

# Norfolk Projects Offshore Wind Farms Kittiwake Implementation and Monitoring Plan

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Norfolk Vanguard Limited  
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Author: MacArthur Green and Royal HaskoningDHV

*Photo: Kentish Flats Offshore Wind Farm*

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**Annex 1 Kittiwake Compensation Consultation report..... Provided as a separate document**

**Annex 2 Kittiwake Structure Concept Design Report..... Provided as a separate document**

**Annex 3 Kittiwake Nesting Success on Artificial Structures .....** Provided as a separate document

**Annex 4 Kittiwake Structure Detailed design report .....** Provided as a separate document

**Annex 5 Kittiwake Structure Final Detailed Drawings.....** Provided as a separate document

**Annex 6 Section 4.6.3 of the Kittiwake Compensation Plan.....** Provided as a separate document

## Glossary of Acronyms

AON	Apparently occupied nests
BEIS	Department for Business, Energy & Industrial Strategy
DCO	Development Consent Order
DEFRA	Department of Environment Food and Rural Affairs
DML	Deemed Marine Licence
EIA	Environmental Impact Assessment
FFC	Flamborough and Filey Coast
KIMP	Kittiwake Implementation and Monitoring Plan
KSG	Kittiwake Steering Group
MMO	Marine Management Organisation
NE	Natural England
RSPB	Royal Society for the Protection of Birds
SoS	Secretary of State
SPA	Special Protection Area

## 1 Introduction

1. This document sets out the Kittiwake Implementation and Monitoring Plan (KIMP) for the delivery of the Norfolk Projects Kittiwake Compensation. The KIMP has been developed by the Norfolk Projects Kittiwake Steering Group (KSG).
2. The Norfolk Boreas and Norfolk Vanguard offshore wind farm projects are both being developed by Vattenfall Wind Power Ltd (Vattenfall). They are two separate projects with separate offshore sites; however, they share an offshore cable corridor and an onshore cable route. Norfolk Vanguard and Norfolk Boreas (collectively ‘the Norfolk Projects’) are being developed together in a strategic manner in order to maximise efficiencies and ultimately reduce the cost to the consumer of green energy.
3. Norfolk Boreas was given consent in December 2021 followed by Vanguard in February 2022. Due to the potential effects of the Norfolk Boreas and Norfolk Vanguard projects on kittiwakes from the Flamborough and Filey Coast (FFC) Special Protection Area (SPA) both projects are required to provide compensation.
4. This KIMP has been prepared pursuant to paragraph 4 of Schedule 19, Part 1 of the Norfolk Boreas Offshore Wind Farm Order 2021 (Norfolk Boreas DCO) and paragraph 4 of Schedule 17, Part 1 of the Norfolk Vanguard Offshore Wind Farm Order 2022 (Norfolk Vanguard DCO) (together referred to here as the “compensation schedules”) and this document serves to discharge the condition for both projects. The conditions stipulate:

*The KIMP must include measures to increase the number of adult kittiwakes available to recruit to the FFC in accordance with the principles contained in the kittiwake compensation plan, must contain the relevant matters identified in section 4.6.3 of the kittiwake compensation plan and must include in particular:*

- a) *details of the location where the compensation measures will be delivered and the suitability of the site to deliver the measures (including why the location is appropriate ecologically and likely to support successful compensation) [provided in section 3];*
- b) *details of landowner agreements demonstrating how the land will be bought or leased and assurances that the land management will deliver the ecology objectives of the KIMP [provided in section 4];*
- c) *details of the design of the artificial nest structures, including the projected number of nests that will be accommodated on the structures, and how risks from avian or mammalian predation and unauthorised human access will be mitigated [provided in section 5];*
- d) *an implementation timetable for the delivery of the artificial nest structures that ensures all compensation measures are in place to allow four full kittiwake*



- breeding seasons prior to the operation of any turbine forming part of the authorised development [provided in section 6];*
- e) a maintenance schedule for the artificial nest structures [provided in section 7];*
  - f) details of the proposed ongoing monitoring and reporting on the effectiveness of the measures, including: survey methods; success criteria; adaptive management measures; timescales for the monitoring and monitoring reports to be delivered; and details of the factors used to trigger alternative compensation measures and/or adaptive management measures [provided in section 8];*
  - g) provision for annual reporting to the Secretary of State, to include details of the number of birds colonising the site including: evidence of birds prospecting; nesting attempts; egg laying; hatching; and fledging, to identify barriers to breeding success and target alternative or adaptive compensation measures [provided in section 8];*
  - h) details of how natal dispersal and colony interchange with the FFC kittiwake colony should be investigated, potentially using colour-ringing of chicks [section 8]; and*
  - i) minutes from all consultations with the KSG [provided in section 10 and in Annex 2].*
5. This KIMP address all of the above DCO conditions as well as the relevant matters identified in section 4.6.3 of the kittiwake compensation plan which are set out in Annex 6 of this document.
6. As the intention is to deliver the compensation for both projects together a single KIMP has been drafted to discharge the relevant conditions of the compensation schedules for both DCOs.

## 1.1 Consultation

7. The KSG is comprised of representatives of the Norfolk Projects, Natural England, the Marine Management Organisation (MMO), East Suffolk Council, Great Yarmouth Borough Council and the Royal Society for the Protection of Birds (RSPB) A chairperson, who is independent from the members organisations, has been appointed to oversee proceedings.
8. A consultation report is provided in Annex 1. This has been prepared as a record of all engagement with the KSG and demonstrates the robust and collaborative consultation process that has been undertaken. All members of the KSG have had an opportunity to input to the process and the feedback received has been considered and acted upon where appropriate. An agreement log is being kept by the KSG and updated prior to and following each meeting, the agreement log, at time of submission of the KIMP is provided as Appendix 2 to the KSG consultation report (Annex 1).

9. Further information on how KSG members have contributed towards the final design of the Kittiwake nesting structures is provided in section 5.2 of this document.

## 1.2 Document development

10. This document has been developed over many iterations (as recorded on page i) in consultation with the KSG who have contributed to the scope and delivery of the KIMP.
11. An initial skeleton draft of the KIMP was produced to inform preliminary discussions with the KSG at the first meeting (13 April 2022). It included an outline of the document structure together with proposed content. In advance of the second steering group meeting (30<sup>th</sup> June 2022) a full draft of the document was produced and circulated for discussion with the KSG.
12. Following the third KSG meeting (11<sup>th</sup> August 2022) the document was again updated, and further detail added to form version 2. A further review period by the KSG was then completed and comments addressed prior to issue of version 3 being circulated in preparation for the fourth KSG meeting (6<sup>th</sup> October 2022; see section 6 and Annex 1 for further detail). Further comments were then provided at the fourth meeting which allowed the finalisation of the document for submission to the Secretary of State (SoS).

## 2 Summary of proposed compensation measures

13. The general approach to compensation was set out in *Flamborough and Filey Coast SPA In Principle Compensation* (Referred to as the kittiwake compensation plan in the compensation schedules). This confirmed that the provision of artificial nesting structures would be the most effective means of compensating for in-combination effects on kittiwake populations. The approach would enable improved productivity for the North Sea kittiwake population from which recruits to the FFC SPA population are drawn.
14. Following the Norfolk Boreas examination, concept designs for two options, a wall structure and a tower structure, were developed which drew inspiration and learning from other artificial nesting structures which have been successful, such as the artificial tower built on the Tyne and the wall structure which was built at the entrance to Lowestoft harbour. The concept design report is provided in Annex 2 of this document.
15. A study was subsequently undertaken by MacArthur Green (2021) to examine existing use of artificial structures by kittiwakes in the UK (at Dunbar, along the Tyne and in Lowestoft; Annex 3) to ascertain the features of artificial sites associated with higher breeding success. The results of this study fed into design revisions for the

proposed structures and, following extensive consultation with the KSG, the designs were developed further (see the detailed design report, Annex 4), with final designs agreed by all KSG members (see Annex 5, final design drawings).

## 2.1 Strategic approach to compensation

16. Kittiwake compensation is also required for two ScottishPower Renewables (SPR) offshore windfarm sites (East Anglia ONE North and East Anglia TWO). The proposed nesting structure will be a modular design so, in the event that the SPR projects proceed, the nesting structure would be capable of accommodating sufficient compensation capacity for the SPR projects. However, kittiwake compensation for the SPR projects (including any related monitoring and adaptive management measures) would be approved separately from and does not form part of this KIMP. The modular design will also allow individual units to be removed for modification or repair as necessary. Details of the size of each section (and number of nests allowed for) of the wall and tower are provided in section 5.

## 3 Location of compensation measures

17. A number of potential locations for the artificial nesting structure have been considered and discussed in detail with the KSG, however the location being taken forward is at Lowestoft Port, with a location on the outer port wall near the existing kittiwake nest wall (Figure 1).
18. An agreement with the landowner has been entered into as set out in section 4 and planning permission has also been granted as described below.
19. Lowestoft Port is considered to be the most suitable location, largely due to its proximity to the sea and accessibility for construction and monitoring purposes. Lowestoft was also considered more preferable in large part due to the existing presence of breeding kittiwake in the port and the town. This is expected to result in rapid colonisation of any new structures in Lowestoft. Furthermore, the Lowestoft Port location is adjacent to a wall that was built for kittiwake nesting in the 1990s but which was abandoned due to high levels of predation by large gulls and foxes (lessons regarding the design of this site and why it failed to provide a long-term nesting site have been included in the current designs). Kittiwake still nest at various locations around the port (see Annex 3), and therefore there is clear precedent that the site is suitable.
20. Planning permission under the Town and Country Planning Act 1990 for the installation and maintenance of the Kittiwake nesting structures at the proposed location at the port of Lowestoft was granted on 4 October 2022 (planning reference DC/22/3202/FUL). The application was not considered to constitute an 'EIA development' under the Infrastructure Planning (Environmental Impact Assessment)



Regulations 2017 (as amended) or the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (hereafter referred to as the EIA Regulations) (planning reference DC/22/1347/EIA). The Planning Application and planning decision can be found on the East Suffolk Council website<sup>1</sup>.

#### 4 Details of landowner agreement.

21. On 2 November 2022 Norfolk Vanguard Limited and Norfolk Boreas Limited (alongside Norfolk Vanguard East Limited, East Anglia Two Limited and East Anglia One North Limited) entered into an option agreement with Associated British Ports in relation to the land (shown in Figure 5) at the Port of Lowestoft Suffolk (the Option Agreement). The land comprises two parcels which form part of the land registered at HM Land Registry with absolute title under title number SK272783, namely Land at Northern Pier Head comprising 1011.71sqm (0.25 acres) and Land at Sladdens Pier facing elevation comprising 49.23sqm (0.012 acres) (the Property).
22. During the Option Period of two years from the date of the Option Agreement, the Norfolk Projects have the right to enter onto the Property and access to and egress from the Property across the Port (Associated British Port's Port of Lowestoft) to carry out any tests, site surveys and inspections that are reasonably required to confirm the suitability of the Property for the purposes specified in the lease as detailed below.
23. The Option Agreement grants the Norfolk Projects the option to require Associated British Ports to grant a lease of the Property in the form annexed to the Option Agreement. The term of the lease is for 40 years commencing on the date of the lease. The Norfolk Projects are also granted the option to take a further lease of up to 25 years by serving written notice on Associated British Ports not less than 24 months prior to the expiration of the term.
24. The Permitted Use of the lease is for the construction, erection, maintenance and use of a structure to accommodate up to 450 kittiwake nests. The lease grants the Norfolk Projects the additional rights detailed below.
25. The lease grants the Norfolk Projects the right to undertake works for the installation, erection and use, and removal of the Kittiwake Compensation Measures, as well as fencing, monitoring and surveillance equipment and any ancillary communications infrastructure. Kittiwake Compensation Measures is defined as the provision of kittiwake nesting structures on the Property suitable for up to 450 nests.
26. The Norfolk Projects are also granted the right to pass to and from the Property over the roads, designated by the landlord, provided at the Port for dock purposes.

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<sup>1</sup> <https://publicaccess.eastsuffolk.gov.uk/online-applications>

27. Additionally, the Norfolk Projects are granted the rights to connect to and use the conduits serving the Property and to lay, install, use, maintain, repair, replace, inspect, upgrade, make connections to, decommission and remove conduits for the supply of electricity and telecommunications services to and from the Property in approved locations.
28. The lease also grants the Norfolk Projects the right to park two motor vehicles in spaces designated by the Landlord for visitors to the Port.
29. Lastly, the Norfolk Projects are granted the right to use an agreed part of the Port during construction of the Kittiwake Compensation Measures as a temporary works compound.

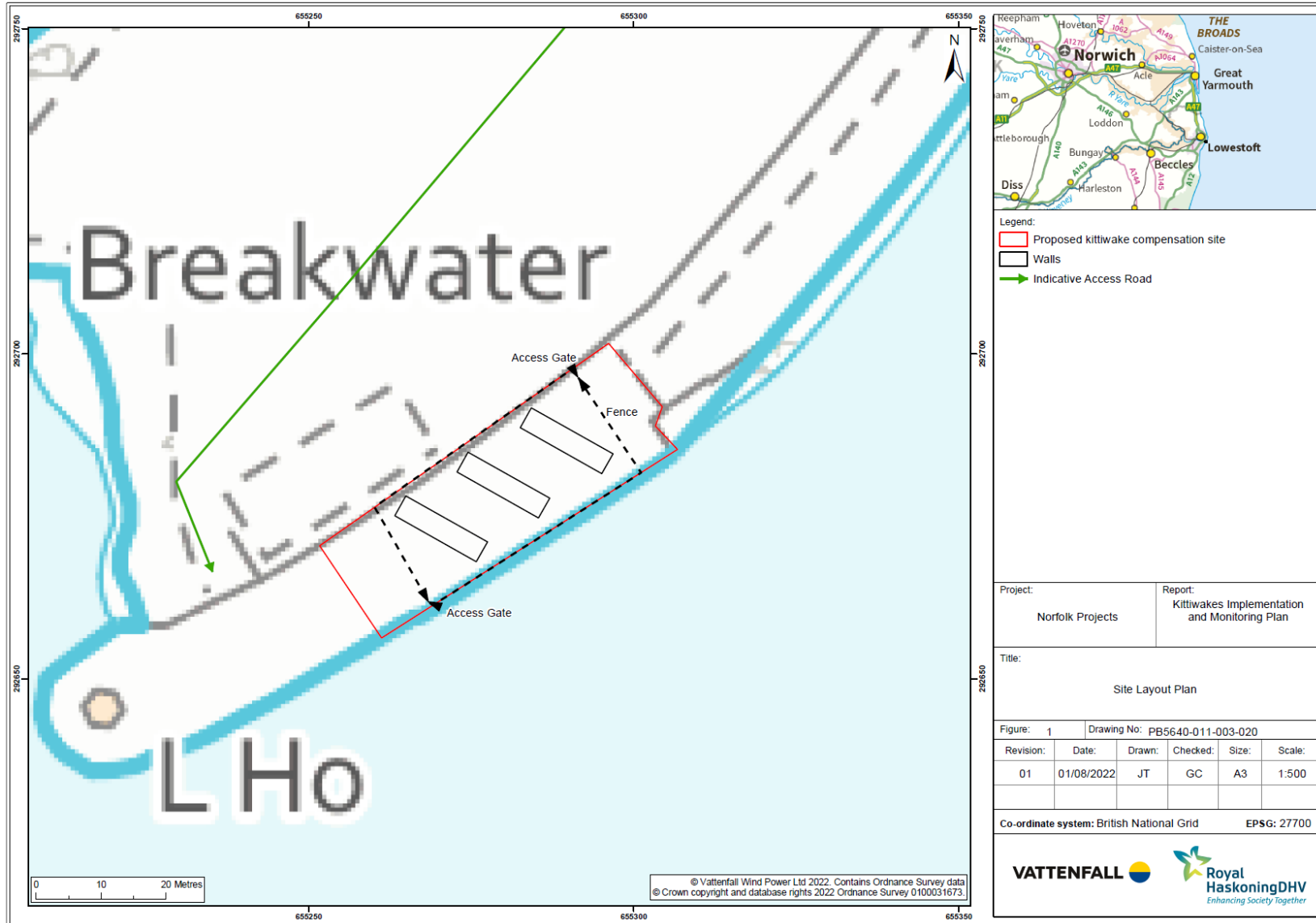


Figure 1 Area for lease

## 5 Artificial nest structure design

### 5.1 Scale of compensation

30. Collision Risk Modelling (CRM) undertaken for the Norfolk Project DCOs predicted the loss of 14 and 21 kittiwakes for the Norfolk Boreas and Norfolk Vanguard developments respectively. In the Habitats Regulations Assessment (HRA) for Norfolk Boreas the SoS stated:

*The Secretary of State considers that sufficient information has been provided to give confidence that necessary compensatory measures can be secured that will ensure the overall coherence of the national site network for kittiwake. The Secretary of State agrees that the objective of the compensation is to provide 14 adult kittiwakes per year which could be recruited into the Flamborough and Filey Coast SPA population and that the following measures can be addressed as conditions of the DCO.*

31. A very similar statement was made by the SoS in the Norfolk Vanguard HRA:

*The Secretary of State agrees that the objective of the compensation is to provide 21 adult kittiwakes per year.*

32. To calculate the size of artificial structure required to meet these requirements several factors have been taken into account, as summarised below and in Table 5.1. The number of nests has been estimated using:

- An assumed survival of 50% chicks to adulthood;
- A compensation colony productivity rate of 1.2 (the average Lowestoft kittiwake productivity, see e.g. Carter 2014, MacArthur Green 2021), an FFC productivity rate of 0.6 (Aitken et al. 2017), leaving a difference of 0.6 chicks per nest available to recruit elsewhere (e.g. FFC) derived following guidance in Natural England (2020); and
- An overall 3:1 ratio for additional kittiwake capacity, following the approach applied for habitat compensation (as highlighted by Natural England).

**Table 5.1 Number of kittiwake nests required to compensate for Norfolk Boreas and Norfolk Vanguard projects (note that the proposed compensation has the potential to accommodate up to 432 nests).**

Site	Predicted kittiwake loss due to collision	no. chicks required to achieve necessary adults (assuming 51% survive to adults)	Allowance that 0.6 chicks per nest are available to recruit elsewhere	3:1 ratio
Boreas	14	28.6	46.7	145
Vanguard	21	42.9	71.4	215
Total	35	71.5	118.1	360

## 5.2 Evolution of the nesting structure design

33. Prior to the first steering group meeting, the Norfolk Projects engaged Royal HaskoningDHV to develop initial designs for artificial nesting structures for kittiwake. The basis for these “concept designs” drew inspiration from existing successful structures including a bespoke tower located at Gateshead and the Lowestoft harbour kittiwake wall structure (which was initially successful, but subsequently failed due to predation). Two options were developed, a tower structure and a wall structure. The tower structure has three sides like the successful Gateshead tower and thereby permits nesting on ledges with different aspects. The wall structure was designed with a modular concept so that the length could be readily adjusted to suit the requirements of any particular deployment location. Annex 2 presents the concept designs.
34. In parallel with the concept design work, MacArthur Green were commissioned to undertake a study of kittiwakes nesting on artificial structures to determine which parameters resulted in success. The study, which is provided in Annex 3, concluded that the following characteristics should be provided for an artificial kittiwake nesting feature:
- Nesting ledges that are between 80 and 150 mm wide, and no more than 200 mm wide.
  - Several rows of ledges, designed to reduce risk that birds nesting on lower ledges will be fouled by excrement from ledges above; e.g. by having a stepped structure with the lower ledges recessed relative to the ledges above, or a back wall angled outwards at few degrees from the vertical.
  - Sheltered from waves or sea spray during storms.
  - Direct access for the birds to the sea would be desirable, but not essential.
  - Close to existing colonies if possible, as this would be likely to result in faster colonisation.
  - Shelter from direct sun, by selecting north, north-east or north-west-facing sites for artificial ledges, or by providing a large overhanging roof.
  - Shelter from crow and large gull access by providing a large overhanging roof, but is also inherent in narrow ledges.
  - Shelter from rain, e.g. by providing a large overhanging roof.
  - Constructed to minimise risk of predator access (i.e. fox, mink or rat).
  - Construction material may be stone, brick, concrete, timber or tyres. Metal may also be suitable, providing the site is sheltered from direct sun to avoid overheating.
  - Ledges can be continuous without breaks, but kittiwakes often select nest sites against a side wall, so having stops built into ledges every c. 1.5 m is desirable and may provide additional predator protection.

- Kittiwakes are highly tolerant of human activity and noise around their nests, so sites do not need to be away from human activity and could be compatible with industrial activity. However, noise and mess made by kittiwakes means that sites away from human residential, commercial or business areas would be preferable.
  - A spacing allowance of 50cm between nests.
35. The findings from the MacArthur Green study as well as feedback from the KSG on the concept design report were used as the basis of design for the detailed design stage (see Annex 4). At this point the designs moved to a “cabinet” based design whereby the nesting ledges were encased in a cabinet (Figure 2). This approach has several advantages. Firstly, it allows for easy removal or replacement of sections of ledges in isolation from the rest of the structure, secondly it increases the amount of stops or book-ends which the MacArthur green report recommended, and thirdly, it increases the modularity of the structures which allows for scaling up or down if required. Another significant change in the detailed design was the tapering of ledges to prevent fouling of nests on lower ledges from those above. Starting at the top of a cabinet with a top ledge width of 200mm the ledges gradually decrease in width to 100mm which accords with the recommendations provided by MacArthur Green.
36. Through discussions with Steering group members concerns were identified with how the nests would be accessed for monitoring purposes without disturbing the nesting birds, these concerns were addressed for both wall and tower structures by decreasing the size of access doors in the rear of the cabinets so that only two ledges would be accessed from each door. Further discussions on this topic raised concerns that if conducted during windy conditions opening the doors in the back of the wall structure for monitoring could result in the nests being blown off the ledge. These discussions resulted in a structure being added to the rear of the wall to allow sheltered access as shown in Figure 2. Table 5.2 provides a summary of all the design modifications that were made following consultation with the KSG.
37. The detailed designs were presented at the second steering group meeting, and these were agreed in principle pending further information to be provided on site layout (see section 5.3 for further detail) and a more thorough review of the detailed design report following the meeting.
38. Prior to the third steering group meeting comments were provided on the detailed design which included concerns regarding the fact that on the tower design a central ledge existed between the upper and lower cabinets which could be accessed by predatory gulls, and the fact that predatory gulls could nest on top of the wall structures. During the third steering group meeting possible solutions to both of these issues were discussed and it was agreed that modifications would be made to



the cabinets of the tower structure (see Table 5.2, and the minutes from the third steering group meeting included in Appendix 4 for the KSG Consultation report which forms Annex 1 of this KIMP), however the concerns around gulls nesting on the roof structure (see Paragraph 35) were allayed through discussion by ornithology experts within the group and therefore this did not result in a change to the designs.

39. Also at the third steering group meeting discussions around the sustainability of the structures and materials used resulted in a redesign of the wall to reduce the amount of concrete within the structure and replace it with steel. With the commitment to make these changes, the designs were agreed by the Steering group and these final agreed designs are provided in Annex 5.
40. It was agreed with the KSG at the third steering group that the preferred design to take forward at the Lowestoft location was the wall structure. The final wall structure presented in Figure 2 includes a number of design characteristics which have been developed to improve the chances of success:
  - Modular design – to allow for scalability of nesting ledge space.
  - Cabinet design of ledges allowing for easy replacement of sections if failure occurs, or modification is required.
  - Safe and low disturbance access to nests for monitoring.
  - Numerous “book ends” as this appears to be a preference for kittiwakes
  - Multiple predator deterrents from aerial and ground threats.
  - Security from trespassers (both structures can be locked).
  - Sheltered- including tapering ledges
  - Constructed from materials which are not prone to overheating and are of a lower Carbon footprint.
41. In addition, the kittiwake wall structure has the following design features:
  - The nesting ledges can be accessed from the rear to allow birds to be caught and fitted with leg rings. Ledge access is via individual small hatches, and these are protected within a secure covered building to the rear, which will minimise disturbance.
  - A modular design, with each unit approximately 2.5m long, allowing the structure to scaled to suit the space available at a deployment location.

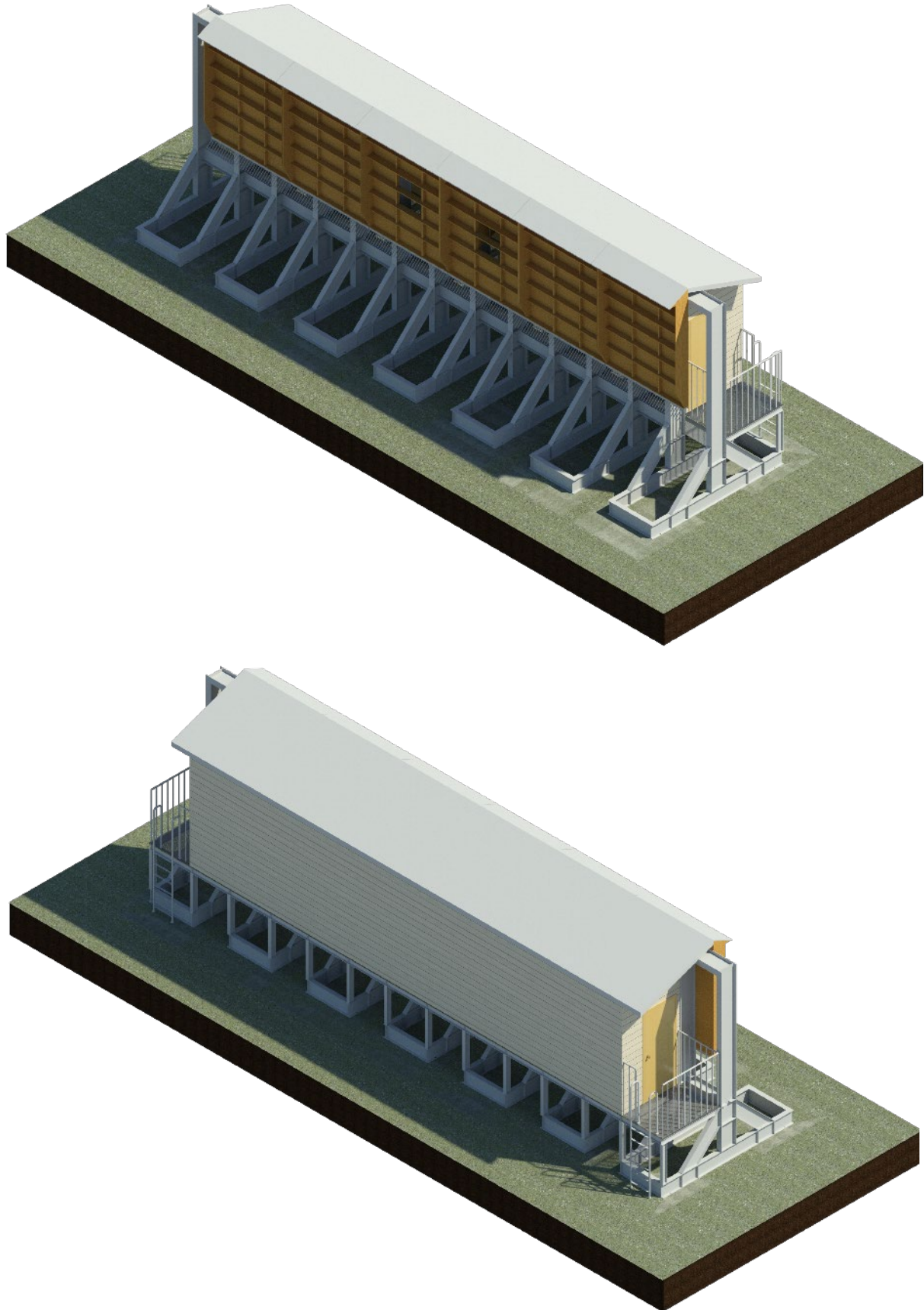


Figure 2 Final Wall design (top image is front view, bottom image is the rear view)

42. As discussed above significant collaboration between the KSG members informed and refined the design of both structures and a summary of this input and the resultant modifications is provided below.

**Table 5.2 Design modifications informed by the KSG**

Comment	Design solution
<b>Wall structure</b>	
The concept designs especially for the wall structure would lead to some disturbance to the nests when hatches are opened for monitoring purposes	The size of the hatches was reduced and the number increased so that only two ledges are serviced by each hatch.
The concept wall design included a mobile scaffolding structure. Concerns were raised that kittiwakes or gulls may try to nest on this structure.	An enclosed sheltered area was added to the rear of the wall structure design. This had the added advantage of removing the concerns regarding disturbance (see line above) especially in windy conditions.
Ledges should be narrow, experience from birds nesting in Lowestoft show that there is a preference for ledges less than 200mm and as small as 100mm (birds have been known to nest on narrow window ledges)	This information concurred with the findings of the nesting study and resulted in ledges tapering from 200m at the top to 100mm at the bottom.
Mess from nests on higher ledges could foul nests on lower ledges, this should be prevented if possible	
<b>Site layout and fence design (discussed in sections 5.3 and 5.4 below)</b>	
Images of the fence surrounding the structures presented at the steering group meeting indicated that the overhang might trap birds as they try to access the structures.	Following consultation with possible suppliers a fence design has been developed which accords with the RSPB guidance on fence design (White & Hirons 2019). Key considerations will be avoidance of barbed wire and use of an appropriate mesh size to avoid the risk of entrapment. Height will be sufficient, in combination with the overhang, to prevent fox access.
Concerns were raised regarding how birds would access the structures within the proposed site locations. This was of particular concern with the wall structures at Lowestoft and of less concern with the tower structures as they have a much smaller footprint.	Three-dimensional models were created to demonstrate distances between the wall structures and other structures surrounding the proposed site location at Lowestoft.  The site layout was also designed to provide maximum space between the wall structures whilst remaining within the lease area proposed by the port.

43. The final agreed detailed design drawings are presented in Annex 5. Other suggestions were made, and possible solutions investigated but not taken forward to the final designs for example, Natural England raised concerns about predatory gulls

nesting on the roof of the wall structure. The design team suggested adding an Apex roof with sloping sides and this solution was presented at steering group meeting 3. Following further discussions, it was agreed that this modification was not required because, as the RSPB noted, Kittiwakes coexist with predatory gulls in Lowestoft (and indeed more widely) and this does not appear to affect the productivity of the Kittiwakes. The Apex solution, therefore, does not form part of the compensation measures, but could be used as an adaptive management measure in future if required (see Section 9).

44. In summary, two designs were developed in order to ensure flexibility in advance of finalising the location, since different sites would be expected to be more or less suitable for either the wall or tower option. However, the preferred design to take forward at the Lowestoft location is the wall structure.

### 5.3 Site layout

#### 5.3.1 Port of Lowestoft

45. Although the landowner at the port of Lowestoft, the Association of British Ports (ABP), offered a number of potential locations, the most favourable option was on the outer side of the North pier (Figure 3). This location has the best access to open sea and is in a relatively quiet part of the port protected from outside influence by an existing 4m high wall (Figure 4).
46. It should be noted that the area adjacent to this site, on the other side of the 4m wall, is intended to be developed by the Port as part of the Lowestoft Eastern Energy Facility (LEEF) programme. The exact timing of the work to be undertaken at this site in the coming years is not currently clear as there are a number of different scenarios proposed depending on the number of berths created; however all scenarios proposed within the Environmental Statement show that works are likely to be completed by Q1 2023.
47. The plans show that there are to be no works to the section of the North Pier on which the proposed compensation site is located, nor are there any plans for works to the remainder of the North Pier structure (see Figure 1). Construction of offices is proposed, however these are well to the north of the compensation site. To the east of the compensation site, the construction of a bund is proposed, which will require some piling and new access roads are proposed. However, for two reasons these activities are not expected to be detrimental to kittiwake colonisation and breeding on the proposed structures. Firstly, the 4m wall is to be retained and this will provide a barrier to noise and visual disturbance. Secondly, kittiwake are extremely tolerant of human activity and already nest on numerous buildings and structures throughout the port and Lowestoft town, in close proximity to machinery, vessels, vehicles

(including on window ledges along main roads with double-decker bus routes) and people, with no evidence of disturbance.

48. It was agreed that the wall structure would be the best design to deploy at this location. The main reasons for this are that it would be almost completely screened from view by the existing 4m high wall which would remove any landscape impacts and the fact that a similar kittiwake nesting structure located at the end of the ports' North pier had previously been successful (although it has since fallen out of use, thought to be due to predation and the lack of maintenance).
49. Once it was determined that a wall structure was most appropriate, optioneering work was undertaken to settle on the best layout. The options considered before arriving at the final agreed layout are as follows:

#### Option 1

- A **single wall parallel** to the existing 4m high port wall was considered however this would result in ledges either facing south-southeast or north-northeast. Nests located on the southern side could overheat whilst ledges on the northern side would have less direct access to the sea, as it would be facing directly towards the existing 4m high wall. Therefore, that option was ruled out.

#### Option 2

- Multiple separate wall structures were then considered as the modular design allows for this level of flexibility. Multiple structures also allow more ledge space for nests to fit into a smaller footprint.
- In order to maximise length of walls that could fit into the space offered by the landowner they would need to be rotated away from parallel to the existing wall.
- If they were rotated further north, the access to the sea would be less immediate. Should they be rotated further to the east there would be a risk of overheating during the morning. In addition to this the eastern end of each wall would then be located too close to the edge of the quay and the risk of structural harm to the existing concrete base could occur during the installation.
- With the orientation chosen the ledges could be placed on the southern side of wall, however that would risk overheating, therefore the northeast orientation was considered the most optimum.
- It would be possible to orientate the three towers north to south (i.e., a mirror image of what is presented) however that would result in exposure to sun until midday.



50. The final orientation is presented in Figure 5.



Figure 3 Proposed location for Kittiwake structures at the port of Lowestoft



Figure 4 Photos of the proposed location at the port of Lowestoft



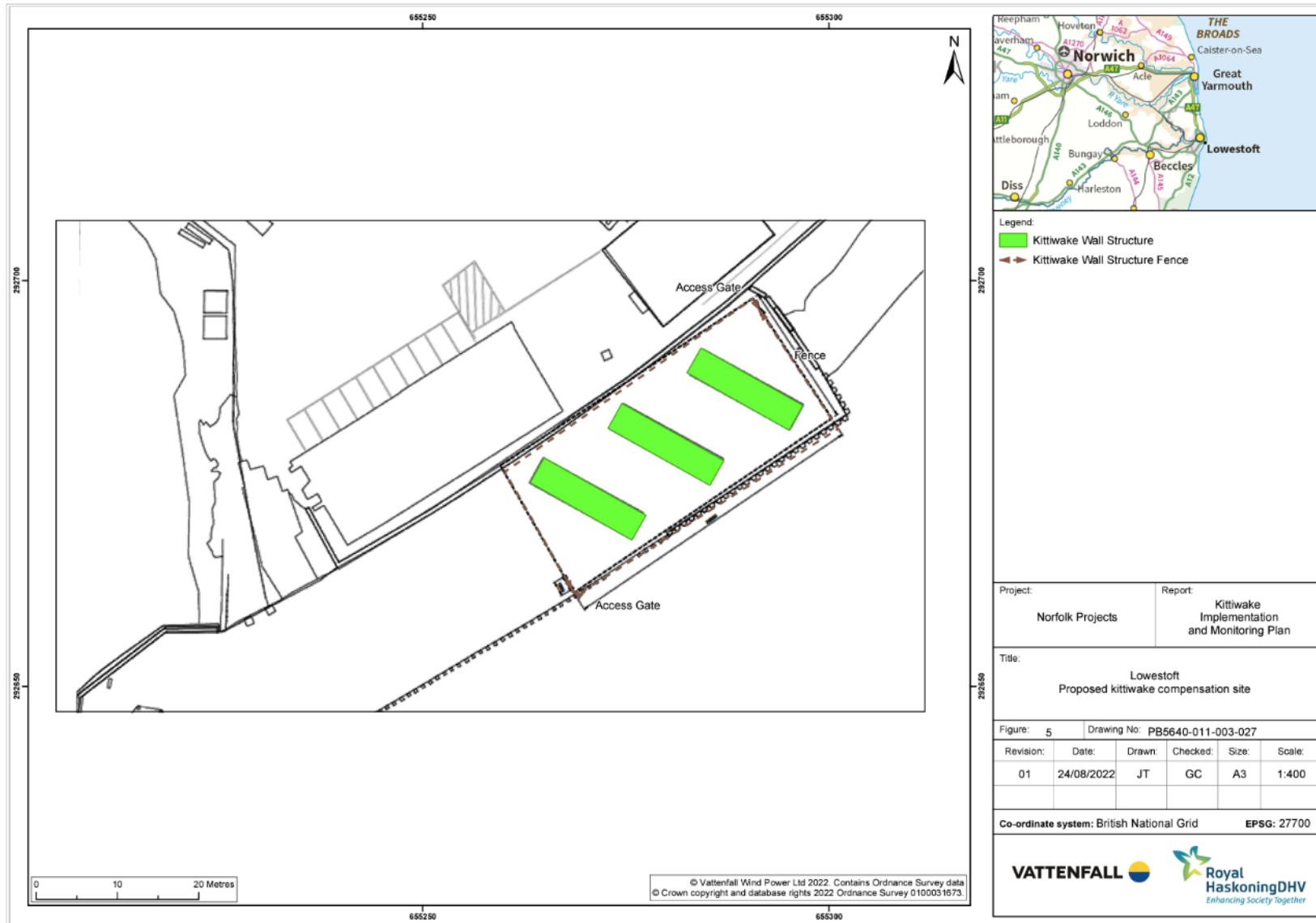


Figure 5 Proposed site layout of kittiwake wall structure at the port of Lowestoft

51. During discussions about the proposed site layout at the second steering group meeting concerns were raised about whether the kittiwakes would be able to access the structures by navigating around and between the walls and other existing structures in the vicinity. To facilitate these discussions a three-dimensional model was created of the proposed site layout, an image from which is provided in Figure 6. The separation distance between the structures will be at least 7.5m at the closest point above ground level. On consideration of this additional information the KSG agreed that the spacing was suitable.

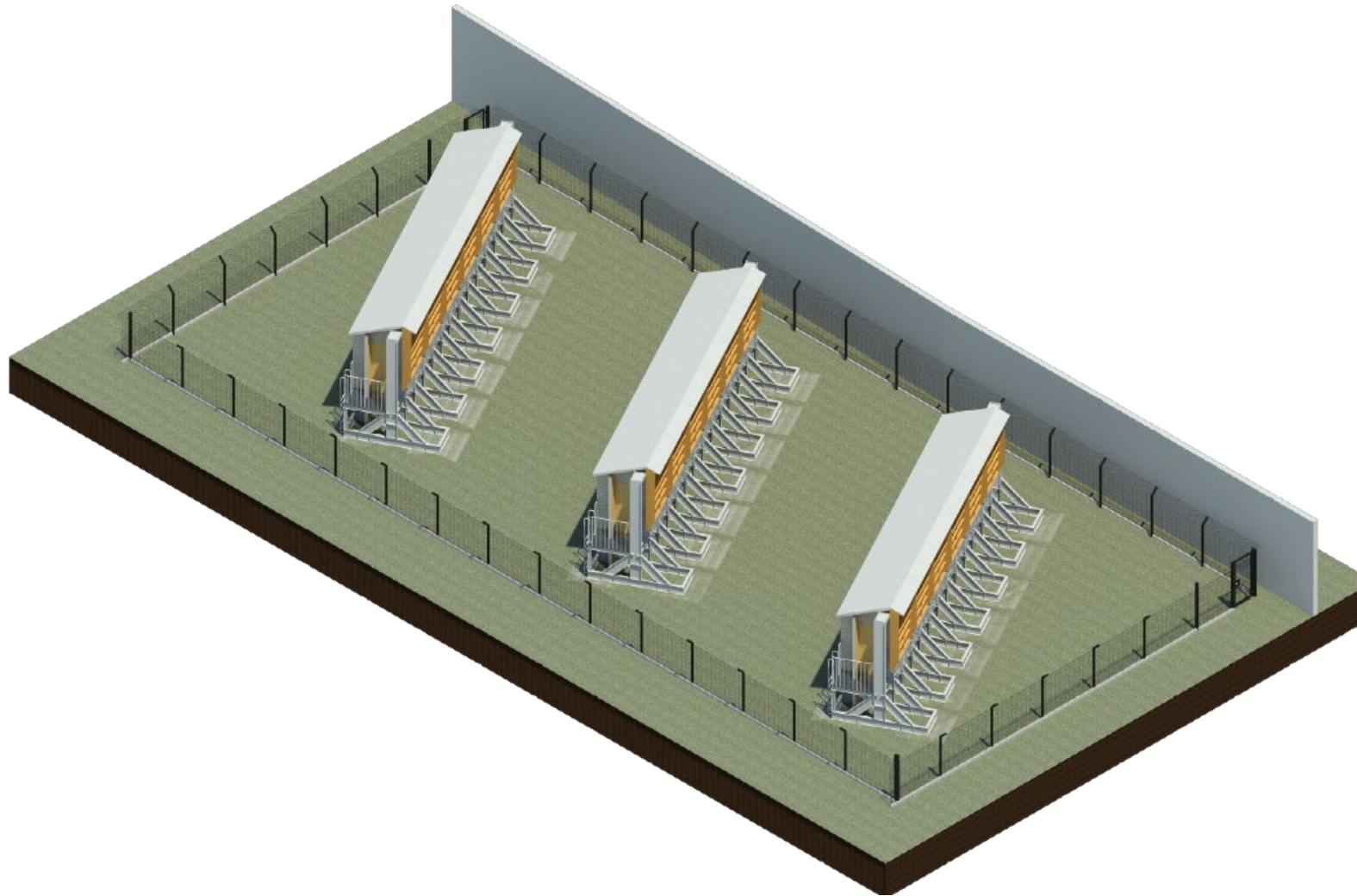


Figure 6. Image from three-dimensional model of the site layout at the port of Lowestoft

## 5.4 Fence design

52. It has been agreed by the KSG that a predator proof fence should be used to enclose the kittiwake nesting structures in order to prevent access by mammalian predators (e.g., fox) and thereby maximise reproductive success. The fence is also likely to reduce human disturbance to the nesting birds, although neither port site has public access so this risk should be minimal. The proposed fence layouts are illustrated in Figure 5 and Figure 6. The specification of the fence will adhere to the guidance provided in the RSPB manual on the Predator Exclusion Fence design (White & Hirons 2019) and will:

- Have a height of 1.8m,
- Have a mesh size of 5 x 10cm,
- Be topped with a 45° angled overhang c. 60cm (smooth material or floppy mesh) to the outside,
- A narrow skirt will be pinned at the base to the existing concrete using tamper proof bolts,
- Have a wire with min gauge of 1mm,
- Have a design life of at least 35 years (with regular maintenance) and be maintained or replaced as necessary for the duration of the compensation; and
- Be constructed with particular care to ensure that potential weak points (corners and gates) are well installed with minimal gaps.

## 6 Delivery timetable

53. The projected delivery timetable for the kittiwake nesting structure is set out in Figure 7.
54. The compensation schedules state that *“no operation of any turbine forming part of the authorised development may begin until four full breeding seasons following the implementation of the measures set out in the KIMP have elapsed. For the purposes of this paragraph each breeding season is assumed to have commenced on 1 March in each year and ended on 30 September.”* This requirement to implement the kittiwake compensation in advance of the operation of turbines largely dictates the timetable for delivery.
55. Completion of construction is expected in January 2023, to enable commissioning of the structure prior to the earliest kittiwake arrivals in late February (as currently occurs in Lowestoft). Once the structures are commissioned the compensation measures will have been implemented for the purposes of the DCO. Completion of the structures prior to the start of the 2023 breeding season allows for a minimum of four breeding seasons (defined as 1 March-30 September, as per the DCO) before the proposed first operation of turbines within the Norfolk Projects in 2027.

56. Key milestones for the delivery of the nesting structures by February 2023 comprise:

- Consultation with the KSG between April and August 2022 to agree the location and design - Complete;
- Submission of planning applications for the structure to the relevant local planning authorities (LPAs) in August 2022 – Complete;
- Planning consent for the structure granted in October 2022;
- KIMP (this document) submitted to the SoS 1 November for approval by the end of November 2022;
- The structure itself will be fabricated off-site, to enable rapid deployment on-site;
- On-site installation works are expected to commence in December 2022, to enable completion of the compensation measures prior to the arrival of the first kittiwakes at the end of February 2023;
- Post installation consultation with the KSG to discuss any unforeseen aspects which occur as a result of construction and how these may be factored into any adaptive management required; and
- Annual ongoing reporting to the KSG and SoS.

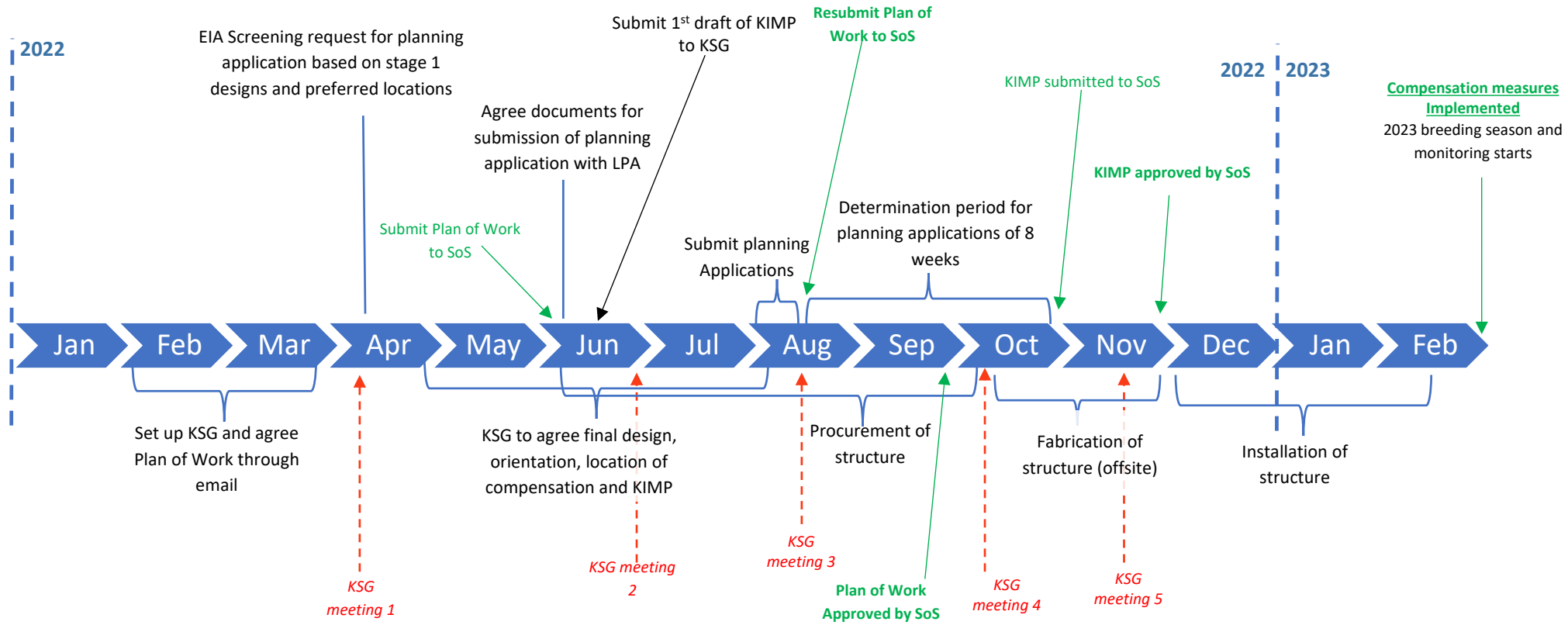


Figure 7 Projected implementation timetable for the delivery of artificial nest structures



## 7 Maintenance schedule

57. It will be important that the nest structure is maintained in a sound state so that it continues to provide a safe and effective structure for kittiwake breeding. To ensure this there will be regular inspections by a qualified engineer and ornithologist to ensure the needs of the birds are met and that the structure is safe for ornithologists engaged in monitoring studies. These inspections will primarily be conducted during the nonbreeding season in order to avoid unnecessary disturbance (kittiwakes are only in attendance at their nesting sites from late February to August).
58. An initial inspection will be conducted in September each year to identify any works required and to schedule these in at appropriate times. As well as a post-breeding inspection to allow any major works to be undertaken in advance of the following season, remote inspection (e.g. using binoculars) will also be performed during the breeding season in case any emergency repairs are required. There will also be a pre-season check conducted in January to ensure the site is in good condition immediately prior to bird arrivals. This will be conducted to allow sufficient time for all necessary repairs to be completed. It may also be necessary to undertake checks following severe weather.
59. Pre-breeding season inspections will also ensure that the nest access doors and panels are all operational.
60. Repair work during the breeding season will only be conducted if it is considered essential due to the high degree of disturbance this would cause, and the risk of egg and chick loss to predatory gulls. Due to the modular nature of the structures repair work can be isolated to small sections of the structures.
61. Due to the current (2022) outbreak of highly pathogenic avian influenza (HPAI) in the UK it may also be appropriate to attempt to disinfect the nesting ledges between breeding seasons. Should this be considered necessary, and it can be undertaken without acting against the aims of the compensation (for example nest removal over winter may reduce the likelihood of pairs from returning in the following breeding season) then statutory advice and guidance on such matters would be followed.
62. Similarly, it may be necessary to remove the carcasses of kittiwakes suspected of dying from HPAI. This will be undertaken following the statutory guidance on safe removal.

## 8 Artificial nest site, natal dispersal and colony interchange monitoring and reporting

63. The kittiwake compensation has been developed with the aim of providing additional replacement breeding age birds into the southern North Sea population

(from which birds at the FFC SPA are recruited), to replace the loss of 35 adults per year from the FFC SPA population (14 for Norfolk Boreas and 21 for Norfolk Vanguard). As it is not feasible to directly monitor all recruitment to the FFC SPA population (due to its large size and inaccessibility) it will be necessary instead to monitor other aspects of both the compensation population and other kittiwake populations in the region from which the performance of the compensation measures will be inferred. For the purposes of the monitoring 'regional' is defined as within 100km of the compensation population (this is the distance that most birds recruit within). This comprises, to the north the Norfolk coast as far as Scolt Head and to the south, all of the Suffolk coast and part of the Essex coast as far as Clacton-on-Sea.

64. Core monitoring is considered the minimum required to address the above aspects and will be undertaken in all years (unless otherwise agreed with the KSG and SoS). Additional monitoring is planned for the first three years (with the potential for extension) which will collect wider evidence to assist understanding the performance of the population. Since the latter list has been drawn up prior to the compensation commencing it should not be considered as exhaustive, since other studies may be identified as being more appropriate or informative, depending on observations of the colony. It should also be noted that methods which involve catching birds (e.g. for fitting leg rings) are expected to be subject to restrictions caused by the presence of HPAI in seabird populations, so may not be feasible at least initially.
65. The following will form the core monitoring, undertaken annually commencing in the first breeding season following installation of the structures:
  - Counts of the number of pairs (apparently occupied nests, AON) and productivity, backed up with photographs to enable the fate of individual nests to be tracked (remotely controlled cameras may also be installed to permit more intensive monitoring with minimal disturbance). In the first year of monitoring (2023), counts of AON, eggs and chicks will be made every two weeks between March and August (10 counts in total). Following review of the results, and in discussion with the KSG, this may be reduced (e.g. monthly).
  - Chicks will be ringed with BTO and colour rings for the first 10 years of monitoring (2023-2032; with possible extension, subject to discussion with the KSG), adults will be ringed with BTO and colour rings until year 5 of the monitoring (with possible extension, subject to discussion with the KSG). In both cases the work will be undertaken by suitably trained, qualified and experienced seabird researchers, and only if there are no welfare or HPAI concerns.

66. In the first three years following initiation of the compensation the following additional monitoring will be undertaken (with possible extensions dependent on results obtained):

- Consideration of any relationships between nest position (on the structure(s)) and breeding success;
- Diet studies of compensation population, through collection of pellets and/or regurgitated material during handling of birds for ringing (note this aspect will be opportunistic and it is not proposed that efforts to force regurgitation will be made);
- Estimation of the regional population size (AON at accessible/visible locations within 100 km, focus will be onshore locations and efforts to survey offshore structures are not being proposed). Where possible counts will be made by visual observation and backed up with photographs to provide a permanent record and to facilitate comparisons across years (note this is expected to primarily comprise Lowestoft, however other areas along the East Anglian coast will be kept under review for monitoring should either surveys or contact with local bird groups etc. indicate the presence of breeding kittiwakes);
- Productivity of regional population (no. fledged/pair), derived from a sample of locations from the regional population since it is not considered feasible to monitor the entire regional population. This will be based on a minimum of three visits to the sample sites during the breeding season (May/June/July);
- Ring resighting campaigns. For adults this will be combined with the regional population counts and productivity sampling (above), with the aim of identifying any movement of adults from the compensation population to other urban and natural locations (i.e. to investigate if the new structure attracts recruits to the location which subsequently move into other urban locations where they may come into conflict with people). For juveniles this will focus on identifying recruitment locations for individuals hatched at the compensation colony, therefore the focus for this will commence four years after the first chicks are ringed. It is intended this will be coordinated with other kittiwake research, particularly at FFC SPA, and will include proportionate contributions from the Norfolk Projects to support existing ringing work of relevance to the compensation;
- Ringing (BTO and colour rings) of chicks produced at other regional populations may also be undertaken, at a sample of locations where such work is considered feasible (a survey to investigate opportunities for such

work will be planned for summer 2023). This may permit the origins of ringed birds which recruit to the compensation population to be determined; and

- Adult birds in the compensation population may be fitted with GPS tags to enable understanding of their breeding season foraging behaviour (distances, locations, etc.). However, this will only be conducted if it is considered to provide important data, due to the need to balance the knowledge gained with the welfare aspects associated with such studies.

67. It is hoped that much of the above monitoring will be conducted collaboratively with other interested parties, such as developers providing similar compensation, seabird researchers and other seabird interest groups. This will minimise the risk of duplication of effort and unnecessary disturbance to breeding birds.

### 8.1 Timescales for Reporting

68. Following each year of monitoring, at least one KSG meeting will be organised to present the findings and discuss how these will be reported. In accordance with paragraph 4 f) and g) and paragraph 7 of the kittiwake compensation schedules an annual report will be produced and provided to the KSG and SoS as soon as practical each year (with the aim of providing this by the end of November). The anticipated stages for producing the annual reports are provided in Figure 8.



Figure 8 Anticipated Annual reporting to the KSG and SoS

## 9 Compensation performance - monitoring and adaptive management

69. The compensation schedule states that the annual reporting:

*must include details of any finding that the measures have been ineffective in securing an increase in the number of adult kittiwakes available to recruit to the FFC and, in such case, proposals to address this. Any proposals to address effectiveness must thereafter be implemented by the undertaker as approved in writing by the Secretary of State in consultation with the relevant statutory nature conservation body.*

70. On the advice of Natural England, an expert group was convened to consider how to monitor the success of the compensation, attended by representatives from the UK Centre for Ecology and Hydrology (UKCEH) and the RSPB (Natural England did not have capacity to attend). It was agreed through discussion in this group that, while productivity was the ultimate measure of success, it was critical that the reasons for any shortfall were recorded in order that appropriate remedial steps (if warranted) could be taken. Thus, while it was agreed that it was sensible to set targets for colony performance (at least 180 chicks fledged per year in at least 3 out of 5 years, from year five of the scheme onwards), these metrics should be used as a framework for monitoring and that it is just as important that consideration is given to an understanding of the status of kittiwake colonies more widely, in order to determine the compensation colony's relative performance.
71. Thus, the performance of the new colony should not be viewed in isolation but should be seen in the wider context of kittiwake breeding success locally (i.e. Lowestoft) and regionally (e.g. southern North Sea). Hence, poor breeding success at the compensation colony in a year when this is also seen at most other kittiwake colonies locally or regionally would be indicative of wider issues (e.g. reduced prey stocks or adverse weather conditions) and would not automatically trigger remedial action at the compensation colony. However, under these circumstances the Norfolk Projects would look to understand the reasons for poor reproductive performance at the compensation colony, attempt to identify potential remedies and collaborate with relevant groups to understand the wider context in terms of other local or regional colony breeding success.
72. Conversely, if the compensation colony performs less well than other monitored sites, this would be a strong indicator that action is required to identify and address the causes.
73. During the initial years following installation of the nesting structures (e.g. one to five), monitoring is expected to be focussed on understanding the mechanisms for colonisation. For example, there may evidence that birds are not prospecting at the new structure, or prospecting but not settling, or settling but abandoning during nest building, etc. and each of these would lead to a requirement for different remedial measures. Data will be collected with the aim of understanding the reasons for whichever of these may be occurring, such as the suitability of the nesting ledges or

protection from weather and predators and the most appropriate corresponding responses. Other factors which will be monitored will include nest attendance rates and foraging trip duration, as these will indicate the degree of effort required by the breeding adults and may indicate reasons for reproductive failure. As noted above, it will also be necessary to conduct similar monitoring at a sample of other locations to understand if any observed patterns are replicated elsewhere.

74. If colonisation does occur in the initial years (i.e. years one to five following construction of the nest structures) and initial recruits have good breeding success, but the rate of colony growth appears to be lower than would be needed for the colony to reach capacity (i.e. approx. 360 nests) within five years then reasons for this will be investigated. This may highlight avoidance of particular areas of the structures (e.g. more exposed, further from the sea, etc.), which could be targeted for modification or highlight that additional effort in attracting birds would be beneficial (e.g. use of decoys and broadcasting colony calls).
75. The monitoring and requirements for adaptive management will be conducted on an annual basis at least until such time as it is agreed that the colony is self-sustaining and performing at least as well as other local colonies.
76. As discussed above, the adaptive management measures to be considered will depend on the circumstances, however actions may include:
  - Encouragements to attract and accelerate recruitment through use of colony playback, placement of old kittiwake nests on shelves and installation of decoy birds;
  - Structural modifications to improve suitability (e.g. addition of vertical baffles, change in ledge width, increased weather or predator protection, etc.);
  - If productivity (per pair) appears to be lower than would be expected then the causes will be investigated and options such as supplementary feeding explored (note however this option would require careful consideration to rule out other more systemic causes, such as collapse of prey stocks, that short-term feeding would be unable to make up for); and,
  - Provision of nesting material (if this appears to be limiting).
77. If there appear to be problems caused by the structures themselves, these will be addressed through targeted modifications, extension, orientation, increased weather protection, improved predator protection and/or disturbance prevention. For example, should the presence of predatory gulls nesting on the roof of the structures be linked with a reduction in productivity the option to add a more steeply pitched roof could be implemented (see section 5 for further detail).
78. As a final consideration, alternative locations which may accommodate alternative structure designs (such as the tower design set out in Annex 5) will be considered.



## 10 Kittiwake Steering Group minutes

79. Minutes of all KSG meetings are provided as Appendix 4 to the KSG consultation report which forms Annex 1 of this KIMP.

## 11 References

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