromagnetic fields***" Ayesha, s et al., Plant Stress 9 (2023) 100198). Such effects could compromise crop consistency (and therefore marketable yield) in the vicinity of the cables.

4.3.20 Heat emanating from underground cables could also cause some crops (those planted in the vicinity of the cables) to develop more quickly than others. It would not be feasible to harvest crops within the same field at different times, meaning that crops that matured early would have to be discarded upon harvesting as they would be over-ripe and unsaleable. This situation is far more extreme in the case of vegetable crops grown to exacting standards, these needing to be consistently ripe. With combinable crops, once ripe, they can stand in the field awaiting harvesting for a number of days, allowing other areas at different stages of ripening to also become suitably ripe for harvesting.

Above: example of heat emitted from a buried electrical cable seen to melt frost cover – picture of a Triton Knoll cable near Amber Hill, Boston.

Below: Triton Knoll cable effect near Sibsey Northlands in two crops showing different growth stages and resulting inconsistent crop canopy effects. These are crops coming to the second, and third harvests since reinstatement respectively.



5 <u>Compensation, Funding and Socio-economic impacts</u>

5.1 Compensation per se is not for this Examining Authority to consider. However, in order to evaluate whether or not there is a compelling case in the public interest for the compulsory purchase powers and whether or not those powers are proportionate, it is critical to understand whether or not compensation is available to all affected parties. Where there is no entitlement to compensation, in the absence of agreement from the undertaker to pay compensation, interference with an occupier conducting its business on the land is unlikely to be justified and the Order ought not to be made.

5.2 The way land is now farmed, and has always been, in Lincolnshire is not fully reflected in the Compensation Code. The way in which T.H. Clements holds, occupies and farms land affected by the Project is set out above. Much of the land T.H. Clements farms is farmed on an informal basis which is insufficient to found a compensation claim, including a claim for disturbance (which would likely be a significant part of any claim made by T.H. Clements).

5.3 In broad terms, the Compensation Code requires a proprietary interest in order to qualify for compensation, including disturbance. The main categories of persons that this might include are: freeholders, leaseholders, mortgagees, owners of rent charges, beneficiaries under trusts of land and owners of equitable interests (e.g. an option to purchase land). It does not include those without a formal interest in land such as a licensee. Those area which T.H. Clements farms on an informal basis would not qualify.

5.4 There is a right under section 37 of the Land Compensation Act 1937 for disturbance payments to be made to persons who are disturbed from their lawful possession of land acquired but who do not have a proprietary interest which would otherwise entitle them to compensation (which would cover such informal arrangements). However, section 37 does not assist here, as subsection 37(7) disapplies section 37 in relation to any land which is used for the purposes of agriculture.

5.5 Section 22 of the Agriculture (Miscellaneous Provisions) Act 1963 ("the 1963 Act") is capable of assisting. It is entitled "*Allowances to persons displaced from agricultural land*" and provides for payments to persons displaced from agricultural land. It is the broadly equivalent section to section 37 of the 1973 Act but applies to agricultural land. However, there is a fundamental difference: it is a discretionary power to pay compensation to those without a formal interest in agricultural land, not an obligation. As such, it does not protect T.H. Clements without the express agreement of the ODOW.

5.6 Paragraphs 231 and 232 of the Statement of Reasons **[AS1-032, p.40]** state:

> "*231. All known occupiers of land affected by the Onshore ECC have been consulted with. Those with an Agricultural Holdings Act (AHA) tenancy or Farm Business Tenancy (FBT) with a period of more than 2 years will be able to sign into the HoTs so long as the landowner has not reserved rights to grant easements. Where there is a more informal arrangement in place, the occupier will be eligible to sign into an Occupiers Consent Form with the Applicant, enabling them to submit a claim to the Applicant for losses as a direct result of the Project.*
>
> *232. The Occupiers Consent Form has not yet been issued to any occupiers and is currently under review with the Solicitors Action Group ("SAG"). The SAG is a working group of solicitors similar to that of the LIG, representing the majority of landowners and occupiers affected by the Project.*"

5.7 The Occupiers Consent Form has been issued. T.H. Clements is due to sit down with ODOW in November and welcomes the opportunity to negotiate. The Occupiers Consent Form is a deed under which the occupier of land consents to grant of an option agreement and deed of grant by the underlying landowner (which grant ODOW the necessary rights to build out the Project) in return for certain compensation. T.H. Clements acknowledges that this could be the basis for future agreement but it does not address some fundamental issues which will likely propagate loss such as cable depth and drainage – outlined above – and nor does it explicitly compensate for crop damage outside of the land covered by the option agreements which may be necessary where crop loss is caused by fugitive dust. T.H. Clements looks forward to sitting down with the ODOW on these points. However, as things stand, without an agreement with ODOW, T.H. Clements does not have a right to be compensated across a significant proportion of the area it farms and which would be affected by the Project.

5.8 The Examining Authority is, therefore, currently being asked by ODOW to recommend approval of compulsory purchase powers without any guarantee of compensation.

5.9 Expropriation without compensation and for the commercial benefit of a private business is plainly inappropriate and disproportionate. It is only compensation that can make powers of expropriation in the public interest proportionate so as to warrant their use and the interference with human rights.

5.10 Paragraph 17 of the CA Guidance, states that any application for a development consent order authorising compulsory acquisition must be accompanied by a statement explaining how it will be funded. Such statement should provide as much information as possible about the resource implications of both acquiring the land and implementing the project for which the land is required. If a project is not intended to be independently financially viable, or financing details cannot be finalised until there is certainty about the assembly of the necessary land, the applicant (in this case ODOW) should provide an indication of how any potential shortfalls are intended to be met, including the degree to which other bodies (public or private sector) have agreed to make financial contributions or to underwrite the scheme, and on what basis such contributions or underwriting is to be made.

5.11 As explained above, the construction of the Project would result in the loss of a vast amount of highly productive farming land, including a significant amount of the land currently being farmed by T.H. Clements.

5.12 The loss of that land would have such a detrimental impact on T.H. Clements farming operations including production capacity and service level requirements for retailers, that it would be near impossible for T.H. Clements to fulfil its supply contracts with its customers (retailers). The loss of supply contracts with key retailers, including Tesco Plc, (which, if lost, would be very difficult to regain in the foreseeable future) could be so significant that the business could be extinguished as a result.

5.13 T.H. Clements current annual turnover is £80 million and it is anticipated that this will increase to circa £100 million within the next three years. Notably, the proposed Project's Property Cost Estimate (ODOW Application Document Reference 4.2.4) is only just over £51 million.

5.14 If compensation is agreed in principle (as it must to justify the compulsory purchase powers and interference with property rights protected by the Human Rights Act), compensation for the extinguishment of a circa £100m/year for a single business (there are many farming businesses affected by the Project), would be significant in itself and of such order of magnitude that it could comfortably exceed the Project's Property Cost Estimate on its own.

5.15 While Article 44 of the Order, as currently drafted, would require ODOW to put in place a guarantee or other form of security in respect of its liability to pay compensation under the Order, before exercising any compulsory acquisition or temporary possession powers, ODOW would at present appear to fail to meet one of the key considerations which must be demonstrated to the satisfaction of the Secretary of State in order to meet the overriding test for making of the Order including compulsory acquisition powers in the first place (i.e. that there is a compelling case in the public interest to justify interference with the private rights of those who have interests in the land included in the Order).

5.16 If compensation is not agreed in principle, not only does it raise a fundamental issue with the justification of the compulsory purchase powers, it threatens the ongoing viability of a significant business the potential loss of which is a material detrimental socio-economic impact of the Project which weighs materially against the grant of consent.

6 Conclusion

6.1 T.H. Clements will continue to engage constructively with ODOW in an effort to resolve the above outlined issues of concern during Examination. However, given that the proposed Project has the potential to devastate T.H. Clements' business, pending satisfactory resolution of its concerns, T.H. Clements must strongly **object** to the Order and reserves its right to make further representations during the course of the Examination should that be necessary.

6.2 As T.H. Clements indicated at the preliminary meeting, the issues raised in this WR in relation to impacts on agricultural practice are important and wide spread. The same or similar issues have been raised by landowners up and down the proposed onshore cable route corridor and have been raised in the following relevant representations:

6.2.1 RR-012: Brown & Co

6.2.2 RR-023: Fred Grant Co

6.2.3 RR-024: Brown & Co Property and Business Consultants LLP on behalf of George Hay & Sons Limited

6.2.4 RR-026: Brown & Co Property and Business Consultants LLP on behalf of G-VEG Limited

6.2.5 RR-029: Hub Rural Ltd on behalf of The Holmes 1987 Pension Fund

6.2.6 RR-030: Hub Rural Ltd on behalf of Henry Tunnard Ltd

6.2.7 RR-032: Hub Rural Ltd on behalf of Jonathan Gordon Fowler (and J Fowler & Sons)

6.2.8 RR-033: Brown & Co Property and Business Consultants LLP on behalf of J W Grant & Co

6.2.9 RR-034: Brown & Co Property and Business Consultants LLP on behalf of J W Grant & Co Pension Fund

6.2.10 RR-035: The Lincolnshire Association of Agricultural Valuers Land Interest Group

6.2.11 RR-040: Hub Rural Ltd on behalf of Janice Norma Pettitt, Richard Nelson Pettitt, F Pettitt & Son

6.2.12 RR-043: Brown & Co Property and Business Consultants LLP on behalf of M Baker (Produce) Ltd Pension Scheme

6.2.13 RR-058: Savills (UK) Limited

6.2.14 RR-062: Brown & Co Property and Business Consultants LLP on behalf of Stanley David Codd Will Trust

6.2.15 RR-063: Brown & Co Property and Business Consultants LLP on behalf of Staples Brothers Limited

6.2.16 RR-064: Brown & Co Property and Business Consultants LLP on behalf of Staples (Vegetables) Ltd

6.2.17 RR-069: Brown & Co Property and Business Consultants LLP (Brown & Co Property and Business Consultants LLP) on behalf of VER Limited

6.2.18 RR-073: Will Barker & Co (Will Barker & Co) on behalf of Will Barker & Co

6.2.19 RR-075: Savills (UK) Limited on behalf of Woodlands Farm (Kirton) Limited and Andrew Peter Dennis

6.2.20 RR-076: Hub Rural Limited on behalf of W T Taylor & Sons

6.2.21 RR-077: William Barker

6.2.22 RR-078: Brown & Co Property and Business Consultants LLP (Brown & Co Property and Business Consultants LLP) on behalf of Doreen Belton

6.2.23 RR-079: Brown & Co Property and Business Consultants LLP on behalf of Steve Belton

6.2.24 RR-081: Brown & Co Property and Business Consultants LLP on behalf of Messrs A, J & R Daubney

6.2.25 RR-082: Hub Rural Ltd on behalf of Gerald Hicks

6.2.26 RR-083: Hub Rural Ltd (Hub Rural Ltd) on behalf of Paul Cameron Holmes

6.2.27 RR-087: Fraser Dawbarns LLP on behalf of Alan Harold Naylor

6.2.28 RR-088: Fraser Dawbarns LLP on behalf of Ann Naylor

6.2.29 RR-089: Fraser Dawbarns LLP on behalf of Brian Douglas Naylor

6.2.30 RR-090: Fraser Dawbarns LLP (Fraser Dawbarns LLP) on behalf of Simon Brian Naylor

6.2.31 RR-094: Brown & Co Property and Business Consultants LLP on behalf of Roseanna Skelham, Elizabeth Schweikhardt & Victoria Jane White

6.2.32 RR-095: Hub Rural Ltd on behalf of Mark Skipworth and Betty Skipworth

6.3 Give their substantive nature and widespread effect, T.H. Clements hopes the Examining Authority will consider these issues at an issue specific hearing.

6.4 Should the Examining Authority require any additional information in relation to this representation, please contact Fiona Barker or Melanie Grimshaw of Mills & Reeve at [redacted] or [redacted]

Mills & Reeve LLP

Appendix 1
Expert CV- Philip J Wright- Qualifications and experience

INTRODUCTION

My name is Phillip Wright. I am a Director and founder of Wright Resolutions Limited, a consultancy established in 2007, which provides specialist advice to the agricultural industry, including agricultural machinery/equipment manufacturers and farmers.

I am a Chartered Engineer with a BSc. (Hons) in Agricultural Engineering. I am a member of the following organisations:

- The Institution of Agricultural Engineers (MI Agr E.), by which I was awarded the Michael Dwyer Memorial Prize in May 1999, and the Award for Contribution to the Land Based Sector in May 2009.
- The American Society of Agricultural and Biological Engineers (M ASABE.)
- The British Society of Soil Science (MI Soil Sci.).

EXPERIENCE

1979- 2007- Simba International Limited

Simba International Limited were a major UK Manufacturer of cultivation equipment. Simba subsequently moved under the ownership of Great Plains of the USA, and latterly, Simba Great Plains became part of Kubota.

In my role as Design Engineer, I had responsibility for all product design and development. I became Technical Director in 1989, with full responsibility for all engineering aspects of the product range, from initial design, through to sales and product support. This role interfaced with Sales/Marketing and Production, these duties being undertaken by fellow Directors in the Company.

I participated in a successful management buy-out of Simba in 1997, along with my fellow Directors.

I was instrumental in identifying Horsch GmbH (based in Germany) as a commercial partner for Simba, a co-operation that secured the future of the business in a challenging agricultural market scene in UK and across Europe.

2007 to present: Wright Resolutions Limited.

In my role as Director of Wright Resolutions Limited, I provide specialist advice to agricultural machinery/equipment manufacturers on product design and training for staff covering soils and cultivations. From a design viewpoint, this includes all aspects of 3D Computer Aided Design (CAD), computer simulation, and Finite Element (stress) Analysis. Advice is also provided on aspects of CE self-certification for companies manufacturing products within this field of expertise. Larger Machinery UK distribution providers (including Horsch UK) also ask for training and updates for their staff on soils and cultivation techniques, and how such principles apply to their products.

Another key part of the business is providing independent advice to farmers, and agronomy businesses on soil structure and cultivations, together with providing assistance with the adoption, and development of crop establishment systems and techniques in the UK and overseas.

Such advice includes development of current products, for example, specific field cultivation and drilling machinery, and their components, and systems which enhance clients capabilities to establish crops in an economically and environmentally efficient manner. My independent expert advice enables clients to make informed decisions about product choice, field setting, and their overall crop establishment strategies based on the fundamental principles of soils and cultivations, and to tailor their applications (for example, the choice of a direct drill to farm in a regenerative manner) to the current rapidly changing farming environment. Areas covered by this advice include:

- Identification of soil structure problems and associated issues such as impaired drainage;
- Identification and alleviation of compaction, run-off, capping and general soil erosion issues;
- Selection of appropriate machinery, systems of cultivation, and cropping to suit client requirements;
- Optimal machinery settings for conditions prevailing and subsequent crop requirements;
- General cultural techniques for crop establishment, and control of weeds, pests and diseases;
- Assistance with a move to a regenerative farming approach;
- Provision of bespoke training for farmers, operators, and other related personnel.

Wright Resolutions client base includes Vaderstad UK, Horsch UK, Lemken, Kverneland UK, Larrington Trailers, Tillso, John Dale Drills, Wox Agricultural, and a number of UK and European Farming Groups, together with many individual Farmer clients in the UK and overseas, including Dyson Farming. Soils and Environmental advisory work has been undertaken for the Environment Agency, the Agriculture and Horticulture Development Board, Natural England, the Potato Council, RSK ADAS (formerly the Agriculture Development Advisory Service) , McCains and Pepsico, together with the Agricultural Engineers Association, the James Hutton Institute, Monsanto, BASF (https://www.basf.com/gb/en.html), Frontier, Agrii, and Bayer Crop Science.

In addition to the above, I am also an Associate Lecturer at Lincoln University, teaching soils, drainage, and cultivations techniques on their BASIS Soil and Water courses.

I have acted as an expert witness in the High Court Patent dispute between Claydon and Mzuri in February 2021, and represented numerous farmer clients in disputes with the providers of large scale infrastructure schemes, such as pipeline installations through farmland, over potential threats to/impacts on soil quality and crop yields.

Additional information can be obtained from the Company website: www.wrightresolutions.co.uk

Appendix 2-
Expert CV- Iain Gould- Qualifications and experience

Iain is currently Associate Professor of Soil Science at the University of Lincoln, having joined the University in 2016 as a post-doctoral researcher looking at post-flood soil management in coastal silt soils. Prior to this Iain spent 2 years working in Soil Science consultancy for the construction and landscape sector, working on soil resource plans, soil management plans and stockpile surveys.

Iain has a PhD in Soil Science from Lancaster University (2014) and his current research focusses on enhancing sustainability in agricultural soil management. Iain is the departmental Short Course lead, delivering professional short courses including Soil and Water Management, Advanced Soils and Sustainable Land Management to the agricultural industry.

Appendix 4-
Expert CV- Damian Pawson- Qualifications and experience

Damian Pawson, Technical Director - Air Quality, Environment, SWECO

EXPERTISE STATEMENT

Damian is a Technical Director of air quality in Sweco's Environment, Sustainability & Design business unit. He has 18 years of experience in air quality assessment, incorporating expert witness, project management, client and regulator engagement and business development.

Damian has won, managed and delivered technical air quality assessments for major projects within the UK, Australia and Middle East. He has delivered projects within the energy, carbon capture, transport, wastewater treatment, oil & gas, mining, and development and planning sectors.

Damian has comprehensive understanding and working knowledge of applying and reviewing detailed atmospheric dispersion modelling (e.g. ADMS, Aermod, CALPUFF, TAPM) applied to air quality assessments supporting the development of major infrastructure.

KEY SKILLS

•

- Expert Witness experience
- Technical project delivery, quality assurance and peer review
- Certified project manager
- Public and private sector client / regulator engagement
- EIA and technical reporting
- Emissions inventory development
- Atmospheric dispersion modelling (ADMS, Aermod, CALPUFF, TAPM)
- Project-specific air quality monitoring plans
- Clean Air Zone feasibility (emissions inventory, modelling, business case input)
- Environmental permitting (emissions & air quality)
- Odour impact assessment
- Line management & team leadership

ACADEMIC QUALIFICATIONS/COURSES

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- BSc (Hons) Environmental Science
- Project Manager Certification (URS Program) 2012

PROFESSIONAL MEMBERSHIPS

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- Full Member of the IAQM
- Full Member of the IES

EMPLOYMENT HISTORY

2017-2022 Associate Director, Air Quality, WSP

2015-2017 Principal Consultant, Air Quality, Mouchel (acquired by WSP)

2012-2015 Senior Consultant, Air Quality, URS

2009-2012 Consultant, Air Quality, Royal Haskoning

2006-2009 Environmental Consultant, Waterman Group

RECENT PROJECT EXPERIENCE

1 A5 Western Transport Corridor, Northern Ireland

Client: Department for Infrastructure

Damian provided technical leadership of the detailed emissions inventory development and atmospheric dispersion modelling associated with the construction and operation of the proposed A5 WTC road scheme, approximately 94km in length. Damian was appointed Expert Witness for air quality at public inquiries for the road scheme held in 2016 and, following the publication of an Environmental Statement Addendum in 2019, at the second inquiry in 2020. The air quality assessment underwent a high level of scrutiny, with a number of queries and objections made to the scheme on air quality grounds. Damian was appointed Expert Witness for air quality at both inquiries and responded to air quality specific queries during proceedings. The Commissioners report (2016 & 2020) concluded that the scheme should proceed on the basis of a number of recommendations, but none of these related to air quality.

2 Proposed Amine-Based Carbon Capture and Storage Plant at Drax Power Station, Selby

Client: Drax

Damian was the technical air quality lead for the DCO detailed air quality assessment for a proposed CCS plant at one of the UK's largest power stations. The assessment required extensive consultation with the Environment Agency and relevant local authorities to establish an appropriate approach to the complex atmospheric dispersion modelling of potentially carcinogenic pollutant emissions associated with the post-combustion CCS process, including amines and nitrosamines. The assessment focussed on the impact to human and ecological receptors, with comparisons against relevant environmental assessment levels and health-based standard. The assessment also considered the potential for cumulative impacts associated with other committed developments with the potential to emit air pollutants within the study area.

3 Proposed open-cut Gold Mine, Victoria, Australia

Client – Crocodile Gold Corp

Damian was the technical lead in completing an air quality assessment, comprising the development of a particulates and combustion emissions inventory for all mine activities in accordance with national and international best practice. Consultation with the Victoria EPA was undertaken to agree an approach to modelling meteorology using TAPM and CALMET, with subsequent dispersion modelling using CALPUFF. Sensitive residential receptors were located within 100 m of the open-cut pits, thus requiring a detailed investigation into best practice mitigation measures for all potential dust generating activities. Included preparation of evidence for public inquiry.

4 Dysart East Coal Project, Qld, Australia

Client – Bengal Coal

Damian led an air quality assessment relating to Stage 2 of a proposed coal mine in Dysart, Qld. This required the compilation of an emissions inventory for criteria pollutants comprising particulates and combustion gases. Appropriate mitigation control factors were applied to mine activity emission rates represented within the inventory, predominantly relating to dust mitigation. Meteorological and atmospheric dispersion modelling was undertaken using TAPM, CALMET and CALPUFF to predict ground level concentrations at identified sensitive receptors. In addition to applying best practice controls, the assessment recommended monitoring protocols to establish local baseline conditions and enable compliance monitoring throughout the project. A refined air quality technical assessment was submitted as a result of objections to dust deposition from the mine, specifically to roads, railways, substations, and overhead power lines within and near to the site.

5 Pacific Aluminium (Rio Tinto), Increased Bauxite Mining Project, Haul Road, Northern Territory

Air Quality Technical Lead

Damian was the technical lead in planning and executing a baseline dust monitoring survey and atmospheric dispersion modelling study for a proposed haul road associated with an existing bauxite mine and alumina refinery. A comprehensive review of existing and proposed mine and refinery activity data was carried out to develop an emissions inventory for the project. Meteorological modelling was completed, followed by detailed atmospheric dispersion modelling of PM_{10} and $PM_{2.5}$ using the inventory data, to predict concentrations at identified sensitive receptors in adjacent townships and native communities. The study included investigation into suitable dust mitigation measures.

6 Multiple Proposed Data Centre Developments, Finland

Client: Confidential

Damian provided technical expertise as part of the project team completing air quality assessments for EIAs relating to three proposed data centre developments in Finland. This required extensive consultation with key stakeholders and the project team, including stack height determination assessments for the proposed back-up diesel generators to feed into the design stage.

The assessment considered the potential local air quality impacts associated with exhaust emissions from a large number of back-up diesel generators in each development, specifically for routine testing/maintenance and for provision of emergency back-up power.

Complex dispersion modelling was undertaken using Aermod, developed by the US EPA, to predict ground level concentrations of oxides of nitrogen (NO_x) and nitrogen dioxide (NO_2) at both sensitive human and ecological receptors. The assessment was completed with reference to relevant national and international guidance, as well as national and European air quality standards/guidelines. Each study concluded that the proposed development generators would have no significant effect on air quality.

7 Proposed 50MW Energy from Waste Plant, Hull

Client – HRS Ltd

Damian led a detailed air quality assessment for a proposed 50MW waste from energy plant in Hull. The study required consultation with the local authority to agree the assessment methodology proposed as part of the development planning application. Extensive stack emissions modelling was completed for the proposed plant, including assessment of cumulative impacts from adjacent power plant and accounting for the influence of nearby wind turbines and buildings that could influence dispersion. The assessment considered emissions of gaseous pollutants (e.g. NO_x, SO_2), particulates (PM_{10}, $PM_{2.5}$), and heavy metals from the plant and the potential impacts at local sensitive receptors (both human and ecological).

The proposed plant was highly contentious within the local community and air quality concerns were at the forefront. Damian attended two public consultation events where question and answer sessions were held on the topic of emissions from the proposed plant.

8 Proposed Sizewell C Nuclear Power Plant & Infrastructure

Client – Suffolk County Council

Damian provided technical peer review of the air quality methodology proposed as part of the environmental impact assessment relating to the proposed Sizewell C development. Damian attended a meeting with Suffolk County Council to discuss the proposed approach and determine the extent of review required.

Damian provided formal feedback to the Council on the proposed methodology, including comments relating to the air quality monitoring strategy, applicable air quality guidance references, and the detailed dispersion modelling approach for assessing emissions from construction, traffic, and plant operation.

Appendix 3

Expert CV- Daniel Jobe- Qualifications and experience

Daniel Jobe MRICS FAAV, Partner, Brown & Co Property and Business Consultants LLP
With over 17 years' experience in the Compulsory Purchase sector Daniel has developed an extensive understanding of land acquisition strategies, implementation of powers and strategic CPO advice. Acting predominantly on behalf of agricultural landowners and occupiers he has extensive technical skills developed on major UK national infrastructure projects and acquisitions through both DCO and CPO processes.

Daniel has been heavily involved in all of the recent offshore wind and interconnector schemes making land fall in Lincolnshire over the last decade. He works closely with affected parties throughout the duration of the schemes' development from initial contact with landowners through to completion of construction and reinstatement.

Having practised in the region for all of his professional life, Daniel is fully aware of the pertinent issues that concern fenland farmers when faced with large scale infrastructure projects. These matters usually centre around land drainage, disturbance and reinstatement which, while all being common points of concern, are emphasised when dealing with the fragile soils of the low lying Lincolnshire Fens where absolute care is necessary to mitigate the risk of long term damage from construction.

As an experienced negotiator with a professional grounding in general agricultural practise, in addition to his personal farming links, Daniel has the skills and knowledge to communicate easily and directly with the rural community.

Daniel is a Member of the Royal institution of Chartered Surveyors, a Registered Valuer and a Fellow of the Central Association of Agricultural Valuers (FAAV) , both qualifications demonstrating a professional level of expertise in agricultural and rural valuation as well as proficiency on issues affecting the countryside. Fellowship of the CAAV demands high levels of knowledge of agricultural tenancy matters, sales and disposals, acquisitions and farm business advice.

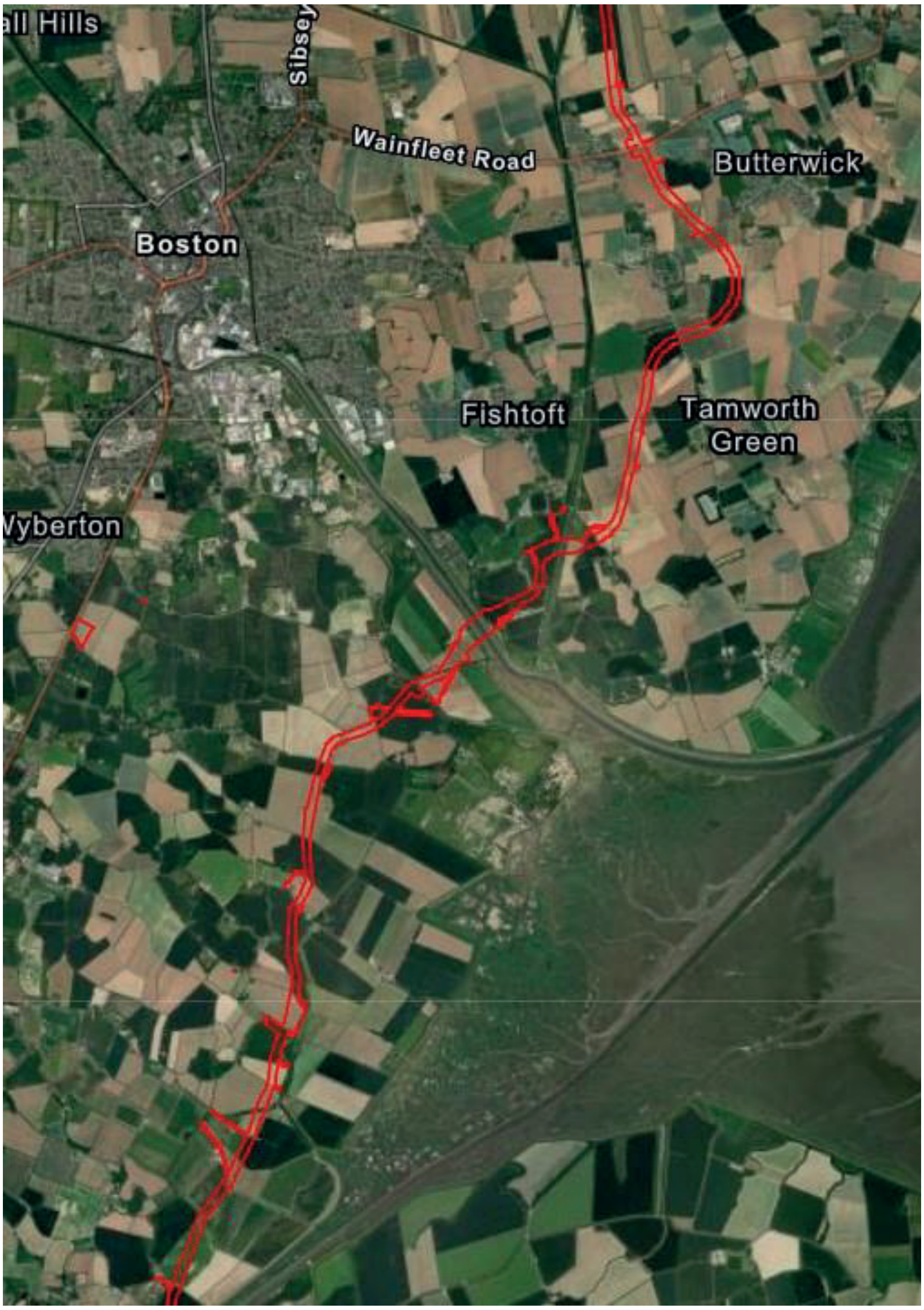
Relevant experience acting on behalf of affected parties includes:

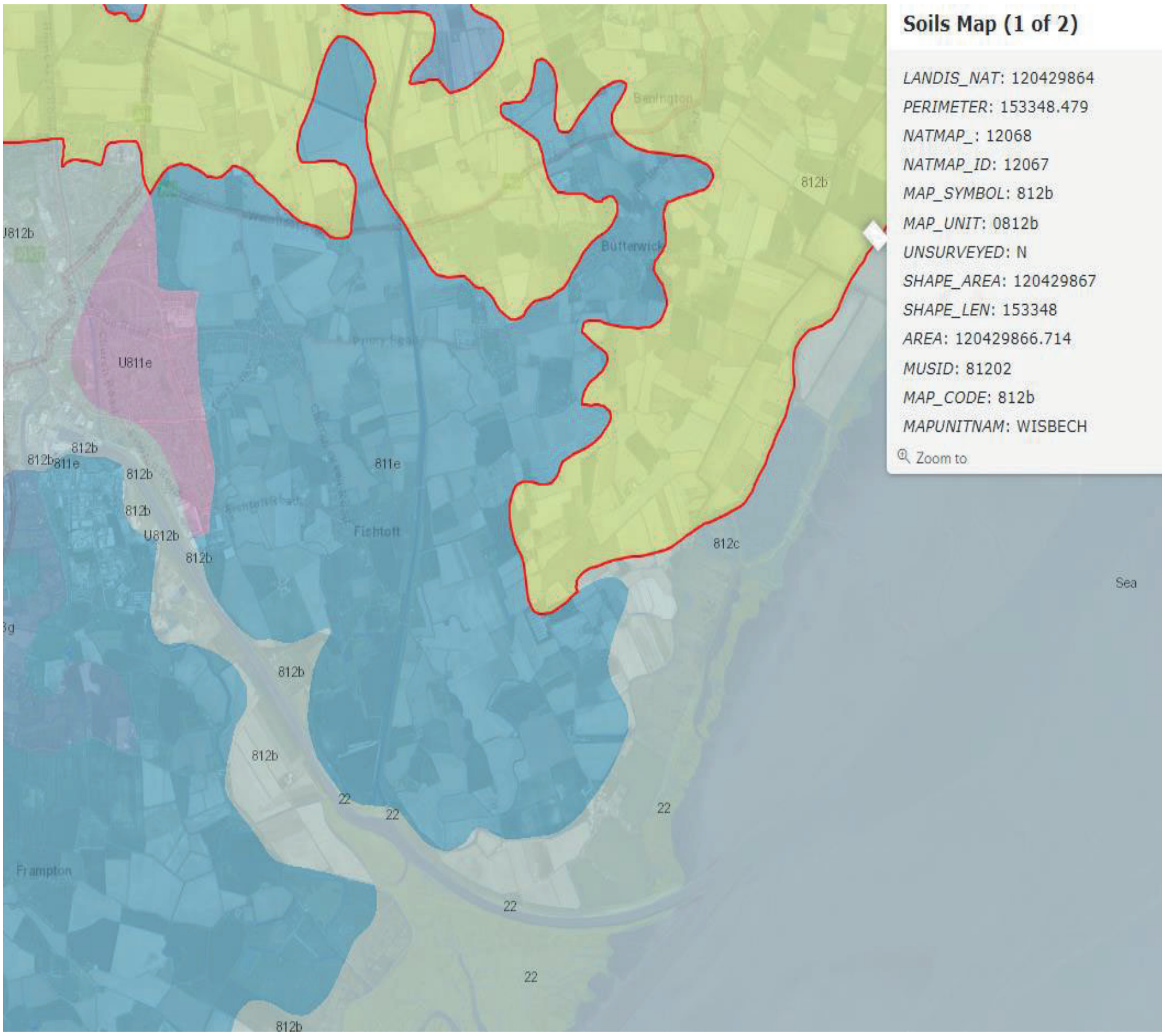
- Hornsea 1 Offshore Windfarm - Key negotiator to establish option and lease agreements for the construction of a cable easement delivering renewable power from off shore wind farm (2012 – 2020)
- Hornsea 2 Offshore Windfarm - Key negotiator to establish option and lease agreements for the construction of a cable easement delivering renewable power from off shore wind farm (2012 – 2023)
- Triton Knoll Offshore Wind Farm – Securing landowner interest for onshore cable easement, disturbance, drainage and reinstatement (2015 – 2021)
- National Grid Viking Link Ltd Interconnector – Negotiator for the acquisition of landowner interests, disturbance, drainage and reinstatement (2018 – present)

Appendix 5

Soil Associations and characteristics of the land farmed by T.H. Clements

The route of the ODOW cable which is of significant interest to T.H. Clements is shown outline in red on the below map, and is accompanied by extracts of maps showing the predominant Soil Associations present along that route. (Cranfield University 2024. *The Soils Guide.* Available: [redacted] Cranfield University, UK. Last accessed 31/05/2024).

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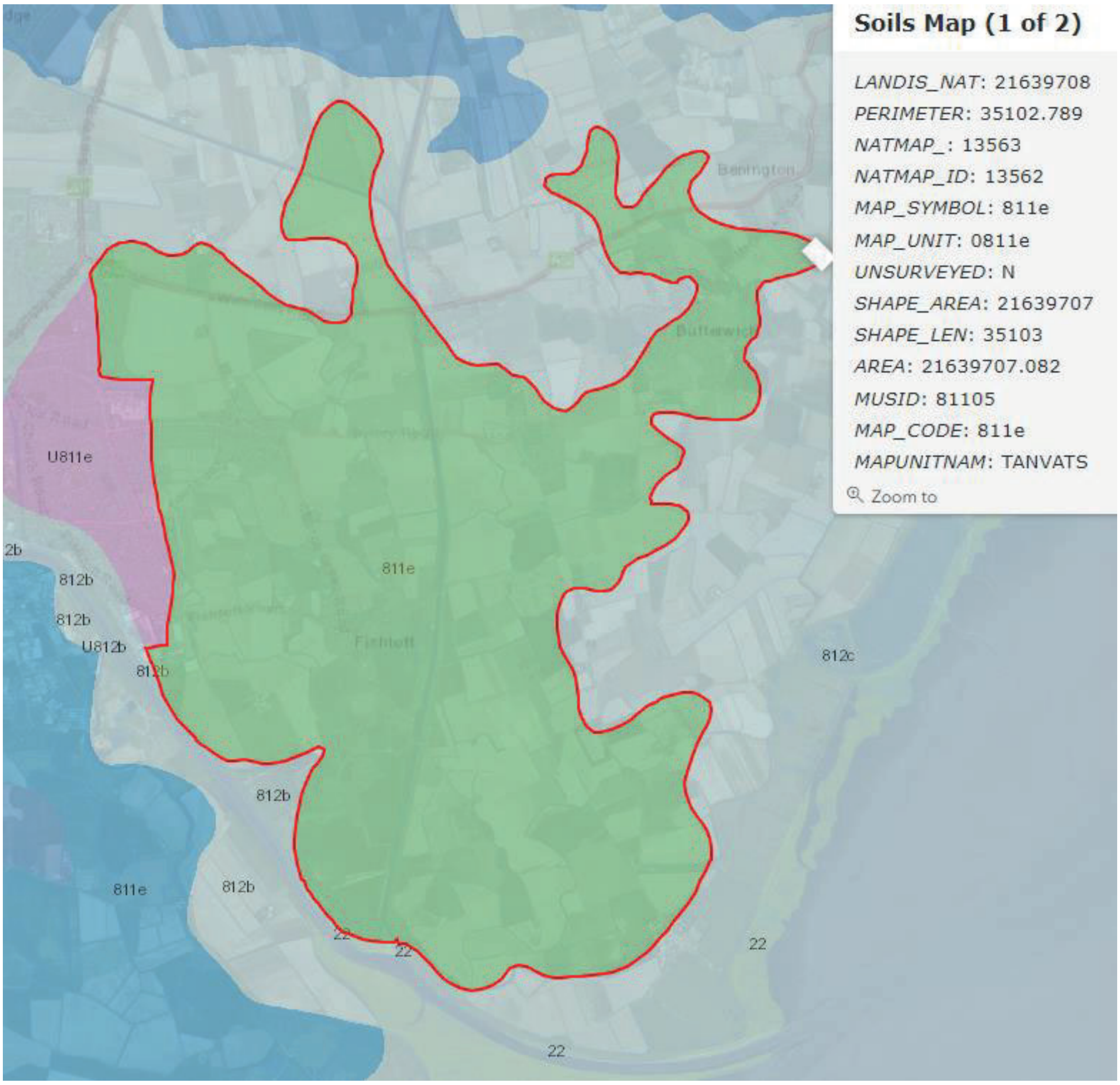
SHAPE_LEN: 153348
AREA: 120429866.714
MUSID: 81202
MAP_CODE: 812b
MAPUNITNAM: WISBECH
Zoom to
812b
U812b
U811e
811e
812c
22
Sea
Butterwick
Fishtoft
Frampton



Soils Map (1 of 2)
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UNSURVEYED: N
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SHAPE_LEN: 35103
AREA: 21639707.082
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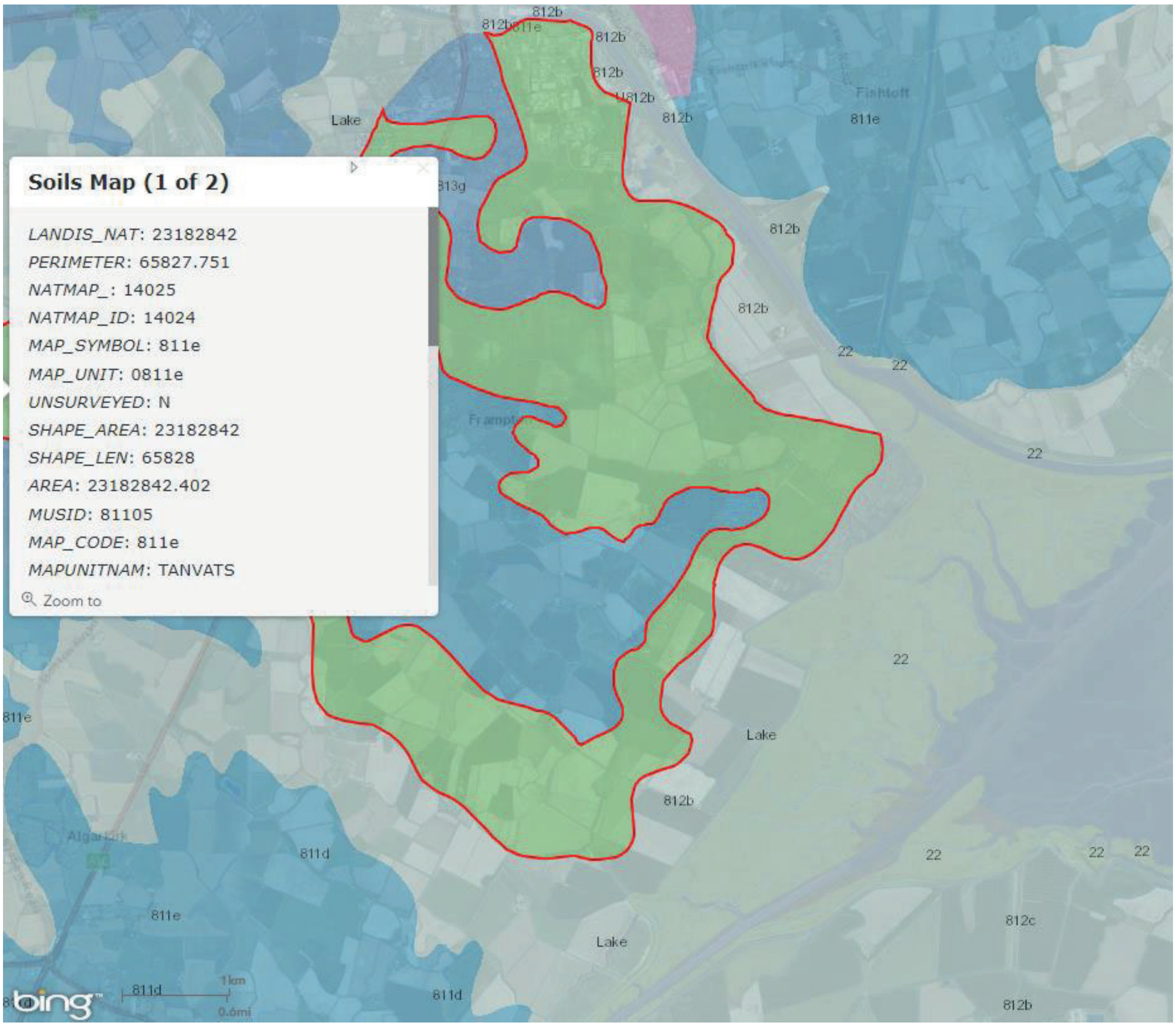
MAP_CODE: 811e
MAPUNITNAM: TANVATS
Zoom to
U811e
811e
812b
U812b
812c
22



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SHAPE_LEN: 65828
AREA: 23182842.402
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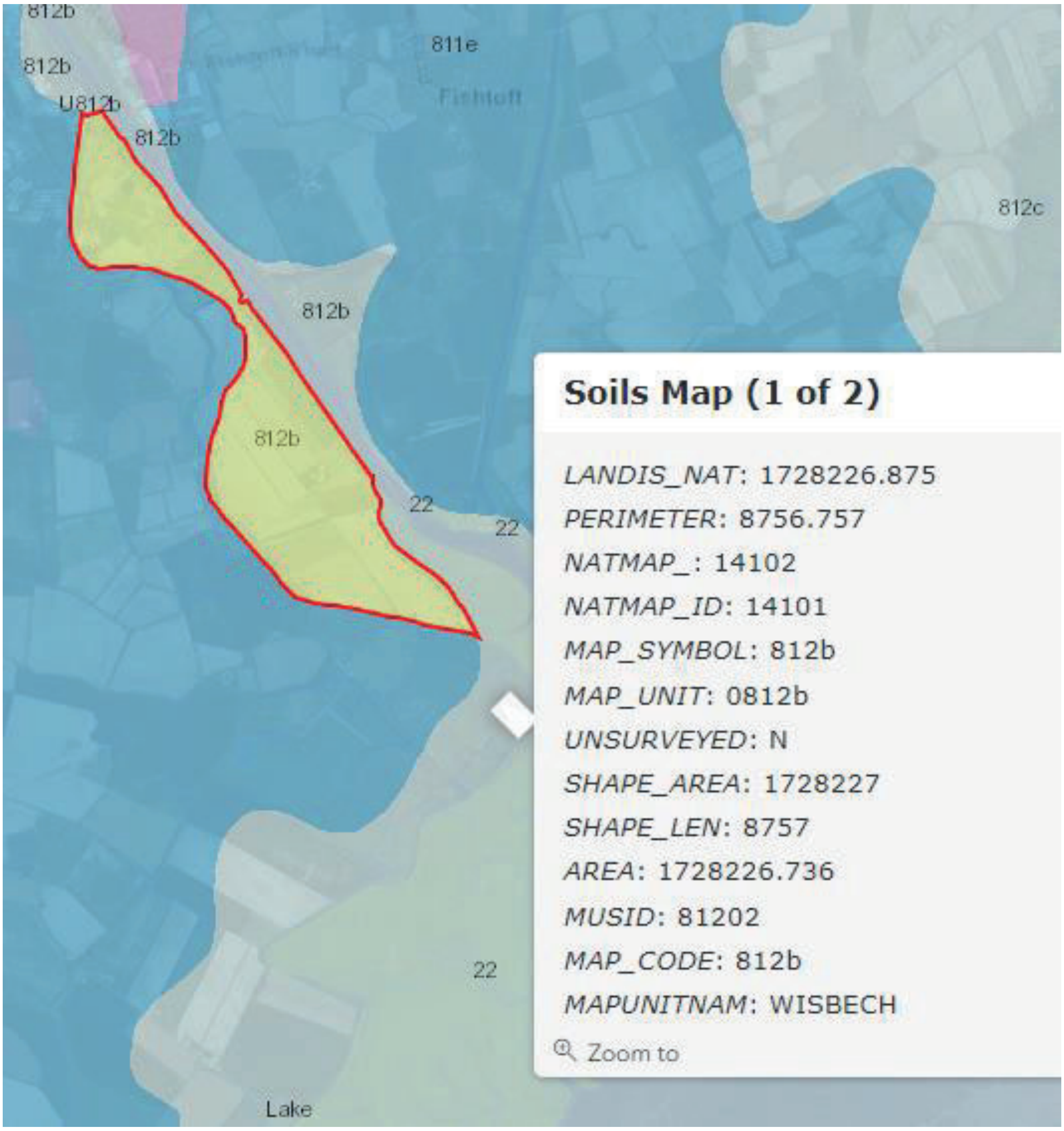
MAP_CODE: 811e
MAPUNITNAM: TANVATS
Zoom to
812b
811e
Lake
22
812c
811d
bing



812b
812b
U812b
812b
811e
812c
812b
812b
22
22
22
Lake
Soils Map (1 of 2)
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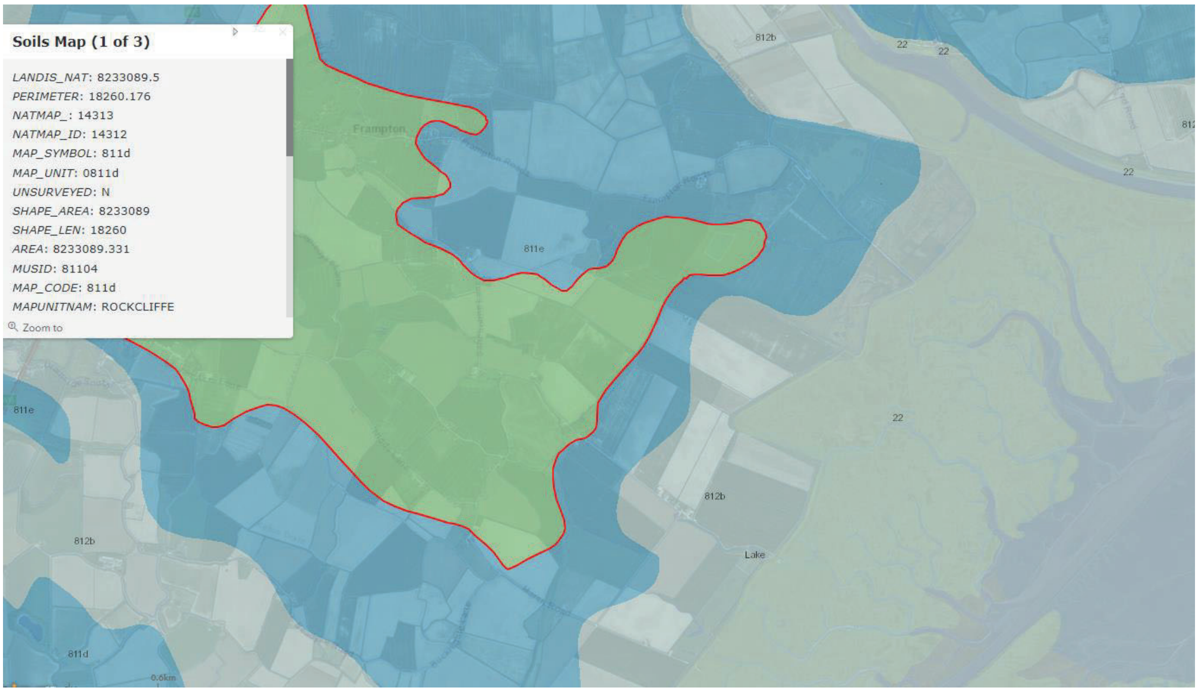
Zoom to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SHAPE_LEN: 18260
AREA: 8233089.331
MUSID: 81104
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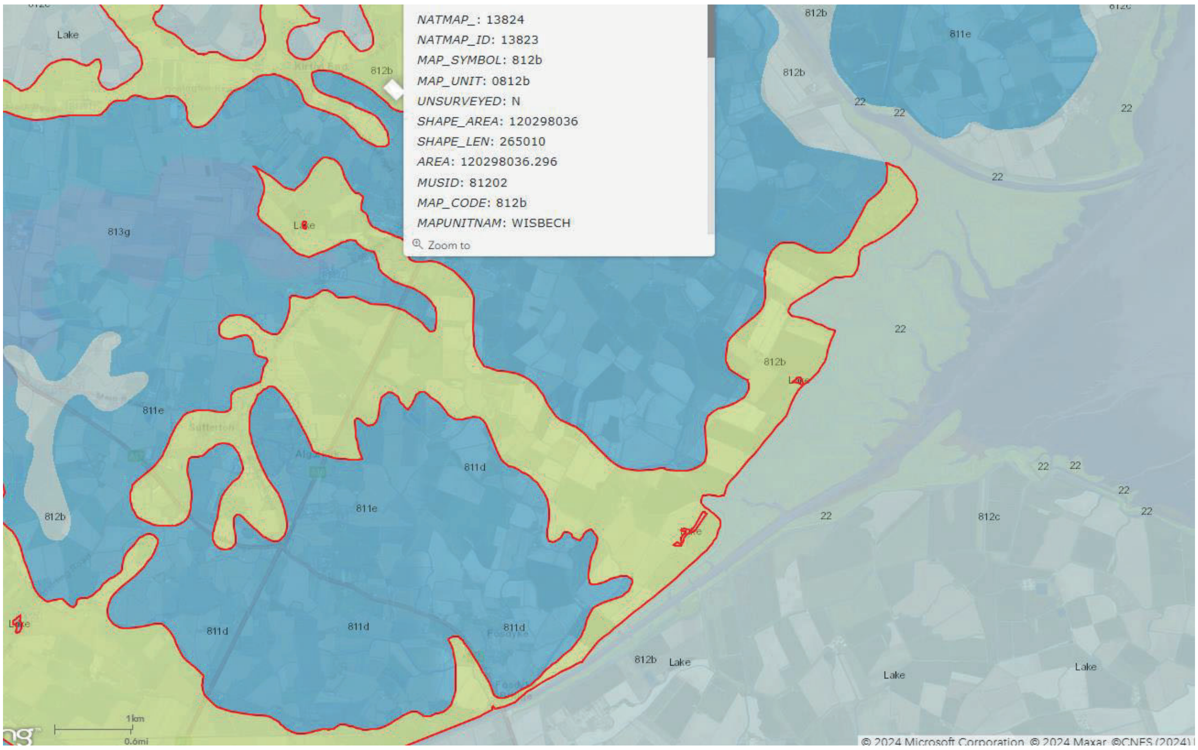
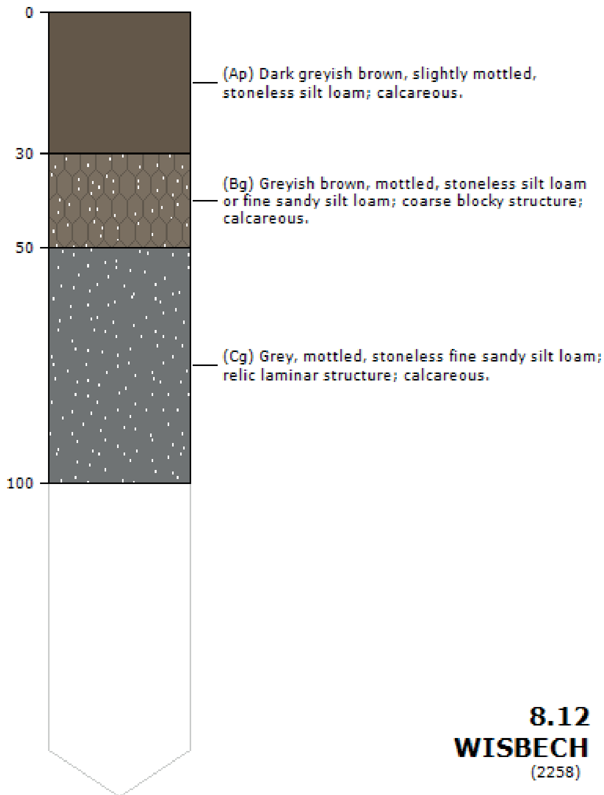
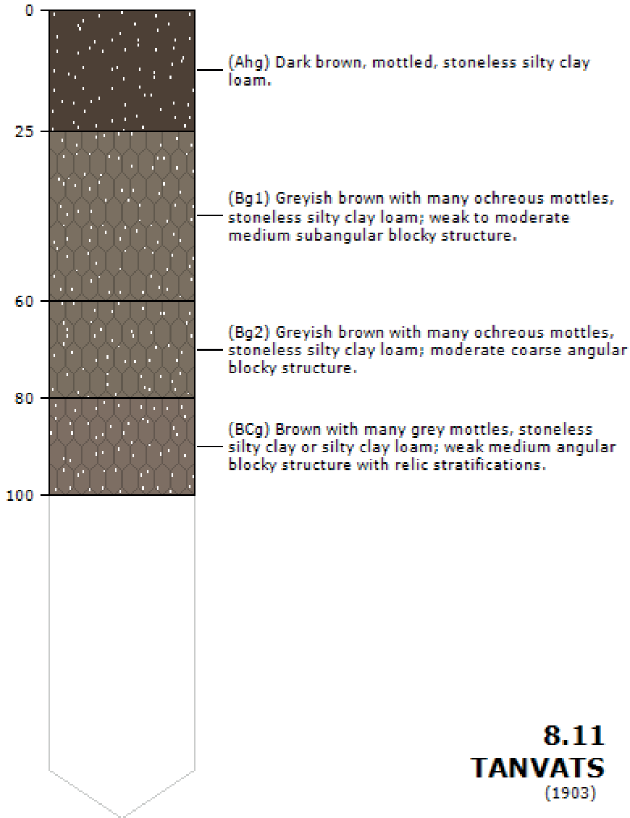
MAPUNITNAM: ROCKCLIFFE
Zoom to
Frampton
811e
812b
22
811d
Lake
0.6km

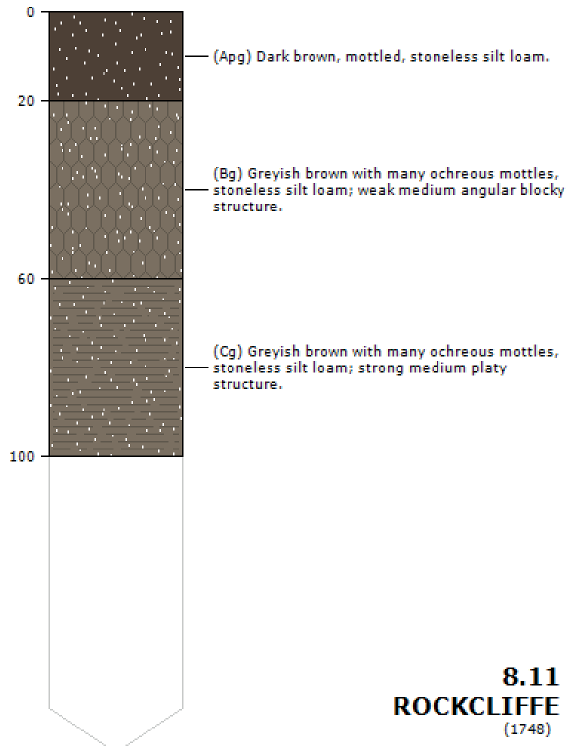




8.12
WISBECH
(2258)



8.11
TANVATS
(1903)



8.11
ROCKCLIFFE
(1748)

PREDOMINANT SOIL ASSOCIATIONS:

- **WISBECH:** Deep, stoneless calcareous coarse silty soils. Groundwater usually controlled by ditches or pumps. Flat land with low ridges. Risk of wind erosion locally. Marine alluvium geology.
- **TANVATS:** Deep stoneless fine & coarse silty and clayey soils with groundwater levels controlled by ditches and pumps. Flat land. Matine alluvium geology.
- **ROCKCLIFFE:** Deep stoneless silty and fine sandy soils variably affected by groundwater, depending on artificial drainage. Flat land. Marine alluvium geology.
-

The nature of all the predominant soils in this area implies a high likelihood of unsupportive, fragile, deep silt based characteristics.

All the soils are deep, hence the increased risk of farming machinery ‘sinking through the profile in wet conditions until it becomes ‘grounded’.

TH Clements Foxholes Field (which falls along the proposed route) is classified as being within the Wisbech Association soil (see map following). A test pit dug on 26/09/2024 to 1.8m depth showed a fine silt loam topsoil approximately 0.4m deep, followed by a coarser silt loam topsoil to 0.7m, below which a sandy silt loam subsoil extends to depth. This is a typically complex soil pattern seen locally. Both upper (topsoil) horizons had higher levels of organic matter (evidenced by the colour) than the subsoil beneath. The uppermost topsoil layer was of darker colour and is likely to contain higher levels of nutrition from regular inversion of crop residues to this depth. The coarser silt loam topsoil layer from 0.4m to 0.7m is likely to have reduced levels of nutrition whilst offering support to the crop, as evidenced by the high volumes of crop roots present. This intermediate topsoil zone also has a higher nutrient content compared to the subsoil beneath.

Coarser silt in the subsoil confirms the likelihood of “running” areas when the soil at depth is wet.

Furthermore, such complexity along the proposed route to be excavated makes it impossible to completely replicate when such levels are reinstated, unless the topsoil (in total in the area dug being 0.7m) is segregated into 2 bunds (corresponding to depths from 0m to 0.4m, and 0.4m to 0.7m in this case, although this is likely to be variable, when considering the entire route). Such variability will be according to the sand, and organic matter fractions present within the silt loam soil itself.

Sub-dividing the topsoil according to the levels and small texture differences present is required, otherwise the reinstated soil profile will not fully replicate the situation before excavations started. This is likely to be a very complex process in terms of identification of multiple topsoil layers present, their relative depths, and managing this along the route during reinstatement.

By not sub-dividing the topsoil into its two distinct zones there are additional issues to be considered:

- The upper layer, higher in nutrient (a result of incorporation of plant residues, etc. over time) will be diluted by mixing with the deeper topsoil layer. The most nutritious, upper topsoil soil is then not fully in contact with the developing plant roots in their critical, earlier growth stages
- Mixing of the lower topsoil layer with the upper layer brings more occluded carbon/biology present in the lower layer nearer to the soil surface where aeration is greater. CO_2 release from this soil then is increased as a direct result. This further degrades the delicate balances achieved by TH Clements in their soils to date.

- The upper layer, nutrient rich, is now placed deeper (in effect). This places it closer to the land drains, and potentially, to the water courses which feed from these. This has both cost (of nutrient available to the crop) and environmental (nutrient leaching) issues.

TH Clements would anticipate that mixing of these topsoil layers (in effect, diluting the uppermost layer of highest nutrient holding capacity) would reduce yield in this pipeline zone from the most optimal levels by up to 40%, according to the crop. Furthermore, any associated variability which results (in terms of crop maturity in fields along the route) could lead to the crop being completely discarded in the cable zones when the field as a whole is harvested.

[Above: Wisbech association soil (yellow) with the approximate location of Foxholes Field dotted in green]

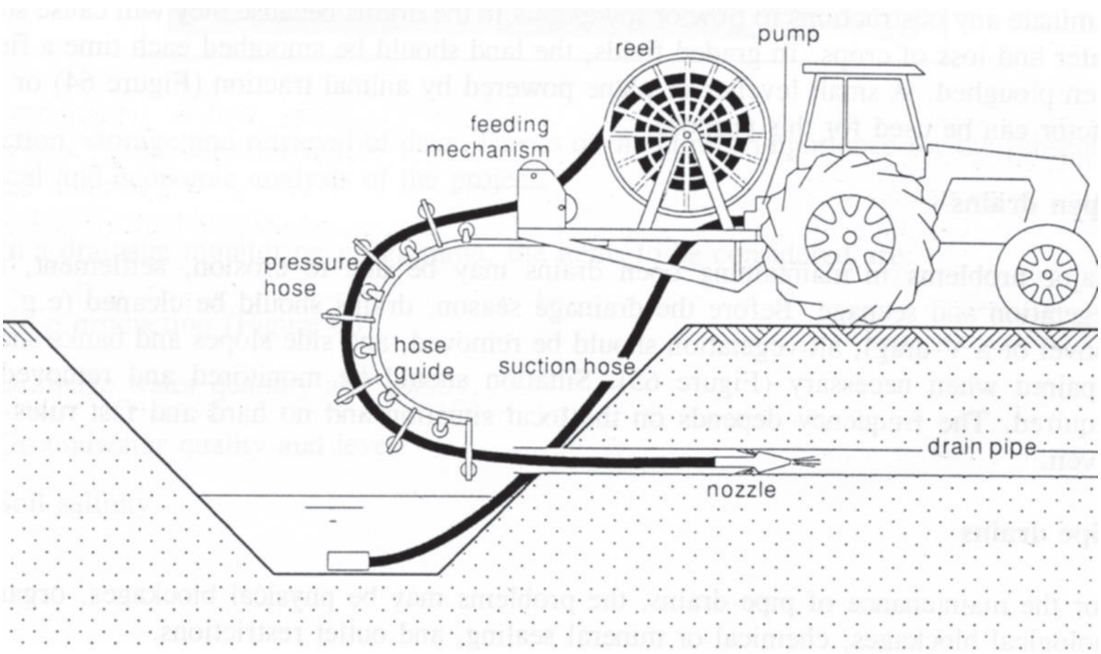
[Above: profile showing 3 distinct layers, 0 to 0.4m, 0.4m to 0.7m, with the subsoil below]

[Above, left: knife position at the 0.4m depth. This has darker, higher organic matter content fine silt loam above, and lighter, reduced organic matter content, slightly coarser silt loam below to 0.7m. These layers provide a balance of water and nutrient to the crops. Both layers clearly have high volumes of roots from the last crop harvested. Right: below 0.7m,, the sandy silt loam subsoil also has roots passing through, these are reduced in volume, and provide the crop with access to water mainly]

Appendix 6

Drain Jetting.

Land drainage pipes installed on high silt content soils require routine maintenance to remove silt deposits which cause restrictions or blockages. TH Clements undertake this as required, and need to ensure jetting continues in the future. This will ensure that the fields remain capable of producing crops to the current required high levels of quality and yield.



Jetting is carried out by equipment which uses high pressure water to clear [silt] deposits, and propel the jetting nozzle and following pressure hose along the drain pipe. The drawing above shows the principle. Where a drainage pipe has a stepped joint, or a junction with a sharp change in direction, the progress of the nozzle and pressure hose is then restricted. It is vital, therefore, that drainage pipe runs:

1 terminate at a ditch outfall to allow access for the nozzle and pressure hose. This is the current situation in fields now, prior to any cable run installation; and

2 do not have mis-aligned joints or junctions/deviations/steps along their length which then restrict passage of jetting equipment along the drainage pipe.

If drainage pipes are cut to allow installation of an electricity cable, and this prevents reinstatement of the drainage pipes in perfect alignment, any resulting deviation (or steps in the pipe direction) will compromise the effectiveness of the drainage system because:

(a) silt particles suspended in the drain water are most likely to ‘sediment out’ at any such steps, accelerating, and exacerbating the blockage potential and;

(b) such blockages then cannot be effectively removed by jetting, as this operation is compromised.

Should this be the case, the alternative is to excavate the pipe in the region of the blockage and manually clear this. Where such junctions are close to the cable run, excavation of drains is high risk, and would require permission [in each case from ODOW]. This is an unacceptable situation, given the increased likelihood of such issues arising if pipe runs have been compromised.

Appendix 7

A. **List of farmers affected by the Triton Knoll and Viking Link schemes**
B. **Email from Ian Grant of Bishop Farm Partners, Sibsey to Daniel Jobe at Brown & Co**
C. **Photographs showing stone contamination left on farmer's land following removal of the haul road for the Viking Link scheme**
D. **Newspaper article extracts dated 22nd and 23rd October 2024**

A. List of farmers affected by the Triton Knoll and Viking Link schemes and

1. N Scott, E A Dring Farms Ltd, Holland Fen

2. R & A Firth, Bicker Fen

3. A Bush, B Bush & Sons Ltd, Revesby

4. T Wrisdale, Malcolm Wrisdale Ltd, East Keal

5. W Grant, J W Grant & Co, Old Leake

6. I Grant, Bishop Farm Partners, Sibsey

7. John & Richard Emerson, J & R Emerson Ltd, Hubbert's Bridge

8. Steven Lunn, J&S Lunn, Frithville

B. Email from Ian Grant of Bishop Farm Partners, Sibsey to Daniel Jobe at Brown & Co

[EXTERNAL] Re: Stone contamination

From: Ian Grant

To: Daniel Jobe

Fri 18/10/2024 12:30

Morning Dan,

Further to your stone contamination analysis I can confirm that a low level of white chalk stone can still be visible in parts of the easement.

I do not consider this to be too much of a problem except I wished that I had not taken the material for further use as the plastic and stone are more of a waste by-product.

More concerning is the level of blackgrass in the Viking Link easement where poor weed regrowth spraying on the banks was insufficiently carried out.

Lastly on the Triton Knoll easement I have drone photos of where the cables have caused premature senescence in spring beans four years after signing off due to the heat from the cables.

Please add all comments to the Planning Inspectorate.

Kind regards

Ian

On Thu, 17 Oct 2024 at 09:47, Daniel Jobe wrote:

Dear Ian and Stuart

> As you are aware, Lincolnshire has been, and is being, affected by a number of large infrastructure schemes, the most recent being the proposed Outer Dowsing Offshore Wind farm. I am currently in the process of making representations on behalf of a farming client in relation to the proposed Development Consent Order (DCO) for that scheme, and wish to raise specific concerns about the challenges of haul road removal and reinstatement, and in particular, the risk of residual stone contamination and impact on farming.
>
> In order to demonstrate the risk and adverse consequences of stone contamination, I am seeking accounts of the experiences of farmers whose land has suffered from stone contamination in the past and propose to include the paragraph below in the written representation.
>
> It would be most helpful if you could confirm if, (1) you agree that this paragraph is a true representation of your experience of the impacts of either/or the Triton Knoll and

Viking Link schemes and (2) if you are happy for me to reference your name in the Written Representations?:

The large-scale linear infrastructure schemes known as ‘Triton Knoll’ (the Triton Knoll Electrical System comprising the onshore connection for the Triton Knoll Offshore Wind Farm) and the ‘Viking Link’ (the UK onshore element of the National Grid Viking Link Interconnector scheme) both utilised a stone haul road within (along) the construction (cable installation) ‘working width’ to facilitate movement of machinery and materials in changeable ground conditions, whilst minimising compaction. Comprising of crushed stone and installed directly onto geo-textile laid on top of the subsoil, the haul road is designed to prevent the crushed stone from being integrated into the underlying and adjacent soils, and to allow easy removal of the haul road material prior to restoration and reinstatement of the topsoil.

In practice, however, the use of geo-textiles has not prevented stone transferring off the side of the haul road during use and mixing with the soils adjacent. This is due in part to insufficient geo-textile width being used or low-quality material. In addition, haul road removal creates significant levels of contamination of sub-soils as the mechanical movement of stone leads to tearing and failure of the geo-textile layer which deposits stone on unprotected and inevitably trafficked and disturbed sub-soils. Removal of this stone is either by excavator which results in additional sub-soils being removed or alternatively by hand.

Unfortunately, both of these methods of ‘making good’ are fallible. Hand picking stone left on subsoils has not been wholly effective with a percentage being left behind that is either buried through the haul road removal process or missed due to being stone/soil mix. The alternative approach of removing a layer of subsoil beneath the haul road to ‘catch’ any stone contamination results in large quantities of subsoil being removed, lowering field levels and resulting in drainage problems. Any stone that is left behind will naturally make its way through the topsoil to the surface of the land in subsequent years, as a result of usual farming practices, reducing the quality of root crops (by deformation caused by root-on-stone contact).

The need to remove stone by hand is a time-consuming burden, which rests with farmers for years following the completion of construction and ‘restoration’ of land by promotors.

I would be most grateful if you could confirm you are happy for me to include your name as a party that has been affected in a way consistent with the above paragraph.

This is an opportunity to raise specific concerns regarding stone contamination (amongst other matters) with the Planning Inspectorate directly so that these concerns will be given due regard in the examination process. Considering the influx of future developments coming through Lincolnshire in the next few years I do feel this is an opportunity to express specific concerns from past experiences. Please do give me a call if you would like to talk any matters through and I look forward to hearing from you in due course.

Kind regards

Dan

Daniel Jobe,BSc (Hons) MSc MRICS FAAV

Partner, Land Agency

For and on behalf of Brown & Co - Property & Business Consultants LLP

Lincoln Office ,5 Oakwood Road, Doddington,Lincoln,Lincolnshire,LN6 3LH ,United Kingdom

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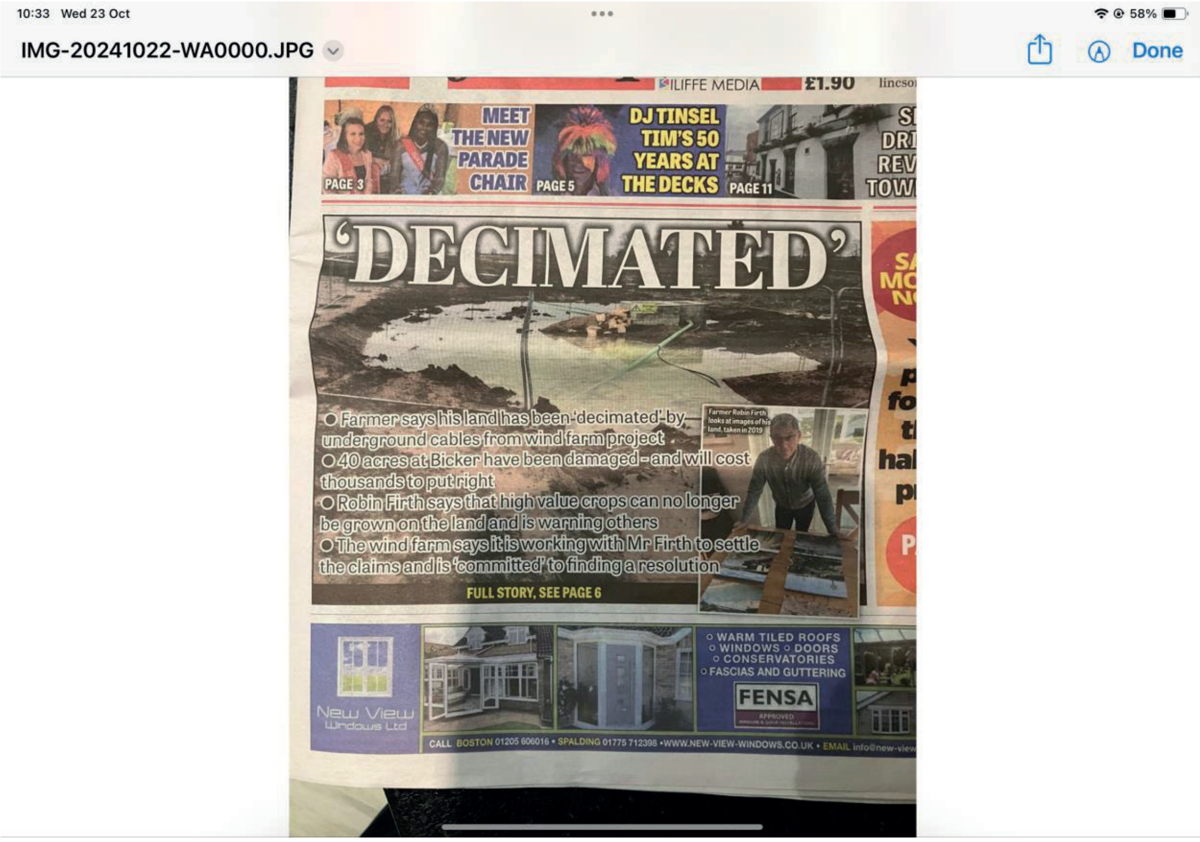
C. **Photographs received from Andrew Bush of B Bush & Sons Ltd, Revesby showing stone contamination that was left on his land after the removal of the haul road for the Viking Link scheme**

D. Newspaper Article Extracts, including from the Lincolnshire Free Press, dated 22 October 2024 and 23 October 2024



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MEET THE NEW PARADE CHAIR PAGE 3

DJ TINSEL TIM'S 50 YEARS AT THE DECKS PAGE 5

PAGE 11

'DECIMATED'

- Farmer says his land has been 'decimated' by underground cables from wind farm project
- 40 acres at Bicker have been damaged - and will cost thousands to put right
- Robin Firth says that high value crops can no longer be grown on the land and is warning others
- The wind farm says it is working with Mr Firth to settle the claims and is 'committed' to finding a resolution

Farmer Robin Firth looks at images of his land, taken in 2019

FULL STORY, SEE PAGE 6

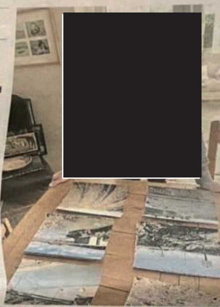
NEWS

ENERGY

Farmer puts out warning after his land is 'decimated' by cables

By Duncan Browne
duncan.browne@iliffepublishing.co.uk
www.lincsonline.co.uk

A farmer has warned of the problems caused by cables being laid under some of the nation's best agricultural land after seeing his fields 'decimated'.


[redacted]

Farmer Robin Firth looks at images of his 'decimated' land, taken in 2019

Robin Firth says he has been left 'miles out of pocket' after 40 acres of his land at Bicker was affected following a catalogue of issues following the installation of power cables for the Triton Knoll offshore windfarm.

And with a series of high-profile energy developments planned for Lincolnshire, Mr Firth is hoping other landowners can heed his warnings to avoid similar issues.

"I should hate to sit back and say nothing and find that the people on the next projects are suffering the same as we are," *said Mr Firth, who said his land has been left 'wetter, lower and contaminated with stones' after having* 400,000 volt cables installed underground.

"If we bring this into the open air it may stop it happening to somebody else.

"It's been a really frustrating, disappointing experience. We're miles out of pocket for a scheme I didn't want in the first place.

"They totally misused the land and treated us like we were nobody."

After a previously good experience with the Bicker Wind Farm project, Mr Firth, 70, was hoping for a similarly smooth ride with the Triton Knoll development, which connects to the National Grid at the nearby Bicker Fen substation.

Although onshore construction work for the windfarm was completed in October 2021, Mr Firth and his wife Ann remain in a battle to see the land returned to its previous state as well as recuperating money owed.

Among the issues the Donington-based farmer said he faced were:

- Stones from a temporary construction road contaminating soil.
- The removal of much-needed topsoil, leaving his land lower and looking to cost around £200,000 to replace.
- Drainage issues after work got underway in 2019. During this period there was heavy rainfall and the dug out land became what Mr Firth labelled a 'pond'. It is estimated it would cost around £40,000 to drain properly.

"They come right through the middle of four of our fields," said Mr Firth, who has recently retired and rents out his land.

"We own four ten-acre fields. If you like, we've now got 12 small fields, which, from a farmer's point of view in this day and age, nobody wants to really farm.

"The fields were growing potatoes, high value crops. Now we're back to growing wheat and barley.

"Across the easement they've installed the cables across as it's a mess basically."

The Firths signed up for the project after representatives of the project approached them with a Development Consent Order, meaning the plans have been deemed nationally significant by the Government's independent planning authority.

"The lever was 'we would pay you X amount if you sign today, but but if you make us bring the DCO in you're going to get half as much," Mr Firth added.

"Once they get a DCO in place, there's nothing you can do about it."

The Firths say the problems began to mount up when contractors got to work.

"We had meetings on site and agree the way forward, but as soon as we turned our backs they were doing as they were before," he explained.

"Our land agent said we've got to sign off on all steps during construction to say we're happy and the work was done properly.

"We never signed anything, apart from for one fence on the easement. I was given the opportunity but said 'I'm sorry you haven't done it to the methodology we all agreed in the first place', but they continued anyway."

Mr Firth's land during work to lay the cables in 2019

For his time spent dealing with the project, Mr Firth was encouraged to submit a time sheet.

"I put in for time spent, there were lots of time spent at meetings, calls, emails," he explained.

"I charged £20 per hour and the land agent told me it should be double that, but we were happy to get it done.

"It came to £13,000 over three years. They turned around and offered me £5,000.

"I said 'you'll find that's below minimum wage. We've still not seen a penny."

"We've got land now we can't grow high value crops on and we've got drainage problems. The land is going to become unfarmable - if you can't drain it you can't farm it.

"We're trying to come to some agreement but we're hearing nothing at all.

"I'd hate to think anybody else would go through this experience, but they may do.

"The farm's been in the family three generations and it's disappointing the land is decimated. If you destroy it mother nature can't put it right."

Major developments planned for Lincolnshire at present include the £7 billion Outer Dowsing Offshore Wind project - which aims to land at Anderby Creek and cable underground through East Lindsey, Boston Borough and South Holland before connecting to a to-be constructed substation at Surfleet Marsh - and the £1.07 billion Grimsby to Walpole plan to erect 420 pylons across an 87-mile stretch between Grimsby and Walpole, near King's Lynn, to bring in power from off-shore windfarms.

"Your good land in Lincolnshire is going to go," Mr Firth added. "People say it's better to lay cables underground than pylons, but I'd rather have pylons. I can farm around that but I'm having a job to farm over this."

A spokesman from RWE said: "We were disappointed to hear about Mr Firth's complaints, as we have been working with him to resolve and settle claims for a long period of time, in good faith and in line with the agreements made. We are committed to finding a resolution as soon as possible, taking into account properly documented and evidenced information."

Images, above and right, Mr Firth took of his land during work to lay the cables in 2019

Donington farmer after his land was damaged by undergound cables in Bicker: ‘I should hate to sit back and say nothing and find people are suffering the same as we are’

By Duncan Browne - [redacted]

Published: 05:00, 23 October 2024

A farmer has warned of the problems caused by cables being laid under some of the nation's best agricultural land after seeing his fields ‘decimated’.

Robin Firth says he has been left ‘miles out of pocket’ after 40 acres of his land at **Bicker** was affected following a catalogue of issues following the installation of power cables for the **Triton Knoll** offshore windfarm.

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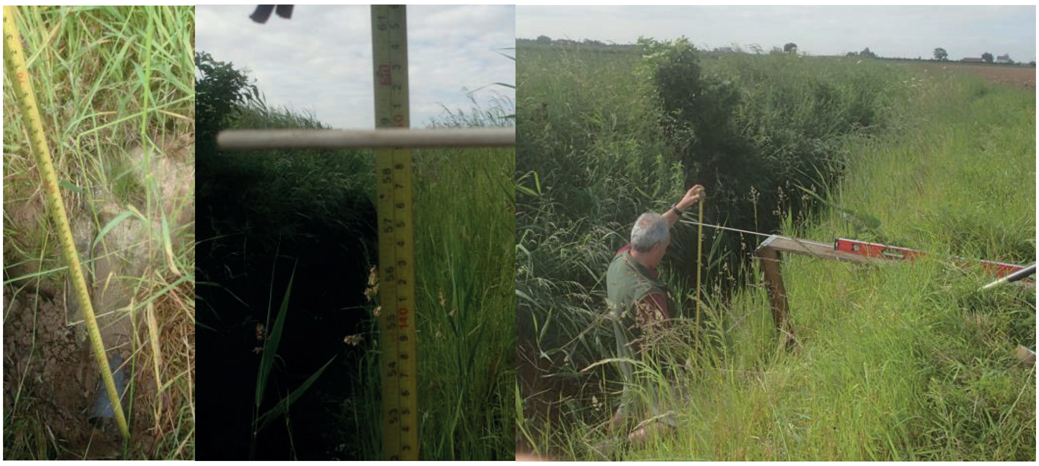
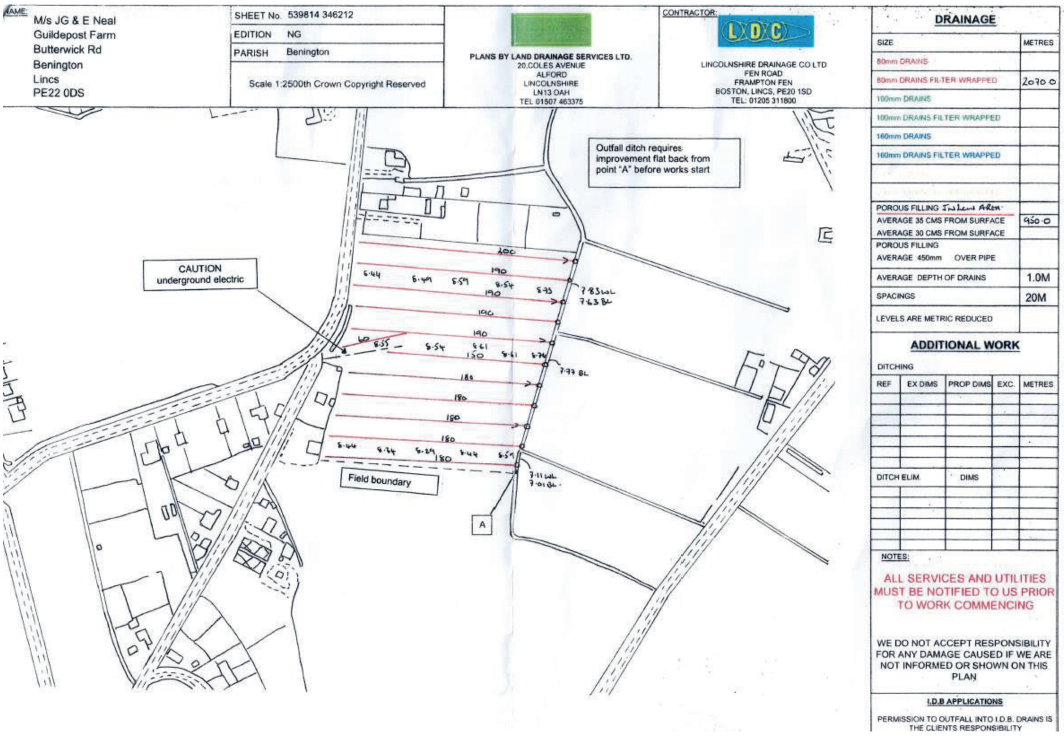
Appendix 8:

Field drain assessments – depth and status.



Above, & following: typical vegetable field farmed by T.H. Clements with a drain outfall measuring 1.5m below the field surface. Drain ditch reference is [52.995752, 0.083786]. The drainage map (following page) shows the average drain depth as 1.0m for this field. The resulting outfall depths therefore are far greater than this average depth

Above: Field surface reference. Below: confirmation of outfall depth below ground level



note average drain depth is designated as 1m, outfalls actually measured 1.5m below the field surface. This illustrates the likely deviations from the average depth (near to the pipe run centre) shown on drainage maps. This field is typical of those farmed by T.H. Clements, having an average drain depth of 1.0m shown on many such drainage maps

Iain Gould and Philip Wright also checked the outfall depth in the TH Clements Foxholes field as detailed in the following pictures. The drainage map is shown on page 21 of the main body of this written representation. This field is located within the proposed ODOW cable route.

ABOVE: T.H. Clements Foxholes field ditch outfalls measure 1.25m to 1.3m below the field surface. ODOW cables installed at the proposed 1.2m depth would directly interfere with this position

Appendix 9

Soil Moisture Measurements taken

The below photographs show measurements being taken of the point where the soil exceeded the plastic limit – into the liquid state - on a T.H. Clements field being harvested on 04/06/2024. Soil moisture levels at depths of 0.9m and below were found to be above typical liquid limit for this soil type (silt loam) at a time of the year when water levels are not usually high.

This is based upon a soil gravimetric moisture content at 0.9m/1.2m depth of 33%.

This reinforces the nature of these “running silt” soils at relatively shallow depth – even in early summer, and the need for appropriately managed drainage. This field is not directly on the proposed ODOW cable route, but was chosen because it was being harvested for vegetables by T.H. Clements at the time and is in close proximity, and has very similar soil characteristics to, the fields affected by the proposed ODOW cable route.

Above: soil sample being taken in a field being harvested by T.H. Clements at the 0.9m to 1.2m depth range which was subsequently tested for gravimetric moisture content by Dr Iain Gould, Associate Professor of Soil Science at the Lincoln Institute for Agri-food Technology, University of Lincoln

Appendix 10:

Trenches/channels dug to remove surface waterlogging, and its effect on TH Clements fields.

Where surface waterlogging is present (for example, in depressions within a field allowing surface water to accumulate in wet periods), trenches are usually dug from these low spots to take water to the surrounding ditches. Clearly, the further from the ditch, and the deeper the depression is, the deeper the trench needs to be dug. Failing to do this will incur yield and quality losses in crops growing in such areas. <u>Typical trenches can be to 1m or greater depth.</u> The following pictures are from fields farmed by Staples Vegetables Ltd adjacent to fields farmed T.H. Clements and the proposed cable route. Crops are at various growth stages, and clearly, waterlogging will affect growth and consistency, and if left for a significant (examples below show from 48 hours) time without these interventions, will also affect marketable yield.

Science and practice confirm the potential for marketable crop yield loss as a result of surface waterlogging. Examples include:

1. Broccoli – 3 days waterlogging can reduce yield to 23-37% of optimal levels.

Varietal differences in wet damage of Broccoli (Brassica Oleracea L. Var. Italica) under waterlogging conditions. Hara et al. Journal of Horticultural Research 2023.

DOI: 10.2478/johr-2023-0026

2. Yield effects depend on waterlogging timing relative to crop growth stage, and is also variety dependent:

The effects of waterlogging stress on plant morphology, leaf physiology and fruit yield in six tomato genotypes at anthesis stage. Yin et al., Vegetable Research 2023, 3:31

3. White Cabbage 3 day waterlogging at early, and/or later growth stages. Relatively insensitive to yield effects.

Response of White Cabbage (Brassica oleracea var. capitata) to Single and Repeated Short-Term Waterlogging. Hud, A et al., Agronomy 2023, 13, 200.

[redacted]

4. General: significant yield loss can occur for vegetables and root crops as a result of waterlogging. Yield loss depends on many factors including crop species, growth stage, duration of flooding, and time of year [***Flood and Coastal Erosion Risk Management: A Manual for Economic Appraisal.*** *Penning-Rowswell et al., 2013. Flood Hazard Research Centre, Middlesex University. ISBN-10 0415815150*].

5. Anecdotal evidence suggests waterlogging beyond a 48 hour period can result in marketable yield crop losses up to 100% depending on species, and growth stage at the time of flooding.

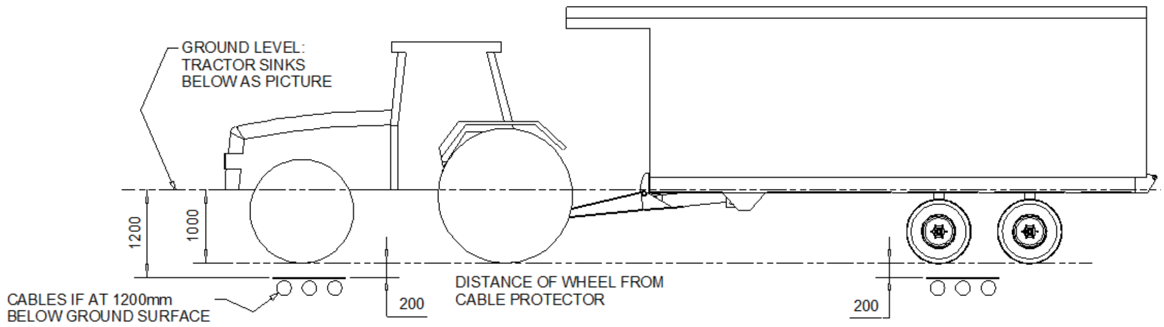
Appendix 11

Harvesting Machinery sinking through wet silt soils – examples

[Above, & below: examples of potato and vegetable harvesting equipment becoming bogged down, otherwise known as "falling through" soils]

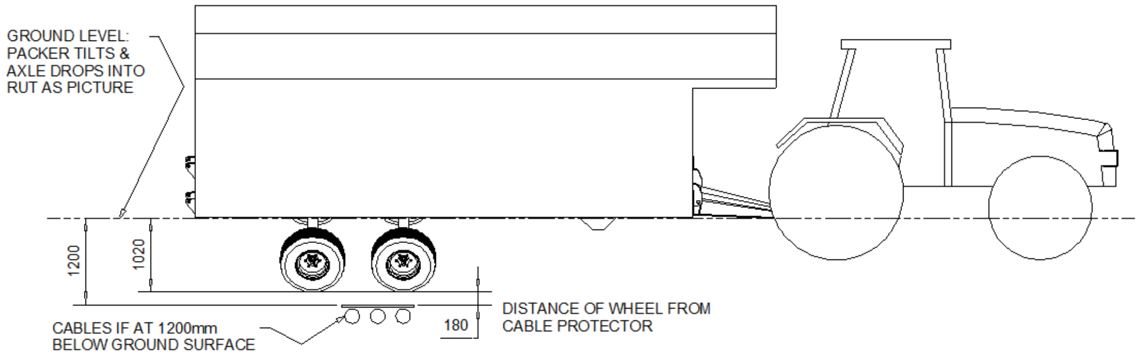
[redacted]

[Above: TH Clements vegetable harvester & tractor being towed out of ruts. The tractor has sunk to >1m as shown by the measurement (inset) of the front wheel. This is shown approximately to scale in the picture following]



[Above: the resulting sinkage puts the wheel within 0.2m of the cable]

[Above: Harvester sunk to its chassis, this height above ground is 1.08m, as shown in the inset. The resulting sinkage at the angle shown below is 1.02m below the ground surface]



[Above: the resulting sinkage puts the harvester wheels within 0.18m of the cable]

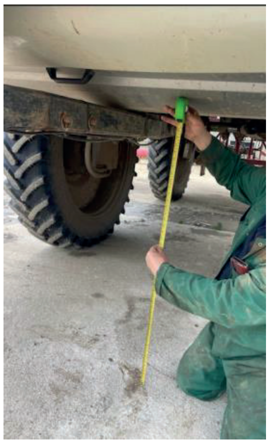
Appendix 12

Spraying Machinery sinking through silt and other wet soils – examples.

Agrifac technical data (supplied on 26/06/2024 by Graham Potter, Agrifac UK Sales Manager) covering the TH Clements sprayer in current use, is as follows:

- Wheelbase 3.1m; length 8.7m; total width 2.95m; height 3.75m.
- Tyres 380/90-R50 Michelin Spraybib (original fitment)
- Ground clearance approx. 1.2m
- Total sprayer loaded weight 17.8t; Front axle 8.6t and rear axle 9.2t (booms unfolded).

Adjustable ground clearance from 130 to 200 cm

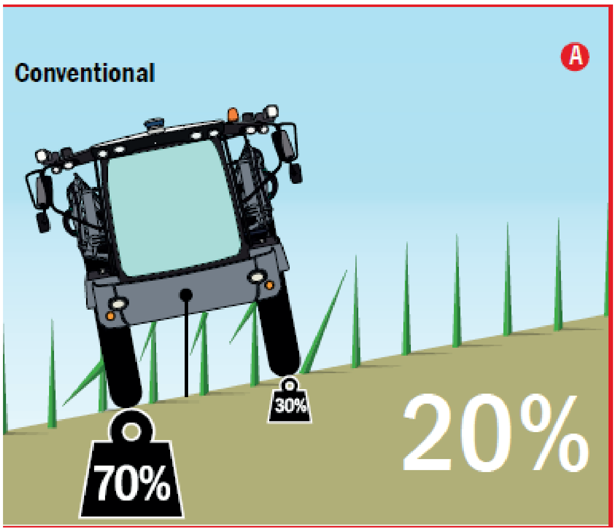


The picture (left) above (Agrifac Condor literature, [redacted] shows a 'clearance' version of the Agrifac Condor sprayer (i.e. capable of being set to a higher ride height of up to 2m). This shows ground clearances in two ride modes. The high ride mode (200cm = 2m) seen could be used for potato and sprout fields between August through to January – when soils are at their wettest. The picture on the right shows the ground clearance of the current TH Clements Condor 4 confirmed at >120cm. Sinkage to the chassis would put wheels at between 1.2m (minimum) and potentially up to 2.0m (maximum) below the ground surface. Clearly, in order not to compromise future farm sprayer upgrades, the high (2m) clearance version of this sprayer should be taken into account when determining possible sinkage depths.

[redacted]

Above shows an example of how the sprayer needs extracting after becoming bogged. In this case the unit needed towing more than 20m before the rear wheel was lifted out of the rut. Here, the rut would have been approximately 1.3m deep.

Pictures above and following illustrate further UK farm examples of this version of the sprayer becoming bogged in break crop, and root crop fields respectively. Pictures c/o Jack Smith, AG Wright & Son Hillrow Causeway, Ely, Cambs.



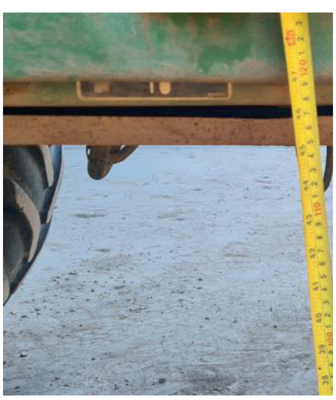
The above shows typical sprayer sinkage – in this case in a UK potato field, on to one side. This situation moves the centre of gravity over to the sunk side, magnifying the axle loads exerted at depth. Typically, this magnification can then exert up to 70% or more (as above picture, right, from the Agrifac literature) onto a buried cable as a single point applied load.

[ABOVE: shows a John Deere self-propelled sprayer with a grounded rear axle being towed out of a rut. A typical JD 4050I sprayer used by Contractors and Growers in the UK has a 12765kg filled weight with up to 58% applied on the rear axle resulting in a 7.4t axle load. Data from the John Deere literature on this model follow. Ground clearance is a minimum of 1.15m (on 620/70-R38 tyres) increasing to 1.25m with 380/90-R54 tyres for vegetable crops]

DIMENSIONS	
Total length (with 40i/50i sprayer installed*)	7.65 m (9.10 m)
*Longest dimension is the boom	
Max. transport width (with 40i/50i sprayer installed)	2.55 m (3.00 m)
Max. transport height (with 520/85R42 tires, beacon light removed)	3.95 m
Ground clearance (with 520/85R42 tyres)	1.00 m
Empty weight** (with 40i/50i sprayer installed including 5,000 litre water in main tank and 400 litre water in rinse tank)	11,315 to 12,015 kg (11,065 to 12,765 kg)
**R41 tractor-type carrier only ballasted	
Weight balance in transport mode (with 40i/50i sprayer installed including 5,000 litre water in main tank and 400 litre water in rinse water tank):	
Front axle	53% (46%)
Rear axle	47% (54%)
Weight balance in application mode boom unfolded 80 cm height with 40i/50i sprayer installed including 5,000 litre water in main tank and 400 liter water in rinse tank:	
Front axle	42%
Rear axle	58%

DIMENSIONS	
Total length (with 40i/50i sprayer installed*)	7.65 m (9.10 m)
*Longest dimension is the boom	
Max. transport width (with 40i/50i sprayer installed)	2.55 m (3.00 m)
Max. transport height (with 520/85R42 tires, beacon light removed)	3.95 m
Ground clearance (with 520/85R42 tyres)	1.00 m
Empty weight** (with 40i/50i sprayer installed including 5,000 litre water in main tank and 400 litre water in rinse tank)	11,315 to 12,015 kg (11,065 to 12,765 kg)
**R41 tractor-type carrier only ballasted	
Weight balance in transport mode (with 40i/50i sprayer installed including 5,000 litre water in main tank and 400 litre water in rinse water tank):	
Front axle	53% (46%)
Rear axle	47% (54%)
Weight balance in application mode boom unfolded 80 cm height with 40i/50i sprayer installed including 5,000 litre water in main tank and 400 liter water in rinse tank:	
Front axle	42%
Rear axle	58%

[redacted]

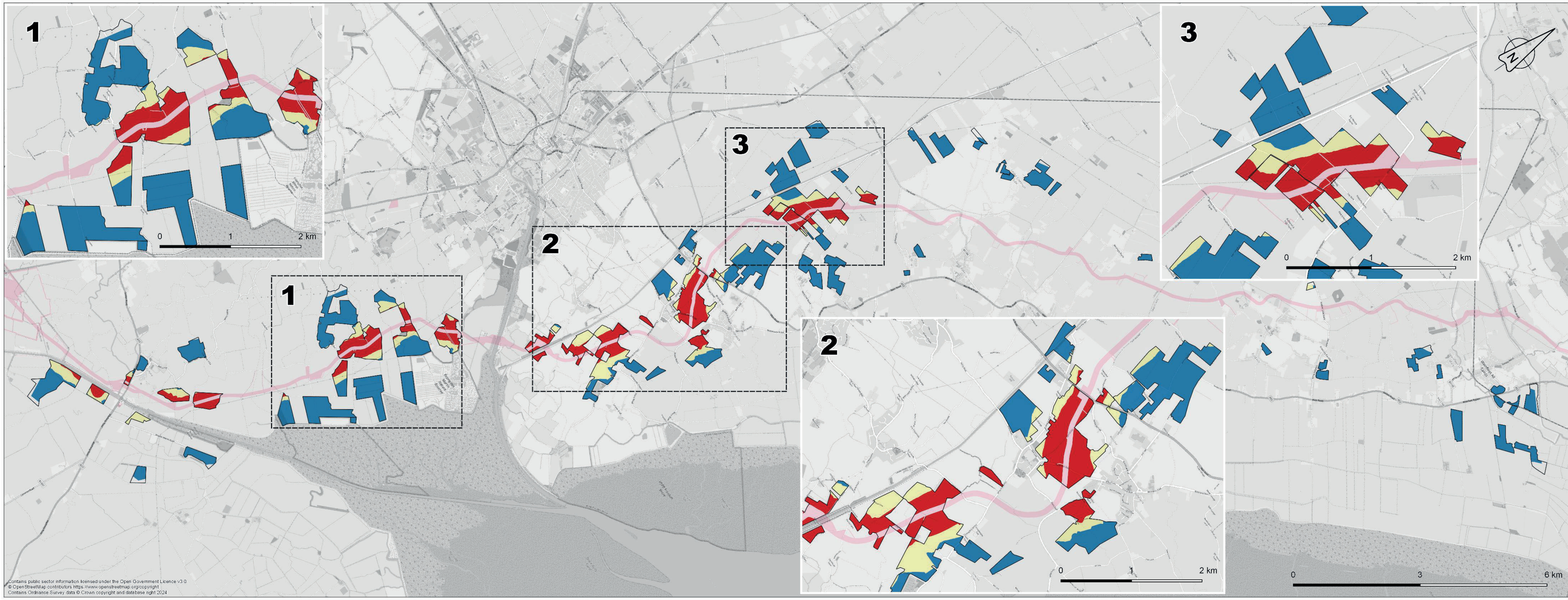


[Above: Minimum ground clearance of a John Deere 4050I sprayer used by H Melton and Sons, Pear Tree Farm, Mill Rd, Wisbech, Cambs]

This final John Deere sprayer example, whilst not being directly related to the aforementioned Agrifac Condor model used by TH Clements, serves to illustrate that other makes of self-propelled sprayer operated by Contractors and large-scale farmers in the locality have similar characteristics in terms of axle loads exerted, and ground clearances (or sinkage depths) likely

Appendix 13

Dust Deposition Plots Linked to Written Representation



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Edinburgh, EH3 9QG
Tel: +44 (0)131 550 6300
www.sweco.co.uk

Client: THClements — growing with confidence

Project Title: Outer Dowsing Offshore Windfarm – Dust Deposition Modelling

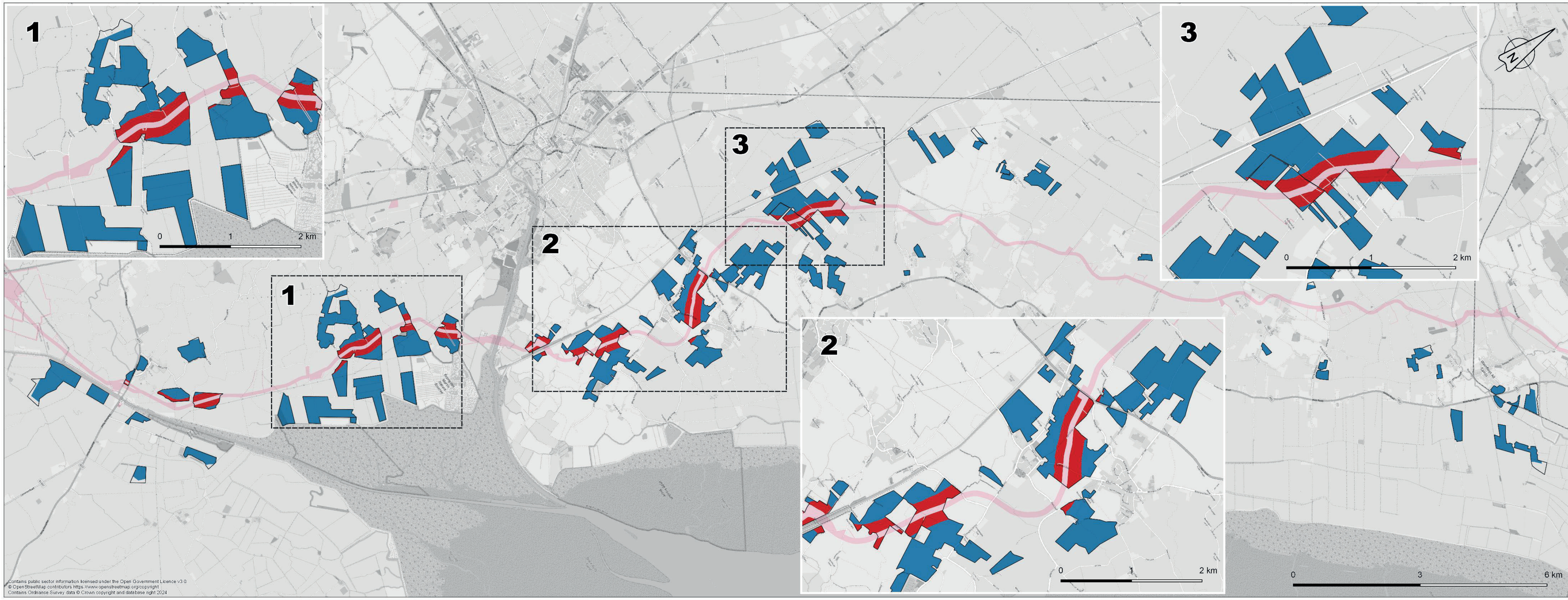
Drawing Title: Figure 13.1 Enabling Works - **With** Dust Control - Modelled Maximum Daily Dust Deposition Flux

Project Stage	Status	Status Description
n/a	n/a	n/a

Drawn	Designed	Checked	Approved
LFS	DP	DP	DP

Sheet Size	Scale	Sweco Ref	Revision
840 x 297	1:50,000	65213546	P01.1

Drawing Number: 65213546-SWE-XX-XX-G-AQ-00017

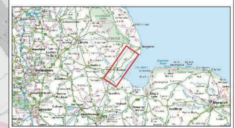


Legend

- TH Clements Fields
- Order Limits

Modelled Maximum Monthly Deposition:
Cable Infrastrucutre Installation
(Assessment benchmark: 2 g/m²/month)

- < 2 g/m²/month
- ≥ 2 g/m²/month



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Rev	Date	Amendment Details	Dr'n	Chk'	App'

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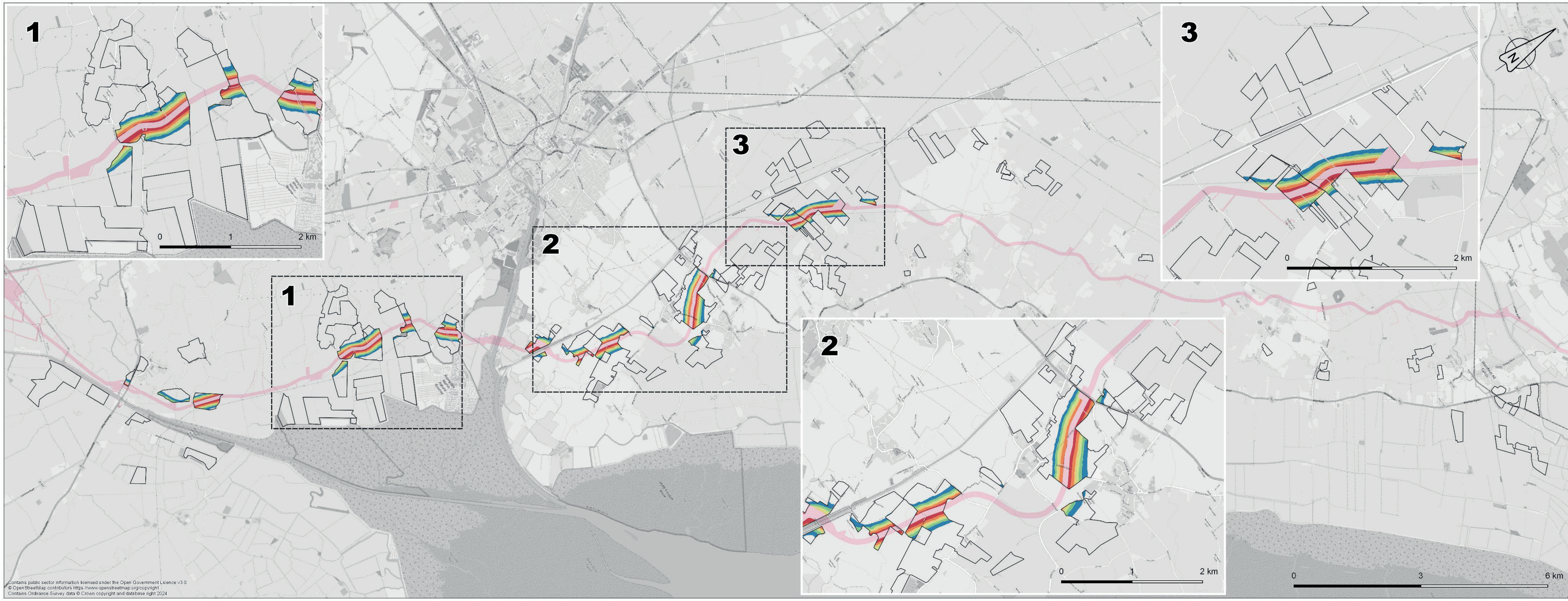
Project Title
Outer Dowsing Offshore Windfarm – Dust Deposition Modelling

Drawing Title
Figure 13.2 Cable Infrastructure Installation - **With** Dust Control - Modelled Maximum Monthly Dust Deposition Flux

Project Stage			
n/a			
Status: n/a	Status Description: n/a		
Drawn: LFS	Designed: DP	Checked: DP	Approved: DP
Sheet Size: 840 x 297	Scale: 1:50,000	Sweco Ref: 65213546	Revision: P01.1

Drawing Number 65213546-SWE-XX-XX-G-AQ-00024

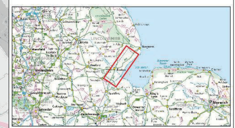


Legend

- TH Clements Fields
- Order Limits

Modelled Exceedance Frequency:
Cable Infrastrucutre Installation
(Assessment benchmark: 80 mg/m²/day)

- ≥ 30 days/year
- ≥ 60 days/year
- ≥ 90 days/year
- ≥ 120 days/year
- ≥ 150 days/ year
- ≥ 200 days/year



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Project Title
Outer Dowsing Offshore Windfarm – Dust Deposition Modelling

Drawing Title
Figure 13.3 Cable Infrastructure Installation - **With** Dust Control - Modelled Exceedance Frequency of Daily Dust Deposition Benchmark

Project Stage			
n/a			
Status: n/a	Status Description: n/a		
Drawn: LFS	Designed: DP	Checked: DP	Approved: DP
Sheet Size: 840 x 297	Scale: 1:50,000	Sweco Ref: 65213546	Revision: P01.1
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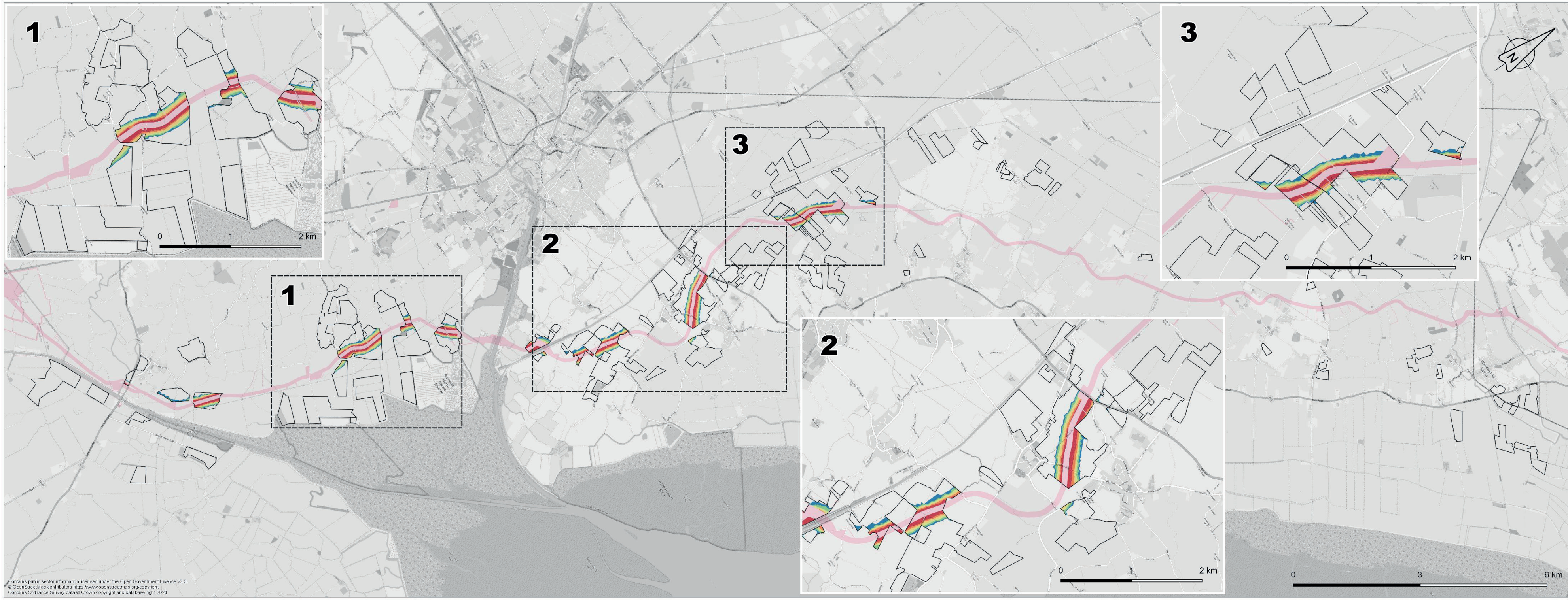
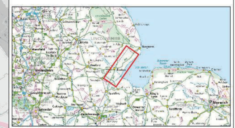


Legend

- TH Clements Fields
- Order Limits

Modelled Exceedance Frequency:
Cable Infrastrucutre Installation
(Assessment benchmark: 2 g/m²/month)

- ≥ 1 months/year
- ≥ 2 months/year
- ≥ 4 months/year
- ≥ 6 months/year
- ≥ 8 months/year
- ≥ 10 months/year



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Rev	Date	Amendment Details	Dr'n	Chk'	App'

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Project Title
Outer Dowsing Offshore Windfarm – Dust Deposition Modelling

Drawing Title
Figure 13.4 Cable Infrastructure Installation - **With** Dust Control - Modelled Exceedance Frequency of Monthly Dust Deposition Benchmark

Project Stage			
n/a			
Status: n/a	Status Description: n/a		
Drawn: LFS	Designed: DP	Checked: DP	Approved: DP
Sheet Size: 840 x 297	Scale: 1:50,000	Sweco Ref: 65213546	Revision: P01.1
Drawing Number: 65213546-SWE-XX-XX-G-AQ-00027			

Appendix 14

Air Quality (Dust Deposition) Impact Report

Technical Report: Dust Deposition Modelling

Appendix 14

Sweco UK Limited	Reg. No. 2888385
Project Name	Outer Dowsing Offshore Windfarm – Dust Deposition Modelling
Project Number	65213546
Client	T.H.Clements & Son Ltd
Author	Damian Pawson
Date	2024-10-03
Document reference	ODOW_THC_DustDepositionModelling_TechnicalReport_Oct24_FINAL.docx

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Table of contents

1 Introduction

1. This report provides a detailed technical account of the dust deposition modelling study completed with respect to assessing the potential for growing crops within land farmed by T.H. Clements & Son Limited ("T.H. Clements") to be adversely impacted by fugitive dust emissions associated with phased construction activities relating to the Outer Dowsing Offshore Wind (ODOW) (Generating Station) project (herein referred to as the 'proposed Project').

2. The applicant for the proposed Project is GT R4 Limited (trading as Outer Dowsing Offshore Wind) and is herein referred to as 'the Applicant'.

3. This assessment was commissioned by T.H. Clements and has been completed by Damian Pawson, a Technical Director of Air Quality at Sweco. Damian benefits from over 18 years' professional experience, having graduated from Lancaster University in 2006 with a First Class Honours degree in Environmental Science and is a Full Member of the Institute of Air Quality Management (MIAQM). Damian has extensive experience in completing dispersion modelling studies for large-scale opencut mining projects where deposition of dust was a primary concern, requiring detailed analysis of dust emissions sources and the development of emissions inventories with reference to best practice international guidance. Damian's CV and bio are provided in **Appendix 4** to the Written Representation.

1.1 Sensitivity of Land Farmed by T.H. Clements

4. T.H. Clements farms approximately 10,000 acres of rural land in Lincolnshire, including a significant proportion of the land affected by the proposed Project's onshore cable route. T.H. Clements is a leading producer of high-end Brassica vegetables and supplies approximately 20% of the Brassica vegetables sold in the UK, having significant contracts with leading retailers, including Tesco plc.

5. In fulfilling these contracts, T.H. Clements is required to adhere to stringent minimum quality requirements, in line with the General Marketing Standard (GMS)[1], applicable to each type of vegetable (e.g. cauliflower, cabbage, broccoli, leek, Brussels sprout).

6. With respect to dust soiling (deposition), the minimum quality requirements within the GMS states that products shall be "…*clean, practically free of any visible foreign matter*"[1], subject to allowed tolerances.

7. Further to this, T.H. Clements customer specifications adopt a zero tolerance approach to visible dust on produce, deeming it unacceptable for purchase. Exceptions may be allowed for natural disasters/weather events, such as the episodic atmospheric transport and widespread deposition of Saharan dust over the UK. In such events, a temporary specification may be applied, but this provides no guarantee that the produce would be accepted by the customer if the more stringent specification can be delivered by another supplier.

8. Within the context of the above stringent requirements applied to crops grown by T.H. Clements, this study has adopted appropriate dust deposition benchmarks, based on literary research, against which the results of the atmospheric dispersion modelling could be assessed (see **Section 2**).

[1] Commission Implementing Regulation (EU) No 543/2011 of 7 June 2011 laying down detailed rules for the application of Council Regulation (EC) No 1234/2007 in respect of the fruit and vegetables and processed fruit and vegetables sectors; Consolidated text: Annex I; Part A General Marketing Standard (accessed via https://www.gov.uk/guidance/comply-with-marketing-standards-for-fresh-fruit-and-vegetables)

1.2 Study Area

9. The primary objective of this study was to assess the potential for fugitive dust emissions to deposit on growing crops, specifically in relation to the phased construction of the proposed Project's onshore cable route.

10. The spatial scope of this study was determined based on the locations of fields farmed by T.H. Clements that are in proximity to the proposed Project onshore cable route. The study area captures segments 5 to 14 inclusive of the onshore cable route corridor, as shown in Figure 3.3.1 of Application Document 6.2.3 (Examination Library reference APP-089.

11. The study area extent is depicted in **Figure 1**, showing the field locations in relation to the proposed cable route within the Order Limits[2].

12. For clarity, the land owned by T.H. Clements that falls within the Order Limits was excluded from the study area, given that it would not be possible to farm this land (i.e. no crops present to be impacted by deposited dust).

13. The cable route construction works are described as being in five key phases (Para. 188, page 84 of Application Document 6.1.3; Examination Library reference APP-058), as follows:

    1. Pre-construction works
    2. Enabling works
    3. Cable infrastructure installation
    4. Cable installation
    5. Reinstatement works & demobilisation

14. On the premise that the pre-construction works will be non-intrusive (Paras. 195-198, Pages 85-86 of Application Document 6.1.3 Chapter 3 Project Description; Examination Library reference APP-058) and that the cable installation works will not include inherently dusty activities (Para. 256, page 100 of Application Document 6.1.3 Chapter 3 Project Description; Examination Library reference APP-058), this study has focussed on fugitive dust emissions from activities associated with the following three construction phases:

    1. Enabling works
    2. Cable infrastructure installation
    3. Reinstatement works & demobilisation

1.3 Request for Information issued to ODOW

15. To facilitate the dust deposition modelling assessment, information contained within the Applicant's Environmental Statement and associated documents (as listed in the proposed Project's Examination Library[3]) was relied upon, as outlined in **Table 4-1** of **Section 4.1**.

16. Additional information was requested via an email submitted by Brown & Co. (on behalf of T.H. Clements) to the Applicant on 5 July 2024. A record of the requested information and the Applicant's response, where applicable, is given in **Table 1-1**.

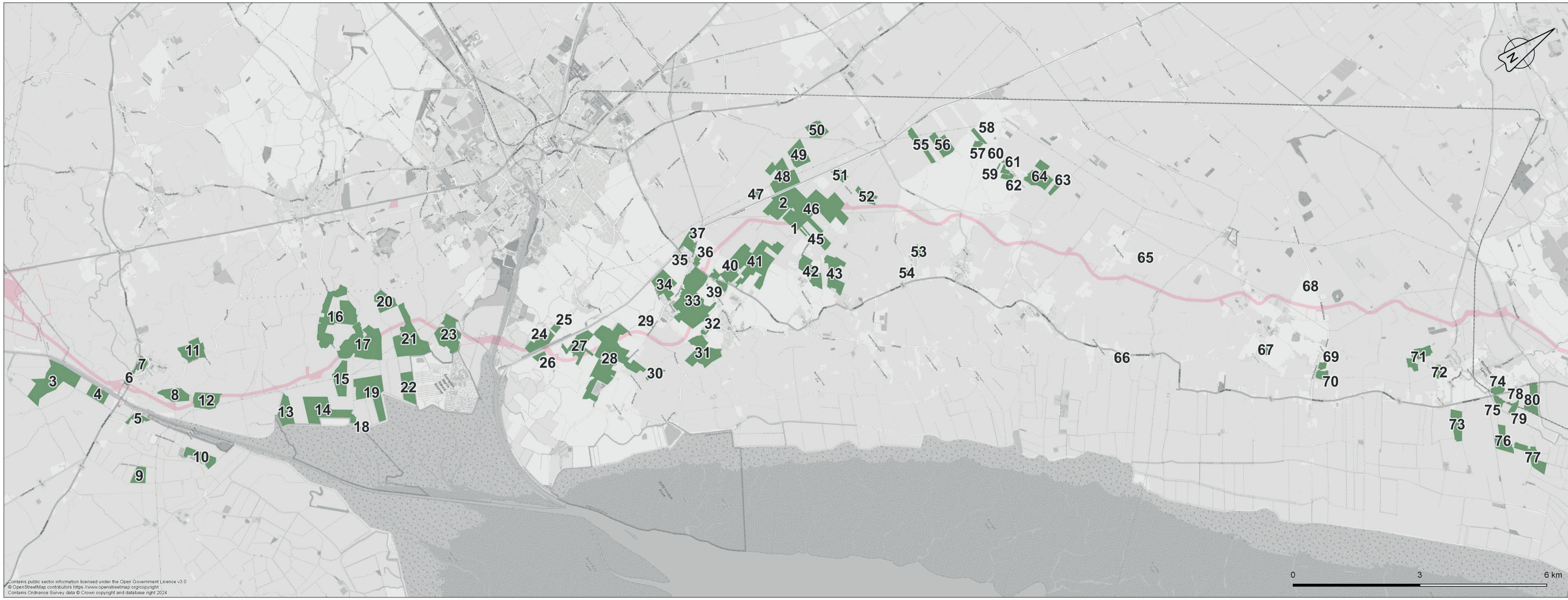
17. Where the requested information was not provided by the Applicant and/or not contained within the Application Documents[3], appropriately justified assumptions were made in completing the dust deposition assessment. The assumptions and associated limitations of the assessment are detailed in **Section 5**.

[2] Proposed Project Order Limits provided in georeferenced shapefile format by the Applicant via email dated 23 July 2024.

[3] Planning Inspectorate website for ODOW Project Documents and Examination Library accessed via https://national-infrastructure-consenting.planninginspectorate.gov.uk/projects/EN010130/documents

Table 1-1: Additional information request submitted by T.H. Clements to the Applicant in relation to the proposed Project

Requested Information (issued via email dated 5 July 2024)	Applicant's Response (dated 23 July 2024)
Shapefiles (GIS format) of the proposed Project's onshore cable route, including Order Limits boundary and locations of temporary accesses, construction compounds, in addition to the proposed trenches, haul road alignment, and storage bunds within the 80 m working width corridor.	Shapefiles of the latest Order Limits and Works Plan were provided by the Applicant. Further information on locations of proposed trenches and spoil bunds was not provided. Applicant stated this was because "…*this information is not available at this stage and will be subject to FEED and detailed design*…" Haul road alignment was not provided in requested format, but Applicant provided reference to the indicative alignment (as depicted on Figure 3.4 of Application Document 6.2.3 Chapter 3 Project Description Figures; Examination Library Reference App-089).
Volume of material to be excavated along the onshore cable route, proportioned according to topsoil and subsoil, focussed on the land parcels of concern.	Applicant stated "…*we are checking internally to see if this information is available at this stage and will revert in due course*…" A further follow-up request for this information was issued to the Applicant on 7 August, but no response had been received at the time of writing this report (October 2024).
Average width of topsoil and subsoil storage bunds along the onshore cable route.	Applicant stated "…*The indicative cross section can be found in the Project Description on the PINS website*…" However, Plate 8.1, Page 93 of Application Document 6.1.3 Chapter 3 Project Description; Examination Library reference APP-058 does not contain indicative measurements of soil bund widths.
A construction programme, including provisional dates for incremental excavation and backfilling of trenches along the onshore cable route over the land of concern, by land plan reference	Applicant confirmed that this cannot be provided at this stage. Applicant stated "…*At this point in time as outlined previously to the LIG, we cannot confirm this level of detail until we have a contractor appointed for construction activities and have developed a construction programme*…"
In the absence of a detailed construction programme, provide an estimate of the average number of days over which construction and reinstatement activities would take place in any given land parcel.	Applicant confirmed that this cannot be provided at this stage. Applicant stated "…*We can't provide you with an estimate or average at this point in time due to not having a construction programme. In keeping with our consultation to date, we will keep you and your clients fully informed and we will release this information as soon as it is available*…" No further update provided by the Applicant at the time of writing this report (October 2024).



Legend

- TH Clements Fields
- Order Limits

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Project Title

Outer Dowsing Offshore Windfarm – Dust Deposition Modelling

Drawing Title

Figure 1
Dust Deposition Assessment Study Area

Project Stage			
n/a			
Status: n/a	Status Description: n/a		
Drawn: LFS	Designed: DP	Checked: DP	Approved: DP
Sheet Size: 840 x 297 mm	Scale: 1:50,000	Sweco Ref: 65213546	Revision: P01.1
Drawing Number: 65213546-SWE-XX-XX-G-AQ-0001			

2 Identifying a Dust Deposition Assessment Benchmark

2.1 Basis for determining a Benchmark for T.H. Clements' land

18. There are no overarching statutory standards in the UK relating to dust deposition. Local authorities or the Environment Agency can impose specific limits through planning conditions or environmental permits, with power to issue abatement notices under the Environmental Protection Act 1990 if dust from an activity is considered to be a statutory nuisance. Such limits are often tailored to the specific site and its local conditions.

19. Dust deposition is typically considered to be an annoyance issue, which is subjective and based on a number of factors, including but not limited to:

- Baseline dust deposition conditions
- Type, scale, and duration of dust-generating activities
- Weather conditions (e.g. humidity; topography; wind speed and direction; precipitation)
- The type and sensitivity of the receiving environment (e.g. residential; commercial; agricultural)
- The nature of the dust being deposited (e.g. origin; composition; particle size; colour).

20. Such factors make it difficult to define an absolute benchmark(s) for deposited dust, especially when one individual's perception or tolerance of what is deemed an annoyance may differ from another.

21. However, the key differentiating factor in this study is that the potential for annoyance / nuisance is not being assessed *per se*. T.H. Clements are required by their customers, and as per the GMS[1], to provide produce that is, as a minimum, "…*clean, practically free of any visible foreign matter*". Failure to meet this requirement is likely to result in the affected produce being rejected, resulting in reduced harvested yields and associated revenue losses.

22. Therefore, an appropriately stringent benchmark that reflects the nature of T.H. Clements minimum quality requirements is required, equivalent to a level of dust deposition that has the potential to be visible on growing crops.

2.1.1 Nature of Brassica Crops & Growing Seasons

23. In determining an appropriate benchmark to assess the potential for visible dust on the growing crops within land farmed by T.H. Clements, the nature of the Brassica vegetables must also be considered.

24. Given that the dust likely to be generated by the proposed Project's activities will be associated with the disturbance of topsoil and subsoil layers within the onshore cable route corridor (see **Section 4.2**), deposited dust is likely to be dark in colour. Therefore, the Brassica vegetables have the potential to present a surface that will provide a contrast to the deposited dust (e.g. white cauliflower curd, light green leaves of cabbage and Brussels sprout, white/green parts of leek). This could result in deposited dust becoming visible at low levels of deposition.

25. Furthermore, the shape and form of Brassicas are such that any deposited dust could accumulate / be retained within various parts of the crop as they grow (e.g. layers of

cabbage, leek, Brussels sprout; surface of cauliflower curd; surface of broccoli floret). The potential accumulation of dust would not only increase dust visibility but could also lead to discolouration / spoiling of the vegetable such that it does not meet GMS[1] minimum requirements.

26. The Brassicas grown on T.H. Clements' land are subject to differing growing seasons, maturation periods, and are harvested at varying times throughout the year, as exhibited in **Appendix A** of this document (*2023-2024 Cropping Guide*). As such, T.H. Clements' land has the potential to be sensitive to dust deposition throughout all months of the year.

27. Therefore, an annual dust deposition flux benchmark would not be representative in this study, given that crops are grown and picked intermittently over a year. The dust deposition benchmark(s) applicable to T.H. Clements' land should reflect shorter term periods (i.e. daily and/or monthly) to align with the nature of farming activities and to acknowledge the potential for visible dust to deposit on growing crops within a short timeframe.

2.2 Review of Dust Deposition Benchmarks

28. The following documents were reviewed with respect to determining an appropriate dust deposition benchmark for this study:

- Environment Agency (July 2013) *Technical Guidance Note M17: Monitoring Particulate Matter in Ambient Air around Waste Facilities*[4]
- Scottish Government (1996) Planning Advice Note 50: *Controlling the environmental effects of surface mineral workings (Annex B: The Control of Dust at Surface Mineral Workings)*[5]
- Germany Federal Ministry for Environment, Nature Conservation and Nuclear Safety (July 2002) *Technical Instructions on Air Quality Control – TA Luft*[6]
- New South Wales Environmental Protection Authority (2022) *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*[7]
- Queensland Government (October 2024) *Environmental Protection Act 1995 Guideline: Application requirements for activities with impacts to air v5.03*[8]
- New Zealand Ministry for the Environment (2016) *Good Practice Guide for Assessing and Managing Dust*[9]
- Vallack, H. W. and Shillito, D.E (June 1998) *Suggested Guidelines for Deposited Ambient Dust*[10]

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[4] Environment Agency (July 2013) Technical Guidance Note M17: Monitoring Particulate Matter in Ambient Air around Waste Facilities. Available online: https://www.gov.uk/government/publications/m17-monitoring-of-particulate-matter-in-ambient-air-around-waste-facilities

[5] Scottish Government (1996) Planning Advice Note 50: Controlling the environmental effects of surface mineral workings. Available online: https://www.gov.scot/publications/planning-advice-note-pan-50-controlling-environmental-effects-surface-mineral/

[6] Federal Ministry for Environment, Nature Conservation and Nuclear Safety*; First General Administrative Regulation Pertaining the Federal Immission Control Act (Technical Instructions on Air Quality Control – TA Luft) of 24 July 2002*

[7] New South Wales Environmental Protection Authority (2022) *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*. Available online: [redacted]

[8] Queensland Government (October 2024) *Environmental Protection Act 1995 Guideline: Application requirements for activities with impacts to air v5.03.* Available online: [redacted]

[9] New Zealand Ministry for the Environment (2016) *Good Practice Guide for Assessing and Managing Dust*. Available online: [redacted]

[10] Vallack HW and Shilito DE (1998), Atmospheric Environment, Vol 32 (No.16) pp.2737-2744

29. In the UK, in the absence of a statutory standard, a "custom and practice" dust nuisance guideline of 200 mg/m^2/day is widely adopted for general dust deposition. This is acknowledged by the Environment Agency[4] as being limited in that it is "…*simply a custom and practice yardstick and it was never based on actual dose-response data*…", being referred to as a "…*complaints likely guideline for receptors located in residential areas and outskirts of towns*", as per Vallack and Shillito (1998)[10].

30. In Germany, TA Luft[6] assigns a higher deposition guideline value of 350 mg/m^2/day for the "…*protection against significant nuisances or significant disadvantages due to dustfall*…".

31. Both UK and German guideline values are not wholly applicable to this study, given the rural location of T.H. Clements' land and the sensitivity of the crops to dust deposition, as dictated by the GMS minimum quality requirements[1].

32. However, the Vallack and Shillito (1998) study, which is the paper referenced by the Environment Agency[4], also suggested a "*complaints possible*" guideline range for "*open country*" of between 80 mg/m^2/day and 100 mg/m^2/day. This implies that dust may become visible at lower deposition levels.

33. Similarly, whilst the Scottish Government's Planning Advice Note 50 (Para. 28, Annex B)[5] references the above UK and German guidelines, it recognises the potential for dust to become visible at much lower levels of deposition:

"*…guideline values in the range 200 - 350 mg/m^2/day have been variously used for mineral sites. It should be noted that the nature of deposit can influence strongly the perception of nuisance. For example, black coal dust which has a high contrast with its background may cause complaints if deposited at a rate in excess of only 80 mg/m^2/day*."

34. In Australia, the New South Wales Environmental Protection Authority (NSW EPA)[7] has established two benchmarks relating to deposited dust; 2 g/m^2/month (maximum project-only contribution) and 4 g/m^2/month (maximum total including background deposited dust), which equates to 65 mg/m^2/day and 130 mg/m^2/day, respectively. Queensland Government[8] references a guideline value of 120 mg/m^2/day, which sits within the ranges established by NSW EPA.

35. In New Zealand, the Ministry for the Environment good practice guide[9] sets a recommended guideline of 4 g/m^2/month, which aligns with the upper value given by the NSW EPA. However, this document also references that the nature of dust may also be relevant, such that visible soiling can occur at lower deposition rates, stating that "…*some highly sensitive residential areas may find deposition rates of 2 g/m^2/month (above background levels) objectionable and offensive…*".

36. The benchmark(s) for this assessment needs to be sufficiently stringent to recognise the sensitivity of the growing fields and the nature of the Brassica crops. As this study focusses on the Project-only dust contribution from construction activities, the benchmark(s) should align with the more stringent deposition criteria referenced above.

2.3 Dust Deposition Benchmarks applied to Assessment

37. Based on the above review, there is agreement across national and international guidance that visible dust can accumulate at relatively low rates of deposition, particularly where the dust is dark in colour and the receiving surface presents a contrast.

38. Considering the nature of the Brassica crops, as outlined in **Section 2.1.1**, which must meet stringent minimum quality requirements for visible matter, this assessment adopted the following benchmarks in line with the stricter guideline values identified in the review:

- **Daily dust deposition benchmark: 80 mg/m^2/day**
- **Monthly dust deposition benchmark: 2 g/m^2/month**

39. These benchmarks were applied to the dust deposition modelling, specifically focussing on the proposed Project contribution only (i.e. excluding background contributions to deposited dust). When applying these benchmarks, it was also important to assess the frequency at which exceedances might occur within T.H. Clements' land (e.g. number of days and/or months per year that the benchmarks are exceeded, if at all).

40. For the purposes of this assessment, and within the context of the limitations and assumptions set out in **Section 5**, an exceedance frequency of **120 days or more per year** (compared to the daily benchmark) or a frequency of **four or more months per year** (compared to the monthly benchmark) is considered to represent a ***high risk*** of dust accumulation on T.H Clements' land.

41. In practice, visible accumulation could occur over much shorter timescales, due to the sensitivity of Brassica crops, the time of year (i.e. crop maturity), and variations in the intensity of dust emissions. As such, a modelled exceedance frequency of 30 days or more per year, or one month or more per year, cannot be completely disregarded.

42. However, in the context of the limitations and assumptions for this study – as set out in detail **Section 5** – on the balance of probability, a modelled exceedance frequency at or above 120 days or four months (i.e. 33% of the year or more) indicates a high likelihood that the impacted area of land will experience visible dust accumulation (termed as 'high risk').

43. Overall, the above frequency thresholds are considered appropriate to highlight the risk of visible dust accumulation on T.H. Clements' land without being overly conservative. As such, the likelihood of deposited dust impacting T.H. Clements' ability to produce crops in line with customer requirements could be assessed.

3 Baseline Conditions

3.1 Climate

44. To understand the climate characteristics of the study area, a review of the Met Office's regional climate description for Eastern England[11] was undertaken, encompassing the latest 30-year period (1981-2010). A concise summary of key meteorological variables is provided below:

- **Temperature**
  - The mean annual temperature ranges from 9.5°C to 10.5°C, influenced by altitude and proximity to the coast.
  - Winter temperatures see daily minimums around 1°C, while mean summer temperatures reach between 20°C and 23°C, comparable to London, the warmest area of the UK.
  - Eastern England holds several maximum temperature records in the UK, with the highest being 37.3°C at Cavendish in August 2003.
- **Rainfall**
  - Eastern England is one of the driest regions in the UK, typically receiving less than 700 mm of rain annually.
  - Rainfall is more evenly distributed throughout the year compared to other regions, due to the 'rain-shadow' effect produced by high ground to the west and a higher frequency of convective rainfall in summer.
  - Across most of the region there are, on average, about 30 rain days (rainfall greater than 1 mm) in winter (December to February) and less than 25 days in summer (June to August).
- **Snowfall**
  - Snowfall varies across the region, ranging from below 20 days up to 30 days of snow falling each year, depending on location and altitude.
  - Days with snow lying are fewer, ranging from about 6 to 15 days per year, with accumulations rarely exceeding 15 cm.
- **Wind**
  - The region is one of the most sheltered parts of the UK, given the prevalence of Atlantic storms, which typically impact regions to the north and west of the UK.
  - Winds are usually stronger by day than by night due to increased turbulence caused by temperature rise, resulting in higher average speeds and more gusty winds. Periods of light or calm winds are more prevalent inland, with coastal areas having similar wind directions to inland locations but higher wind speeds.
  - The prevailing wind direction is from the southwest. However, during Atlantic depressions, wind may shift from south or southwest to west or northwest.
  - Springtime tends to have a maximum of winds from the northeast.

[11] Met Office (n.d.). Regional climates. Met Office. https://www.metoffice.gov.uk/research/climate/maps-and-data/regional-climates/index (accessed October 2024)

45. Overall, the study area falls within one of the driest regions in the UK, with evenly distributed rainfall throughout the year. The area is also likely to experience higher summer temperatures compared to other regions. Although the region is sheltered, winds are usually stronger during the daytime than at night, owing to turbulent effects caused by temperature rise.

3.2 Baseline Dust Deposition

46. There is no current baseline dust deposition monitoring undertaken within or near to the study area. This is common, given that dust deposition monitoring is usually undertaken on a project- or site-specific basis prior to, and during, dust-generating activities associated with construction and other regulated activities (e.g. quarries, industrial installations).

47. The study area is in a rural setting, predominantly characterised by agricultural land use. Aside from intermittent agricultural activities and / or natural events (e.g. Saharan dust episode), the fields associated with T.H. Clements within the study area are highly unlikely to experience noticeable dust deposition from external sources.

48. A previous study by the Department of the Environment (DoE, 1991)[12] cites typical baseline dust deposition rates within the range of 10 to 50 mg/m^2/day in rural areas, based on annual mean monitoring data. The Vallack and Shillito (1998)[10] provides summary statistics of monthly monitoring data across varying land uses, with a median dust deposition of 28 mg/m^2/day reported for 'open country' (i.e. rural areas). This median value sits centrally within the range given by the DoE study. Although both studies are dated, the applicability of the baseline deposition values to rural areas, such as within the study area, is likely to remain representative.

[12] Roy Waller Associates (1991) *Environmental effects of surface mineral workings: report to Department of the Environment.* Department of the Environment.

4 Assessment Methodology

49. This section provides a detailed account of the development of the dust emissions inventory and the dust deposition dispersion modelling approach for the proposed Project's construction activities, along with the associated limitations and assumptions in the assessment.

4.1 Key Data and Resources

50. This assessment primarily relied on information published by the Applicant, accessed via the Planning Inspectorate website[3]. In addition, several national and international guidance and best practice documents were referenced in completing the assessment.

51. The key documents, data, and resources referenced throughout this study are indexed in **Table 4-1**.

Table 4-1: Index of key data and resources for the dust deposition technical study

Data / Resource	Description	Source/Reference
Proposed Project Description	Provision of information relating to approach to onshore cable construction phasing and programme; onshore cable construction corridor working width; soil management; traffic and haul roads; maximum design parameters. This information was relied on to develop the dust deposition inventory and modelling assessment (see **Sections 4.2** and **4.3**).	Section 8, pages 83-102 of Application Document 6.1.3 Chapter 3 Project Description; Examination Library reference APP-058.
Onshore Order Limits	Order Limits for onshore works. Provided as a scaled georeferenced shapefile by the Applicant (see **Figure 1**).	Application Document 2.3 Onshore Location plan; Examination Library reference AS1-006. Shapefile provided by Applicant via email dated 23 July 2024.
Outline information on construction dust mitigation measures	The Applicant has set out a list of ‘highly recommended’ and ‘desirable’ dust management and mitigation measures. Where possible, these were incorporated into the dust deposition modelling assessment (see **Section 4.2.4**)	Section 2, pages 7-11 of Application Document 8.1.2 Outline Air Quality Management Plan; Examination Library reference APP-270.
Outline information on soil management	The Applicant has set out a series of management measures and working practices relating to soil management, including for the construction phasing of the proposed Project (e.g. soil stripping, haul road, soil handling, soil storage, and stockpile maintenance). Where applicable, this information was incorporated into the dust deposition modelling assessment (see **Sections 4.2** and **4.3**).	Sections 4 and 5, pages 15-25 of Application Document 8.1.3 Outline Soil Management Plan; Examination Library reference APP-271.
Construction plant list	The Applicant has set out a list of plant (vehicles/equipment) to be used during each phase of the proposed Project’s construction phase. This includes the size and indicative number of each plant type. Where applicable, this information was relied on to develop the dust deposition modelling assessment (see **Section 4.2**).	Section 26.3, pages 2-9 of Application Document 6.3.26.3 Appendix 3 Construction Plant List; Examination Library reference APP-216.
Haul road vehicle movements data and construction working hours	The Applicant has set the out the core working hours for the construction phase (7am to 7pm; Monday to Saturday). The maximum and average daily (two-way) vehicle trip generation associated with the indicative 42-month construction programme is also set out. For the dust deposition modelling assessment, the average daily trip generation data were used across all phases of construction included in the model.	Paras. 146-147 and Table 27.28, pages 64-66 of Application Document 6.3.26.3 Appendix 27.1 Transport Assessment; Examination Library reference AS1-086.

Data / Resource	Description	Source/Reference
	Where applicable, the dust emissions inventory for construction activities was based on the available working hours per year. See **Sections 4.2** and **4.3.5**).	
Land occupied by T.H. Clements	Boundaries of all land/fields occupied by T.H. Clements were used to identify appropriate 'receptor' locations to be included in the dispersion model (see **Section 4.3.7)**.	Land boundaries provided by Brown & Co. via email on 24 July 2024.
Representative soil particle data for the study area	Indicative silt content (%), moisture content (%), particle size distribution, bulk density, and particle density data for soils within the study area were provided for use in this study (see **Sections 4.2** and **4.3.6**)	Data provided by Dr Iain Gould, University of Lincoln via email on 17 July and 6 August 2024.
Emission factors for the proposed Project dust emissions inventory	Derivation of emission factors for construction activities with the potential to generate dust emissions has utilised international best practice guidance published by the United States Environmental Protection Agency (US EPA) and the Australian Government Department for Climate Change, Energy, the Environment and Water (DCCEEW). The emission factors derived for this assessment have used local site-specific variables, where possible (see **Sections 4.2**).	US EPA AP-42 *Compilation of Air Pollutant Emissions Factors from Stationary Sources*; Chapter 13.2.2 Unpaved Roads (November 2006); Chapter 13.2.3 Heavy Construction Operations (October 1998); Chapter 13.2.4 Aggregate Handling and Storage Piles (November 2006).[13] Australian DCCEEW *National Pollutant Inventory* (NPI); Emission Estimation Technique Manual (EETM) for Mining version 3.1 (January 2012); EETM for Fugitive Emissions version 2.0 (January 2012).[14]
Lakes AERMOD View Version 12.0	Atmospheric dispersion modelling software that integrates meteorological data, terrain, and user-defined emission sources to simulate the dispersion of pollutants (including dust) over a specified area. Used to model dust emissions from proposed Project construction activities and predict dust deposition across T.H. Clements' land (see **Section 4.3**).	Licensed software published by Lakes Environmental Software.
Meteorological data	Five years of hourly sequential weather data (2019-2023), representative of conditions in the study area, were purchased from Lakes Environmental for use in the AERMOD dispersion model (see **Section 4.3.3**).	AERMOD-ready data were purchased from Lakes Environmental Software. Data provided on 25 July 2024.

[13] US EPA AP-42 Compilation of Air Emissions Factors from Stationary Sources, Fifth Edition, Volume 1 accessed online via: [redacted]

4.2 Dust Emissions Inventory Development

4.2.1 Phasing of Construction

52. As outlined in Section 1.2, the dust emissions inventory was completed for the following three discrete phases of the proposed Project's construction:

- Enabling works
- Cable infrastructure installation
- Reinstatement works & demobilisation

53. The construction period relating to the onshore cable installation, capturing all the above phases, is anticipated to require up to 42 months (Plate 11.1, Page 117 of Application Document 6.1.3 Chapter 3 Project Description; Examination Library reference APP-058).

54. However, as part of these works, primary construction compounds and temporary construction accesses are programmed to be in use for a maximum of 36 months (Tables 8.2 and 8.3, Pages 87-88 of Application Document 6.1.3 Chapter 3 Project Description; Examination Library reference APP-058). Similarly, the Applicant has assumed that 100% of the haul road will be retained for up to a maximum of 36 months in any one location, except for the section between the A52 and the Landfall compound (up to 51 months) (Para. 257, page 101 of Application Document 6.1.3 Chapter 3 Project Description; Examination Library reference APP-058), though this section of haul road is outside of the study area for this assessment.

55. Based on the above and given that the study area for this assessment does not capture the full extent of the onshore cable route, the dust emissions inventory and dispersion modelling has assumed that each of the three construction phases will require up to 12 months (i.e. combined total of 36 months) and that the haul road will remain in use throughout all three phases.

4.2.2 Emission Factors for Dust Generating Activities

56. Total dust, equivalent to total suspended particulates (TSP) in this study, can be considered to be any particle with a diameter of up to 100 micrometres (μm) (*Section 2.1.1. of New Zealand Ministry of the Environment guidance document*[9]). Dust (TSP) emissions are derived by multiplying an activity-specific emission factor by the associated activity rate over a defined period of time. To facilitate development of a dust emissions inventory, it was necessary to identify the dust-generating activities, corresponding emission factors, and the activity rate over a given time.

57. Initially, the potential dust-generating activities for each construction phase were identified based on information from the relevant proposed Project application documents, as summarised in **Table 4-2**.

58. For any dust-generating activities not explicitly mentioned in the application documents but included in **Table 4-2**, appropriate justification is provided.

Table 4-2: Dust-generating activities included in emissions inventory

Phase	Activity included in Inventory	Document Reference / Assumption
Enabling Works	Topsoil strip (scraping)	Paras. 66-69 and 76, Pages 20-21 of Application Document 8.1.3 Outline Soil Management Plan; Examination Library reference APP-271.
	Transfer of stripped topsoil to allocated soil bund areas (loading/unloading)	
	Bulldozer movements (incl. % of operation during activity)	Table 26.3, Page 3 of Application Document 6.3.26.3 Appendix 3 Construction Plant List; Examination Library reference APP-216.
	Installation of haul road (aggregate unloading)	Para. 226, Page 91 of Application Document 6.1.3 Chapter 3 Project Description; Examination Library reference APP-058.
	Heavy goods vehicle (HGV) movements on haul road (wheel generated dust from unpaved roads)	Para. 147 and Table 27.28, Pages 65-66 of Application Document 6.3.26.3 Appendix 27.1 Transport Assessment; Examination Library reference AS1-086.
	Grading of haul road using vibrating roller	Table 26.5, Page 4 of Application Document 6.3.26.3 Appendix 3 Construction Plant List; Examination Library reference APP-216.
	Wind erosion (exposed topsoil bunds & exposed areas following topsoil strip)	Assumed based on above Enabling Works activities, which will create exposed areas of soil at risk of wind erosion.
Cable Infrastructure Installation	Excavation of subsoil (cable trenches)	Para. 229 and Plate 8.1, Pages 92-93 and Table 8.5, Page 98 of Application Document 6.1.3 Chapter 3 Project Description; Examination Library reference APP-058.
	Transfer of subsoil to allocated soil bund areas (loading/unloading)	Para 76, Page 21 of Application Document 8.1.3 Outline Soil Management Plan; Examination Library reference APP-271.
	HGV movements on haul road (wheel generated dust from unpaved roads)	As per ‘Enabling Works’.
	Backfill of subsoil to cable trenches (loading/unloading)	Para. 232, Page 93 of Application Document 6.1.3 Chapter 3 Project Description; Examination Library reference APP-058.
	Wind erosion (exposed cable trench ‘pits’; exposed topsoil & subsoil bunds; exposed surfaces)	Assumed based on above Cable Infrastructure Installation activities, which will create exposed areas of soil at risk of wind erosion.
Demobilisation & Reinstatement	HGV movements on haul road (wheel generated dust from unpaved roads)	As per ‘Enabling Works’.
	Backfill of topsoil (loading/unloading)	Para. 260, Pages 101-102 of Application Document 6.1.3 Chapter 3 Project Description; Examination Library reference APP-058.
	Haul road aggregate strip (scraping of aggregate)	Para. 228, Page 92 of Application Document 6.1.3 Chapter 3 Project Description; Examination Library reference APP-058. Table 26.13, Page 8 of Application Document 6.3.26.3 Appendix 3 Construction Plant List; Examination Library reference APP-216.
	Transfer of stripped aggregate (loading to HGVs)	
	Bulldozer movements	
	Wind erosion (exposed areas, excluding reinstated trenches and bunds)	Assumed based on above Demobilisation & Reinstatement activities.

60. Subsequent to identifying relevant dust-generating activities, the next step was to assign appropriate emission factors to each activity.

61. There is a lack of UK-based or European Environment Agency (EEA) dust emission factors for the activities included in this study. However, the EEA air pollutant emission inventory guidebook (2023)[15] cites the use of US EPA AP-42 emission factors for "…*a more detailed methodology for analysis of emissions from construction*…", particularly when detailed dispersion modelling based on source-specific parameters is conducted, as in this study.

62. Furthermore, New Zealand guidance for assessing and managing dust[9] states that "…*the most widely used and extensive data on emission factors are published by the US EPA (AP-42) and the Australian Ministry for the Environment (NPI EETMs)*".

63. Therefore, activity-specific emission factors were derived using equations referenced in US EPA AP-42[13] and Australian NPI EETMs[14], as detailed in **Table 4-3**. This table sets out the adopted emission factor for each activity, including the source (AP-42 or NPI), the equation used, applicable variables (e.g. silt and moisture content of material, local meteorology), and associated explanatory notes.

64. The use of these emission factors represents a precautionary approach, such that the total dust emissions derived in this inventory may be overestimated. This is because the typical environmental conditions for which these factors were derived (i.e., arid/semi-arid climates in Australia and the USA) differ from the more temperate climate of the UK. However, to minimise uncertainty in this regard, the emission factors adopted for this assessment rely on local and site-specific variables where possible. These variables, along with any associated assumptions and limitations, are provided in **Table 4-3**.

[15] European Environment Agency (2023) *EMEP/EEA air pollutant emission inventory guidebook 2023: Technical guidance to prepare national emission inventories (NFR 2.A.5.b Construction and demolition)*

Table 4-3: Activity-specific emission factor equations used in dust (TSP) emissions inventory

Phase	Activity	TSP Emission Factor (EF)	EF Units	EF equation variable(s)	Notes / Assumptions & Limitations
ENABLING WORKS	**Topsoil strip (scraping)**	Default values adopted for TSP Page 57, *NPI EETM for Mining* (2012)	Kilogram per tonne (kg/t)	-	US EPA AP-42 provides a default factor for this activity, which specifically relates to the removal of topsoil by scraping. The NPI EETM for Mining (2012) adopts the AP-42 default approach.
	Transfer of stripped topsoil to allocated soil bund areas (loading/unloading)	$EF = 0.74 \times (0.0016) \times \frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}$ *U = mean wind speed (m/s)* *M = material moisture content (%)* Page 13.2.4-4, *AP-42 Chapter 13.2.4 Aggregate Handling and Storage Piles* (2011)	kg/t	*U* = 5.07 m/s *M* = 30%	Mean wind speed (*U*) was derived using five years of hourly sequential meteorological data (2019-2023), representative of conditions in the study area (see **Section 4.3.3**). Moisture content (*M*) provided by Dr Gould, University of Lincoln via email on 17 July 2024. This value (30%) was based on sampling of *subsoil* completed in June 2024, considered to be moist at the time of sampling. Whilst this value will vary dependent on location, land use, and prevailing conditions, Dr Gould noted that "…*a working topsoil would be less than this."* The soils within the study area are described by Dr Gould as "…*lacking strength/cohesion*…", such that it "…*could make stockpiles very loose and erodible*…" particularly as the moisture content reduces. Therefore, applying 30% to topsoil in this equation is likely to provide a relatively optimistic estimate of dust emissions (i.e. higher moisture content = lower dust emission).
	Bulldozer movements	$EF = 2.6 \times \frac{(s)^{1.2}}{(M)^{1.3}}$ *s = silt content (%)* *M = moisture content (%)* Page 15, *NPI EETM for Mining* (2012)	Kilogram per hour (kg/h)	*s* = 65% *M* = 30%	Silt content (*s*) provided by Dr Iain Gould, University of Lincoln via email on 28 August 2024, on the following basis: "*By hand texturing it was being diagnosed by both Philip Wright* [Wright Resolutions Ltd] *and myself* [Dr Gould] *as silt loam, which is at least 65% silt*". This was assumed to apply to both the topsoil and subsoil throughout the study area. Subsoil may have a higher proportion of very fine sand particles, but in the absence of further information, this could not be confirmed. Moisture content (*M*) provided by Dr Iain Gould, University of Lincoln via email on 17 July 2024 (as above).
	Installation of haul road aggregate (unloading from HGVs)	As per '*Transfer of stripped topsoil to allocated soil bund areas (loading/unloading)*' above.	kg/t	*U* = 5.07 m/s *M* = 15%	Mean wind speed (*U*) derived as outlined above (see **Section 4.3.3**). It was assumed that the selected aggregate for the haul road will have a lower moisture content than the topsoil/subsoil. However, 15% moisture content (*M*) is likely to represent a high estimate for road aggregate, indicating that the derived EF will be relatively optimistic (i.e. higher moisture content = lower dust emissions).

Phase	Activity	TSP Emission Factor (EF)	EF Units	EF equation variable(s)	Notes / Assumptions & Limitations
ENABLING WORKS	**HGV movements on haul road (wheel generated dust from unpaved roads)**	$EF = \frac{0.4536}{1.6093} \times 4.9 \times \left(\frac{s}{12}\right)^{0.7} \times \left(\frac{W \times 1.1023}{3}\right)^{0.45}$ s = silt content (%) W = vehicle gross mass (tonnes) Page 16, *NPI EETM for Mining* (2012)	kg per vehicle km travelled (kg/VKT)	*s* = 9% *W* = 12 tonnes (unloaded); 32 tonnes (loaded)	Assumed that aggregate will be used for entire length of haul road to be installed within the onshore cable section included in study area. Based on an MOT Type 1 aggregate, silt content (*s*) is typically limited to 9%, which has been assumed for this assessment. Given that the haul road will be installed on, and surrounded by, topsoil and subsoil, the likelihood of soil dust settling on the haul road is considered to be high. Therefore, resuspension of soil dust from HGV movements on the haul road, with a higher silt content, is likely. The application of 9% silt for the haul road aggregate is relatively optimistic, as it does not capture the potential for soil dust resuspension (i.e. lower silt content = lower dust emission). HGV gross vehicle mass (*W*) based on the use of a typical 20 tonne tipper (Para. 51, Page 22, Application Document 6.3.26.3 Appendix 3 Construction Plant List; Examination Library reference APP-216) EF equation was applied assuming that 50% of HGV movements will be fully loaded (*W* = 32 tonnes) and 50% unloaded (*W* = 12 tonnes). This is based on a *Volvo FM420 8x4 Tipper*.
	Grading of haul road using vibrating roller	$EF = 0.0034 \times S^{2.5}$ *S = mean vehicle speed (km/h)* Page 16, *NPI EETM for Mining* (2012)	kg/VKT	*S* = 9 km/h	Use of driven vibrating roller for haul road grading (Table 26.5, Page 4, Application Document 6.3.26.3 Appendix 3 Construction Plant List; Examination Library reference APP-216). Mean speed (*S*) based on *JCB Vibratory Roller VM166D*, which has a stated working speed of 7.3 km/h and a travel speed of 11.4 km/h. EF has assumed a central value (*S*) of 9 km/h.
	Wind erosion (topsoil bunds & other exposed areas within working width)	$EF = \left(1.9 \times \left(\frac{s}{1.5}\right) \times 365 \times \left(\frac{365 - p}{235}\right) \times \left(\frac{f}{15}\right)\right) \div 8760$ *s* = silt content (%) *p* = number of days per year with rainfall >0.25 mm *f* = % time wind speed is >5.4 m/s Page 59, *NPI EETM for Mining (2012)*	kg per hectare per hour (kg/ha/h)	*s* = 65% *p* = 153 days *f* = 38.5%	This equation was used given the availability of location-specific data. Silt content (*s*) provided as per notes for '*Bulldozer movements*' above. The average number of days per year with rainfall above 0.25 mm (*p*) and percentage of time wind speed is above 5.4 m/s (*f*) were derived based on five years of hourly sequential meteorological data (2019-2023), representative of conditions in the study area (see **Section 4.3.3**).

Phase	Activity	TSP Emission Factor (EF)	EF Units	EF equation variable(s)	Notes / Assumptions & Limitations
CABLE INFRASTRUCTURE INSTALLATION	**Excavation of subsoil (cable trenches)**	As per '*Transfer of stripped topsoil to allocated soil bund areas (loading/unloading)*' for Enabling Works phase.		U = 5.07 m/s M = 30%	Mean wind speed (U) was derived using five years of hourly sequential meteorological data (2019-2023), representative of conditions in the study area (see Section 4.3.3). Moisture content (M) provided by Dr Gould, University of Lincoln via email on 17 July 2024. This value (30%) was based on sampling of subsoil completed in June 2024, considered to be moist at the time of sampling. Therefore, on average, applying 30% moisture content to subsoil in this equation is likely to provide a relatively optimistic estimate of dust emissions (i.e. higher moisture content = lower dust emission).
	Transfer of subsoil to allocated soil bund areas (loading/unloading)				
	Backfill of subsoil to cable trenches (loading/unloading)				
	HGV movements on haul road (wheel generated dust from unpaved roads)	As per '*HGV movements on haul road (wheel generated dust from unpaved roads)*' for Enabling Works phase.			The Applicant has stated that the average HGV movements associated with the construction of the proposed Project are based on an assumed 42-month construction programme (Para. 147, Page 65 of Application Document 6.3.26.3 Appendix 27.1 Transport Assessment; Examination Library reference AS1-086). Therefore, this activity remains constant across all phases included in the emissions inventory.
	Wind erosion (cable trench 'pits'; topsoil & subsoil bunds; other exposed surfaces)	As per '*Wind erosion (topsoil bunds & other exposed areas within working width)*' for Enabling Works phase.			For exposed cable trenches, a 50% control factor (i.e., reduction in dust emissions) was applied to account for the fact that the exposed soil surfaces are below ground level. This reduction reflects the decreased likelihood of wind erosion and dust generation compared to above-ground surfaces.

Phase	Activity	TSP Emission Factor (EF)	EF Units	EF equation variable(s)	Notes / Assumptions & Limitations
DEMOBILISATION & REINSTATEMENT	**HGV movements on haul road (wheel generated dust from unpaved roads)**	As per ‘*HGV movements on haul road (wheel generated dust from unpaved roads)*’ for Enabling Works and Cable Infrastructure Installation phases.			
	Backfill of topsoil (loading/unloading)	As per ‘*Transfer of stripped topsoil to allocated soil bund areas (loading/unloading)*’ for Enabling Works phase.			
	Haul road aggregate strip (scraping of aggregate)	As per ‘*Topsoil strip (scraping)*’ for Enabling Works phase (default EF value).			
	Transfer of stripped aggregate (loading to HGVs)	As per ‘*Installation of haul road (aggregate unloading)*’ for Enabling Works phase.			
	Bulldozer movements	As per ‘Bulldozer movements’ for Enabling Works phase.			
	Wind erosion (exposed areas, excluding reinstated trenches and bunds)	As per ‘*Wind erosion (topsoil bunds & other exposed areas within working width)*’ for Enabling Works phase.			

4.2.3 Activity Rates for Dust Generating Activities

69. The next step in developing the dust emissions inventory was to multiply the emission factor by the respective activity rate for each construction activity across the phases. The activity rates for each activity, along with data sources and assumptions used in the calculations, are presented in **Table 4-4**. These were calculated for the discrete length of the onshore cable route corridor that was included within the study area (see **Figure 1**).

70. Where possible, Project-specific and site/local-specific data and assumptions have been applied to ensure the robustness and validity of the inventory, in line with the reasoning set out in ***para. 64***.

71. As outlined in Section 4.2.1, it is assumed that each of the three construction phases will last up to 12 months (a total of 36 months combined), with the haul road remaining in use throughout all phases. Therefore, the activity rates used in developing the inventory, as referenced in **Table 4-4**, were applied within this context on a ‘per annum’ basis.

Table 4-4: Proposed Project activity rates specific to each dust (TSP) generating activity included in the inventory

Phase	Activity Type	Activity Rate (per annum)	Activity Rate Source / Calculation Assumptions
ENABLING WORKS	**Topsoil strip (scraping)**	1,562,022 tonnes	The Applicant states that the topsoil depth "…*is to be determined*…" (Para. 66, page 20 of Application Document 8.1.3 Outline Soil Management Plan; Examination Library reference APP-271). Dr Gould, University of Lincoln, noted via email on 17 July 2024 that a "…*working assumption with agricultural soils would be a topsoil depth to ~30cm*…" (0.3 m), which has been adopted for this assessment. The scraped depth of the haul road is expected to be 0.6 m (Para. 226, page 91 of Application Document 6.1.3 Chapter 3 Project Description; Examination Library reference APP-058), which has been included in calculating the activity rate and assumed to apply for the entire length of the haul road within the study area. Typical width of haul road will be 6.8 m and will run entire length of cable route (Para 222, page 91 of Application Document 6.1.3 Chapter 3 Project Description; Examination Library reference APP-058). This has been rounded to 7 m for purposes of calculating activity rate. Topsoil strip assumed to occur across entire 'typical 80 m wide temporary working width', except for where topsoil bunds will be placed (Para. 67, page 21 of Application Document 8.1.3 Outline Soil Management Plan; Examination Library reference APP-271). Assumed that topsoil bunds will be placed either side of the 'typical 60 m wide permanent corridor' and will run entire length of corridor (Plate 8.1, page 93 of Application Document 6.1.3 Chapter 3 Project Description; Examination Library reference APP-058). Average width of topsoil bunds assumed to be 5 m (i.e. 10 m total to account for 2 x bunds) *Width of topsoil strip to 0.3 m depth = 80 m – 10 m – 7 m = 63 m* Length of cable route corridor within study area = 48.3 km (calculated based on onshore order limits shapefile provided by Applicant via email dated 23 July 2023). *Area to be stripped to 0.3 m depth = 63 m x 48,300 m = 3,042,900 m^2* *Stripped volume (excl. haul road) = 3,042,900 m^2 x 0.3 m = 912,870 m^3* *Area to be stripped to 0.6 m depth (haul road) = 7 m x 48,300 m = 338,100 m^2* *Stripped volume (haul road only) = 338,100 m^2 x 0.6 m = 202,860 m^3* Topsoil bulk density = 1.4 g/cm^3 (or 1.4 tonne/m^3). This was provided by Dr Gould, University of Lincoln, via email on 17 July 2024. Dr Gould noted that bulk density is likely to vary across the study area, but this value is considered to be representative. *Total topsoil mass stripped = (912,870 m^3 + 202,860 m^3) x 1.4 t/m^3 = 1,562,022 tonnes*
	Transfer of stripped topsoil to allocated soil bund areas	1,562,022 tonnes	Calculation as per '*Topsoil strip (scraping)*'. Assumed that stripped topsoil will be transferred to bund areas using excavators (Para. 68, page 21 of Application Document 8.1.3 Outline Soil Management Plan; Examination Library reference APP-271).

Phase	Activity Type	Activity Rate (per annum)	Activity Rate Source / Calculation Assumptions
ENABLING WORKS	**Bulldozer movements**	8,093 hours	A total of three 20 tonne dozers to be used for topsoil stripping, site prep, and haul road installation with an 'estimated percentage of operation during activity' of 80% (Table 26.3 and Table 26.5, pages 3-4 of Application Document 6.3.26.3 Appendix 3 Construction Plant List; Examination Library reference APP-216). This activity accounts for the movement of dozers on the exposed soil areas within the working width and is separate to dust generation arising from scraping or topsoil transfer activities. Activity rate is based on number of working hours per annum. Core working hours given as 7am – 7pm Monday to Saturday (Para. 146, page 64 of Application Document 6.3.26.3 Appendix 27.1 Transport Assessment; Examination Library reference AS1-086). Number of available working days per annum assumed as: *365 days – 52 Sundays – 8 Bank Holidays – 24 miscellaneous days (e.g. adverse weather, machine downtime/maintenance) = 281 working days (12 hours/day) = 3,372 working hours.* *Number of dozers x Working Hours = 3 x 3,372 = 10,116 hours/annum* *Dozer activity hours = 10,116 hours/annum x 80% estimated operation during activity = 8,093 hours/annum*
	Installation of haul road aggregate (unloading from HGVs)	324,576 tonnes	Assumed that volume of stripped soil will be equal to volume of aggregate required to install haul road. *Stripped volume (haul road only) = 338,100 m^2 x 0.6 m = 202,860 m^3* (as per calculation for '*Topsoil strip (scraping)*') Typical bulk density for MOT Type 1 aggregate is 1.6 t/m^3, which has been assumed for this calculation. *Mass of aggregate to be imported for haul road installation = 202,860 m^3 x 1.6 t/m^3 = 324,576 tonnes*
	LOADED HGV movements on haul road (wheel generated dust)	279,553 VKT	HGV annual average daily traffic (AADT) movements based on 42-month construction period are provided 'per segment' of the onshore cable route (Table 27.28, page 66 of Application Document 6.3.26.3; Examination Library reference AS1-086). Assumed that all HGVs arriving at an access to the cable route corridor would also use the haul road and each 2-way HGV movement includes a vehicle arriving at a construction access, unloading and departing at the same access (Para. 146, bullet nos.5-6, pages 64-65, Appendix 27.1 Transport Assessment; Examination Library reference AS1-086). For purposes of this assessment, AADT data for segments 5 to 14 (including Onshore substation) has been used. Length of each discrete segment (km) was calculated using the onshore order limits shapefile provided by Applicant via email dated 23 July 2023.
	UNLOADED HGV movements on haul road (wheel generated dust)	279,553 VKT	Total VKT travelled per day in each segment was calculated by multiplying the average HGV AADT value by segment length (km). Available working days per annum = 281 days (as per '*Bulldozer movements*' above). For each segment, total VKT/annum = VKT/day x 281 days Assumed that 50% of total VKT/annum will be made by loaded HGVs and 50% by unloaded HGVs. *For each segment, LOADED VKT/annum = 50% x (VKT/day x 281 days)*; *UNLOADED VKT/annum = 50% x (VKT/day x 281 days)* *Total LOADED VKT haul road HGV movements in study area = Sum of LOADED VKT for all segments = 279,553 VKT/annum* *Total UNLOADED VKT haul road HGV movements in study area = 279,553 VKT/annum*

Phase	Activity Type	Activity Rate (per annum)	Activity Rate Source / Calculation Assumptions
ENABLING WORKS	**Grading of haul road using vibrating roller**	24,282 VKT	Assumed average grader speed of 9 km/h based on *JCB Vibratory Roller VM166D*. One driven vibrating roller to be used during haul road installation with an 'estimated percentage of operation during activity' of 80% (Table 26.5, page 4 of Application Document 6.3.26.3 Appendix 3 Construction Plant List; Examination Library reference APP-216). *Available working days per annum = 281 days = 3,372 working hours* (as per '*Bulldozer movements*' above) *Grader activity hours = 3,372 hours/annum x 80% = 2,698 hours/annum* *Grader VKT = 2,698 hours x 9 km/h = 24,282 VKT/annum*
	Wind erosion: Topsoil bunds	188,158 ha.hours	Assumed that topsoil bunds will be placed either side of the 'typical 60 m wide permanent corridor' and will run entire length of corridor (Plate 8.1, page 93 of Application Document 6.1.3 Chapter 3 Project Description; Examination Library reference APP-058). Typical topsoil bund height will be 2 m, maximum 3 m above ground level (Para. 76, page 21 of Application Document 8.1.3 Outline Soil Management Plan; Examination Library reference APP-271). This assessment has assumed 2 m height for entire length of the topsoil bund. *Volume of topsoil to be stripped (including haul road) = 1,115,730 m^3* (as per '*Topsoil strip (scraping)*') *Total area of bunds within cable route in study area = 1,115,730 m^3 / 2 m = 557,865 m^2 = 55.79 hectares* *Area of each bund either side of typical 60 m wide permanent corridor = 55.79 ha / 2 = 27.89 ha* *Width of each bund = 278,932 m^2 / 48,300 m (length of corridor in study area) = 5.8 m* *No. of hours that wind speed >5.4 m/s per year = 3,372 hours = 38.5% of all hours in year.* Based on analysis of five years of annual meteorological data representative of the study area (see **Section 4.3.3**). *Activity rate = total topsoil bund area x No.* hours wind speed >5.4 m/s = *55.79 ha x 3,372 hours = 188,158 ha.hours*
	Wind erosion: Other exposed areas	837,942 ha.hours	Vegetation will be cleared and topsoil will be stripped from the 80 m onshore cable corridor working width, except for the area used for topsoil storage (Para. 67, page 21 of Application Document 8.1.3 Outline Soil Management Plan; Examination Library reference APP-271). *Area to be cleared and topsoil stripped (excl. haul road) = 3,042,900 m^2* (as per '*Topsoil strip (scraping)*') *Area covered by topsoil bunds = 557,865 m^2* *Exposed soil area = 3,042,900 m^2 – 557,865 m^2 = 2,485,035 m^2 = 248.5 ha* *No. of hours that wind speed >5.4 m/s per year = 3,372 hours* (as per '*Wind erosion: Topsoil bunds*') *Activity rate = 248.5 ha x 3,372 hours = 837,942 ha.hours*

Phase	Activity Type	Activity Rate (per annum)	Activity Rate Source / Calculation Assumptions
CABLE INFRASTRUCTURE INSTALLATION	**Excavation of subsoil (cable trenches)**	2,637,180 tonnes	Four cable trenches will be excavated throughout the corridor extent (Para. 234, page 94 of Application Document 6.1.3 Chapter 3 Project Description; Examination Library reference APP-058). Dimensions of each cable trench provided in Table 8.5, page 98 of Examination Library reference APP-058: *Maximum depth = 3 m; Width at surface = 5 m; Width at base = 1.5 m* *Total combined width at surface = 4 x 5 m = 20 m* *Total combined width at base = 4 x 1.5 m = 6 m* *Length of cable trench assumed to be equivalent to length of corridor in study area = 48,300 m* *Trapezoidal volume = ((20 m + 6 m) / 2) x 48,300 m * 3 m = 1,883,700* m^3 Topsoil bulk density = 1.4 g/cm^3 (or 1.4 tonne/m^3). As per '*Topsoil strip (scraping)*' and assumed to apply to subsoil. *Total excavated subsoil mass = 1,883,700 x 1.4 t/*m^3 *= 2,637,180 tonnes*
	Transfer of subsoil to allocated soil bund areas	2,637,180 tonnes	
	Backfill of subsoil to cable trenches	2,637,180 tonnes	
	LOADED HGV movements on haul road (wheel generated dust)	279,553 VKT	As per '*Enabling Works*' phase. HGV AADT movements are based on 42-month construction period, therefore VKT activity rate applied to all phases.
	UNLOADED HGV movements on haul road (wheel generated dust)	279,553 VKT	
	Wind erosion: Topsoil bunds	188,158 ha.hours	As per '*Enabling Works*' phase. Topsoil bunds to be reinstated during '*Reinstatement & Demobilisation*' phase (Para. 84, page 22 Application Document 8.1.3 Outline Soil Management Plan; Examination Library reference APP-271).
	Wind erosion: Subsoil bunds	158,821 ha.hours	Assumed that subsoil bunds will be placed either side of the 'typical 60 m wide permanent corridor' and will run entire length of corridor (Plate 8.1, page 93 of Application Document 6.1.3 Chapter 3 Project Description; Examination Library ref. APP-058). Typical subsoil bund height will be 3-5 m (Para. 76, page 21 of Application Document 8.1.3 Outline Soil Management Plan; Examination Library reference APP-271). This assessment has assumed 4 m height for entire length of the subsoil bund. *Volume of excavated subsoil = 1,883,700* m^3 (as per '*Excavation of subsoil (cable trenches)*') *Total area of bunds within cable route in study area = 1,883,700* m^3 */ 4 m = 470,925* m^2 *= 47.1 hectares* *Area of each bund either side of typical 60 m wide permanent corridor = 47.09 ha / 2 = 23.5 ha* *Width of each bund = 235,463* m^2 */ 48,300 m (length of corridor in study area) = 4.9 m* *No. of hours that wind speed >5.4 m/s per year = 3,372 hours = 38.5% of all hours in year.* *Activity rate = 47.1 ha x 3,372 hours = 158,821 ha.hours*

Phase	Activity Type	Activity Rate (per annum)	Activity Rate Source / Calculation Assumptions
CABLE INFRASTRUCTURE INSTALLATION	**Wind erosion: Exposed cable trenches**	325,735 ha.hours	Four cable trenches will be excavated throughout the corridor extent (Para. 234, page 94 of Application Document 6.1.3 Chapter 3 Project Description; Examination Library reference APP-058). Dimensions of each cable trench provided in Table 8.5, page 98 of Examination Library reference APP-058: *Maximum depth = 3 m; Width at surface = 5 m; Width at base = 1.5 m* *Total combined width at surface = 4 x 5 m = 20 m* *Length of cable trench assumed to be equivalent to length of corridor in study area = 48,300 m* *Exposed surface area of trenches = 20 m x 48,300 m = 966,000 m^2 = 96.6 ha* *No. of hours that wind speed >5.4 m/s per year = 3,372 hours = 38.5% of all hours in year.* *Activity rate = 96.6 ha x 3,372 hours = 325,735 ha.hours*
	Wind erosion: Other exposed surfaces	353,386 ha.hours	Vegetation will be cleared and topsoil will be stripped from the 80 m onshore cable corridor working width, except for the area used for topsoil storage (Para. 67, page 21 of Application Document 8.1.3 Outline Soil Management Plan; Examination Library reference APP-271). *Area to be cleared and topsoil stripped (excl. haul road) = 3,042,900 m^2* (as per '*Topsoil strip (scraping)*') To avoid double counting of exposed surfaces, the area occupied by topsoil bunds, subsoil bunds, and exposed cable trenches has been subtracted. *Area covered by topsoil bunds = 557,865 m^2* *Area covered by subsoil bunds = 470,925 m^2* *Area covered by exposed cable trenches = 966,000 m^2* *Exposed soil area = 3,042,900 m^2 – 557,865 m^2 – 470,925 m^2 – 966,000 m^2 = 1,048,110 m^2 = 104.8 ha* *No. of hours that wind speed >5.4 m/s per year = 3,372 hours* (as per '*Wind erosion: Topsoil bunds*') *Activity rate = 104.8 ha x 3,372 hours = 353,386 ha.hours*

Phase	Activity Type	Activity Rate (per annum)	Activity Rate Source / Calculation Assumptions
DEMOBILISATION & REINSTSTEMENT	**LOADED HGV movements on haul road (wheel generated dust)**	279,553 VKT	As per '*Enabling Works*' phase. HGV AADT movements are based on 42-month construction period, therefore VKT activity rate applied to all phases.
	UNLOADED HGV movements on haul road (wheel generated dust)	279,553 VKT	
	Backfill of topsoil	1,562,022 tonnes	As per '*Topsoil strip (scraping)*' The stripped topsoil will be reinstated to restore land to its pre-development quality (Para. 84, page 22 Application Document 8.1.3 Outline Soil Management Plan; Examination Library reference APP-271).
	Haul road aggregate strip (scraping)	324,576 tonnes	All haul road aggregate will be removed and land reinstated upon completion of construction phase (Para 228, page 92 of Application Document 6.1.3 Chapter 3 Project Description; Examination Library reference APP-058). Therefore, mass of aggregate to be stripped from haul road and subsequently transferred to HGVs for removal off site is equivalent to the calculation presented for '*Installation of haul road aggregate (unloading from HGVs)*' in Enabling Works.
	Transfer of stripped aggregate	324,576 tonnes	
	Bulldozer movements	5,395 hours	Two 20 tonne dozers to be used for haul road removal with an 'estimated percentage of operation during activity' of 80% (Table 26.13, page 8 of Application Document 6.3.26.3 Appendix 3 Construction Plant List; Examination Library reference APP-216). This activity accounts for the movement of dozers on the exposed soil areas within the working width and is separate to dust generation arising from scraping or aggregate transfer activities. *Number of dozers x Working Hours = 2 x 3,372 = 6,744 hours/annum* *Dozer activity hours = 6,744 hours/annum x 80% estimated operation during activity = 5,395 hours/annum*
	Wind erosion: Exposed areas (excluding reinstated trenches and bunds)	467,359 ha.hours	*Area to be cleared and topsoil stripped (excl. haul road) = 3,042,900 m^2* (as per '*Topsoil strip (scraping)*') To avoid double counting of exposed surfaces, the area occupied by topsoil bunds has been subtracted. Assumed that reinstated areas as part of Cable Infrastructure Installation phase (subsoil and cable trenches) will be revegetated and not exposed. *Area covered by topsoil bunds = 557,865 m^2* *Area covered by subsoil bunds (reinstated) = 470,925 m^2* *Area covered by exposed cable trenches (reinstated) = 966,000 m^2* *Area covered by haul road (exposed due to aggregate strip) = 338,100 m^2* *Exposed soil area = 3,042,900 m^2 + 338,100 m^2 – 557,865 m^2 – 470,925 m^2 – 966,000 m^2 = 1,386,210 m^2 = 138.6 ha* *No. of hours that wind speed >5.4 m/s per year = 3,372 hours* (as per '*Wind erosion: Topsoil bunds*') *Activity rate = 138.6 ha x 3,372 hours = 467,359 ha.hours*

4.2.4 Dust Control (Mitigation) Factors

72. The emission factors detailed in **Table 4-3** assume that there are no dust control measures implemented for each respective activity. The assessment of uncontrolled emissions (i.e. no mitigation) in the emissions inventory is likely to represent an overly precautionary assessment, particularly as the Applicant has submitted an Outline Air Quality Management Plan (Section 2, pages 7-11 of Application Document 8.1.2; Examination Library reference APP-270) and Outline Soil Management Plan (Sections 4 and 5, pages 15-25 of Application Document 8.1.3; Examination Library reference APP-271).

73. Therefore, to provide a balanced assessment, it was appropriate to develop an emissions inventory *with dust control* factors included for comparison with the uncontrolled inventory. The dust control factors, sourced from US EPA AP-42[13] and/or Australian NPI EETMs[14], were applied based on the proposed dust control measures for the relevant construction activities.

74. The application of these control factors optimistically assumes that each mitigation measure will be implemented and effective from the start of the relevant activity. Additionally, it is assumed that each measure will be consistently applied throughout the activity's duration, ensuring that control efficiency is maintained.

75. For example, a control efficiency of 40% (*NPI EETM for Mining 2012*)[14] has been applied to wind erosion sources associated with soil bunds and other exposed surfaces within the onshore cable route working width, attributed to the 'seeding' of the soil (Paras. 78-82, page 22 of Application Document 8.1.3 Outline Soil Management Plan; Examination Library reference APP-271).

76. Although the emissions inventory in this study assumes that this level of control applies for the duration of exposure (i.e. 12 months), paragraph 78 of the Outline Soil Management Plan states "…*where soil is to be stored for <u>over 6 months</u> it will be covered or sown over the top and sides with an agreed seed mix to protect the soil against erosion*…". Additionally, paragraph 218 of Chapter 3 Project Description (Page 90 of Application Document 6.1.3; Examination Library reference APP-058) states that "…*subject to the time of year/weather conditions, stockpiles may be required to be covered until the seeding has germinated and to prevent windswept particles*".

77. Based on an analysis of soils in a field within the study area, completed on 4 June 2024, soil experts Dr Iain Gould (University of Lincoln) and Philip Wright (Wright Resolutions Ltd) noted that the soils lack strength/cohesion, which could make stockpiles very loose and erodible (i.e. susceptible to wind erosion). Furthermore, the subsoil is unlikely to be sufficiently cohesive or nutrient-rich (lacking in organic material) to support vegetative cover as a means of reducing wind erosion potential.

78. In the absence of details regarding when and where soil stockpiles will be covered and seeded, as well as the germination period and efficacy of the seeding, a consistent control efficiency of 40% is considered to be potentially optimistic.

79. The dust control factors included in the '*With Dust Control*' emissions inventory are detailed in **Table 4-5**.

Table 4-5: Dust (TSP) control factors applied to relevant construction activities

Activity Type	Control Measure	Control Factor	Reference
Scraping[1, 3] **Bulldozer movements**[1, 3]	-	0%	Applicant has stated that "…*stripping will be carried out when the soil is reasonably dry and friable*" (Para. 67, page 21 of Application Document 6.1.3 Chapter 3 Project Description; Examination Library reference APP-058). Potential for dozers to be used for scraping (Para. 68, page 21 of Application Document 6.1.3 Chapter 3 Project Description; Examination Library reference APP-058). US EPA AP-42 and Australian NPI EETMs assume that no control is applied when using bulldozers and a control factor is only applied to scraping of topsoil when soil is "*naturally or artificially moist*" (Page 21, *NPI EETM for Mining* (2012)). Given that dozers will be used and soil will only be disturbed when reasonably dry and friable, no control measures were assumed.
Loading/unloading (topsoil / subsoil / aggregate)[1, 2, 3]	Water sprays Minimising drop heights	65%	'Highly recommended' construction dust measures included in Table 2.1 of Outline Air Quality Management Plan (Section 2, page 9 of Application Document 8.1.2; Examination Library reference APP-270). Assumed that constant application and control efficiency will be achieved throughout activity duration. Source of control factors: Page 21, *NPI EETM for Mining* (2012)
HGV movements on haul road (wheel generated dust from unpaved roads)[1, 2, 3]	Fixed / mobile water sprinklers	50%	The 'highly recommended' construction dust measures include reference to "…*install hard surfaced haul roads, which are regularly damped down with fixed or mobile sprinkler systems…*" (Table 2.1, page 10 of Application Document 8.1.2 Outline Air Quality Management Plan; Examination Library reference APP-270). This measure is specific to 'trackout' of dust onto the public road network, suggesting that it might only apply at site access points. However, this factor optimistically assumes that watering will be applied to the haul road throughout the length of the working width. Assumed that constant application and control efficiency will be achieved throughout activity duration. Source of control factors: Page 21, *NPI EETM for Mining* (2012)
Grading[1]	Water sprays	50%	As per 'Highly recommended' construction dust measures included in Table 2.1 of Outline Air Quality Management Plan (Section 2, page 9 of Application Document 8.1.2; Examination Library reference APP-270). Assumed that constant application and control efficiency will be achieved throughout activity duration. Source of control factors: Page 21, *NPI EETM for Mining* (2012)
Wind erosion (soil bunds & other exposed areas)[1, 2, 3]	Seeding	40%	As per ***paras. 75-78*** above. Seeding was assumed not to be applicable to exposed trench areas. However, 50% control efficiency (pit retention) was applied to exposed trenches within the uncontrolled inventory. Source of control factors: Page 21, *NPI EETM for Mining* (2012)

Notes:
[1] – Enabling Works Phase; [2] – Cable Infrastructure Installation Phase; [3] – Reinstatement & Demobilisation Phase

4.2.5 Emissions Inventory Summary: Without & With Control Measures

85. The dust emissions inventory for both '*Without Dust Control*' (i.e. uncontrolled) and '*With Dust Control*' (i.e. control factors applied) is summarised in **Table 4-6**, including the activity-specific emission factors (as derived from Table 4-3), activity rates (as per **Table 4-4**), and resulting total mass dust emissions. As per ***para. 71***, the total mass dust emissions are presented on a per annum basis in each construction phase over the extent of the Order Limits in the study area.

Table 4-6: Proposed Project dust (TSP) emissions inventory (***Without Dust Control*** & ***With Dust Control***)

Phase	Activity Type	TSP Emission Factor (EF)	EF Units	Activity Rate (per annum)	Annual TSP Emission (tonnes/annum)	
					'*Without* Control'	'*With* Control'
ENABLING WORKS	**Topsoil strip (scraping)**	0.029	kg/t	1,562,022 tonnes	45	45
	Transfer of stripped topsoil to allocated soil bund areas	0.0001	kg/t	1,562,022 tonnes	<1	<1
	Bulldozer movements	4.680	kg/hr	8,093 hours	38	38
	Installation of haul road aggregate (unloading from HGVs)	0.0001	kg/t	324,576 tonnes	<1	<1
	LOADED HGV movements on haul road (wheel generated dust)	3.276	kg/VKT	279,553 VKT	916	458
	UNLOADED HGV movements on haul road (wheel generated dust)	2.107	kg/VKT	279,553 VKT	589	295
	Grading of haul road using vibrating roller	0.826	kg/VKT	24,282 VKT	20	10
	Wind erosion: Topsoil bunds	7.943	kg/ha/hr	188,158 ha.hours	1,495	897
	Wind erosion: Other exposed areas	7.943	kg/ha/hr	837,942 ha.hours	6,656	3,994
CABLE INFRASTRUCTURE INSTALLATION	**Excavation of subsoil (cable trenches)**	0.0001	kg/t	2,637,180 tonnes	<1	<1
	Transfer of subsoil to allocated soil bund areas	0.0001	kg/t	2,637,180 tonnes	<1	<1
	Backfill of subsoil to cable trenches	0.0001	kg/t	2,637,180 tonnes	<1	<1
	LOADED HGV movements on haul road (wheel generated dust)	3.276	kg/VKT	279,553 VKT	916	458
	UNLOADED HGV movements on haul road (wheel generated dust)	2.107	kg/VKT	279,553 VKT	589	295
	Wind erosion: Topsoil bunds	7.943	kg/ha/hr	188,158 ha.hours	1,495	897
	Wind erosion: Subsoil bunds	7.943	kg/ha/hr	158,821 ha.hours	1,262	757
	Wind erosion: Exposed cable trenches	7.943	kg/ha/hr	325,735 ha.hours	1,294*	1,294*
	Wind erosion: Other exposed surfaces	7.943	kg/ha/hr	353,386 ha.hours	2,807	1,684

Phase	Activity Type	TSP Emission Factor (EF)	EF Units	Activity Rate (per annum)	Annual TSP Emission (tonnes/annum)	
					‘*Without* Control’	‘*With* Control’
DEMOBILISATION & REINSTSTEMENT	**LOADED HGV movements on haul road (wheel generated dust)**	3.276	kg/VKT	279,553 VKT	916	458
	UNLOADED HGV movements on haul road (wheel generated dust)	2.107	kg/VKT	279,553 VKT	589	295
	Backfill of topsoil	0.0001	kg/t	1,562,022 tonnes	<1	<1
	Haul road aggregate strip (scraping)	0.029	kg/t	324,576 tonnes	9	9
	Transfer of stripped aggregate	0.0001	kg/t	324,576 tonnes	<1	<1
	Bulldozer movements	4.680	kg/hr	5,395 hours	25	25
	Wind erosion: Exposed areas (excluding reinstated trenches and bunds)	7.943	kg/ha/hr	467,359 ha.hours	3,712	2,227

Notes:

* 50% control factor applied to ‘*without control*’ emission due to effect of ‘pit retention’

4.3 Atmospheric Dispersion Modelling

4.3.1 Model Selection

86. Dust deposition modelling was undertaken using the US EPA regulatory-approved AERMOD dispersion model (Lakes AERMOD View Version 12.0), which is widely recognised by UK statutory bodies such as Defra and the Environment Agency as a valid tool for assessing air quality impacts.

87. AERMOD is a steady-state Gaussian dispersion model that simulates the dispersion and deposition of air pollutants (including dust) across a defined model domain. It utilises hourly sequential meteorological data and accounts for the influence of varying terrain features and land use types. The model is particularly useful for assessing how pollutants spread and settle over time, considering local weather conditions, such as wind speed and direction, temperature, and atmospheric stability.

4.3.2 Modelled Study Area

88. The modelled study area extent is equivalent to the area identified in **Figure 1**. This captures segments 5 to 14 inclusive of the onshore cable route working width and the land farmed by T.H. Clements within proximity to the cable route corridor.

4.3.3 Meteorological Data

89. Five years of hourly sequential meteorological data (2019-2023) were obtained from Lakes Environmental. These data cover a 4 km x 4 km grid square centred on latitude 52.971N, longitude 0.049E, near Freiston, Lincolnshire, which lies centrally within the modelled study area.

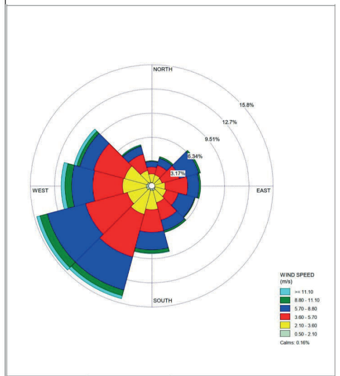
90. The meteorological data were generated by the Weather Research and Forecasting (WRF) model, a state-of-the-art mesoscale numerical weather prediction system that incorporates actual atmospheric conditions (i.e. from observations and analyses). The data account for the surface characteristics and land use types within the grid square, ensuring they are ready for input into the AERMOD model.

91. The data are representative of meteorological conditions within the modelled study area. The respective annual wind roses for these data are presented in **Figure 2**.

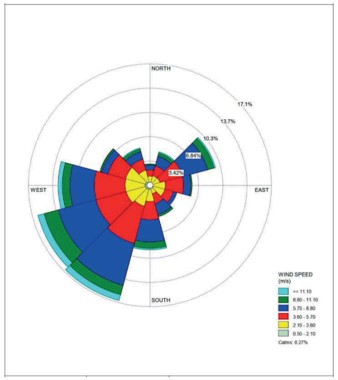
92. Prior to commencing dispersion modelling, an appropriate year had to be selected to simulate hourly meteorological conditions within AERMOD. To facilitate this, a review of the five years of hourly meteorological was completed based on the following variables:

- Average windspeed
- Maximum wind speed
- Percentage of time that wind speed exceeded 5.4 m/s
- Number of days with over 0.25 mm of rainfall.

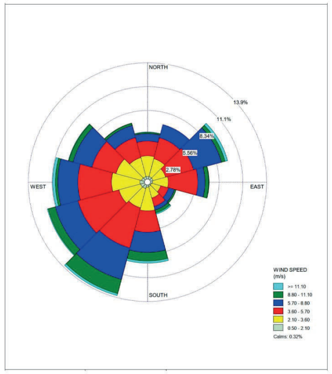
93. Data relating to wind speed and rainfall were the focus of this review, given that they are key in dictating the potential dispersion and deposition characteristics of dust emissions. Additionally, data relating wind speed frequency above 5.4 m/s and days with rainfall exceeding 0.25 mm were considered specifically as these align with the variables used in deriving dust emission factors (i.e. wind erosion and loading/unloading activities). The outputs of this review are presented in **Table 4-7**.



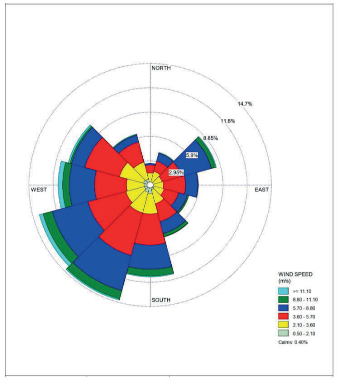
2019



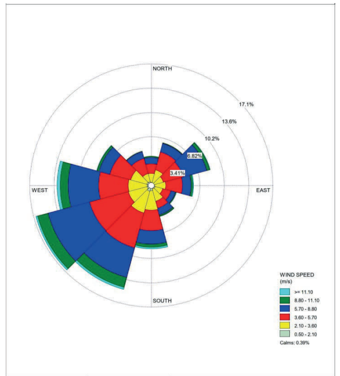
2020



2021



2022



2023

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Project Title
Outer Dowsing Offshore Windfarm – Dust Deposition Modelling

Drawing Title
Figure 2
Modelled Meteorological Data for Freiston, Lincolnshire - Wind Roses for Years 2019-2023

Project Stage: n/a			
Status: n/a	Status Description: n/a		
Drawn: LFS	Designed: DP	Checked: DP	Approved: DP
Sheet Size: 840 x 297 mm	Scale:	Sweco Ref: 65213546	Revision: P01.1

Drawing Number 65213546-SWE-XX-XX-G-AQ-0002

Table 4-7: Review of hourly meteorological variables intrinsic to dust deposition modelling

Variable	Year					5-Year Average
	2019	2020	2021	2022	2023	
Average wind speed (m/s)	5.0	**5.4**	4.8	5.0	5.0	5.1*
90th %ile of wind speeds (m/s)	8.1	**9.0**	8.3	8.2	8.4	8.4
Maximum wind speed (m/s)	16.4	18.1	14.8	**18.5**	15.2	16.6
% time wind speed >5.4 m/s	37.4%	**44.4%**	34.3%	37.5%	39.0%	38.5%*
% calm winds (≤0.5 m/s)	0.2%	0.3%	0.3%	0.4%	0.4%	0.3%
No. days >0.25 mm rain	157	152	164	**124**	170	153*

Notes:
* Indicates 5-year average data used within relevant activity-specific emission factors

94. Whilst the five-year average data for the relevant variables were used in deriving a select number of the activity-specific emissions factors (**Table 4-3**), only one year of hourly sequential data was utilised in the dispersion modelling. There were no significant differences between each year of data reviewed. Year 2022 had the fewest number of days with rainfall exceeding 0.25 mm (124 days) and also recorded the maximum wind speed. However, 2020 generally recorded the highest wind speed statistics.

95. Year 2021 demonstrated statistics that were below the five-year average wind statistics, with the number of days with rain exceeding 0.25 mm (164) being above the five-year average. The ensure the assessment of dispersion conditions and dust deposition was not overly pessimistic, hourly meteorological data for 2021 were selected for the modelling study (i.e. relatively lower wind speeds and higher number of rainfall days exceeding 0.25 mm).

4.3.4 Modelled Dust Emission Sources

96. The activities considered within the emissions inventory were grouped by phase and spatially represented in AERMOD, depending on their location within the cable route corridor and/or the nature of the activity. Two model scenarios were run to align with the dust emissions inventory (see **Table 4-6**), namely:

- **Scenario 1: '*Without* Dust Control'**
- **Scenario 2: '*With* Dust Control'**

97. The annual mass emission totals presented in **Table 4-6** were converted to a 'per second' emission rate for input to the model based on the modelled source dimension for each activity. The dust emission rate for each activity was distributed evenly across the respective segments of the onshore cable route corridor included in the modelled study area.

98. A summary of the modelled emission rates and source characteristics is provided in **Table 4-8**. An overview of the modelled dust emissions sources configuration is presented in **Figure 3**.

Table 4-8: Summary of activity-specific dust (TSP) emission rates and source parameters modelled in AERMOD (‘*Without*’ vs ‘*With*’ dust control)

Phase	Activity Type	AERMOD Source	Modelled Dimension	Notes / Assumption	Modelled TSP Emission Rate ($g/m^2/s$)	
					‘*Without* Control’	‘*With* Control’
ENABLING WORKS	**Topsoil strip (scraping)**	Area	3,381,000 m^2	Dimension equivalent to total area for temporary working width in segments 5-14; excluding 10 m width for topsoil bunds. Drawn in AERMOD as an area source within the Order Limits boundary based on Order Limits shapefile (provided by Applicant via email dated 23 July 2024). Dust emissions evenly distributed within this area. Emissions subject to working hours (3,372 hours per year).	1.10×10^{-6}	1.10×10^{-6}
	Transfer of stripped topsoil to allocated soil bund areas				3.01×10^{-9}	1.05×10^{-9}
	Bulldozer movements				9.23×10^{-7}	9.23×10^{-7}
	Installation of haul road aggregate (unloading from HGVs)				6.26×10^{-10}	2.19×10^{-10}
	Grading of haul road using vibrating roller				4.89×10^{-7}	2.44×10^{-7}
	LOADED HGV movements on haul road (wheel generated dust)	Volume line	*Equivalent to lengths of each discrete onshore cable route segment included in model.*	Inclusive of cable route segments 5 to 14. Length of each discrete cable route segment measured using Order Limits shapefile. This was to ensure dust emissions from HGV movements (as g/s rate) were proportioned in line with Table 27.28, page 66 of Document 6.3.26.3; Examination Library ref. AS1-086. Volume line dimensions (length, width, height) were calculated with reference to US EPA guidance* and based on *Volvo FM420 8x4 Tipper* assumed as being typical HGV. Emissions subject to working hours (3,372 hours per year).	75.45 g/s**	37.73 g/s**
	UNLOADED HGV movements on haul road (wheel generated dust)				48.53 g/s**	24.26 g/s**
	Wind erosion: Topsoil bunds	Area	2 x 258,405 m^2 (*one bund either side of ‘’typical 60 m wide permanent corridor’*)	Given the comparable area dimension of topsoil and subsoil bunds, an average total bund area dimension was calculated so that the same area source could be used for topsoil & subsoil emissions sources, as applicable (516,810 m^2). One bund modelled either side of ’typical 60 m wide permanent corridor’ (i.e. 50% of total bund area modelled on each side of corridor = 258,405 m^2). Emissions evenly distributed within each area.	9.17×10^{-5}	5.50×10^{-5}
	Wind erosion: Other exposed areas	Area	3,381,000 m^2	Drawn in AERMOD as an area source within the Order Limits boundary. Emissions from exposed areas evenly distributed within this area.	6.24×10^{-5}	3.75×10^{-5}

Phase	Activity Type	AERMOD Source	Modelled Dimension	Notes / Assumption	Modelled TSP Emission Rate (g/m²/s)	
					'*Without* Control'	'*With* Control'
CABLE INFRASTRUCTURE INSTALLATION	**Excavation of subsoil (cable trenches)**	Area	3,381,000 m^2	Dimension equivalent to total area for temporary working width in segments 5-14; excluding 10 m width for topsoil bunds. Drawn in AERMOD as an area source within the Order Limits boundary. Dust emissions evenly distributed within this area. Emissions subject to working hours (3,372 hours per year).	5.08×10^{-9}	1.78×10^{-9}
	Transfer of subsoil to allocated soil bund areas				5.08×10^{-9}	1.78×10^{-9}
	Backfill of subsoil to cable trenches				5.08×10^{-9}	1.78×10^{-9}
	LOADED HGV movements on haul road (wheel generated dust)	Volume line		As per '*Enabling Works*'	75.45 g/s**	37.73 g/s**
	UNLOADED HGV movements on haul road (wheel generated dust)				48.53 g/s**	24.26 g/s**
	Wind erosion: Subsoil bunds	Area	2 x 258,405 m^2 (*one bund either side of ''typical 60 m wide permanent corridor'*)	Given the comparable area dimension of topsoil and subsoil bunds, an average total bund area dimension was calculated so that the same area source could be used for topsoil & subsoil emissions sources, as applicable (516,810 m^2). One bund modelled either side of 'typical 60 m wide permanent corridor' (i.e. 50% of total bund area modelled on each side of corridor = 258,405 m^2). Emissions evenly distributed within each area.	7.74×10^{-5}	4.64×10^{-5}
	Wind erosion: Topsoil bunds				9.17×10^{-5}	5.50×10^{-5}
	Wind erosion: Exposed cable trenches	Area	3,381,000 m^2	Drawn in AERMOD as an area source within the Order Limits boundary. Emissions from exposed areas evenly distributed within this area.	1.21×10^{-5}	1.21×10^{-5}
	Wind erosion: Other exposed surfaces				2.63×10^{-5}	1.58×10^{-5}

Phase	Activity Type	AERMOD Source	Modelled Dimension	Notes / Assumption	Modelled TSP Emission Rate ($g/m^2/s$)	
					'*Without* Control'	'*With* Control'
DEMOBILISATION & REINSTSTEMENT	**LOADED HGV movements on haul road (wheel generated dust)**	Volume line		As per '*Enabling Works*'	75.45 g/s**	37.73 g/s**
	UNLOADED HGV movements on haul road (wheel generated dust)				48.53 g/s**	24.26 g/s**
	Backfill of topsoil	Area	3,381,000 m^2	Dimension equivalent to total area for temporary working width in segments 5-14; excluding 10 m width for topsoil bunds. Drawn in AERMOD as an area source within the Order Limits boundary. Dust emissions evenly distributed within this area. Emissions subject to working hours (3,372 hours per year).	3.01×10^{-9}	1.05×10^{-9}
	Haul road aggregate strip (scraping)				2.29×10^{-7}	2.29×10^{-7}
	Transfer of stripped aggregate				6.26×10^{-10}	2.19×10^{-10}
	Bulldozer movements				6.15×10^{-7}	6.15×10^{-7}
	Wind erosion: Exposed areas (excluding reinstated trenches and bunds)	Area	3,381,000 m^2	Drawn in AERMOD as an area source within the Order Limits boundary. Emissions from exposed areas evenly distributed within this area.	9.05×10^{-5}	5.43×10^{-5}

Notes:

* United States Environmental Protection Agency Haul Road Workgroup (2012) *Haul Road Workgroup Final Report: Recommendations November 2012*. Submission to EPA Office of Air Quality Planning and Standards

** Volume line emissions represented as a 'g/s' emission rate in AERMOD, which then evenly distributes the emissions along the entirety of the line source. Emission rate presented in table represents total emission rate along cable route length included in the model. Each cable route segment (5-14 inclusive) was input as a discrete volume line source to enable segment-by-segment dust emissions from HGV movements on the haul road to be proportioned accordingly.

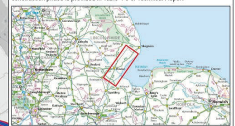
Legend

- TH Clements Fields
- Order Limits

Dust Emission Sources

- Soil Bunds (Wind Erosion from Topsoil and/or Subsoil Bunds)
- Working Width Sources (incl. Wind Erosion, Topsoil/Aggregate Strip, Dozers, Soil/Aggregate Handling, Grading, Excavation, Aggregate Strip; Soil Backfill)
- Haul Road (Wheel Generated Dust)

Notes:
The combination of 'active' dust emission sources in each modelled construction phase is provided in Table 4-8 of Technical Report



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Project Title

Outer Dowsing Offshore Windfarm – Dust Deposition Modelling

Drawing Title

Figure 3
Dust Emission Sources in AERMOD Set Up

Project Stage: n/a			
Status: n/a	Status Description: n/a		
Drawn: LFS	Designed: DP	Checked: DP	Approved: DP
Sheet Size: 840 x 297 mm	Scale: 1:50,000	Sweco Ref: 65213546	Revision: P01.1

Drawing Number: 65213546-SWE-XX-XX-G-AQ-0003

4.3.5 Time-varying Emissions Profile

99. With the exception of the wind erosion sources, all other dust-generating activities will occur only during the specified working hours of the proposed Project's construction period. Wind erosion sources are treated as being ‘active’ at all times, given that they have the potential to release dust depending on weather conditions.

100. In AERMOD, the user can define a time-varying emissions profile for selected emissions sources, allowing them to be modelled as ‘active’ only during specific periods of the day. The core working hours for the proposed Project construction period are 7am to 7pm, Monday to Saturday (Para. 146, page 64 of Application Document 6.3.26.3 Appendix 27.1 Transport Assessment; Examination Library reference AS1-086).

101. Therefore, all modelled emissions sources, except for wind erosion sources, were set as ‘active’ during these hours (7am-7pm; Mon-Sat) for all weeks of the year. For all other times, including Sundays, these emissions sources were assumed to be inactive, releasing no emissions.

102. Although the total mass emissions for these time-varying activities (as per **Table 4-6**) were calculated based on 281 working days per year (accounting for bank holidays and days for machine downtime/maintenance), the associated time-varying emissions profile was applied to all weeks of the modelled meteorological year. This approach could result in overly conservative dust deposition results over an annual period. However, as this study focusses on shorter term dust deposition impacts (i.e. daily and monthly), applying the time-varying emissions profile to all weeks of the year is appropriate to capture all potential meteorological conditions.

4.3.6 Modelled Dust Deposition: Particle Size Distribution

103. AERMOD provides two methods for managing the deposition of dust (TSP) from each modelled source, with the appropriate method selected based on the proportion of total dust particles that has a diameter of equal to or more than 10 µm:

- Method 1 – 10% or more of dust particles has a diameter of >= 10 µm
- Method 2 – Less than 10% of dust particles has a diameter of >= 10 µm.

104. To identify the appropriate method, Dr Iain Gould (University of Lincoln) provided a representative particle size distribution (PSD) from sampling of soil undertaken within a field adjacent to the proposed Project onshore cable route on 4 June 2024. The PSD data, based on particle diameter, are presented in **Table 4-9** below.

Table 4-9: Representative particle size distribution from soil sampling within study area

	Particle Size Distribution			
Category (diameter, µm)	**<2 µm**	**2-20 µm**	**20-200 µm**	**200-2000 µm**
Proportion (%)	13.6%	9.0%	76.1%	1.3%

105. Based on the above data, the soil contains a significant fraction (>10%) of total particulate mass with a diameter of 10 µm or larger. This directed that ‘Method 1’ should be used in AERMOD for handling dust deposition.

106. The PSD data, as presented above, includes categories (e.g. 20 µm and 200 µm) that encompass a wide range of potential particle diameters. For the purposes of representing these data in AERMOD in relation to dust suspension and deposition, the geometric mean of each category was calculated and subsequently aligned with the observation by Dr Iain Gould (University of Lincoln) and Philip Wright (Wright Resolutions Ltd) that the diagnosed

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the topsoil (silt loam) "…*is at least 65% silt*" based on hand texturing in a field within the study area on 4 June 2024 (via email dated 28 August 2024). It is acknowledged that subsoil may have a higher proportion of very fine sand particles (63 – 125 μm), but in the absence of further information, this could not be confirmed.

107. As explained in ***para. 56***, TSP is typically limited to particle diameters of up to 100 μm. As such, the PSD size category for 200-2000 μm (1.3%) was excluded from modelling to focus on particle sizes that have the potential to be suspended in air.

108. With reference to the above, the refined modelled particle size categories input to AERMOD for all dust emission sources is presented in **Table 4-10**. AERMOD also requires the associated particle density for each size category. Dr Gould provided a representative particle density (2.65 g/m^3) via email dated 8 August 2024, which is considered to be a typical value applicable to both topsoil and subsoil layers within the study area.

Table 4-10: Refined particle size distribution data used in AERMOD for dust (TSP) deposition

	Modelled Particle Size Distribution (*informed by geometric mean & observed minimum silt content*)			
Category (diameter, μm)	**1 μm**	**6.32 μm**	**63 μm**	**100 μm**
Proportion (%)	13.6%	9.0%	65.0%	12.4%
Particle density (g/cm^3)	2.65			

109. It is acknowledged that the data presented in both **Table 4-9** and **Table 4-10** are limited, given the coarseness of the size categories and the potential for varying distributions and density over the spatial extent of the study area. However, it is noteworthy that the larger size particles are dominant.

110. The New Zealand Ministry of Environment guidance document (*Section 2.1.1*[9]) notes that "…*large particles* [> 30 μm] *do not last long in the atmosphere, as they tend to fall out rapidly and settle*…*particles deposited on a surface will only become individually visible at about 50 micrometres*". Given the proximity of fields farmed by T.H. Clements to the proposed Project onshore cable route, the prevalence of larger size particles in any potential dust emissions generated by construction activities is likely to be important.

111. The data in **Table 4-10** were applied to all modelled dust (TSP) emissions sources. Regarding the haul road, paragraph 38, page 16 of Application Document 8.1.3 Outline Soil Management Plan (Examination Library reference APP-271) states that:

"…*it is assumed that there will be a requirement to import aggregates to create a stable surface for construction traffic movements*…"

112. With paragraphs 226 and 227, pages 91-92 of Application Document 6.1.3 Chapter 3 Project Description (Examination Library reference APP-058) confirming that:

"…*the exact specification of the [haul] road will be determined upon the appointment of a principal contractor at detailed design stage*…227. *Depending upon the ground conditions, it may not be necessary to undertake works to construct the designated haul road. Where the ground is sufficiently firm enough it may be acceptable to use significantly less granular sub-base material...*"

113. The emissions inventory developed for this study has assumed that an aggregate will be used for the entire length of the haul road (see **Table 4-3**). However, given that the exact specification and composition of the haul road cannot be determined at this stage, the data in **Table 4-10** were applied to the haul road emissions sources in AERMOD.

4.3.7 Modelled Receptors: T.H. Clements Fields

114. Discrete receptor points were solely modelled within the fields owned by T.H. Clements, as identified in the study area. at the following resolutions:

- 25 m resolution up to 100 m from the Order Limits
- 50 m resolution up to 500 m from the Order Limits
- 200 m resolution up to 1,000 m from the Order Limits.

115. This equated to a total of 3,779 discrete receptors, modelled at ground level. The receptor locations are depicted on **Figure 4**. The total area of land occupied by T.H. Clements that is represented in the model equates to 1,388 hectares, across 80(no.) fields[16].

116. The receptors were purposefully concentrated within the fields closest to the cable route, given the potential for maximum dust deposition to occur at these locations.

4.3.8 Treatment of Terrain

117. There are no significant variations in terrain elevations within the modelled study area, meaning wind flows and the associated dispersion of dust are unlikely to be materially influenced by terrain. As such, the modelled study area was treated as flat in AERMOD.

4.3.9 Model Outputs

118. Dust deposition was modelled at all discrete receptors during each phase of construction; *Enabling Works*; *Cable Infrastructure Installation*; and *Demobilisation & Reinstatement*. The modelled dust deposition outputs were expressed as fluxes of dust mass per unit area over the applicable time periods (i.e. g/m^2/day and g/m^2/month) to align with the identified assessment benchmarks (see **Section 2.3**).

119. A summary of the modelled dust deposition outputs for each discrete receptor in the model is provided in **Table 4-11**.

Table 4-11: Summary of dust deposition model output format

Phase	Model Period*	Output Units*	Output Value*	Benchmark*	Additional Model Output*
Enabling Works	24-hours	g/m^2/day	Maximum in year	**80 mg/m^2/day**	No. of benchmark exceedances in year (out of 365 days)
	Monthly	g/m^2/month	Maximum in year	**2 g/m^2/month**	No. of benchmark exceedances in year (out of 12 months)
Cable Infrastructure Installation	24-hours	g/m^2/day	Maximum in year	**80 mg/m^2/day**	No. of benchmark exceedances in year (out of 365 days)
	Monthly	g/m^2/month	Maximum in year	**2 g/m^2/month**	No. of benchmark exceedances in year (out of 12 months)
Demobilisation & Reinstatement	24-hours	g/m^2/day	Maximum in year	**80 mg/m^2/day**	No. of benchmark exceedances in year (out of 365 days)
	Monthly	g/m^2/month	Maximum in year	**2 g/m^2/month**	No. of benchmark exceedances in year (out of 12 months)

Notes:
* Applicable to model outputs for '***Without Dust Control***' and '***With Dust Control***' model scenarios.

[16] Where T.H. Clements' fields share boundaries, these were input to the model as a single field boundary (e.g. four fields in the real-world may be represented by one field in the model). As such, the number of fields visible in the air quality model will differ from the actual number of fields owned by T.H. Clements.

120. As indicated in the table above, the model results were analysed in the context of the identified benchmarks. Specifically, analyses were undertaken of the potential maximum dust deposition impacts across all land owned by T.H. Clements within the study area, along with the corresponding frequency of exceedances, related to each phase of construction.

121. The modelled frequency and spatial extent of any exceedances were used to assess the likelihood of deposited dust adversely impacting T.H. Clements' ability to produce crops in line with customer requirements, accounting for both '*Without*' and '*With*' dust control measures.

122. It is acknowledged that not all the dust-generating activities included in the model are likely to occur continuously over a twelve-month period along the entire length of the Order Limits. For this reason, the annual dust deposition flux has not been assessed as a model output.

123. Similarly, the modelled outputs from each construction phase have not been combined or considered cumulatively. This approach ensured that no double-counting of dust emissions occurred. In reality, construction is likely to be progressed in sections along the cable route corridor, which means that some activities from the *Cable Infrastructure Installation* and *Demobilisation & Reinstatement* phases are likely to overlap before moving to the next section (Paras. 189-192, page 84 of Application Document 6.1.3 Chapter 3 Project Description; Examination Library reference APP-058).

124. In the absence of specific construction programme details, modelling dust emissions in discrete phases, with averaged emission rates across the relevant Order Limits, is considered an appropriate approach for assessing dust deposition over shorter time periods (24-hour/monthly). This ensures that the assessment accounts for varying weather conditions and potential fluctuations in dust deposition throughout the year.

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Project Title
Outer Dowsing Offshore Windfarm – Dust Deposition Modelling

Drawing Title
Figure 4
Modelled Receptors within T.H. Clements' Fields

Project Stage			
n/a			
Status	Status Description		
n/a	n/a		
Drawn	Designed	Checked	Approved
LFS	DP	DP	DP
Sheet Size	Scale	Sweco Ref	Revision
840 x 297 mm	1:50,000	65213546	P01.1

Drawing Number 65213546-SWE-XX-XX-G-AQ-0004

5 Limitations and Assumptions

125. This assessment has been completed within the context of a number of assumptions and limitations relating to the availability of proposed Project information, development of the dust emissions inventory, and atmospheric dispersion modelling.

126. Where possible, information within the proposed Project application documents[3] and/or supplied directly from the Applicant (**Table 1-1**) has been used in developing the dust emissions inventory for this study, particularly with respect to construction phasing, programme, activities, as well as the type and number of plant/HGVs and associated working hours.

127. The key limitations and assumptions, which are referenced throughout this report, are collated below.

5.1.1 Construction Phasing

128. The dust emissions inventory was based on three key phases of the proposed Project's construction; *Enabling Works*; *Cable Infrastructure Installation*; and *Reinstatement & Demobilisation*. This assessment has assumed that the pre-construction works and cable installation works will not include inherently dust activities (*see **para. 14***).

129. A construction programme with details on phasing, dates, and approach to incremental excavation and backfilling of cable trenches was not available at the time of assessment (see **Table 1-1**).

130. Based on provisional information included in the application documents (see ***paras. 53-54***), this assessment has assumed that each of the three construction phases will require up to 12 months (i.e. combined total of 36 months) and that the haul road will remain in use throughout all three phases.

131. On this basis, the dust deposition modelling outputs from each construction phase have not been combined or considered cumulatively. This means that the results of each of the three construction phases included in this assessment have been considered separately. This approach ensured that no double-counting of dust emissions occurred.

5.1.2 Construction Activities

132. All potential dust-generating activities were identified from a review of the application documents[3] and referenced within **Table 4-2**. Given that the majority of these activities comprise a combination of the removal, transfer, storage, and backfilling of topsoil, subsoil, and/or aggregate, the inclusion of wind erosion from stockpiles and/or exposed areas of land within the Order Limits was appropriately assumed.

133. The activity rates for each of the identified construction activities were derived, where possible, based on project-specific and site/local-specific data to minimise uncertainty in the development of the dust inventory (see **Table 4-4**). Where required, appropriately justified assumptions were made. The activity rates used in developing the inventory were applied on a 'per annum' basis given the approach adopted to construction phasing (i.e. 12 months per phase).

134. A summary of the limitations and appropriate assumptions applicable to the calculation of construction activity rates is provided in **Table 5-1**.

135. The emissions inventory for wheel generated dust from haul road HGV movements has been based on average AADT movements across an assumed 42-month construction period (Paras. 146-147 and Table 27.28, Pages 65-66 of Application Document 6.3.26.3 Appendix 27.1 Transport Assessment; Examination Library reference AS1-086). The table of AADT

movements (Table 27.28) also includes the “*maximum daily trip generation*”, which equates to a significantly higher number of HGV movements.

136. The maximum AADT data were not used in this study to avoid an overly precautionary assessment, given the assumptions applicable to construction phasing, with emissions calculated based on a 12-month period for each phase. However, the maximum HGV movements on the haul road would be likely to generate significantly higher levels of dust relative to the average movements, albeit over relatively shorter periods of time.

5.1.3 Emission Factors for Dust Generating Activities

137. The dust emission factors applied in this study were derived using equations referenced in the US EPA AP-42[13] and Australian NPI EETMs[14], as detailed in **Table 4-3**. These factors represent a precautionary approach (see ***para. 64***) because the typical environmental conditions for which these factors were derived differ relative to the UK climate.

138. To reduce uncertainty, local data and relevant assumptions were applied when deriving the emission factors, including:

- Wind speed and rainfall statistics based on five years of hourly meteorological data representative of the study area.
- Representative soil data (moisture content, silt content, bulk density, particle density) provided by soil experts, Dr Iain Gould (University of Lincoln) and Philip Wright (Wright Resolutions Ltd), though it is acknowledged that the values provided will vary throughout the study area.
- A moisture content of 15% for potential haul road aggregate, ensuring the dust emissions factor is not overly conservative (i.e. 15% considered likely to be high).
- A representative silt content of 9% for potential haul road aggregate (e.g. MOT Type 1), which assumes that soil dust of a higher silt content will not settle on the haul road and be re-suspended. (i.e. potentially optimistic in that dust emissions could be higher than modelled).
- The assumption that all HGV movements will be completed by a 20 tonne tipper (*Volvo FM420 8x4 Tipper*).
- For open cable trenches, a 50% control factor was applied in the ‘Without dust control’ inventory to reflect the lower likelihood of dust generation compared to above-ground surfaces.

139. In terms of general soil handling principles, the Applicant has stated in the Outline Soil Management Plan (Para. 39, page 50, para. 50, page 19, and para. 67, page 21 of Application Document 8.1.3; Examination Library reference APP-271) that “…*where practicable, soils will only be moved when they are in a dry and friable condition*…”. The emission factor equations for soil excavation, transfer, and backfilling activities incorporate a 30% moisture content for both topsoil and subsoil (**Table 4-3**).

140. This 30% value was based on sampling of subsoil completed on 4 June 2024 by Dr Iain Gould (University of Lincoln), which found the subsoil to be moist at the time of sampling Dr Gould noted (email dated 17 July 2024) that “…*a working topsoil would be less than this*…”, with soils in the study area described as “…*lacking strength/cohesion*…”, such that it “…*could make stockpiles very loose and erodible*…” as the moisture content reduces.

141. Therefore, applying a 30% moisture content to these activity equations likely provides an optimistic estimate of dust emissions (i.e. higher moisture content leads to lower dust emission), specifically within the context of the above soil handling principles.

5.1.4 Dust Control (Mitigation) Factors

142. Notwithstanding the above, the assessment of uncontrolled emissions ('*Without Dust Control*' scenario) is likely to be overly precautionary, given that the Applicant has submitted an Outline Air Quality Management Plan (Section 2, pages 7-11 of Application Document 8.1.2; Examination Library reference APP-270) and Outline Soil Management Plan (Sections 4 and 5, pages 15-25 of Application Document 8.1.3; Examination Library reference APP-271).

143. Therefore, the '*With Dust Control*' emissions inventory was developed with reference to the measures outlined in the above application documents and appropriate control factors sourced from US EPA AP-42[13] and/or Australian NPI EETMs[14]. However, it is optimistically assumed that all mitigation measures will be implemented effectively from the start of the activity and consistently applied throughout its duration to maintain control efficiency (see ***paras. 74-78***).

144. Given the nature of the soil and handling principles described above, the efficacy of measures such as watering during soil excavation, loading/unloading, and seeding of soil bunds may be limited. An analysis of subsoils typical to the study area, completed by Dr Iain Gould (University of Lincoln) and Philip Wright (Wright Resolutions Ltd) on 4 June 2024, suggests that the subsoil is unlikely to be sufficiently cohesive or nutrient-rich (lacking in organic material) to support vegetative cover as a means of reducing wind erosion potential.

145. However, the potentially reduced efficacy of such control measures has not been accounted for in the assessment, maintaining an optimistic assessment of total dust emissions.

146. It was deemed appropriate to ensure a level of optimism (i.e. promoting lower emissions) was preserved in this study to balance the precautionary (i.e. promoting higher emissions) use of emission factors derived from US EPA AP-42[13] and/or Australian NPI EETMs[14]. This ensured that the model outputs would be less likely to skew towards either an over- or under-prediction.

5.1.5 Atmospheric Dispersion modelling

147. AERMOD is a steady-state Gaussian model, which simulates the atmospheric dispersion of pollutants (including dust) from a source in a normal distribution along two axes – distance crosswind and distance vertically. This allows concentrations (dust deposition) to be predicted at both ground-level and elevated receptors. The plume movement downwind of the source is dictated by wind speed and direction. The meteorological conditions are assumed to remain constant within any given hour in the distance between the source and receptor but can vary from hour to hour. As such, the modelled meteorological parameters for each hour do not vary with distance in the horizontal or vertical direction. The dust deposition fluxes predicted by the model for any hour are independent of predictions in other hours of the model run.

148. Although AERMOD is well-validated for a multitude of scenarios, predictions can differ from actual observed data due to uncertainties in emission factors, meteorological inputs, and the inherent simplifications in modelling atmospheric processes. These uncertainties, relating to emission factors and meteorological inputs, have been minimised in this study by using Project and location-specific data.

149. However, a suitable observational dataset rarely exists to conduct a statistically meaningful validation exercise of model outputs. This is the case in this study, given the absence of local baseline dust deposition monitoring and the fact that the proposed Project is not operational.

150. The model simulates dust particle suspension, transport, and deposition based on generic assumptions about particle size distribution (PSD), wind speed, and surface characteristics,

which may not always reflect local realities. However, these uncertainties have been reduced through the use of data specific to the modelled study area:

- Hourly meteorological data representative of the study area (see **Section 4.3.3**).
- Representative PSD from sampling of soil undertaken within a field adjacent to the proposed Project onshore cable route in the study area (source: Dr Iain Gould, University of Lincoln) (see **Section 4.3.6**).
  - Given that the exact specification and composition of the haul road cannot be determined at this stage (see ***paras. 111-113***), the PSD data were applied to the haul road emissions sources in AERMOD.

151. AERMOD is designed to focus on smaller, airborne particles more effectively, meaning that larger particles (>100 μm), which tend to settle faster due to their size and mass, may not be modelled with as much accuracy in terms of dust deposition.

152. For the purposes of representing the PSD data in AERMOD, the geometric mean of each particle size category was calculated and aligned with the observation by Dr Gould and Philip Wright (Wright Resolutions Ltd) that the diagnosed topsoil (silt loam) "…*is at least 65% silt*" (via email dated 28 August 2024). It is acknowledged that subsoil may have a higher proportion of very fine sand particles (63 – 125 μm), but in the absence of further information, this could not be confirmed. Particle size fractions above 100 μm were excluded from the model to focus on particles that have the potential to remain suspended in air.

153. This approach represents a potentially optimistic assessment outcome regarding deposition, given that larger particle sizes would deposit closer to the emission source. Furthermore, a high proportion of the modelled receptors within T.H. Clements' land would be immediately adjacent to the Order Limits, which further supports this assumption.

154. The modelling has assumed that dust source emissions are released in a uniform manner over the model's time steps. However, a time-varying emissions profile was implemented in the model to align with the proposed Project core working hours, so that emissions from all sources, except wind erosion, were released during working hours only (7am-7pm; Mon-Sat).

155. In the absence of location-specific construction activity information, the dust emission rates for each activity were evenly distributed across the respective modelled areas within the onshore cable route corridor. However, wheel generated dust emissions from the haul road were proportioned according to the HGV movements in each discrete segment of the cable route, as per Table 27.28 of Page 66 of Application Document 6.3.26.3 Appendix 27.1 Transport Assessment (Examination Library reference AS1-086).

156. An inherent limitation of the modelling approach adopted, as dictated by the nature and availability of information, is that the dispersion model may not adequately represent the variation in dust deposition associated with the intermittent nature of construction activities, plant operation, and HGV movements. For example, intense emissions over short periods and prolonged periods of inactivity are not captured, which could result in occasional under- or over-predictions.

157. Not all the dust-generating activities included in the model are likely to occur continuously over a twelve-month period along the entire length of the Order Limits. For this reason, the annual dust deposition flux has not been assessed as a model output.

158. Within the context of the above, modelling dust emissions in discrete phases, with averaged emission rates across the relevant Order Limits, is considered an appropriate approach for assessing dust deposition over shorter time periods (24-hour/monthly). This ensures that the assessment accounts for varying weather conditions and associated fluctuations in dust deposition throughout the year.

Table 5-1: Collated limitations and assumptions applicable to the proposed Project dust emissions inventory

Parameter	Limitation	Assumption	Reference
Topsoil depth	Topsoil depth "…*is to be determined*…" (Para. 66, page 20 of Application Document 8.1.3 Outline Soil Management Plan; Examination Library reference APP-271).	Topsoil depth of 0.3 m.	Dr Iain Gould (Soil Expert), University of Lincoln, email on 17 July 2024 confirming that a "…*working assumption with agricultural soils would be a topsoil depth to ~30cm*…"
Topsoil / Subsoil bulk density	No specific data on topsoil and subsoil bulk density.	Bulk density of 1.4 g/cm^3, applicable to both topsoil and subsoil.	Provided by Dr Iain Gould, University of Lincoln, via email on 17 July 2024. Dr Gould noted that bulk density is likely to vary across the study area, but this value is considered to be representative for topsoil and subsoil.
Number of working days per year	Specific number of available working days per year not stated.	Number of available working days per annum assumed as: *365 days – 52 Sundays – 8 Bank Holidays – 24 miscellaneous days = 281 working days (12 hours/day) = 3,372 working hours.*	Core working hours: Para. 146, page 64 of Application Document 6.3.26.3 Appendix 27.1 Transport Assessment; Examination Library reference AS1-086. Number of 'miscellaneous days' assumed to occur at an average of two per month by Damian Pawson (Technical Director, Sweco) to account for unforeseen cessation of works and to avoid overly pessimistic estimate of dust emissions.
Haul road aggregate composition	No specific data on bulk density of aggregate.	Typical bulk density for MOT Type 1 aggregate of 1.6 t/m^3.	Lincolnshire County Council Highway and Flood Authority (March 2021) *Development Road and Sustainable Drainage Specification and Construction: March 2021 Edition*
	No specific data on silt content (%) of aggregate.	Silt content for MOT Type 1 aggregate of 9%.	
Loaded & Unloaded HGV movements on haul road	No specific data on proportion of loaded and unloaded HGV trips. Type of HGV to be used.	Assumed that half of trips will be loaded, and half will be unloaded. Assumed that 20t tipper (*Volvo FM420 8x4 Tipper)* will be used for HGV trips.	Para. 51, page 22 and para. 146, page 65 of Appendix 27.1 Transport Assessment (Examination Library reference AS1-086) states that "…*the two-way HGV movements assumes a vehicle arriving at a construction access…unloading and departing at the same access*".
Grader speed	No specific data relating to grader speed.	Assumed average grader speed of 9 km/h.	Specification for *JCB Vibratory Roller VM166D* ([redacted]
Topsoil / Subsoil bund placement	No specific information on placement of soil bunds within onshore cable router corridor.	Assumed that soil bunds will be placed either side of the 'typical 60 m wide permanent corridor' and will run entire length of corridor.	Plate 8.1, page 93 of Application Document 6.1.3 Chapter 3 Project Description; Examination Library ref. APP-058.

6 Dust Deposition Modelling Results & Analysis

160. This section presents the results of the dispersion modelling study, both '***Without***' and '***With***' dust control measures applied to the phased construction activities. The results presented for dust deposition within the study area (i.e. T.H. Clements fields) are based on the emission rates specified in **Section 4.3.4**.

161. All figures referenced in this section are presented in **Appendix B** of this report.

6.1 Dust Deposition: WITHOUT Dust Control

6.1.1 Daily Dust Deposition (Benchmark: 80 mg/m^2/day)

162. The maximum daily dust deposition flux across T.H. Clements' fields was modelled for each construction phase. The total combined area of these fields equates to 1,388 hectares.

163. The areas of these fields that are predicted to exceed the benchmark (80 mg/m^2/day) – adopted as a stringent threshold indicating potential accumulation of visible dust on crops – are depicted on **Figure 5** (*Enabling Works*), **Figure 6** (*Cable Infrastructure Installation*), and **Figure 7** (*Reinstatement & Demobilisation*), respectively. These are based on the modelled maximum daily deposition outputs.

164. The following provides a summary of the maximum dust deposition outputs, by phase:

Enabling Works

- Widespread exceedances of the benchmark are predicted within T.H. Clements' land along the extent of the onshore cable route included in the study area.
- The combined area of T.H. Clements' land that exceeds the benchmark is 944 ha, which is 68% of the total land area (1,388 ha).
- Such is the magnitude of exceedance, when applying a less stringent benchmark (120 mg/m^2/day; see ***para. 34***), the area of exceedance remains high at 589 ha (42.5%).

Cable Infrastructure Installation

- The exceedance area remains substantial and widespread, although slightly less pronounced compared to the *Enabling Works*.
- The combined area of T.H. Clements' that exceeds the benchmark is 690 ha, equating to 50% of the total land area.
- When applying the less stringent benchmark (120 mg/m^2/day), the area of exceedance remains substantial at 398 ha (29%).

Reinstatement & Demobilisation

- There is a distinct drop in the maximum dust deposition flux relative to the other phases, but the area of exceedance centred around the cable route remains clear and extensive.
- The combined area of T.H. Clements' that exceeds the benchmark is 367.5 ha, equating to 27% of the total land area.
- When applying the less stringent benchmark (120 mg/m^2/day), an exceedance area of 179 ha (135) remains evident, distributed either side of the Order Limits.

165. A subsequent analysis of the frequency at which the daily benchmark is predicted to be exceeded was undertaken, based on the area of T.H. Clements' land that breaches the

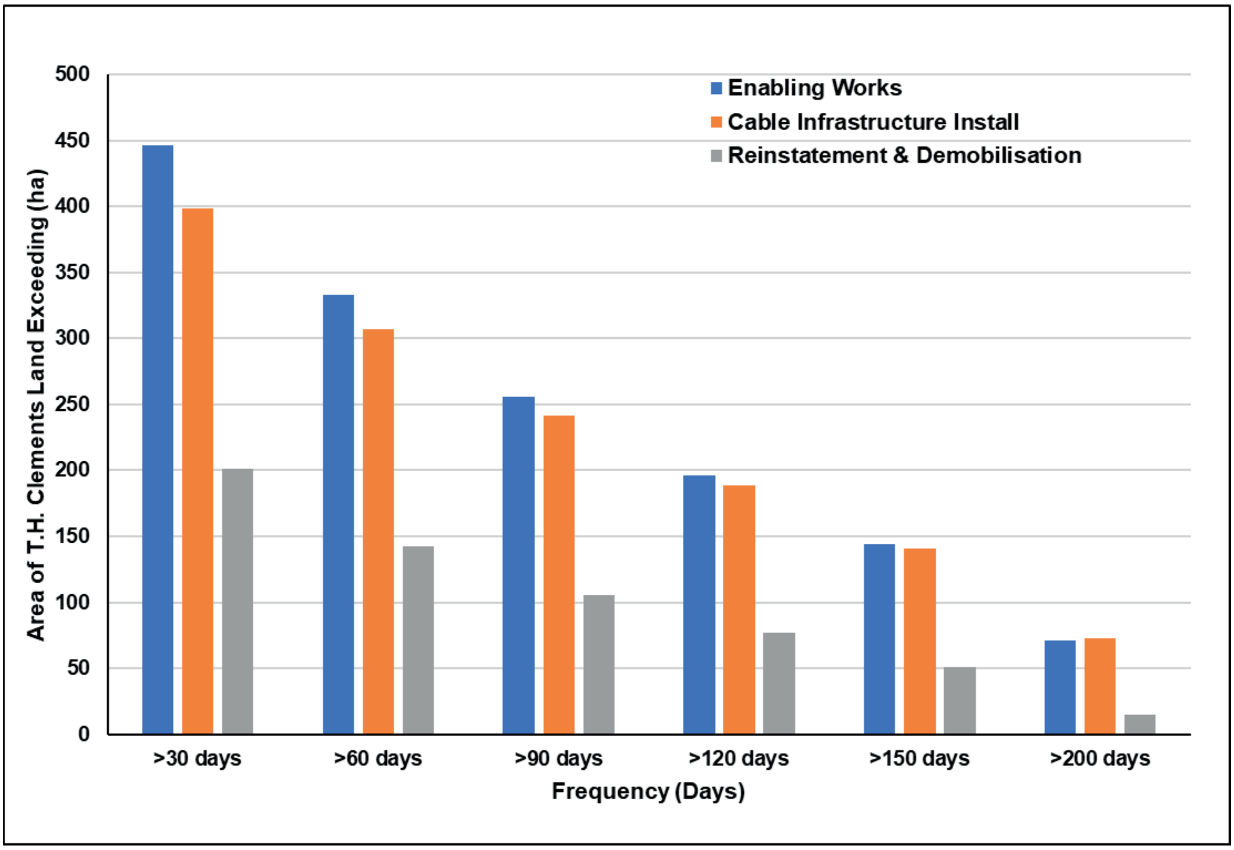
threshold over *X number of days per annum*. The results of this analysis are presented in **Table 6-1** and graphically presented in **Plate 6-1**.

Table 6-1: Frequency of daily benchmark exceedances within T.H. Clements' land ('*Without* Dust Control')

Phase	Area of T.H. Clements' land predicted to exceed 80 mg/m^2/day for *>X days per annum*						
	Area Unit	**>30 days**	**>60 days**	**>90 days**	**>120 days**	**>150 days**	**>200 days**
Enabling Works	Hectares	447	333	256	196	144	71
	% of Total*	32%	24%	18%	14%	10%	5%
Cable Infrastructure Installation	Hectares	398	307	241	188	141	73
	% of Total*	29%	22%	17%	14%	10%	5%
Demobilisation & Reinstatement	Hectares	201	142	106	77	51	15
	% of Total*	15%	10%	8%	6%	4%	1%

Notes:
* Expressed as percentage of total area of T.H. Clements' land within modelled study area

Plate 6-1: Frequency of daily benchmark exceedances ('*Without* Dust Control')



166. A summary of the above results for daily benchmark exceedance frequency is provided as follows:

Enabling Works

- A substantial area of T.H. Clements' land is predicted to exceed the benchmark at a frequency of over 30 days per year, equating to 447 ha of the total area included in the model.
- The area of exceedance with a frequency of over 60 days per year remains above 333 ha, incrementally reducing to 196 ha for exceedances over 120 days per year.
- An area of land equating to 144 ha is predicted to exceed at a frequency of over 150 days per year, reducing to 71 ha for over 200 days.
- The pattern of this exceedance frequency is depicted on **Figure 8**, which is distinctly centred on the Order Limits, with frequency decreasing with distance from the source, as expected.
- Without dust control, the potential for prolonged exceedances poses a distinct risk of visible dust accumulating across a substantial area of T.H. Clements' land.

Cable Infrastructure Installation

- A near-identical pattern of exceedance frequency is observed compared to the *Enabling Works* phase, as evidenced in **Plate 6-1** and **Figure 9**.
- Without dust control, the potential for repeated exceedances poses a distinct risk of visible dust accumulating across a substantial area of T.H. Clements' land.

Reinstatement & Demobilisation

- A distinctly reduced frequency of exceedance is predicted in this phase.
- However, 201 ha of land is predicted to exceed the benchmark at a frequency of over 30 days per year, with 142 ha exceeding for over 60 days, and 106 ha for over 90 days.
- The risk of visible dust accumulation persists during this phase, with the area at risk of repeated exceedance throughout the year (e.g. >90 days) being over 100 ha, distributed on land immediately adjacent to the Order Limits (see **Figure 10**).

6.1.2 Monthly Dust Deposition Flux (Benchmark: 2g/m^2/month)

167. The maximum monthly dust deposition flux across T.H. Clements' fields was modelled for each construction phase.

168. The areas of these fields that are predicted to exceed the benchmark (2 g/m^2/month) – a stringent threshold indicating potential accumulation of visible dust on crops – are depicted on **Figure 11** (*Enabling Works*), **Figure 12** (*Cable Infrastructure Installation*), and **Figure 13** (*Reinstatement & Demobilisation*), respectively. These are based on the modelled maximum monthly deposition outputs.

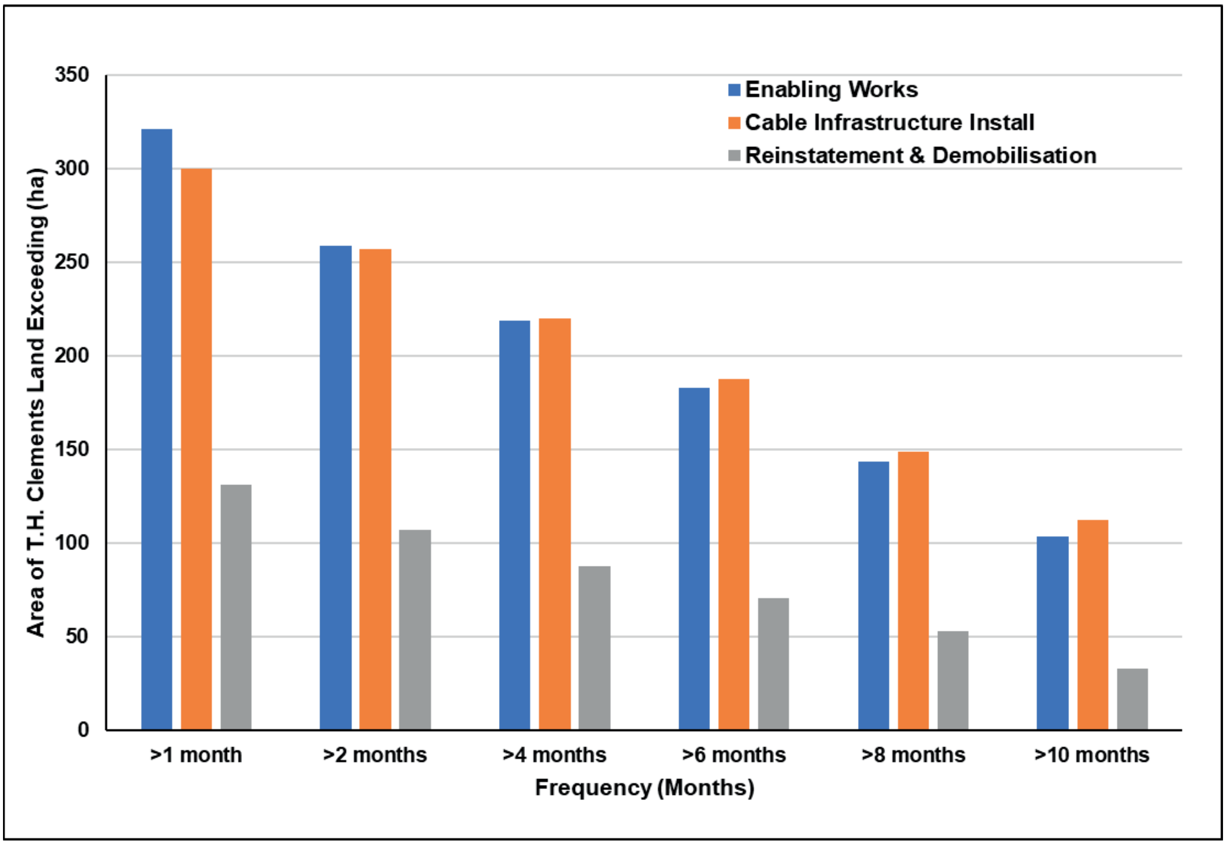
169. A corresponding analysis of the frequency at which the monthly benchmark is predicted to be exceeded was undertaken, based on the area of T.H. Clements' land that breaches the threshold over *X number of months per annum*. The results of this analysis are presented in Table 6-2 and graphically presented in **Plate 6-2**.

Table 6-2: Frequency of monthly benchmark exceedances within T.H. Clements' land ('*Without* Dust Control')

Phase	Area of T.H. Clements' land predicted to exceed 2 g/m^2/month for >*X months per annum*						
	Area Unit	≥1 month	≥2 months	≥4 months	≥6 months	≥8 months	≥10 months
Enabling Works	Hectares	321	259	219	183	143	103
	% of Total*	23%	19%	16%	13%	10%	7%
Cable Infrastructure Installation	Hectares	300	257	220	188	149	112
	% of Total*	22%	19%	16%	14%	11%	8%
Demobilisation & Reinstatement	Hectares	131	107	88	71	53	33
	% of Total*	9%	8%	6%	5%	4%	2%

Notes:
* Expressed as percentage of total area of T.H. Clements' land within modelled study area

Plate 6-2: Frequency of monthly benchmark exceedances ('*Without* Dust Control')



170. The following provides a summary of the maximum monthly dust deposition outputs and associated frequency of exceedances over the modelled year:

Enabling Works

- The modelled maximum monthly deposition results demonstrate that 342 ha of T.H. Clements' land in the study area exceeds the monthly benchmark. The area of exceedance is uniformly distributed either side of the Order Limits, as viewed on **Figure 11.**

- As seen in **Table 6-2** and **Plate 6-2**, 259 ha of the total area is predicted to exceed the benchmark for two or more months per year. The incremental decrease in land area as the frequency of exceedance increases is not very pronounced, with 183 ha predicted to exceed for six or more months per year, a reduction of only 5%.
- An area of 143 ha and 103 ha is predicted to exceed the benchmark for eight or more months and ten or more months per year, respectively.
- The exceedance frequency is clearly focussed either side of the Order Limits, as shown on **Figure 14**.
- Without dust control, the potential for repeated exceedances poses a distinct risk of visible dust accumulating across a substantial area of T.H. Clements' land.
- These results align with those for daily dust deposition ('*Without Dust Control*').

Cable Infrastructure Installation

- The modelled maximum monthly deposition results (**Figure 12**) show a similar exceedance area to the *Enabling Works* phase, covering 309 ha of T.H. Clements' land.
- A near-identical pattern of exceedance frequency is predicted compared to the *Enabling Works* phase, as evidenced in **Figure 15**.
- Without dust control, the risk of visible dust accumulation remains across a substantial portion of T.H. Clements' land. These results align with those for daily dust deposition.

Reinstatement & Demobilisation

- The exceedance area for maximum monthly dust deposition is notably lower in this phase, covering 151 ha of T.H. Clements' land. Despite this reduction, the area of exceedance remains clear on land intersected by or adjacent to the Order Limits, as shown on **Figure 13**.
- Although the area predicted to exceed the benchmark for one month or more is confined to 131 ha of the land, the decrease in land area as the frequency of exceedance increases is limited. For example, 71 ha of land is predicted to exceed for six or more months per year.
- As with daily dust deposition, the risk of visible dust accumulation persists in this phase, with the area at risk of repeated exceedance still material, though concentrated in land immediately adjacent to the Order Limits (see **Figure 16**).

6.2 Dust Deposition: WITH Dust Control

6.2.1 Daily Dust Deposition

171. The maximum daily dust deposition flux across T.H. Clements' fields was modelled for each construction phase, inclusive of relevant dust control factors (as per **Section 4.2.4**).

172. The areas of these fields that are predicted to exceed the benchmark (80 mg/m^2/day) are depicted on **Figure 17** (*Enabling Works*), **Figure 18** (*Cable Infrastructure Installation*), and **Figure 19** (*Reinstatement & Demobilisation*), respectively. These are based on the modelled maximum daily deposition outputs.

173. The following provides a summary of the maximum dust deposition outputs, by phase inclusive of dust control measures:

Enabling Works

- With dust control applied, extensive predicted exceedances of the benchmark remain within T.H. Clements' land along the extent of the onshore cable route.
- Although the inclusion of dust controls reduces the area of exceedance by 58% relative to the '*Without Dust Control*' scenario, the benchmark is exceeded across 395 ha, equivalent to 28% of the total land area (1,388 ha).
- When applying a less stringent benchmark (120 mg/m^2/day), the area of exceedance remains considerable at 14% (196 ha).

Cable Infrastructure Installation

- The exceedance area remains extensive and of a similar magnitude to the mitigated *Enabling Works* phase.
- The combined area of T.H. Clements' that exceeds the benchmark is 346 ha, equating to 25% of the total land area. This represents a 50% reduction in the exceedance area relative to the '*Without Dust Control*' scenario.
- With the less stringent benchmark applied (120 mg/m^2/day), the area of exceedance remains notable at 172 ha (12%).

Reinstatement & Demobilisation

- With dust control measures in place, the exceedance area is predicted to decrease by a further 40% compared to the '*Without Dust Control*' scenario. The remaining exceedance area is 220 ha, which is 16% of T.H. Clements' land.
- Despite the distinct reduction in the maximum dust deposition flux relative to the other phases, an area of over 220 ha remains above, which is substantial.
- When applying the less stringent benchmark (120 mg/m^2/day), the area of exceedance (121 ha) is still evident either side of the Order Limits.

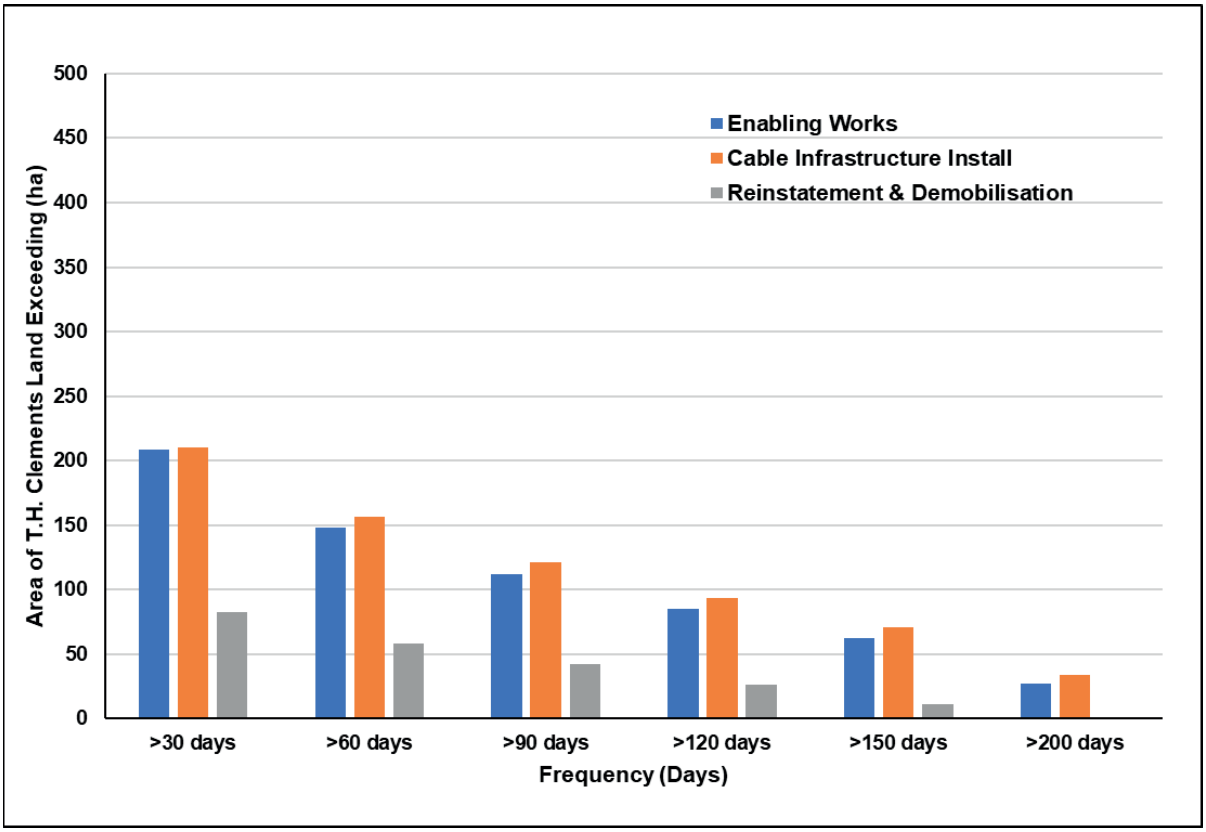
174. The results of the exceedance frequency analysis, accounting for the inclusion of dust control, are presented in **Table 6-3** and graphically presented in **Plate 6-3** (note: the Y-axis scale remains consistent with **Plate 6-1** for ease of comparison).

Table 6-3: Frequency of daily benchmark exceedances within T.H. Clements' land ('*With* Dust Control')

Phase	Area of T.H. Clements' land predicted to exceed 80 mg/m^2/day for >*X days per annum*						
	Area Unit	**>30 days**	**>60 days**	**>90 days**	**>120 days**	**>150 days**	**>200 days**
Enabling Works	Hectares	209	148	112	85	63	27
	% of Total*	15%	11%	8%	6%	5%	2%
Cable Infrastructure Installation	Hectares	210	156	121	94	71	34
	% of Total*	15%	11%	9%	7%	5%	2%
Demobilisation & Reinstatement	Hectares	83	58	42	26	11	0
	% of Total*	6%	4%	3%	2%	1%	0%

Notes:
* Expressed as percentage of total area of T.H. Clements' land within modelled study area

Plate 6-3: Frequency of daily benchmark exceedances ('*With* Dust Control')



175. A summary of the above results for daily benchmark exceedance frequency is provided as follows:

Enabling Works

- The area of T.H. Clements' land predicted to exceed the benchmark for over 30 days per year, with dust control applied, is 209 ha of the total area modelled.
- The exceedance area gradually reduces to 148 ha for exceedances of more than 60 days per year, 112 ha for over 90 days, 63 ha for over 150 days, and 27 ha for over 200 days.
- The pattern of exceedance frequency with dust control applied is depicted on **Figure 20**, indicating an approximate 55% reduction in exceedance area compared to the '*Without Dust Control*' scenario.
- However, the risk of visible dust accumulation remains, with over 100 ha of land exceeding the benchmark for more than 90 days annually.

Cable Infrastructure Installation

- A near-identical pattern of exceedance frequency pattern is observed compared to the *Enabling Works* phase (see **Figure 21**), although the magnitude of exceedance is marginally higher across all categories.
- Even with dust control included, over 120 ha of land is predicted to exceed the benchmark for more than 90 days per year.

Reinstatement & Demobilisation

- Dust control measures are expected to further reduce exceedance frequencies compared to the '*Without Dust Control*' scenario.
- A total of 83 ha of land is predicted to exceed the benchmark for more than 30 days per year, reducing to 42 ha for exceedances over 90 days, and 26 ha for over 120 days.
- While the exceedance area is distinctly smaller in this phase, there remains a risk of visible dust accumulation on T.H. Clements' land, albeit concentrated within a narrow band of land adjacent to the Order Limits (see **Figure 22**).

6.2.2 Monthly Dust Deposition Flux

176. The maximum monthly dust deposition flux across T.H. Clements' fields was modelled for each construction phase, including dust control measures.

177. The areas of these fields that are predicted to exceed the benchmark (2 g/m^2/month) are depicted on **Figure 23** (*Enabling Works*), **Figure 24** (*Cable Infrastructure Installation*), and **Figure 25** (*Reinstatement & Demobilisation*), respectively. These are based on the modelled maximum monthly deposition outputs.

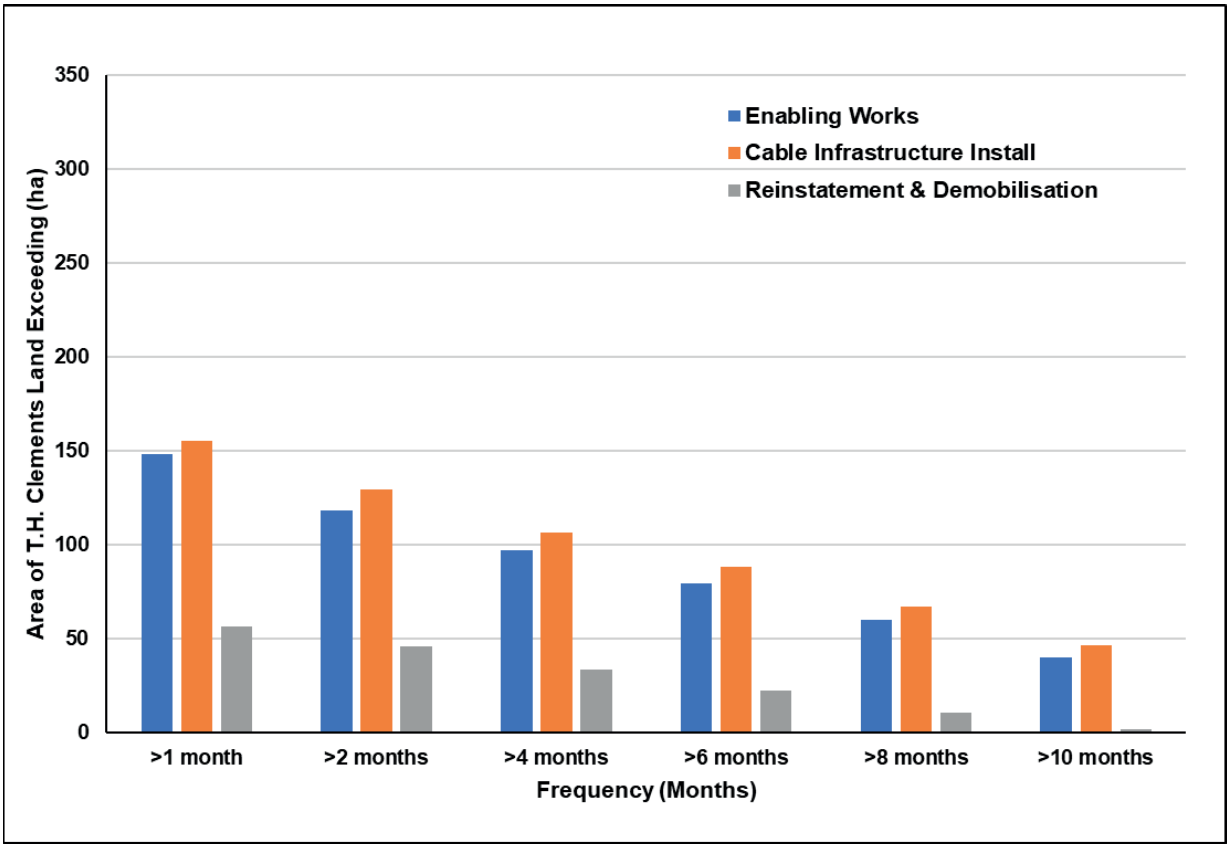
178. The results of the corresponding exceedance frequency analysis, accounting for dust control measures, are presented in **Table 6-4** and graphically in **Plate 6-4** (note: the Y-axis scale remains consistent with **Plate 6-2** for ease of comparison).

Table 6-4: Frequency of monthly benchmark exceedances within T.H. Clements' land ('*With* Dust Control')

Phase	Area of T.H. Clements' land predicted to exceed 2 g/m²/month for >*X months per annum*						
	Area Unit	≥1 month	≥2 months	≥4 months	≥6 months	≥8 months	≥10 months
Enabling Works	Hectares	148	118	97	79	60	40
	% of Total*	11%	9%	7%	6%	4%	3%
Cable Infrastructure Installation	Hectares	156	130	107	89	67	47
	% of Total*	11%	9%	8%	6%	5%	3%
Demobilisation & Reinstatement	Hectares	57	46	33	23	11	2
	% of Total*	4%	3%	2%	2%	1%	0%

Notes:
* Expressed as percentage of total area of T.H. Clements' land within modelled study area

Plate 6-4: Frequency of monthly benchmark exceedances ('*With* Dust Control')



179. The following provides a summary of the maximum monthly dust deposition outputs and associated exceedance frequency over the modelled year, inclusive of dust control measures:

Enabling Works

- The modelled maximum monthly deposition results indicate that 170 ha of T.H. Clements' land exceeds the monthly benchmark, representing a 50% reduction relative to the '*Without Dust Control*' scenario. The area of exceedance is depicted in **Figure 23.**
- As shown in **Table 6-4** and **Plate 6-4**, 118 ha of land is predicted to exceed the benchmark for two or more months per year, even with dust controls in place. Whilst the exceedance area decreases as the exceedance frequency increases, 97 ha is predicted to exceed for four or more months, and 79 ha to exceed for six or more months.
- An area of 60 ha and 40 ha is predicted to exceed the benchmark for eight or more months and ten or more months per year, respectively.
- The exceedance frequency is focussed either side of the Order Limits, as shown on **Figure 26**.
- Despite dust control measures, there remains a risk of visible dust accumulation across a material portion of T.H. Clements' land.
- These results are consistent with the daily dust deposition analysis ('*With Dust Control*').

Cable Infrastructure Installation

- The modelled maximum monthly deposition results (**Figure 24**) show a similar exceedance area to the *Enabling Works* phase, covering 171 ha of T.H. Clements' land. This represents a 55% reduction in exceedance area compared to the '*Without Dust Control*' scenario.
- A near-identical exceedance frequency pattern is predicted compared to the *Enabling Works* phase, as evidenced in **Figure 27**. However, as seen in **Table 6-4** and **Plate 6-4**, the area of exceedance in this phase is marginally higher in each category.
- With dust control, the risk of visible dust accumulation remains across a considerable portion of T.H. Clements' land. These results align with the those for daily dust deposition.

Reinstatement & Demobilisation

- The exceedance area for maximum monthly dust deposition is notably lower in this phase, covering 66 ha of T.H. Clements' land, equivalent to 5% of the total modelled land area. The exceedance area is depicted on **Figure 25**, specifically limited to a narrow band within land intersected by or adjacent to the Order Limits.
- An area of 57 ha is predicted to exceed the benchmark for one month or more, decreasing to 33 ha for four months or more, and 23 ha for six months or more.
- Although dust controls further reduce the exceedance area in this phase, the risk of visible dust accumulation on T.H. Clements' land persists. However, the exceedance area and frequency are notably lower compared to the earlier phases, as demonstrated in **Figure 28**.

7 Conclusions

180. This report provides a detailed assessment of potential impacts from fugitive dust emissions on crops grown by T.H. Clements & Son Limited, a leading Brassica vegetable producer in the UK, during the phased construction of the Outer Dowsing Offshore Wind project's onshore cable route.

181. T.H. Clements operates under strict quality standards, which form part of their customer contracts, requiring harvested crops to be free of visible dust. In the event these standards are not met, crops may be rejected, which will adversely affect their contracts with major UK supermarkets and result in potentially significant revenue losses.

182. The study, completed by Damian Pawson (Technical Director, Air Quality of Sweco), focusses on potential dust deposition during three integral phases of the proposed Project's construction: *Enabling Works*, *Cable Infrastructure Installation*, and *Reinstatement & Demobilisation*. The spatial scope of the study captures T.H. Clements' land in proximity to the Order Limits, with the aim of evaluating the extent to which dust from construction activities may deposit on crops.

183. A benchmarking exercise, based on reviewing national and international guidelines, was completed to determine an appropriate benchmark(s) for assessing potential dust deposition impacts on Brassica crops grown by T.H. Clements. Given the stringent quality requirements for produce to be free of visible foreign matter, benchmarks were set at **80 mg/m²/day** (*daily*) and **2 g/m²/month** (*monthly*), reflecting the lower thresholds at which visible dust, especially dark coloured soil dust, could accumulate and affect T.H. Clements' ability to comply with contractual requirements.

184. The above benchmarks were applied to the dust deposition modelling results, focusing on the proposed Project's dust contribution, both as a maximum impact and to assess the frequency at which exceedances might occur within T.H. Clements' land over the modelled period.

185. The detailed dust emissions inventory and dispersion model were developed for both '*Without Dust Control*' and '*With Dust Control*' scenarios. This approach acknowledged that the Applicant has proposed an Outline Air Quality Management Plan and an Outline Soil Management Plan that include 'highly recommended' mitigation measures.

186. The inventory and model utilised information from documents published by the Applicant[3], international best practice guidelines, and data representative of the study area. The assessment was completed within the context of the limitations and assumptions detailed in **Section 5**.

7.1 Results Discussion

187. The assessment results set out in **Section 6** indicate that there is a clear risk of visible dust accumulation on T.H. Clements' land, in both the '***Without***' and '***With***' dust control scenarios. This risk is evident across all three modelled construction phases, being particularly pronounced in the *Enabling Works* and *Cable Infrastructure Installation* phases.

188. Although the exceedance area, based on the modelled maximum dust deposition impacts, is crucial for assessing the potential for visible dust accumulation, the level of risk increases significantly with a larger area experiencing frequent exceedances.

189. For the purposes of this assessment, and within the context of the associated limitations and assumptions, an exceedance frequency of 120 days or more per year (compared to the daily benchmark) or a frequency of four or more months per year (compared to the monthly

benchmark) is considered to represent a *high risk* of dust accumulation on T.H Clements' land.

190. A summary of the model results is presented in this context in **Table 7-1**.

191. In practice, visible accumulation could occur over much shorter timescales, due to the sensitivity of Brassica crops, the time of year (i.e. crop maturity), and variations in the intensity of dust emissions. The results regarding the variation in exceedance frequencies are detailed in **Section 6**, along with relevant figures.

Table 7-1: Summary of model outputs for *Without* versus *With* Dust Control scenarios for daily and monthly dust deposition across T.H. Clements's land (Units: Hectares)

Phase	Scenario	Summary of T.H. Clements' land area exceeding benchmark (ha):			
		Max Daily*	≥120 days/year**	Max Monthly*	≥4 months/year^^
Enabling Works	*WITHOUT CONTROL*	944	196	342	219
	WITH CONTROL	395	85	170	97
Cable Infrastructure Installation	*WITHOUT CONTROL*	691	188	309	220
	WITH CONTROL	346	94	171	107
Demobilisation & Reinstatement	*WITHOUT CONTROL*	367	77	151	88
	WITH CONTROL	220	26	66	33
	Benchmark	**80 mg/m^2/day**		**2 g/m^2/month**	

Notes:

* Exceedance area based on modelled maximum dust deposition impact against relevant benchmark

** Area predicted to exceed at a frequency of 120 days per year or more

^^ Area predicted to exceed at a frequency of four months per year or more

192. In each phase and in both the '***Without***' and '***With***' dust control scenarios, the exceedance area based on modelled maximum dust deposition consistently exceeds **100 ha** of T.H. Clements' land. This applies to both the daily and monthly modelled deposition fluxes, except for the maximum monthly deposition in the '*With Dust Control*' scenario, where the exceedance area is 66 ha.

193. When focussing on the '***With Dust Control***' scenario and modelled maximum daily deposition, the exceedance area ranges from **220 ha** (*Demobilisation & Reinstatement*) to **395 ha** (*Enabling Works*).

194. In the same scenario, the equivalent maximum exceedance area for monthly deposition ranges from **66 ha** (*Demobilisation & Reinstatement*) to **171 ha** (*Cable Infrastructure Installation*).

195. In each phase, the main dust-generating activities relate to the wind erosion sources (soil bunds and exposed areas, in addition to wheel-generated dust (HGV movements on haul road). Whilst the HGV movements are modelled to be consistent throughout each phase, there is a distinct reduction in wind erosion sources in the *Demobilisation & Reinstatement* phase, due to the reinstatement of subsoil and topsoil within the Order Limits. This explains the clear decrease in maximum exceedance areas reported in this phase.

196. When changing focus to the modelled exceedance frequency, it is evident that the area of T.H. Clements' land subject to an exceedance frequency of equal to or above 120 days

(compared to the daily benchmark) and 4 months (compared to the monthly benchmark) are of a similar magnitude.

197. In the '***With Dust Control***' scenario:

- Daily benchmark exceedance frequency ≥120 days per year;
  - A **high risk of dust accumulation is predicted across 94 ha** (*Cable Infrastructure Installation*); **85 ha** (*Enabling Works*); and **26 ha** (*Demobilisation & Reinstatement*) of T.H. Clements' land, respectively.
- Monthly benchmark exceedance frequency ≥4 months per year;
  - A **high risk of dust accumulation is predicted across 107 ha** (*Cable Infrastructure Installation*); **97 ha** (*Enabling Works*); and **33 ha** (*Demobilisation & Reinstatement*) of T.H. Clements' land, respectively.

198. The same level of agreement between the daily and monthly exceedance frequencies is evident in the '*Without Dust Control*' scenario, but with the modelled exceedance area being at a notably greater magnitude (see **Table 7-1**). For the reasons detailed in **Section 5**, it is appropriate that the conclusions of this assessment focus on the '***With Dust Control***' scenario.

199. However, given the relatively lenient thresholds applied for defining risk of visible dust accumulation (i.e. requiring an exceedance frequency ≥120 days or ≥4 months) and the optimistic application of dust control factors, it is possible that the impacted area of T.H. Clements' land will be of a magnitude that is between the upper ('***Without Dust Control'***) and lower ('***With Dust Control***') modelled outcomes presented here

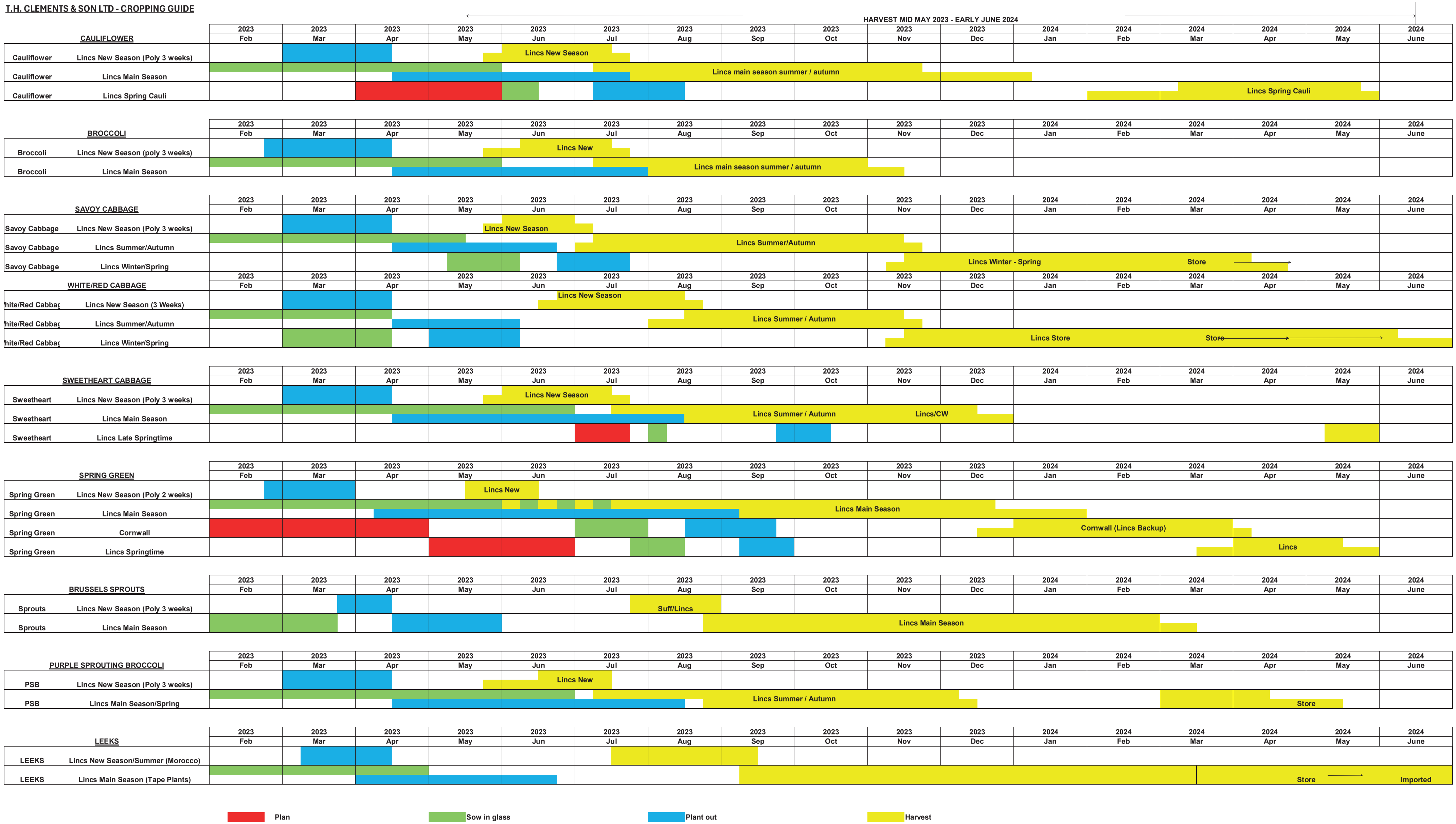
200. **This assessment demonstrates a significant area of T.H. Clements' land at risk of receiving dust deposition at a rate and frequency that could lead to visible dust on growing Brassica crops**.

201. This risk is particularly relevant during the *Enabling Works* and *Cable Infrastructure Installation* phases of construction, especially on land closest to the Order Limits. Therefore, T.H. Clements' ability to produce crops in line with customer requirements is likely to be compromised in these areas.

Appendix A

T. H. Clements & Son Ltd: Cropping Guide Extract for February 2023 to June 2024

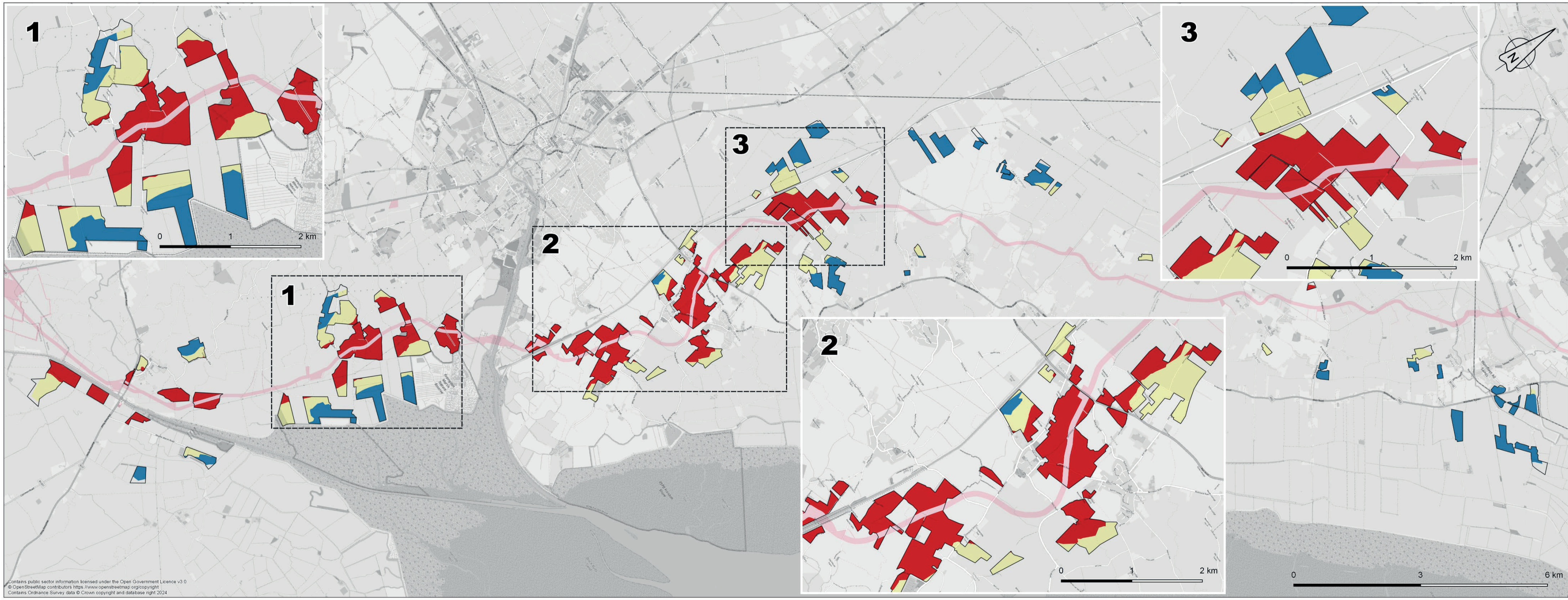
T.H. CLEMENTS & SON LTD - CROPPING GUIDE



Appendix B

Modelled Dust Deposition Plots

Figure Reference List:



Legend

- TH Clements Fields
- Order Limits

Modelled Maximum Daily Deposition: Enabling Works (Assessment benchmark: 80 mg/m²/day)

- < 80 mg/m²/day
- ≥ 80 - <120 mg/m²/day
- ≥120 mg/m²/day

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Outer Dowsing Offshore Windfarm – Dust Deposition Modelling

Drawing Title

Figure 5 Enabling Works - **Without** Dust Control - Modelled Maximum Daily Dust Deposition Flux

Project Stage			
n/a			
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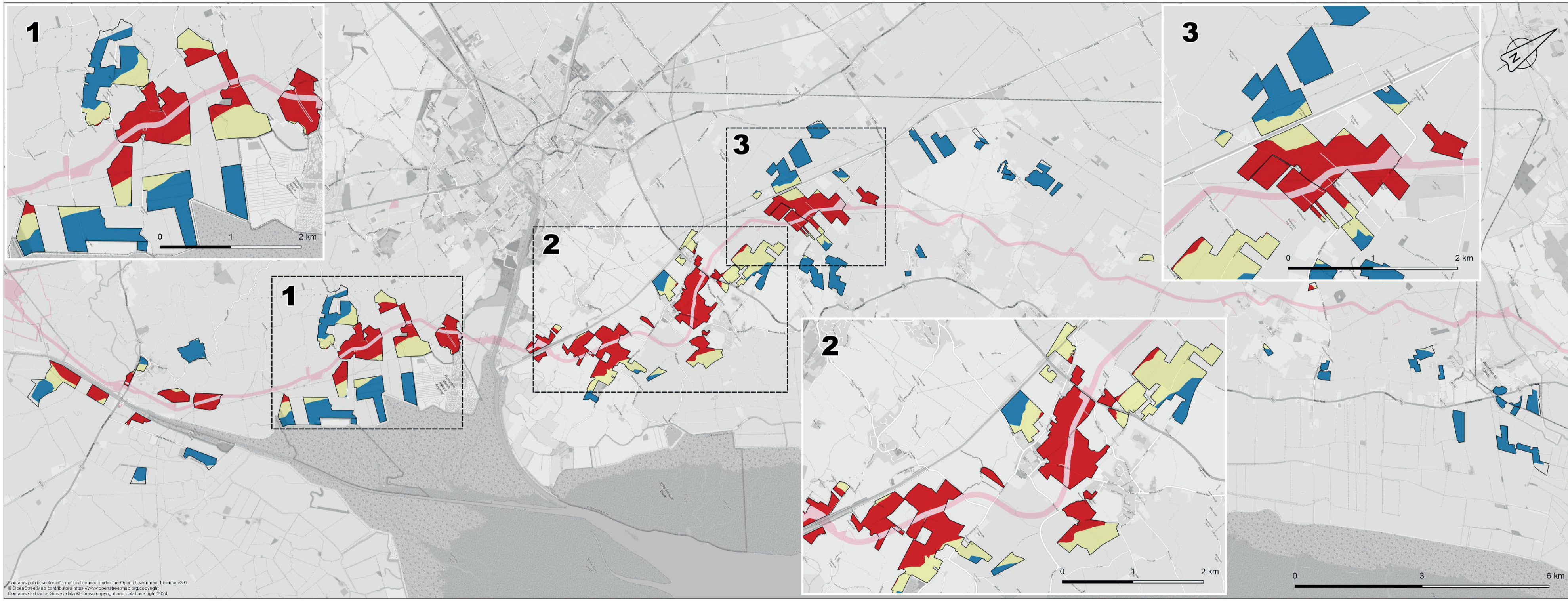

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Project Title: Outer Dowsing Offshore Windfarm – Dust Deposition Modelling

Drawing Title: Figure 6 Cable Infrastructure Installation - **Without** Dust Control - Modelled Maximum Daily Dust Deposition Flux

Project Stage	Status	Status Description	
n/a	n/a	n/a	
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LFS	DP	DP	DP
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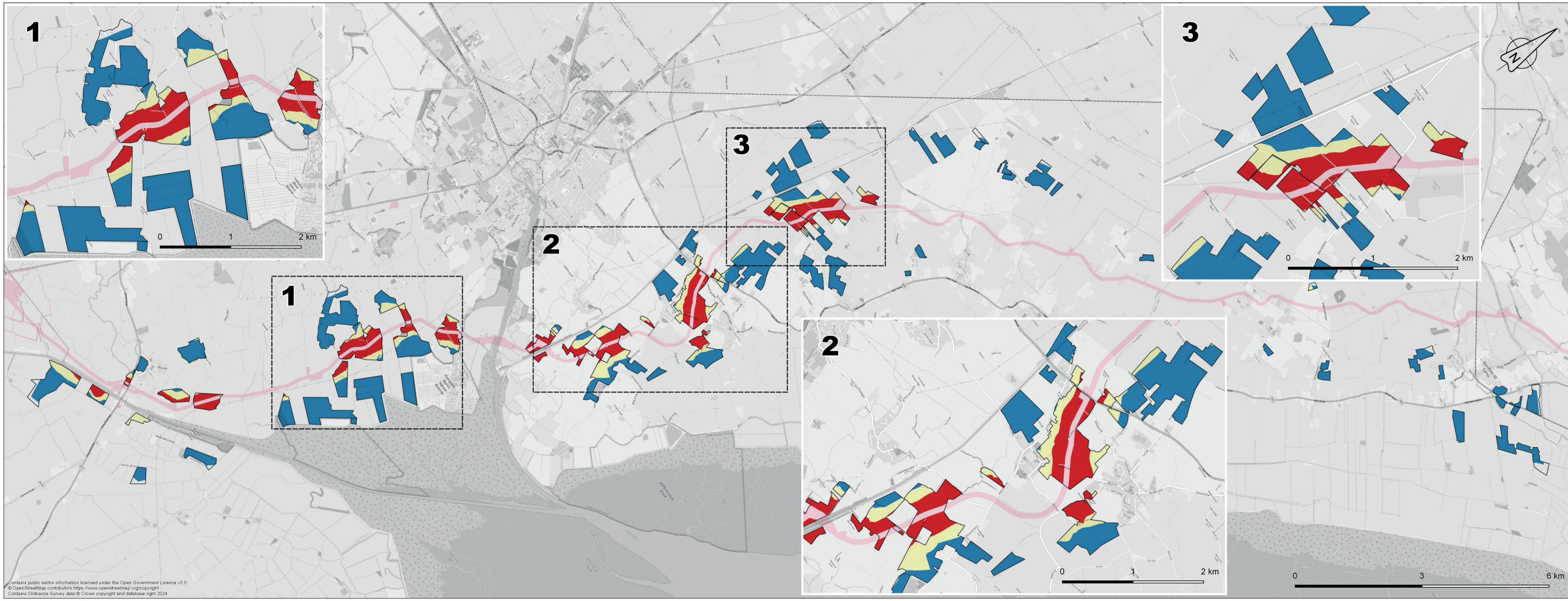

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Drawing Title
Figure 7 Reinstatement & Demobilisation - **Without** Dust Control - Modelled Maximum Daily Dust Deposition Flux

Project Stage			
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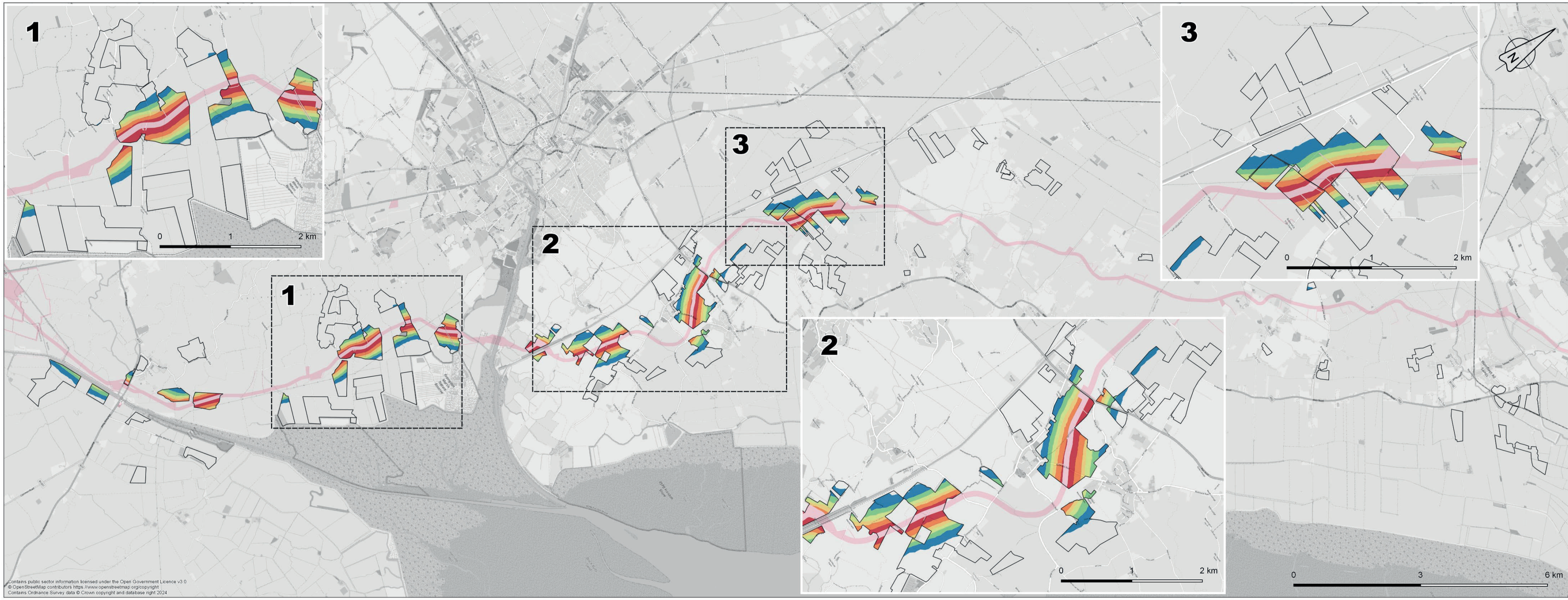

Legend

- TH Clements Fields
- Order Limits

Modelled Exceedance Frequency: Enabling Works (Assessment benchmark: 80 mg/m²/day)

- ≥ 30 days/year
- ≥ 60 days/year
- ≥ 90 days/year
- ≥ 120 days/year
- ≥ 150 days/ year
- ≥ 200 days/year

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Drawing Title
Figure 8 Enabling Works - **Without** Dust Control - Modelled Exceedance Frequency of Daily Dust Deposition Benchmark

Project Stage			
n/a			
Status: n/a	Status Description: n/a		
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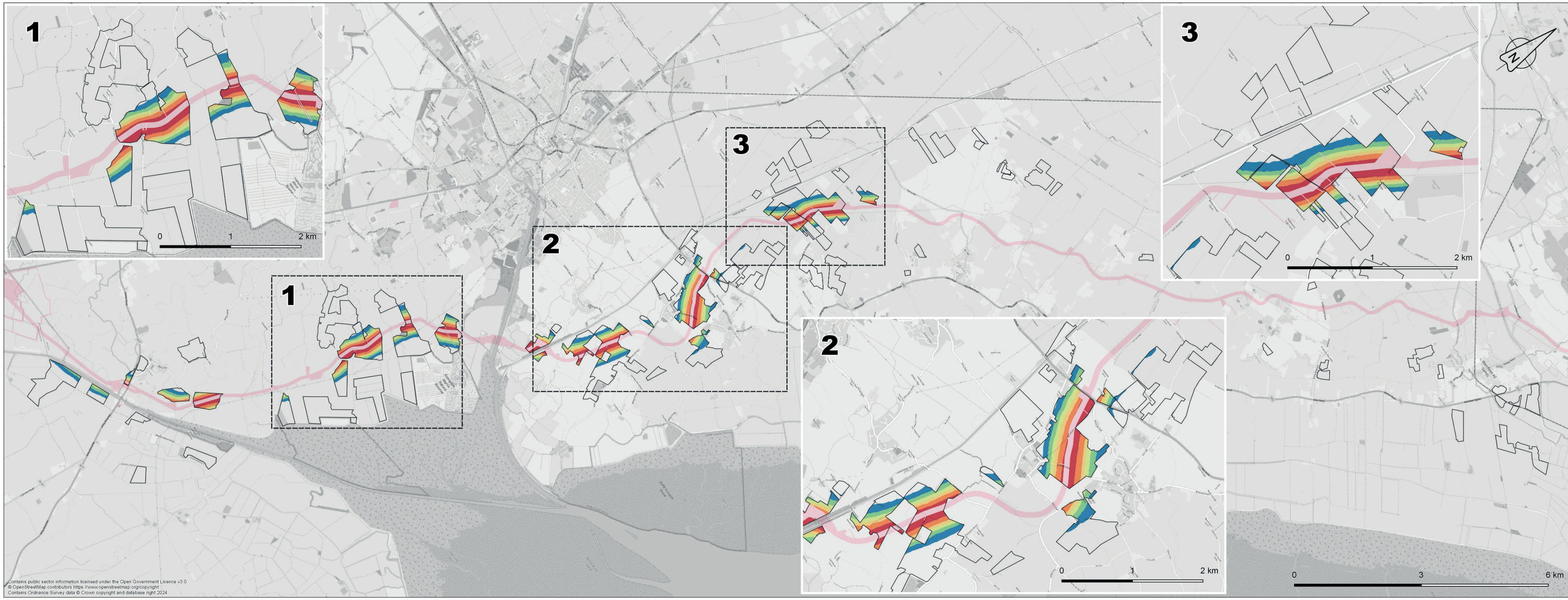

Legend

- TH Clements Fields
- Order Limits

Modelled Exceedance Frequency:
Cable Instrastucture Installation
(Assessment benchmark: 80 mg/m²/day)

- ≥ 30 days/year
- ≥ 60 days/year
- ≥ 90 days/year
- ≥ 120 days/year
- ≥ 150 days/ year
- ≥ 200 days/year

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Outer Dowsing Offshore Windfarm – Dust Deposition Modelling

Drawing Title

Figure 9 Cable Infrastructure Installation - **Without** Dust Control - Modelled Exceedance Frequency of Daily Dust Deposition Benchmark

Project Stage			
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Status	Status Description		
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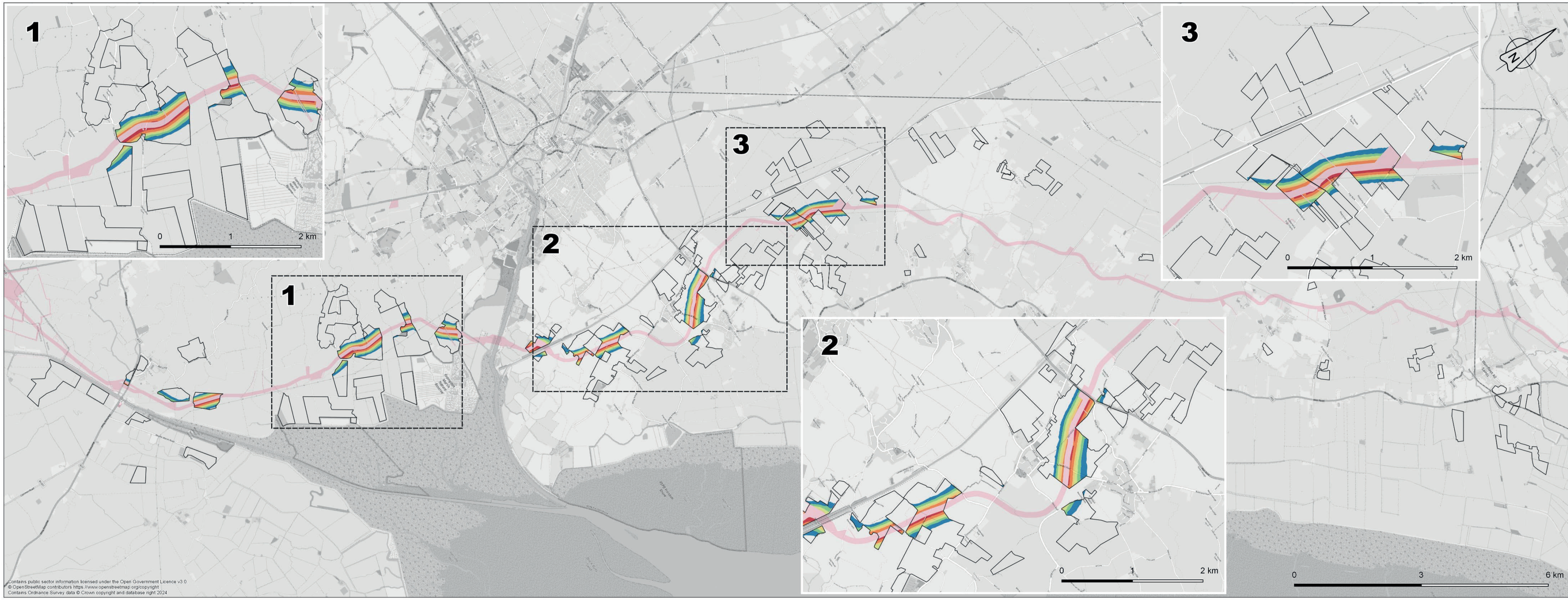

Legend

- TH Clements Fields
- Order Limits

Modelled Exceedance Frequency: Reinstatement and Demobilisation (Assessment benchmark: 80 mg/m²/day)

- ≥ 30 days/year
- ≥ 60 days/year
- ≥ 90 days/year
- ≥ 120 days/year
- ≥ 150 days/ year
- ≥ 200 days/year

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Outer Dowsing Offshore Windfarm – Dust Deposition Modelling

Drawing Title

Figure 10 Reinstatement & Demobilisation - **Without** Dust Control - Modelled Exceedance Frequency of Daily Dust Deposition Benchmark

Project Stage			
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Drawing Number 65213546-SWE-XX-XX-G-AQ-00010

Legend

- TH Clements Fields
- Order Limits

Modelled Maximum Monthly Deposition: Enabling Works
(Assessment benchmark: 2 g/m²/month)

- < 2 g/m²/month
- ≥ 2 g/m²/month

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Project Title
Outer Dowsing Offshore Windfarm – Dust Deposition Modelling

Drawing Title
Figure 11 Enabling Works - **Without** Dust Control - Modelled Maximum Monthly Dust Deposition Flux

Project Stage			
n/a			
Status: n/a	Status Description: n/a		
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Drawing Number 65213546-SWE-XX-XX-G-AQ-00011

Legend

- TH Clements Fields
- Order Limits

Modelled Maximum Monthly Deposition: Cable Infrastructure Installation (Assessment benchmark: 2 g/m²/month)

- < 2 g/m²/month
- ≥ 2 g/m²/month

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Outer Dowsing Offshore Windfarm – Dust Deposition Modelling

Drawing Title

Figure 12 Cable Infrastructure Installation - **Without** Dust Control - Modelled Maximum Monthly Dust Deposition Flux

Project Stage			
n/a			
Status: n/a	Status Description: n/a		
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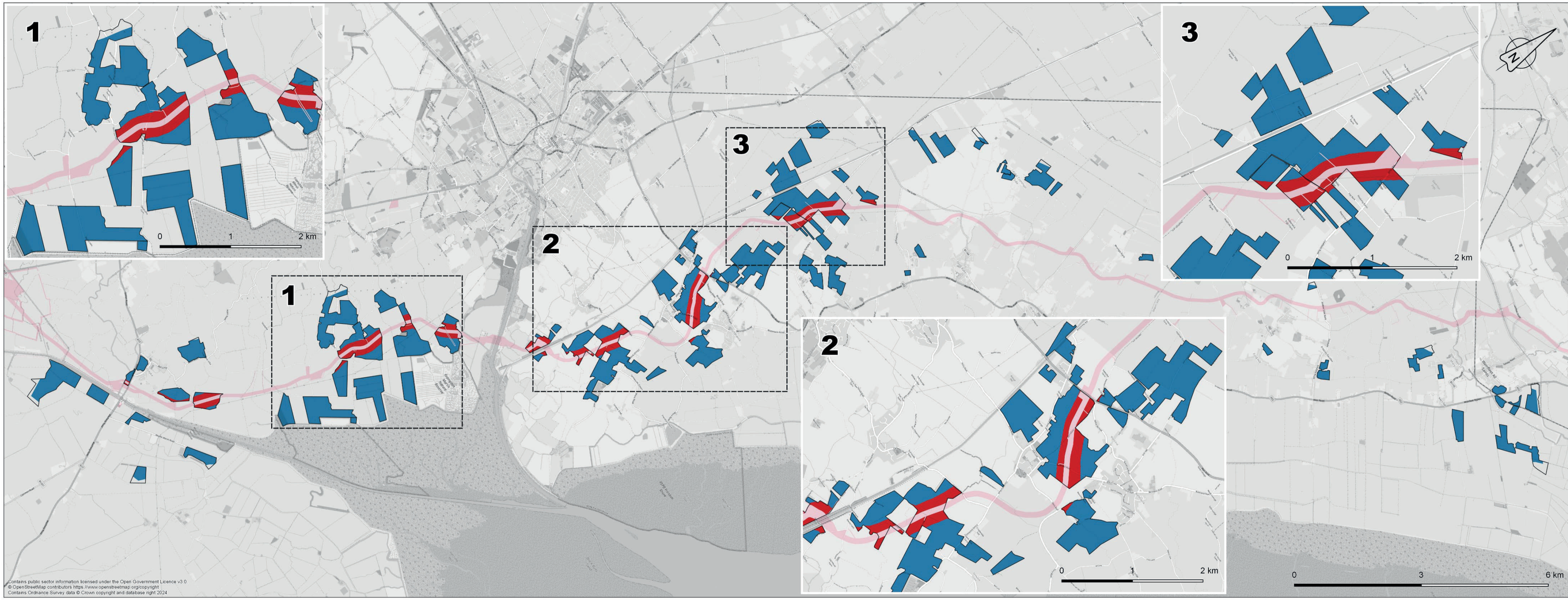

Legend

- TH Clements Fields
- Order Limits

Modelled Maximum Monthly Deposition: Reinstatement and Demobilisation (Assessment benchmark: 2 g/m²/month)

- < 2 g/m²/month
- ≥ 2 g/m²/month

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Drawing Title

Figure 13 Reinstatement & Demobilisation - **Without** Dust Control - Modelled Maximum Monthly Dust Deposition Flux

Project Stage			
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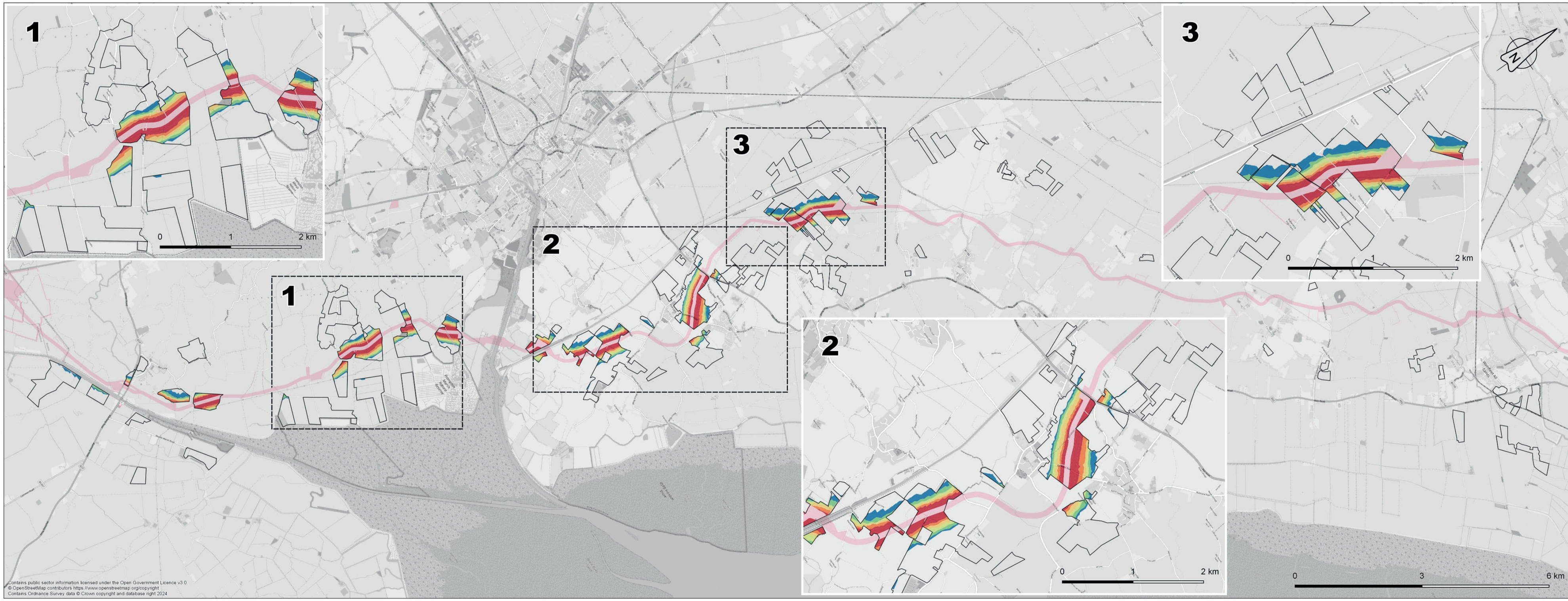

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Project Title: Outer Dowsing Offshore Windfarm – Dust Deposition Modelling

Drawing Title: Figure 14 Enabling Works - **Without** Dust Control - Modelled Exceedance Frequency of Monthly Dust Deposition Benchmark

Project Stage	Status	Status Description
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Drawn	Designed	Checked	Approved
LFS	DP	DP	DP

Sheet Size	Scale	Sweco Ref	Revision
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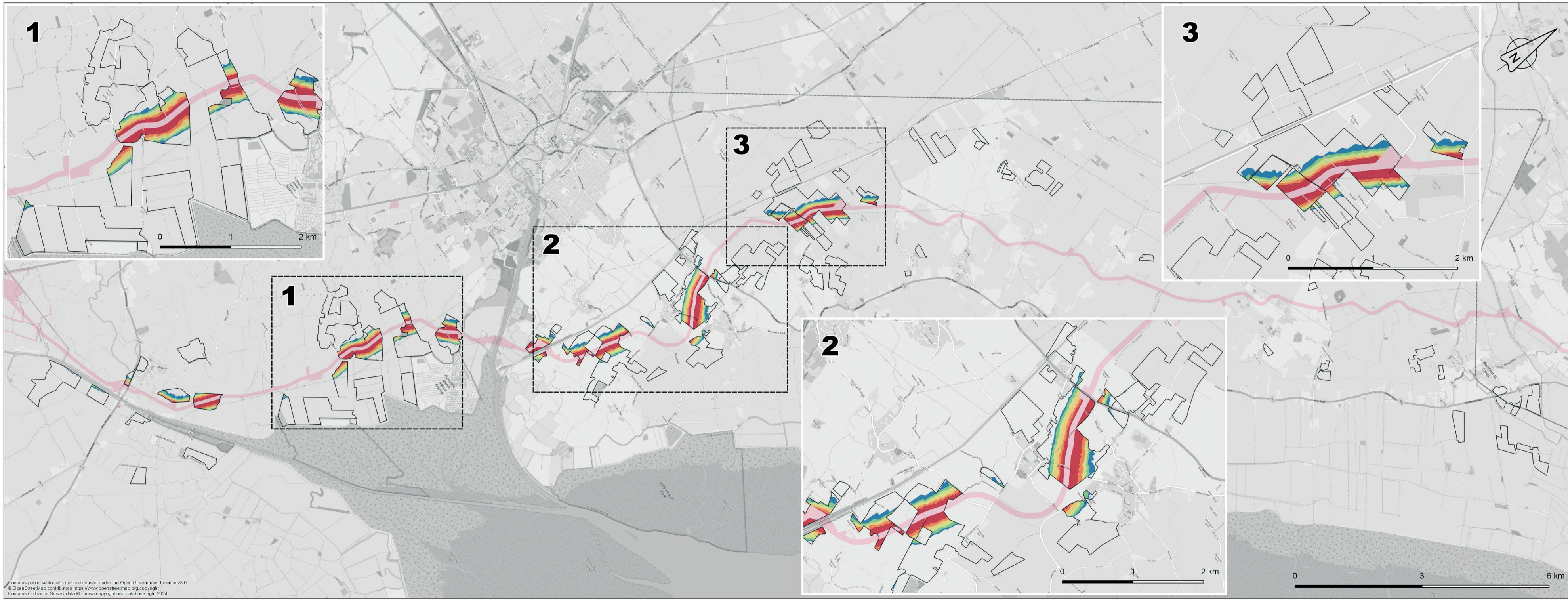

Legend

- TH Clements Fields
- Order Limits

Modelled Exceedance Frequency: Cable Infrastructure Installation (Assessment benchmark: 2 g/m²/month)

- ≥ 1 months/year
- ≥ 2 months/year
- ≥ 4 months/year
- ≥ 6 months/year
- ≥ 8 months/year
- ≥ 10 months/year

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Outer Dowsing Offshore Windfarm – Dust Deposition Modelling

Drawing Title

Figure 15 Cable Infrastructure Installation - **Without** Dust Control - Modelled Exceedance Frequency of Monthly Dust Deposition Benchmark

Project Stage			
n/a			
Status	Status Description		
n/a	n/a		
Drawn	Designed	Checked	Approved
LFS	DP	DP	DP
Sheet Size	Scale	Sweco Ref	Revision
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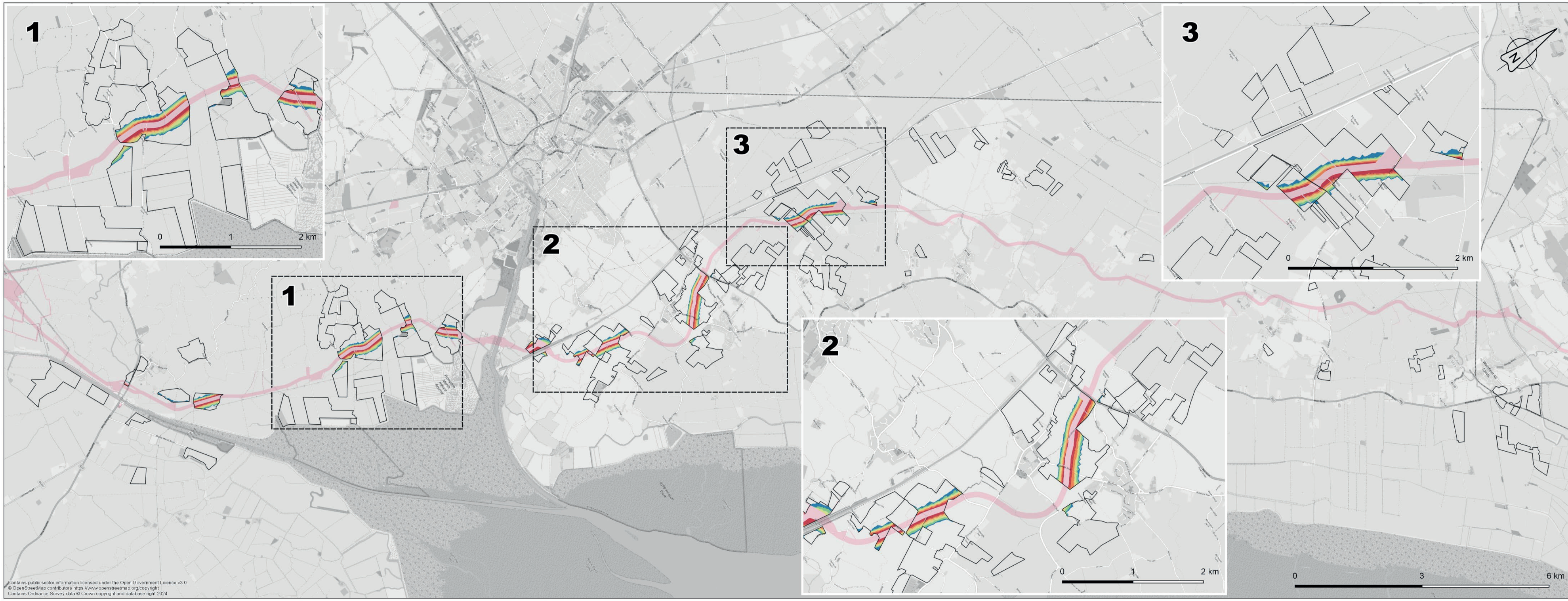

Legend

- TH Clements Fields
- Order Limits

Modelled Exceedance Frequency: Reinstatement and Demobilisation (Assessment benchmark: 2 g/m²/month)

- ≥ 1 months/year
- ≥ 2 months/year
- ≥ 4 months/year
- ≥ 6 months/year
- ≥ 8 months/year
- ≥ 10 months/year

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Outer Dowsing Offshore Windfarm – Dust Deposition Modelling

Drawing Title
Figure 16 Reinstatement & Demobilisation - **Without** Dust Control - Modelled Exceedance Frequency of Monthly Dust Deposition Benchmark

Project Stage			
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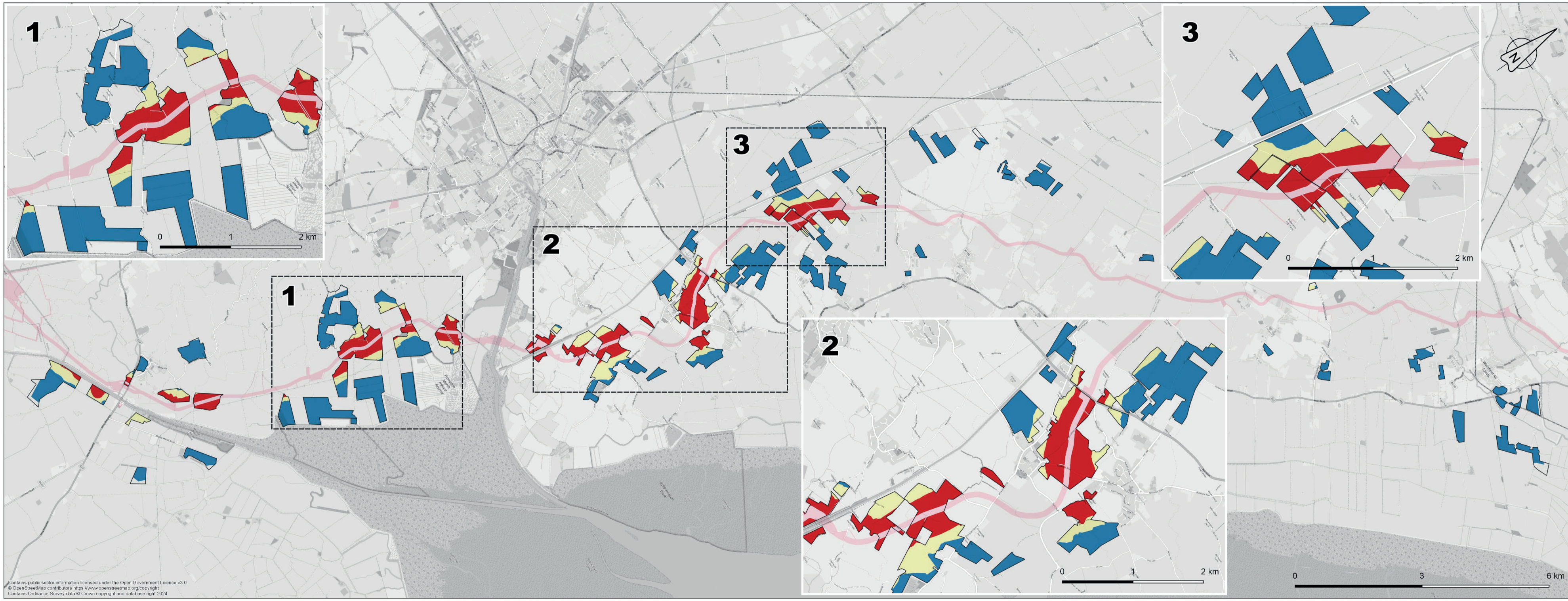

Legend

- TH Clements Fields
- Order Limits

Modelled Maximum Daily Deposition: Enabling Works
(Assessment benchmark: 80 mg/m²/day)

- < 80 mg/m²/day
- ≥ 80 - <120 mg/m²/day
- ≥120 mg/m²/day

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Project Title: Outer Dowsing Offshore Windfarm – Dust Deposition Modelling

Drawing Title: Figure 17 Enabling Works - **With** Dust Control - Modelled Maximum Daily Dust Deposition Flux

Project Stage	Status	Status Description	Drawn	Designed	Checked	Approved	Sheet Size	Scale	Sweco Ref	Revision
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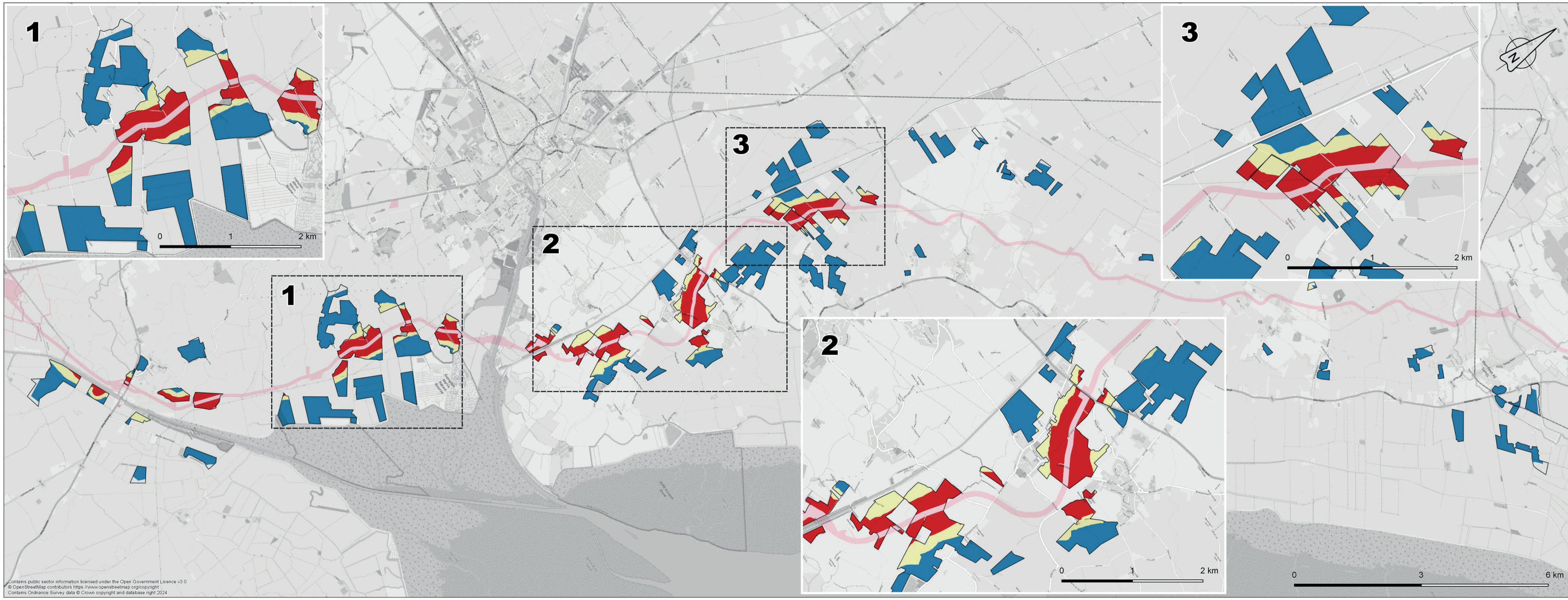

Legend

- TH Clements Fields
- Order Limits

Modelled Maximum Daily Deposition: Cable Infrastrucutre Installation (Assessment benchmark: 80 mg/m²/day)

- < 80 mg/m²/day
- ≥ 80 - <120 mg/m²/day
- ≥120 mg/m²/day

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Project Title: Outer Dowsing Offshore Windfarm – Dust Deposition Modelling

Drawing Title: Figure 18 Cable Infrastructure Installation - **With** Dust Control - Modelled Maximum Daily Dust Deposition Flux

Project Stage			
n/a			
Status: n/a	Status Description: n/a		
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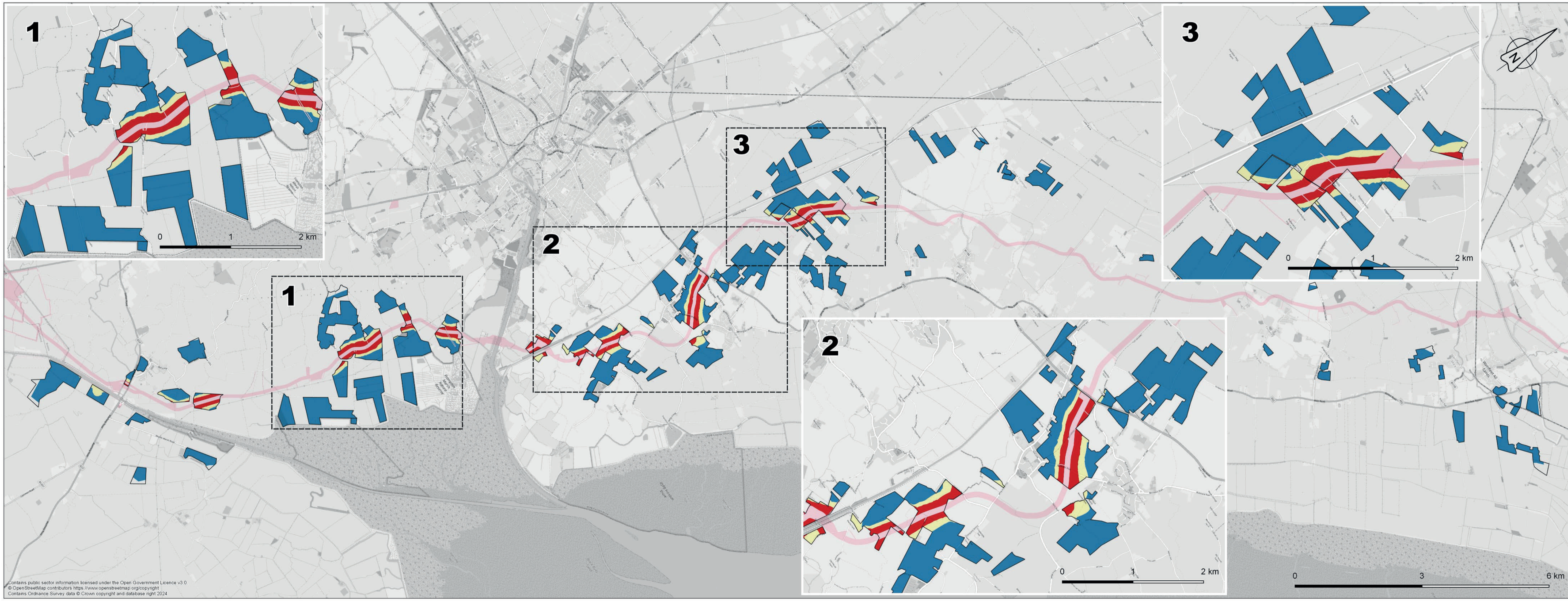
Drawing Number: 65213546-SWE-XX-XX-G-AQ-00018



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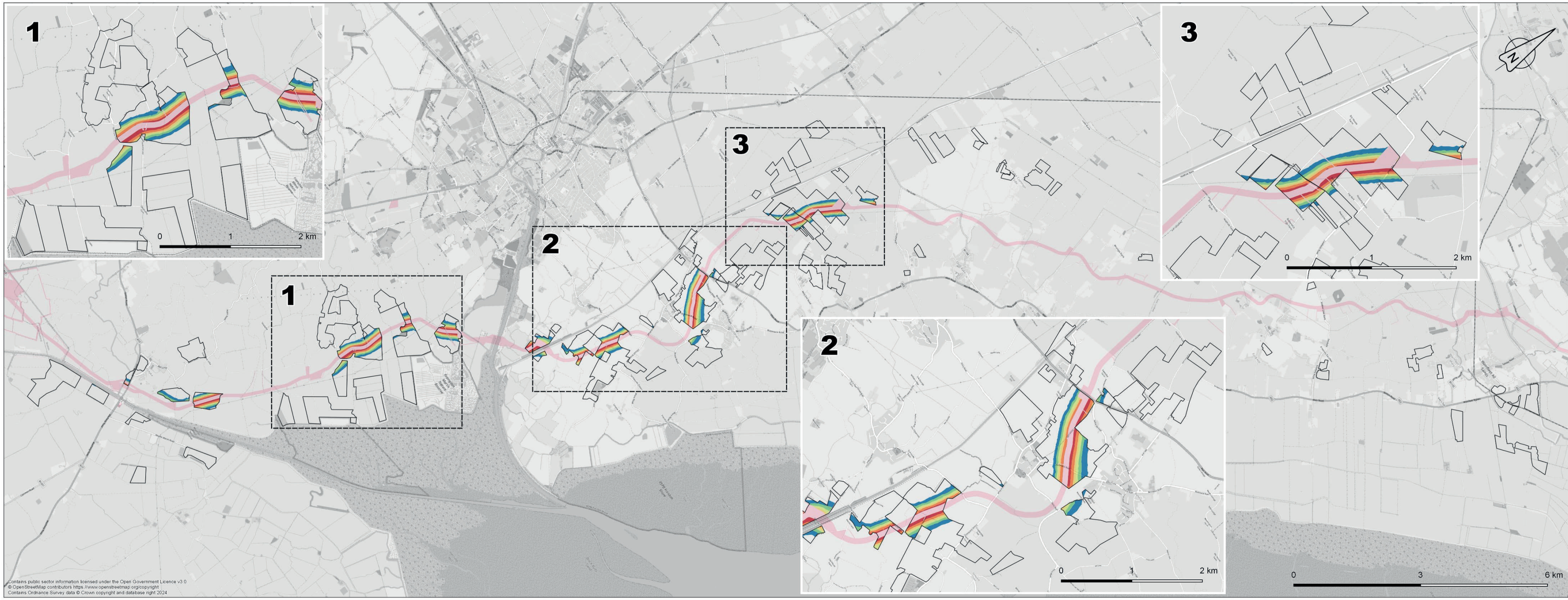
Client: TH Clements – growing with confidence

Project Title: Outer Dowsing Offshore Windfarm – Dust Deposition Modelling

Drawing Title: Figure 19 Reinstatement & Demobilisation - **With** Dust Control - Modelled Maximum Daily Dust Deposition Flux

Project Stage			
n/a			
Status: n/a	Status Description: n/a		
Drawn: LFS	Designed: DP	Checked: DP	Approved: DP
Sheet Size: 840 x 297	Scale: 1:50,000	Sweco Ref: 65213546	Revision: P01.1
Drawing Number: 65213546-SWE-XX-XX-G-AQ-00019			



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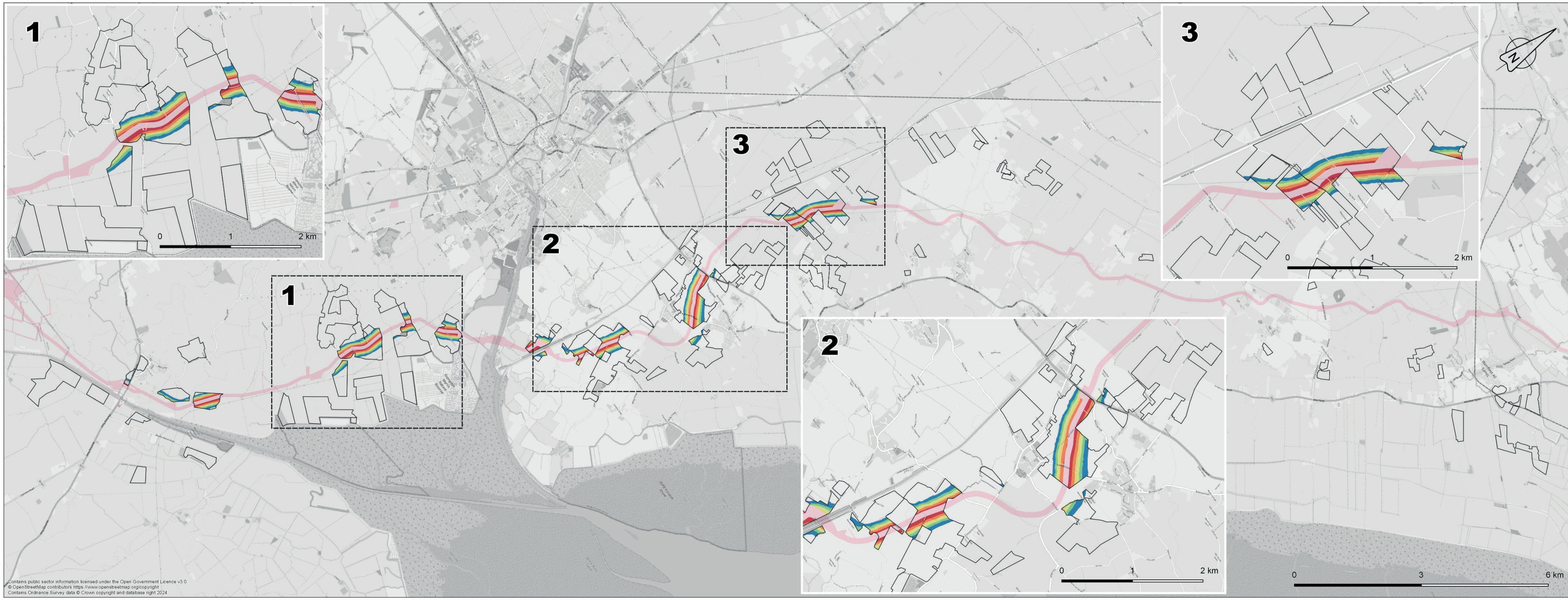
Client: THClements growing with confidence

Project Title: Outer Dowsing Offshore Windfarm – Dust Deposition Modelling

Drawing Title: Figure 20 Enabling Works - **With** Dust Control - Modelled Exceedance Frequency of Daily Dust Deposition Benchmark

Project Stage			
n/a			
Status: n/a	Status Description: n/a		
Drawn: LFS	Designed: DP	Checked: DP	Approved: DP
Sheet Size: 840 x 297	Scale: 1:50,000	Sweco Ref: 65213546	Revision: P01.1

Drawing Number: 65213546-SWE-XX-XX-G-AQ-00020



Legend

- TH Clements Fields
- Order Limits

Modelled Exceedance Frequency:
Cable Infrastrucutre Installation
(Assessment benchmark: 80 mg/m²/day)

- ≥ 30 days/year
- ≥ 60 days/year
- ≥ 90 days/year
- ≥ 120 days/year
- ≥ 150 days/ year
- ≥ 200 days/year

Rev	Date	Amendment Details	Dr'n	Chk'	App'
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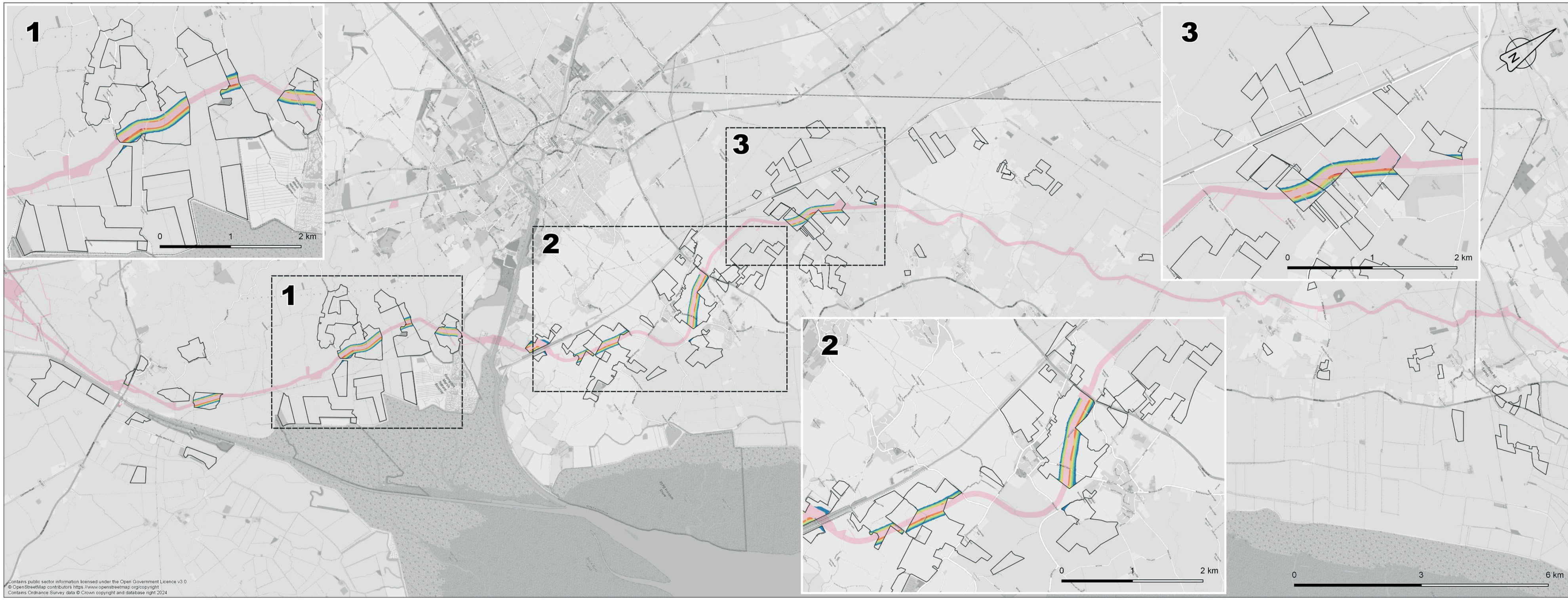
Project Title

Outer Dowsing Offshore Windfarm – Dust Deposition Modelling

Drawing Title

Figure 21 Cable Infrastructure Installation - **With** Dust Control - Modelled Exceedance Frequency of Daily Dust Deposition Benchmark

Project Stage			
n/a			
Status: n/a	Status Description: n/a		
Drawn: LFS	Designed: DP	Checked: DP	Approved: DP
Sheet Size: 840 x 297	Scale: 1:50,000	Sweco Ref: 65213546	Revision: P01.1
Drawing Number: 65213546-SWE-XX-XX-G-AQ-00021			



Legend

- TH Clements Fields
- Order Limits

Modelled Exceedance Frequency:
Reinstatement and Demobilisation
(Assessment benchmark: 80 mg/m²/day)

- ≥ 30 days/year
- ≥ 60 days/year
- ≥ 90 days/year
- ≥ 120 days/year
- ≥ 150 days/ year
- ≥ 200 days/year

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Client

Project Title
Outer Dowsing Offshore Windfarm – Dust Deposition Modelling

Drawing Title
Figure 22 Reinstatement & Demobilisation - **With** Dust Control - Modelled Exceedance Frequency of Daily Dust Deposition Benchmark

Project Stage: n/a

Status	Status Description
n/a	n/a

Drawn	Designed	Checked	Approved
LFS	DP	DP	DP

Sheet Size	Scale	Sweco Ref	Revision
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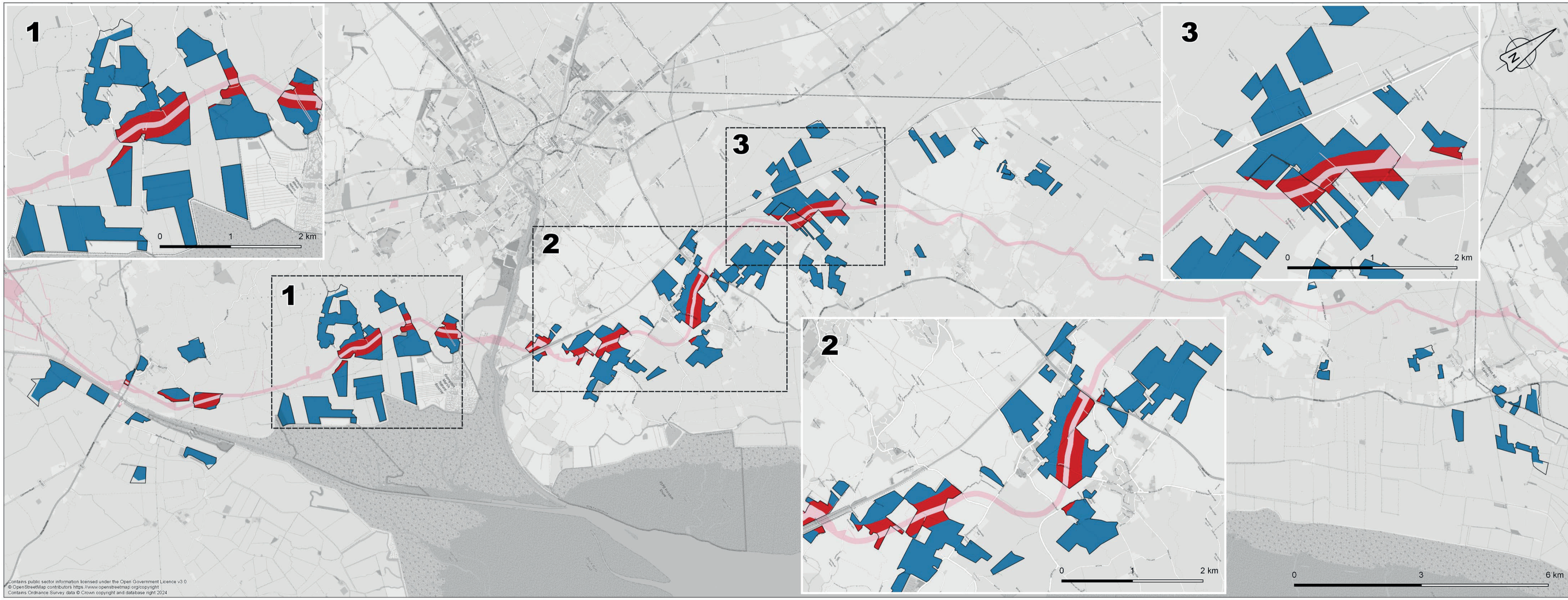
Drawing Number 65213546-SWE-XX-XX-G-AQ-00022



Legend

- TH Clements Fields
- Order Limits

Modelled Maximum Monthly Deposition:
Enabling Works
(Assessment benchmark: 2 g/m²/month)

- < 2 g/m²/month
- ≥ 2 g/m²/month

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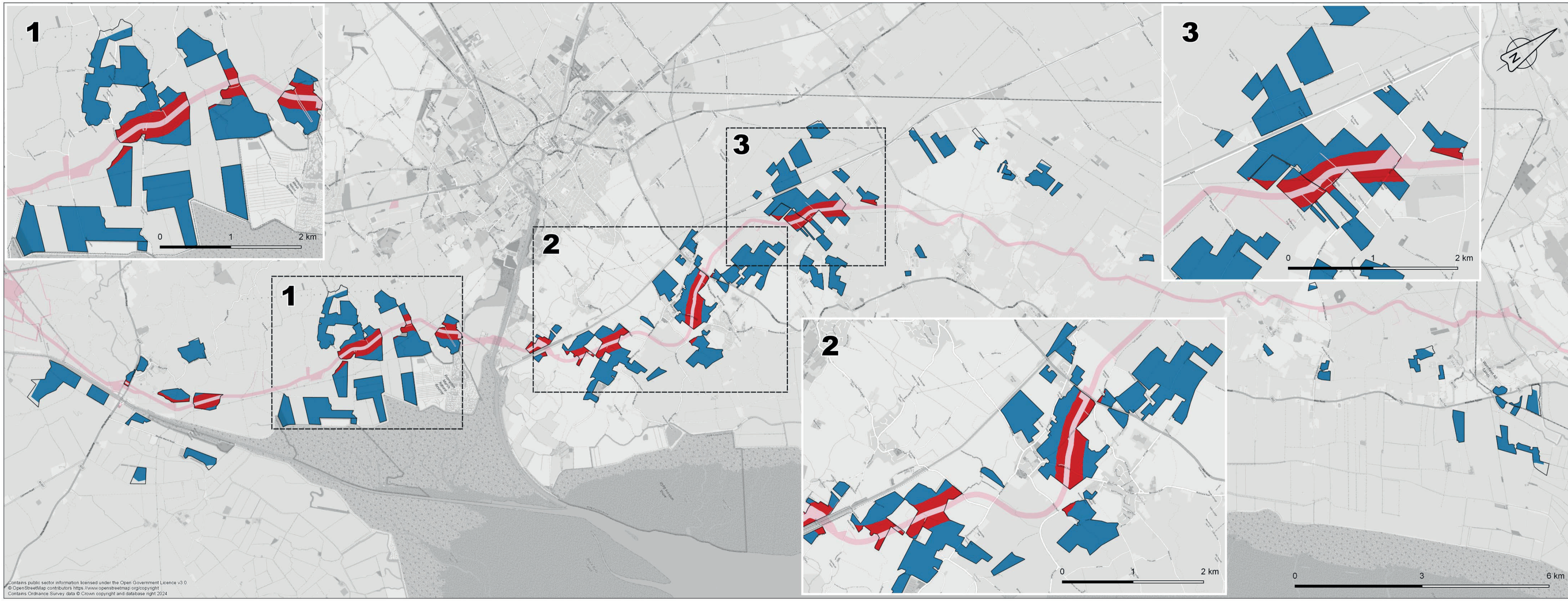
Project Title
Outer Dowsing Offshore Windfarm – Dust Deposition Modelling

Drawing Title
Figure 23 Enabling Works - **With** Dust Control - Modelled Maximum Monthly Dust Deposition Flux

Project Stage			
n/a			
Status: n/a	Status Description: n/a		
Drawn: LFS	Designed: DP	Checked: DP	Approved: DP
Sheet Size: 840 x 297	Scale: 1:50,000	Sweco Ref: 65213546	Revision: P01.1
Drawing Number: 65213546-SWE-XX-XX-G-AQ-00023			



Legend

- TH Clements Fields
- Order Limits

Modelled Maximum Monthly Deposition: Cable Infrastrucutre Installation (Assessment benchmark: 2 g/m²/month)

- < 2 g/m²/month
- ≥ 2 g/m²/month

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Project Title

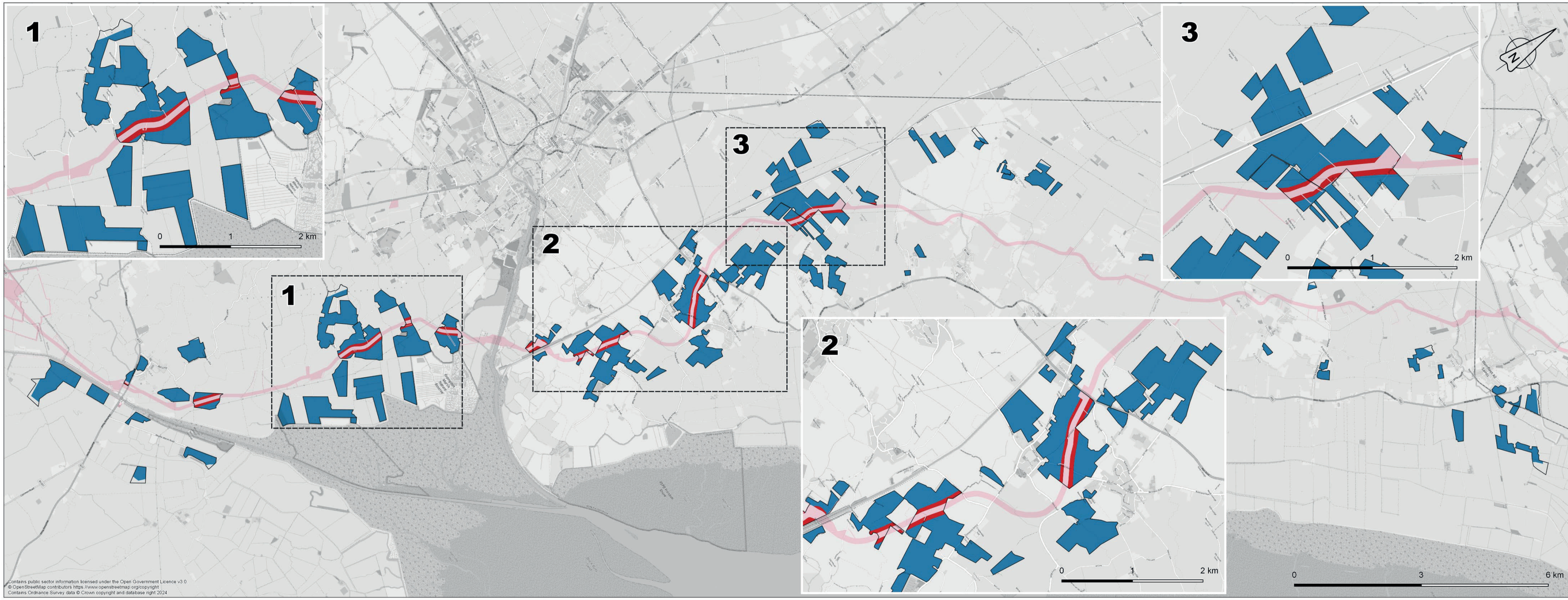
Outer Dowsing Offshore Windfarm – Dust Deposition Modelling

Drawing Title

Figure 24 Cable Infrastructure Installation - **With** Dust Control - Modelled Maximum Monthly Dust Deposition Flux

Project Stage			
n/a			
Status: n/a	Status Description: n/a		
Drawn: LFS	Designed: DP	Checked: DP	Approved: DP
Sheet Size: 840 x 297	Scale: 1:50,000	Sweco Ref: 65213546	Revision: P01.1

Drawing Number 65213546-SWE-XX-XX-G-AQ-00024



Legend

- TH Clements Fields
- Order Limits

Modelled Maximum Monthly Deposition: Reinstatement and Demobilisation (Assessment benchmark: 2 g/m²/month)

- < 2 g/m²/month
- ≥ 2 g/m²/month

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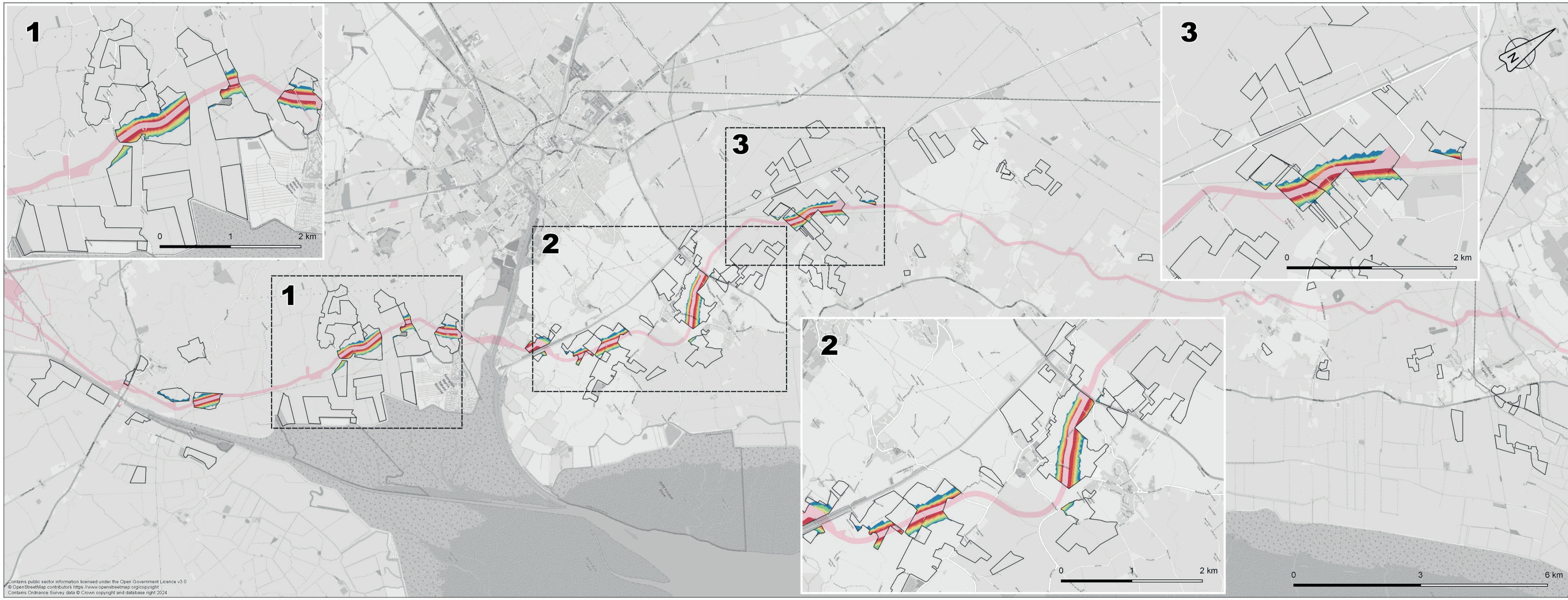
Project Title
Outer Dowsing Offshore Windfarm – Dust Deposition Modelling

Drawing Title
Figure 25 Reinstatement & Demobilisation - **With** Dust Control - Modelled Maximum Monthly Dust Deposition Flux

Project Stage			
n/a			
Status: n/a	Status Description: n/a		
Drawn: LFS	Designed: DP	Checked: DP	Approved: DP
Sheet Size: 840 x 297	Scale: 1:50,000	Sweco Ref: 65213546	Revision: P01.1
Drawing Number: 65213546-SWE-XX-XX-G-AQ-00025			



Legend

- TH Clements Fields
- Order Limits

Modelled Exceedance Frequency: Enabling Works (Assessment benchmark: 2 g/m²/month)

- ≥ 1 months/year
- ≥ 2 months/year
- ≥ 4 months/year
- ≥ 6 months/year
- ≥ 8 months/year
- ≥ 10 months/year

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Project Title

Outer Dowsing Offshore Windfarm – Dust Deposition Modelling

Drawing Title

Figure 26 Enabling Works - **With** Dust Control - Modelled Exceedance Frequency of Monthly Dust Deposition Benchmark

Project Stage: n/a

Status	Status Description		
n/a	n/a		
Drawn	Designed	Checked	Approved
LFS	DP	DP	DP
Sheet Size	Scale	Sweco Ref	Revision
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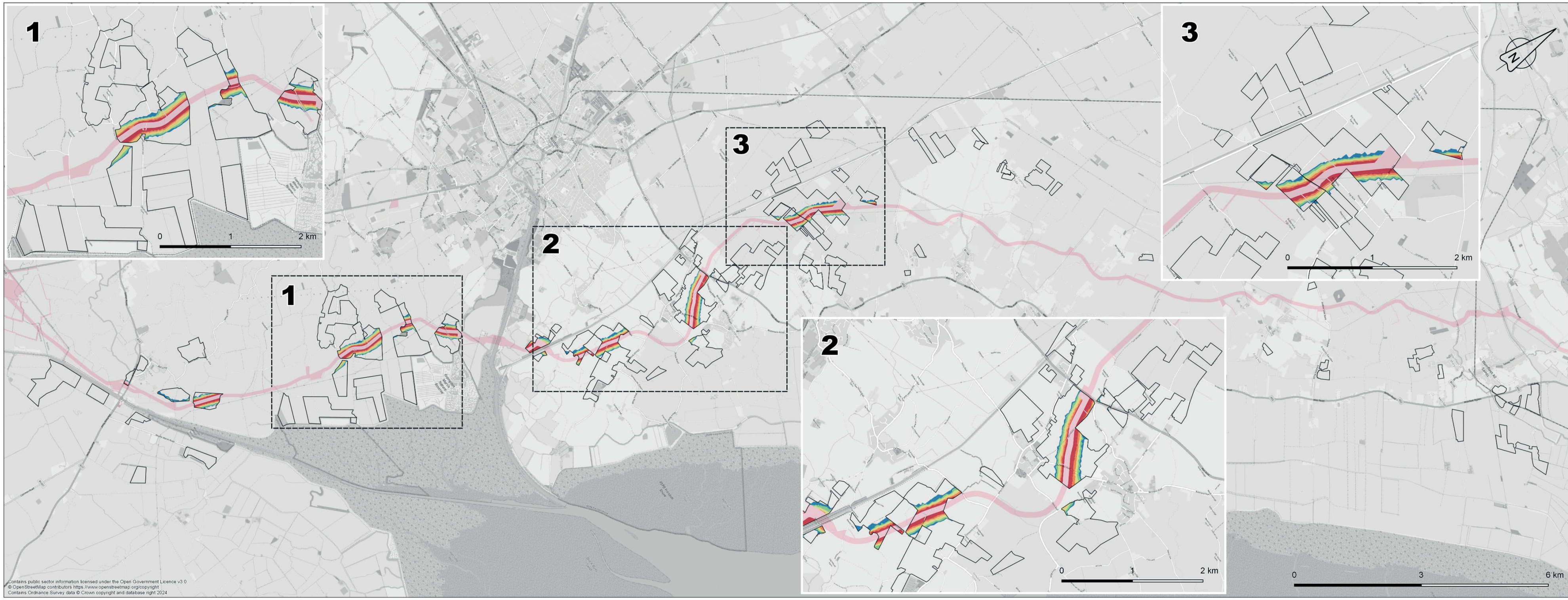
Drawing Number 65213546-SWE-XX-XX-G-AQ-00026



Legend
- TH Clements Fields
- Order Limits

Modelled Exceedance Frequency: Cable Infrastrucutre Installation (Assessment benchmark: 2 g/m²/month)
- ≥ 1 months/year
- ≥ 2 months/year
- ≥ 4 months/year
- ≥ 6 months/year
- ≥ 8 months/year
- ≥ 10 months/year

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Project Title
Outer Dowsing Offshore Windfarm – Dust Deposition Modelling

Drawing Title
Figure 27 Cable Infrastructure Installation - **With** Dust Control - Modelled Exceedance Frequency of Monthly Dust Deposition Benchmark

Project Stage			
n/a			
Status: n/a	Status Description: n/a		
Drawn: LFS	Designed: DP	Checked: DP	Approved: DP
Sheet Size: 840 x 297	Scale: 1:50,000	Sweco Ref: 65213546	Revision: P01.1
Drawing Number: 65213546-SWE-XX-XX-G-AQ-00027			

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Project Title

Outer Dowsing Offshore Windfarm – Dust Deposition Modelling

Drawing Title

Figure 28 Reinstatement & Demobilisation - **With** Dust Control - Modelled Exceedance Frequency of Monthly Dust Deposition Benchmark

Project Stage: n/a

Status	Status Description		
n/a	n/a		
Drawn	Designed	Checked	Approved
LFS	DP	DP	DP
Sheet Size	Scale	Sweco Ref	Revision
840 x 297	1:50,000	65213546	P01.1

Drawing Number 65213546-SWE-XX-XX-G-AQ-00028