



# Sheringham Shoal and Dudgeon Offshore Wind Farm Extension Projects

## Environmental Statement

### **Volume 2**

### Chapter 9 - Fish and Shellfish Ecology

August 2022

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<b>Royal HaskoningDHV</b>	
Approved by:	Date:
<b>Sarah Chandler, Equinor</b>	August 2022

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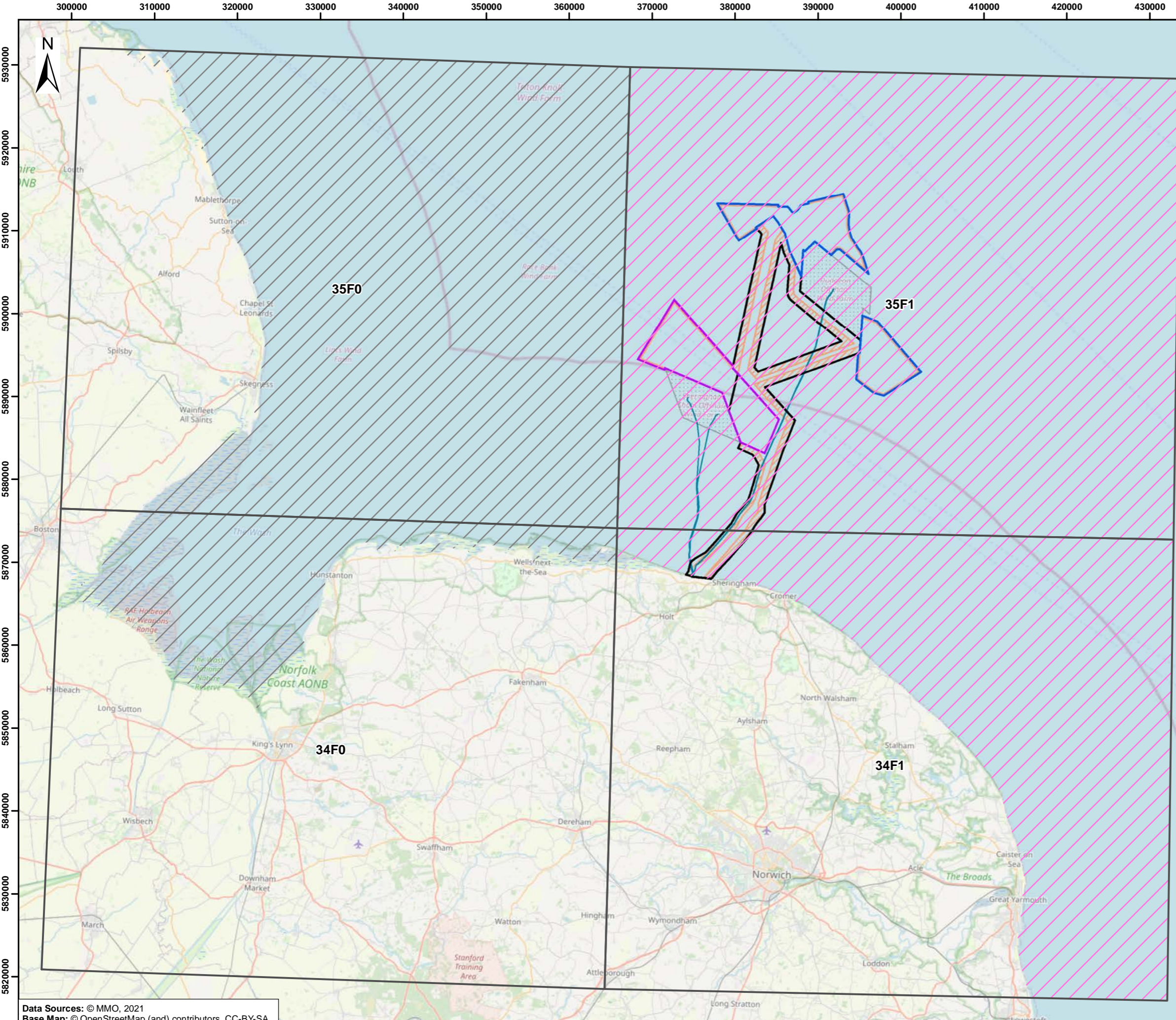
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# Sheringham Shoal and Dudgeon Extension Projects

Title:  
Figure 9.1 Study Area

Document:  
Environmental Statement (ES)  
Chapter 9 Fish and Shellfish Ecology

Application Doc. no.: 6.26

- Legend:
- Dudgeon Offshore Wind Farm Extension Project Wind Farm Site
  - Sheringham Shoal Offshore Wind Farm Extension Project Wind Farm Site
  - Offshore Cable Corridors
  - Offshore Temporary Work Area
  - Existing Offshore Wind Farm
  - Existing Offshore Wind Farm Export Cable
  - ICES Rectangle
  - Local Study Area
  - Regional Study Area



Coordinate Reference System: WGS 1984 UTM Zone 31N  
Transformation WGS84: OSGB\_1936\_To\_WGS\_1984\_7

0 10 20 km  
0 7.5 15 Miles

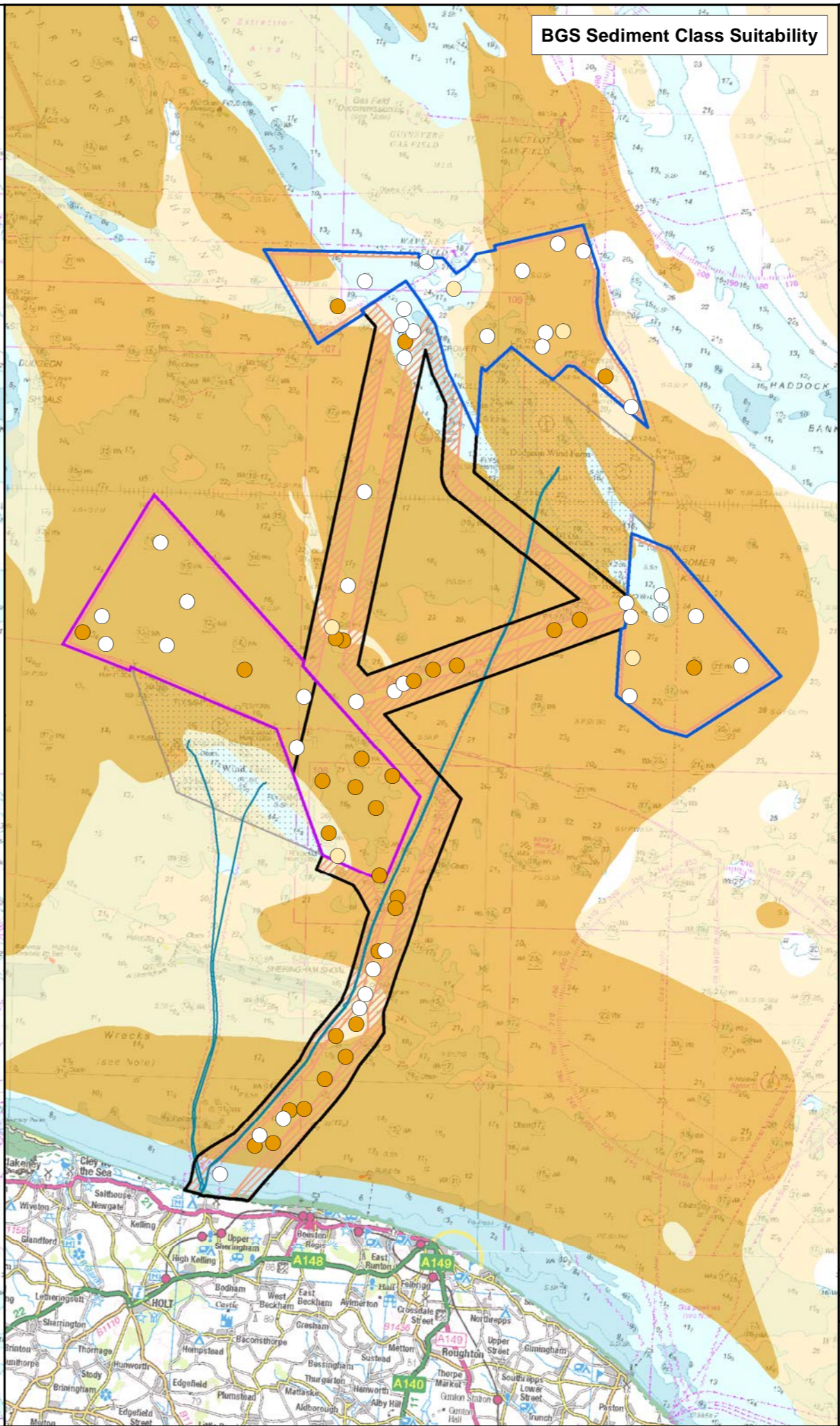
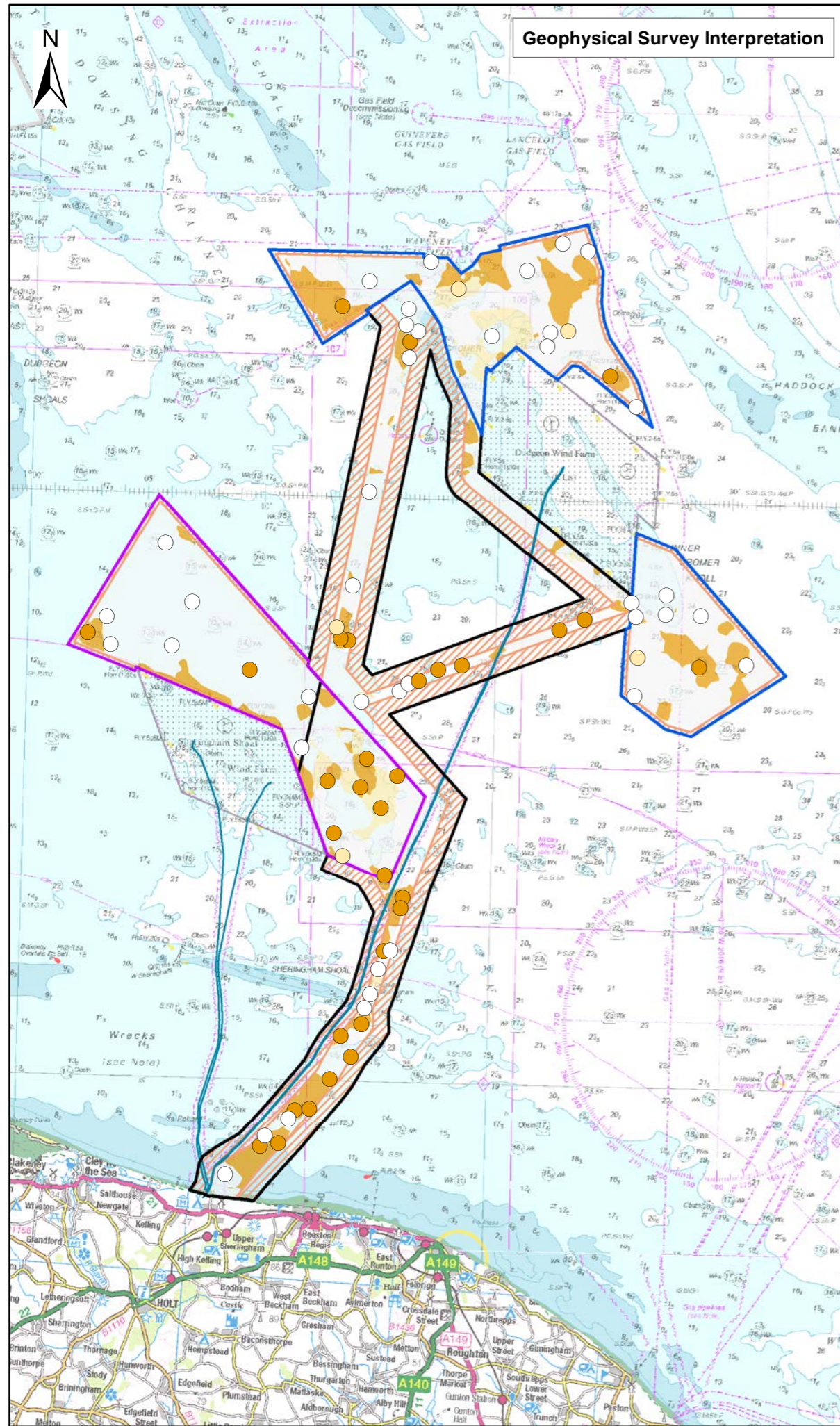
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RHDHV Doc. no.: PB8164\_RHD\_ZZ\_OF\_DR\_Z\_0168

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# Sheringham Shoal and Dudgeon Extension Projects

Title:  
Figure 9.2 Herring Habitat Suitability

Document:  
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Chapter 9 Fish and Shellfish Ecology

Application Doc. no.: 6, 26

- Legend:**
- Dudgeon Offshore Wind Farm Extension Project Wind Farm Site
  - Sheringham Shoal Offshore Wind Farm Extension Project Wind Farm Site
  - Offshore Cable Corridors
  - Offshore Temporary Work Area
  - Existing Offshore Wind Farm
  - Existing Offshore Wind Farm Export Cable

- Grab Samples**
- Herring Suitability**
- Unsuitable
  - Marginal
  - Preferred

- Habitat Area**
- Herring Suitability**
- Marginal
  - Preferred

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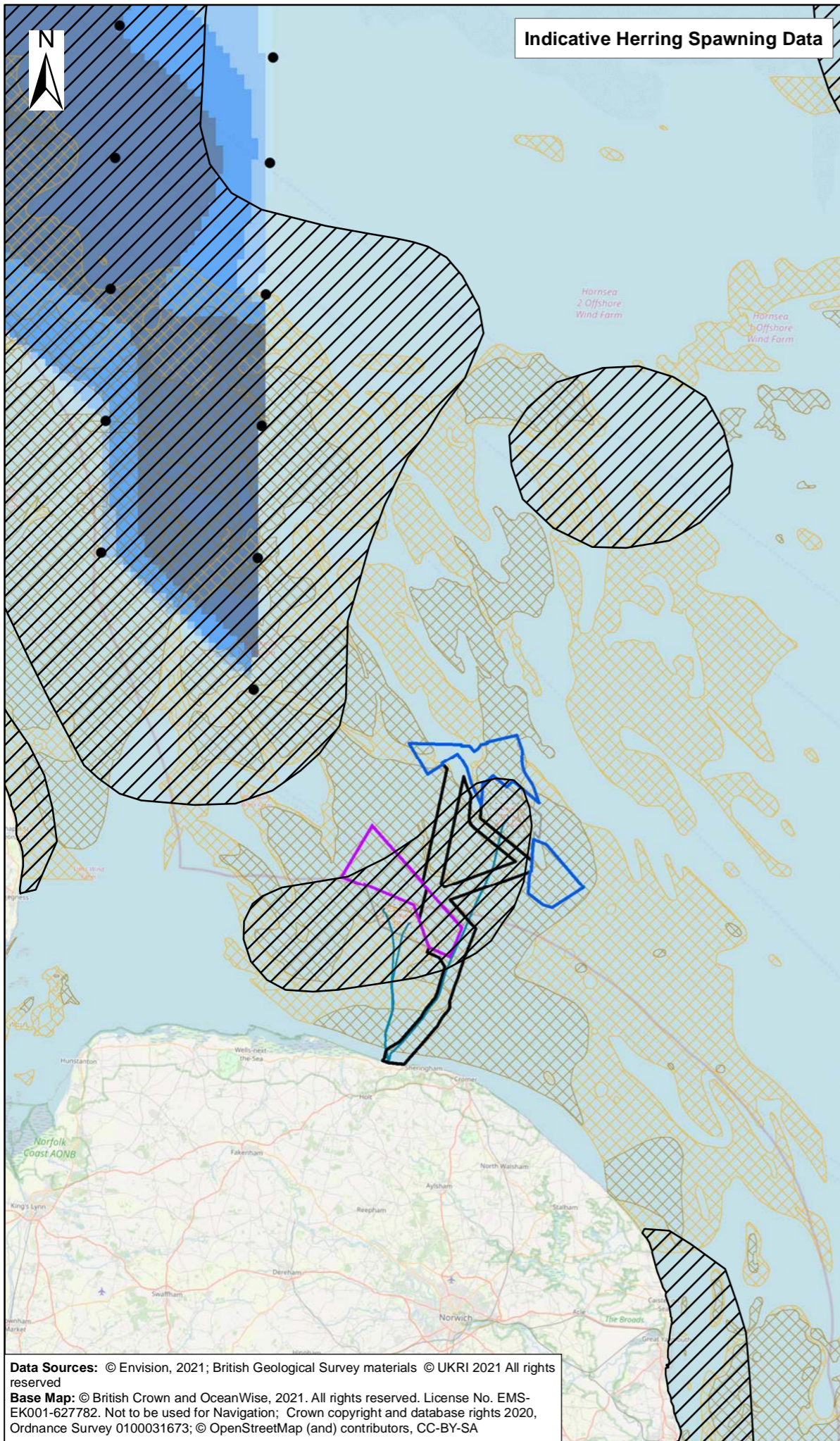


Coordinate Reference System: WGS 1984 UTM Zone 31N  
 Transformation WGS84: OSGB\_1936\_To\_WGS\_1984\_7

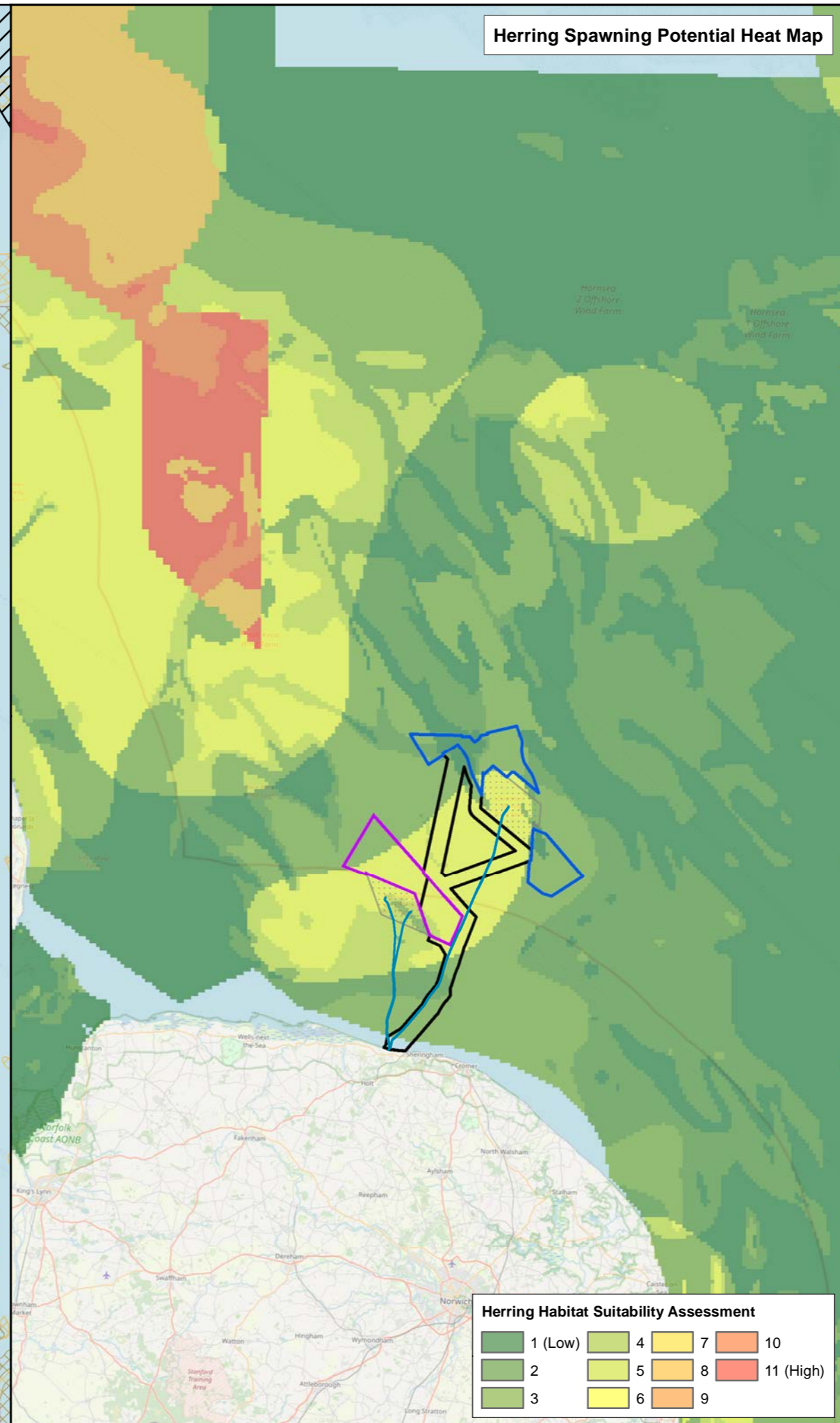
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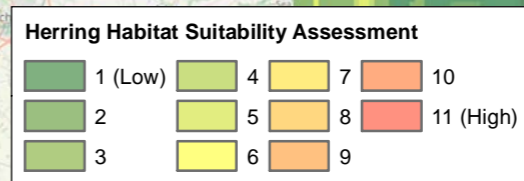
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Indicative Herring Spawning Data



Herring Spawning Potential Heat Map



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# Sheringham Shoal and Dudgeon Extension Projects

Title:  
 Figure 9.3 Herring Potential Spawning Areas

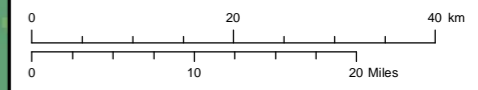
Document:  
 Environmental Statement (ES)  
 Chapter 9 Fish and Shellfish Ecology

Application Doc. no.: 6, 26

- Legend:**
- Dudgeon Offshore Wind Farm Extension Project Wind Farm Site
  - Sheringham Shoal Offshore Wind Farm Extension Project Wind Farm Site
  - Offshore Cable Corridors
  - Existing Offshore Wind Farm
  - Existing Offshore Wind Farm Export Cable
  - Herring Spawning Area (Coull et al 1998)
- BGS Sediment Class**
- Herring Suitability**
- Marginal
  - Preferred
- International Herring Larvae Survey (IHLS) (2009 - 2017)**
- Sample Location
- Larvae Count (per sq/m)**
- 0 - 50
  - 50 - 200
  - 200 - 600
  - > 600



Coordinate Reference System: WGS 1984 UTM Zone 31N  
 Transformation WGS84: OSGB\_1936\_To\_WGS\_1984\_7

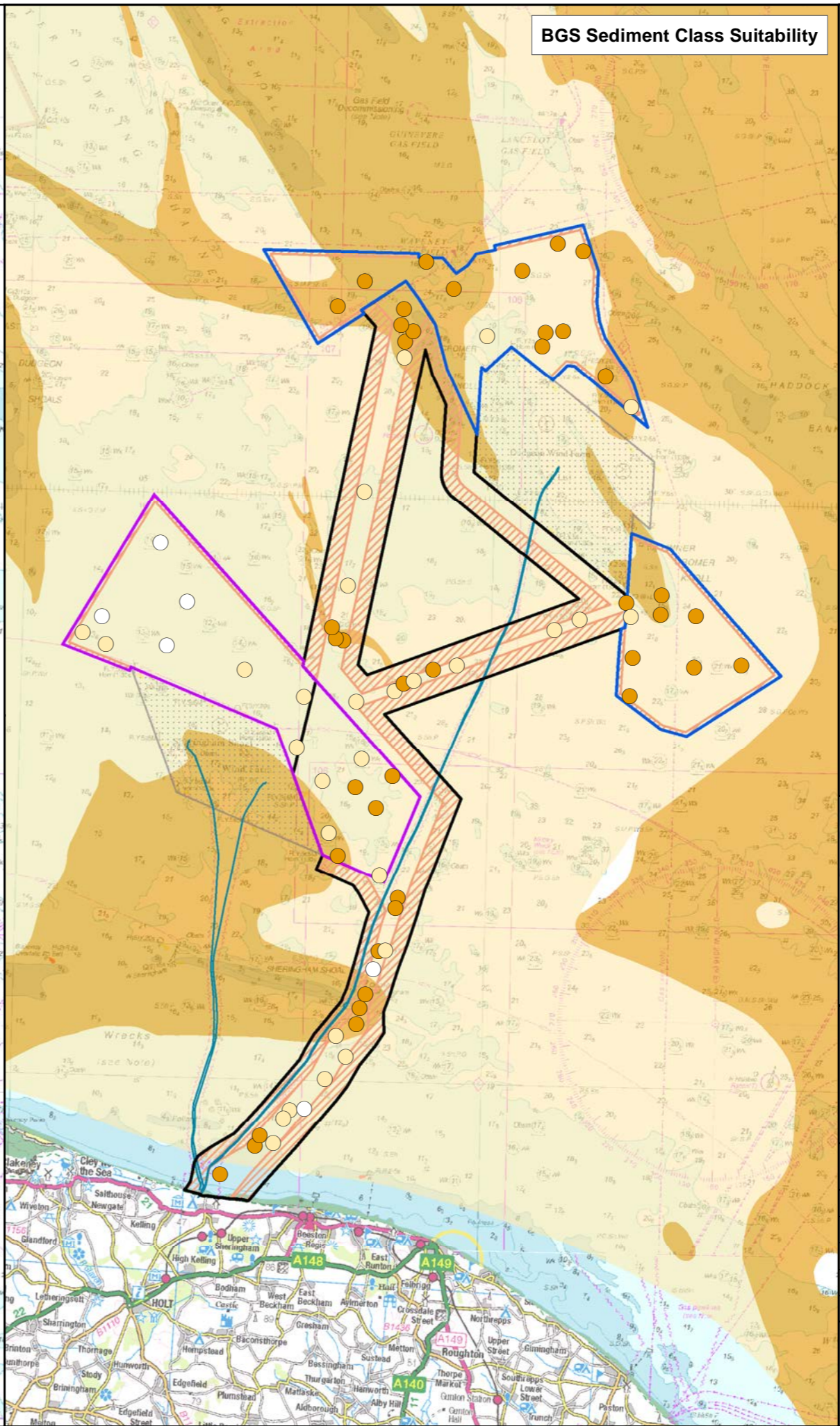
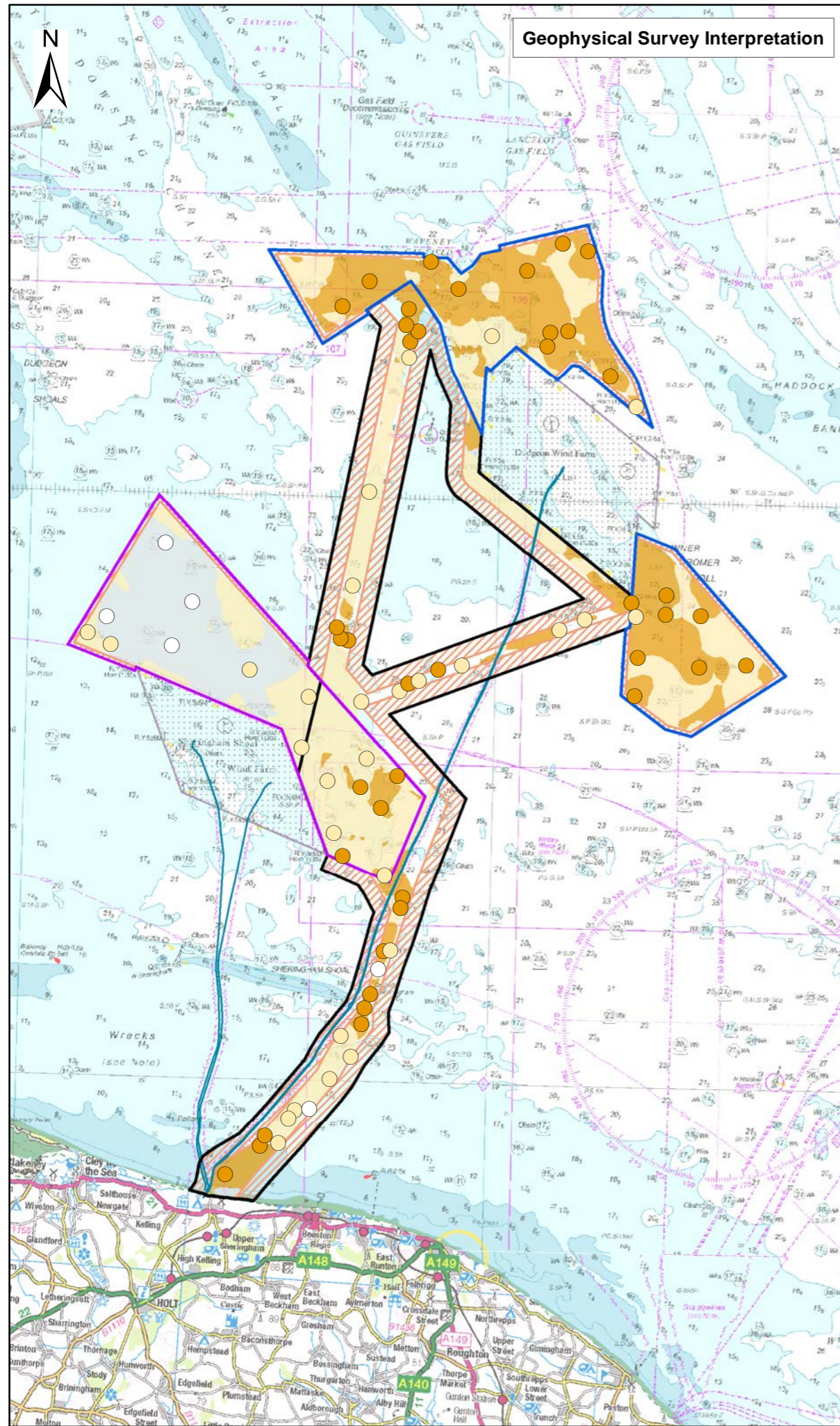


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# Sheringham Shoal and Dudgeon Extension Projects

Title:  
Figure 9.4 Sandeel Habitat Suitability

Document:  
Environmental Statement (ES)  
Chapter 9 Fish and Shellfish Ecology

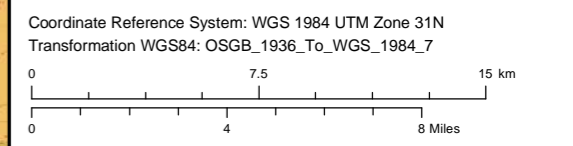
Application Doc. no.: 6, 26

- Legend:
- Dudgeon Offshore Wind Farm Extension Project Wind Farm Site
  - Sheringham Shoal Offshore Wind Farm Extension Project Wind Farm Site
  - Offshore Cable Corridors
  - Offshore Temporary Work Area
  - Existing Offshore Wind Farm
  - Existing Offshore Wind Farm Export Cable

- Grab Samples Sandeel Suitability**
- Unsuitable
  - Marginal
  - Preferred

- Habitat Area Sandeel Suitability**
- Marginal
  - Preferred

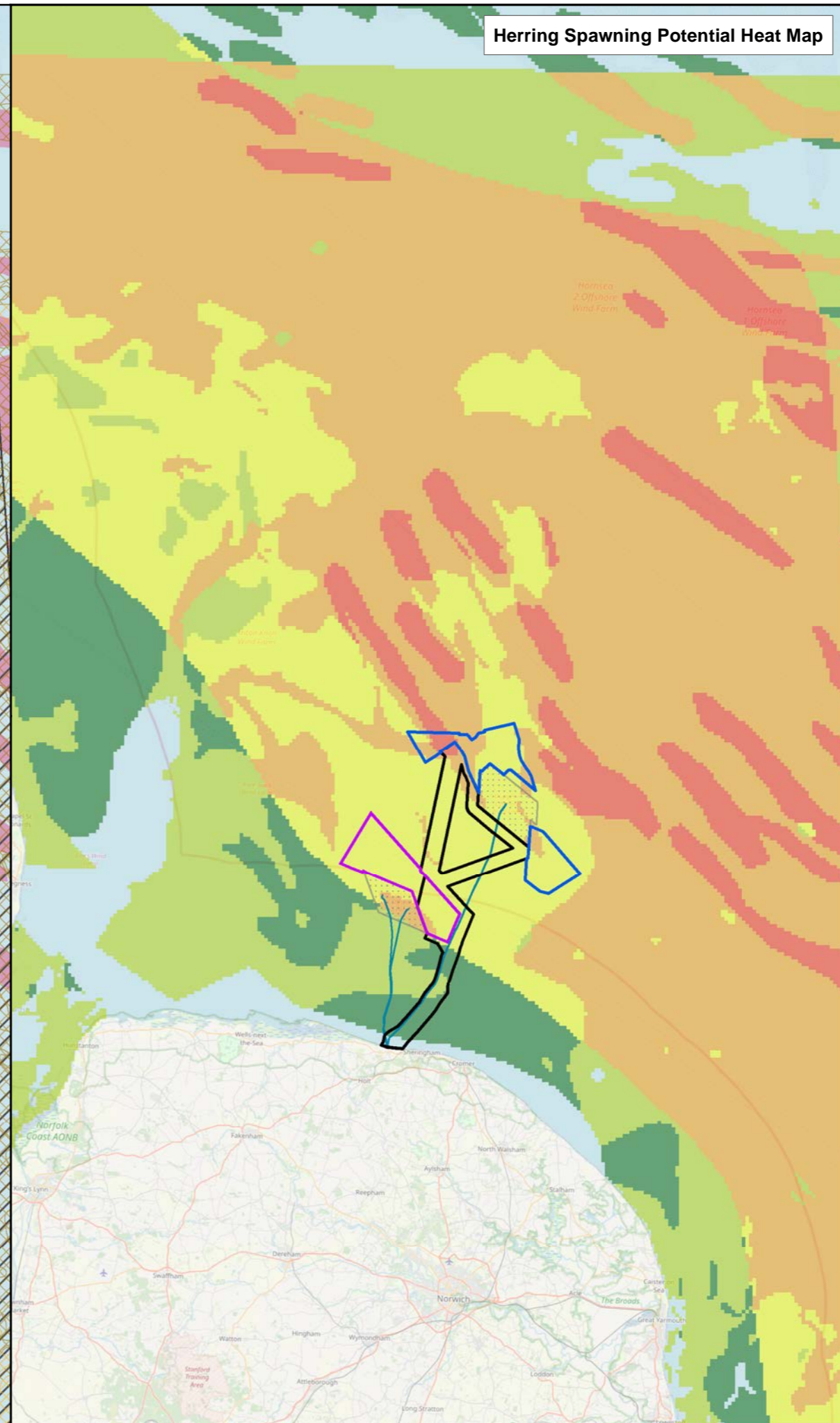
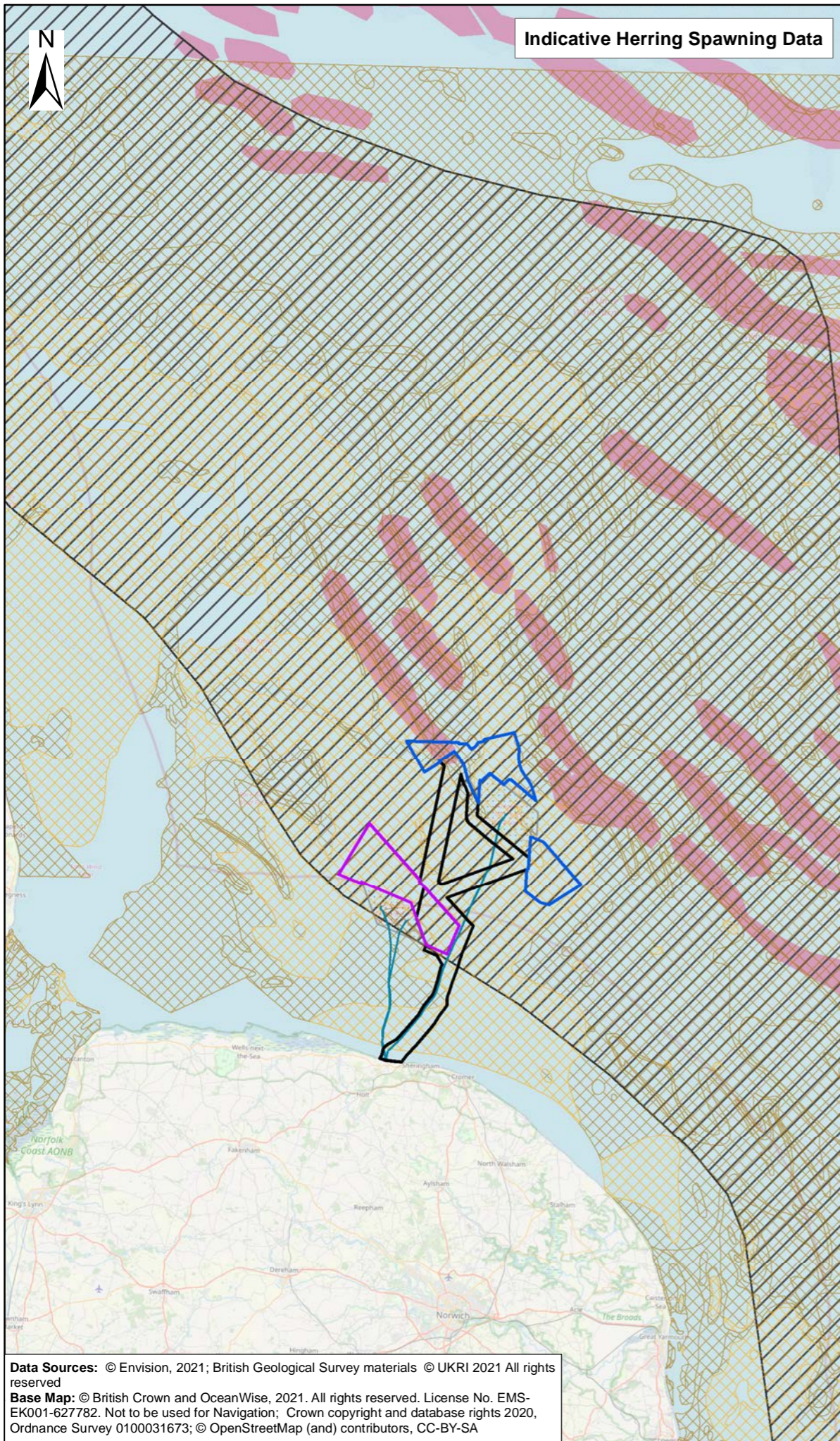
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# Sheringham Shoal and Dudgeon Extension Projects

Title:  
Figure 9.5 Sandeel Potential Spawning Areas

Document:  
Environmental Statement (ES)  
Chapter 9 Fish and Shellfish Ecology

Application Doc. no.: 6, 26

- Legend:**
- Dudgeon Offshore Wind Farm Extension Project Wind Farm Site
  - Sheringham Shoal Offshore Wind Farm Extension Project Wind Farm Site
  - Offshore Cable Corridors
  - Existing Offshore Wind Farm
  - Existing Offshore Wind Farm Export Cable
- BGS Sediment Class**
- Sandeel Habitat Suitability**
- Marginal
  - Preferred
  - Sandeel Spawning Area (Coul et al, 1998)
  - Sandeel Fishing Grounds (Jensen et al, 2011)
- Sandeel Habitat Suitability Assessment**
- |         |   |          |
|---------|---|----------|
| 1 (Low) | 4 | 7        |
| 2       | 5 | 8        |
| 3       | 6 | 9 (High) |



Coordinate Reference System: WGS 1984 UTM Zone 31N  
Transformation WGS84: OSGB\_1936\_To\_WGS\_1984\_7

0 20 40 km  
0 10 20 Miles

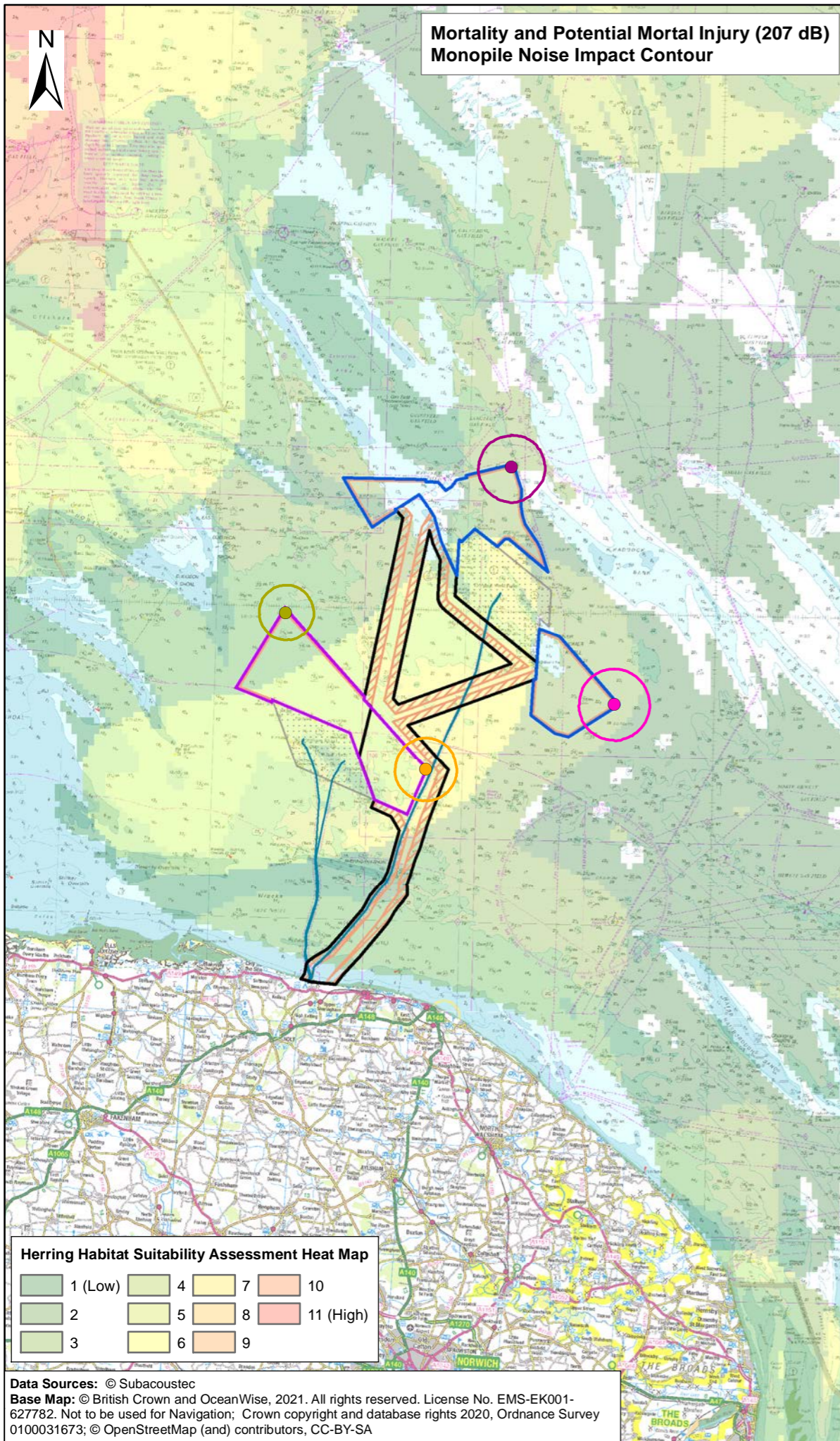
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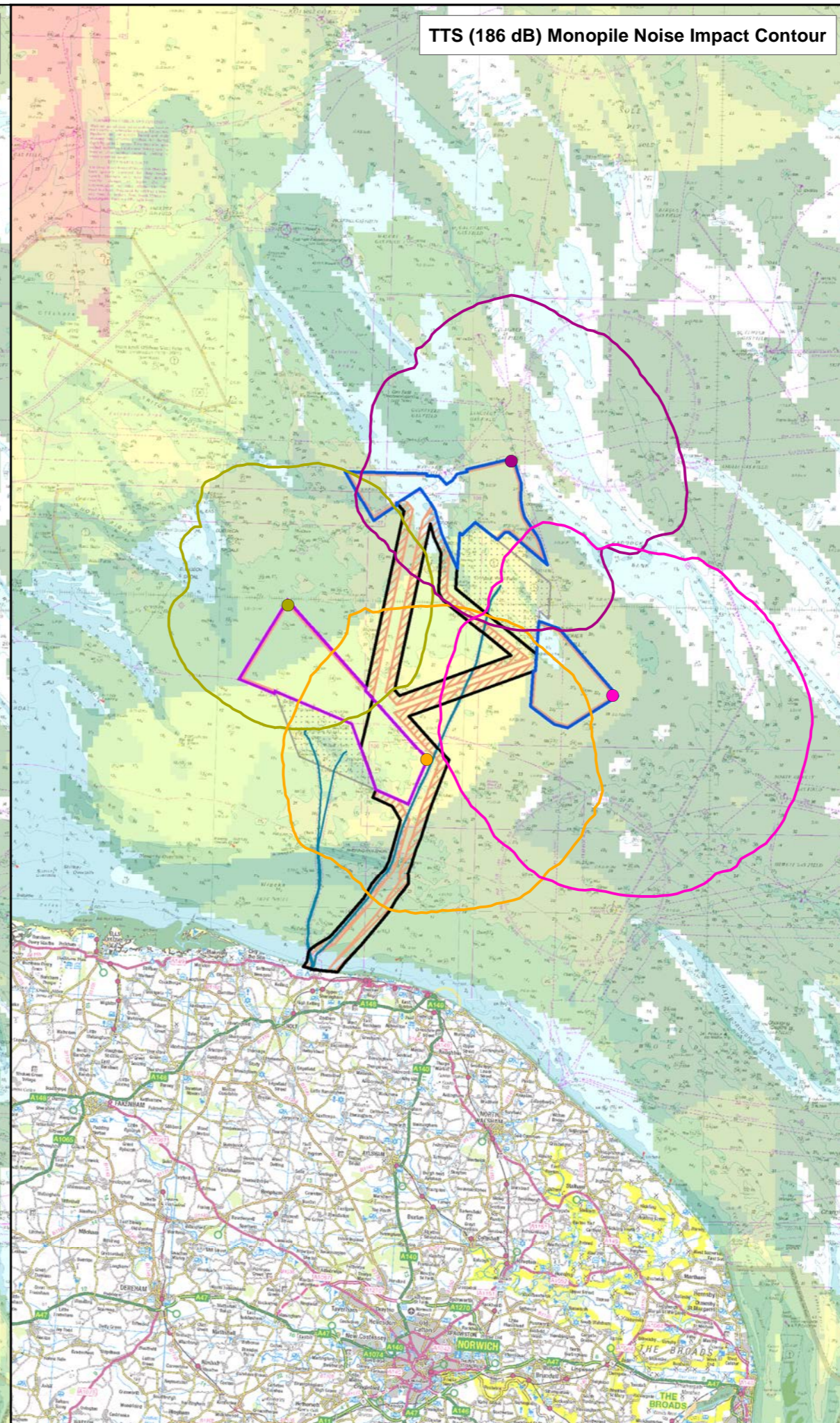
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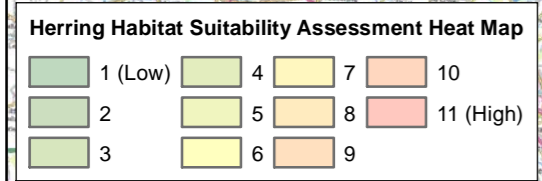




**Mortality and Potential Mortal Injury (207 dB) Monopile Noise Impact Contour**



**TTS (186 dB) Monopile Noise Impact Contour**



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## Sheringham Shoal and Dudgeon Extension Projects

Title:  
 Figure 9.6 Worst Case Single Piling Underwater Noise Impact Ranges in Relation to Potential Herring Spawning

Document:  
 Environmental Statement (ES)  
 Chapter 9 Fish and Shellfish Ecology

Application Doc. no.: 6, 26

- Legend:
- Dudgeon Offshore Wind Farm Extension Project Wind Farm Site
  - Sheringham Shoal Offshore Wind Farm Extension Project Wind Farm Site
  - Offshore Cable Corridors
  - Existing Offshore Wind Farm Export Cable
  - Offshore Temporary Work Area
  - Existing Offshore Wind Farm
- Modelling Noise Point Source**
- Dudgeon North East Modelling Location
  - Dudgeon South East Modelling Location
  - Sheringham East Modelling Location
  - Sheringham North Modelling Location
- Monopile Noise Impact Contours (Stationary Model)**
- Dudgeon South East Noise Contour
  - Dudgeon North East Noise Contour
  - Sheringham Extension East Noise Contour
  - Sheringham Extension North Noise Contour



Coordinate Reference System: WGS 1984 UTM Zone 31N  
 Transformation WGS84: OSGB\_1936\_To\_WGS\_1984\_7

0 10 20 km  
 0 8 16 Miles

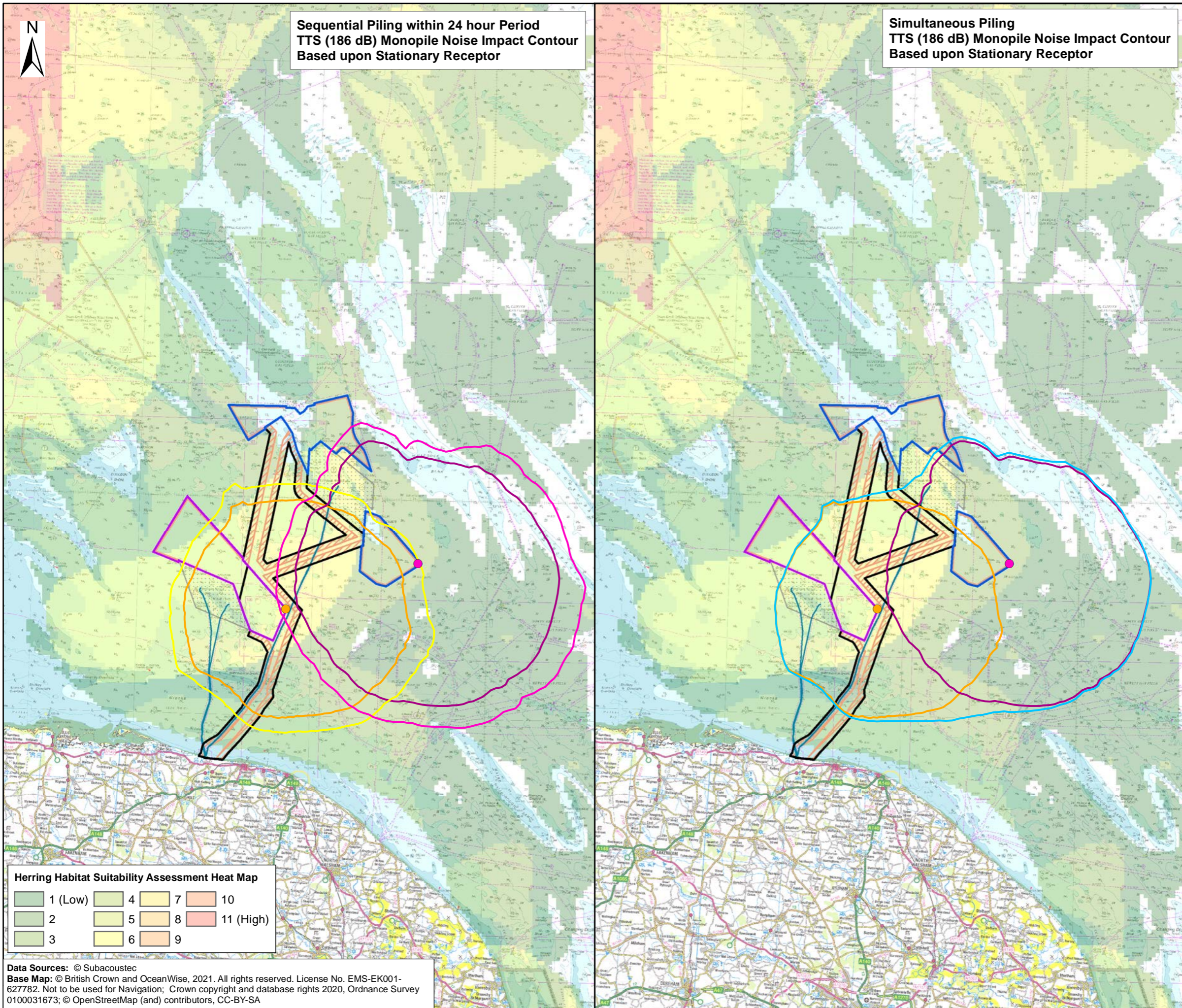
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 RHDHV Doc. no.: PB8164\_RHD\_OF\_DR\_Z\_0171

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**Sequential Piling within 24 hour Period  
TTS (186 dB) Monopile Noise Impact Contour  
Based upon Stationary Receptor**

**Simultaneous Piling  
TTS (186 dB) Monopile Noise Impact Contour  
Based upon Stationary Receptor**

**Sheringham Shoal and  
Dudgeon Extension Projects**

Title:  
Figure 9.7 Worst Case Sequential and  
Simultaneous Underwater Noise Impact  
Areas in Relation to Potential Herring  
Spawning

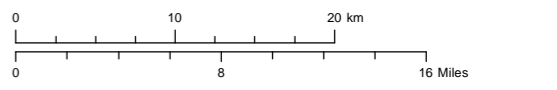
Document:  
Environmental Statement (ES)  
Chapter 9 Fish and Shellfish Ecology

Application Doc. no.: 6, 26

- Legend:
- Dudgeon Offshore Wind Farm Extension Project Wind Farm Site
  - Sheringham Shoal Offshore Wind Farm Extension Project Wind Farm Site
  - Offshore Cable Corridors
  - Offshore Temporary Work Area
  - Existing Offshore Wind Farm
  - Existing Offshore Wind Farm Export Cable
- Modelling Noise Point Source**
- Dudgeon South East Modelling Location
  - Sheringham East Modelling Location
- DEP SE Single Piling**
- DEP SE Single Piling
  - SEP E Single Piling
  - DEP SE and SEP E Simultaneous Monopile
  - DEP SE Sequential Monopile
  - SEP E Sequential Monopile



Coordinate Reference System: WGS 1984 UTM Zone 31N  
Transformation WGS84: OSGB\_1936\_To\_WGS\_1984\_7



Scale: 1:475,000      Scale at size: A3

Equinor Doc. no.: C282-RH-Z-GA-00052  
RHDHV Doc. no.: PB8164\_RHD\_OF\_DR\_Z\_0199

**Herring Habitat Suitability Assessment Heat Map**

1 (Low)	4	7	10
2	5	8	11 (High)
3	6	9	

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

# Sheringham Shoal and Dudgeon Extension Projects

Title: Figure 9.8 Underwater Noise Behavioural Disturbance Impact Ranges (Hawkins et al. (2014) Single Strike (SS) Sound Exposure Level (SEL) criteria based on 135dB) for 1st Strike and Maximum Monopile Hammer Energy at the SEP North and DEP North modelling locations in Relation to Potential Herring Spawning Grounds



Document: Environmental Statement (ES)  
Chapter 9 Fish and Shellfish Ecology

Application Doc. no.: 6, 26

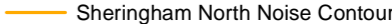

### Legend:

-  Dudgeon Offshore Wind Farm Extension Project Wind Farm Site
-  Sheringham Shoal Offshore Wind Farm Extension Project Wind Farm Site
-  Offshore Cable Corridors
-  Offshore Temporary Work Area
-  Existing Offshore Wind Farm
-  Existing Offshore Wind Farm Export Cable



### Modelling Noise Point Source

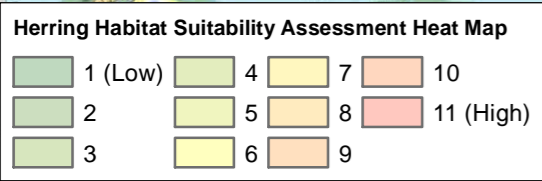
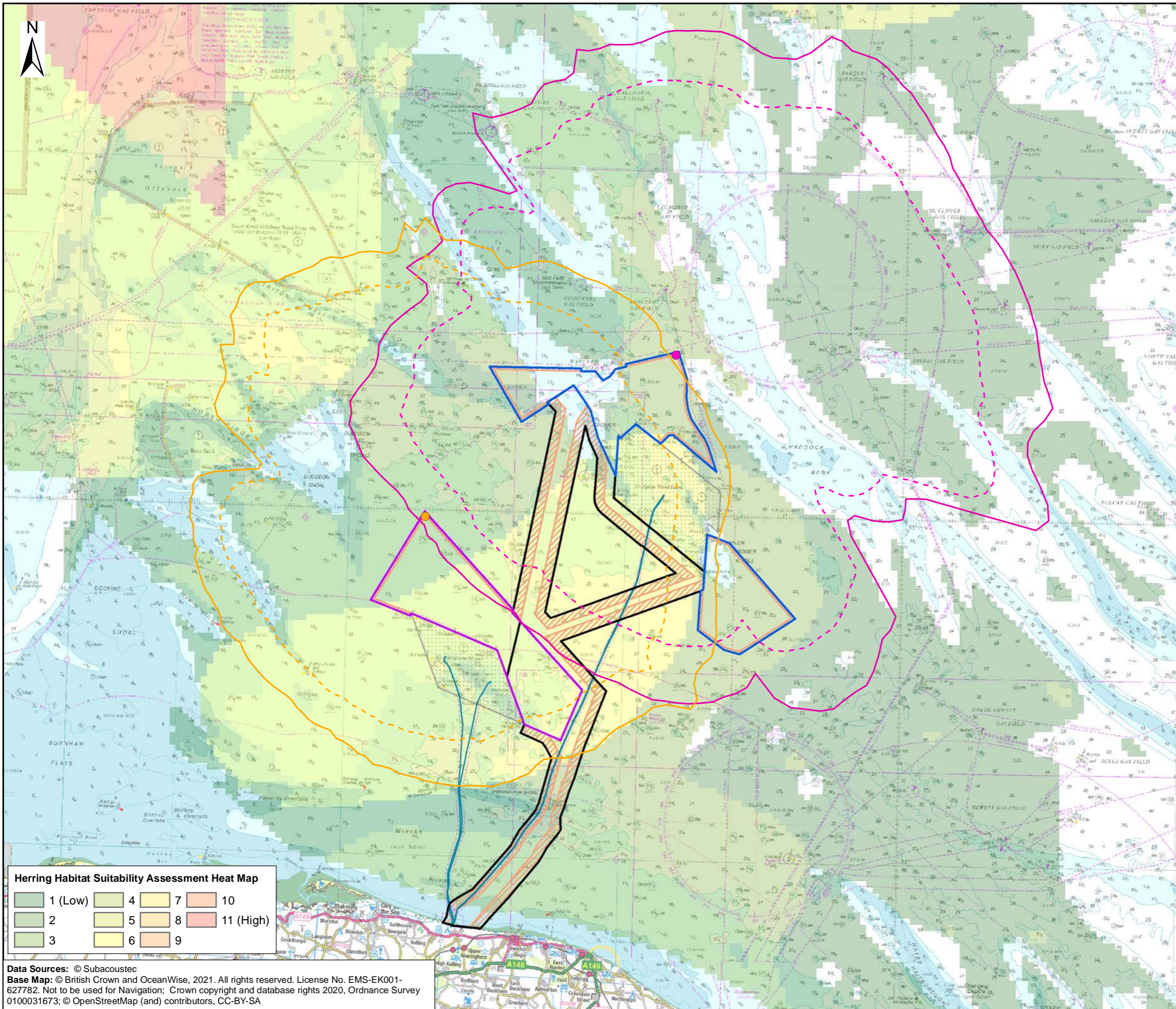
-  Dudgeon North East Modelling Location
-  Sheringham North Modelling Location

### Noise Impact Contours (Max Monopile Hammer Energy)

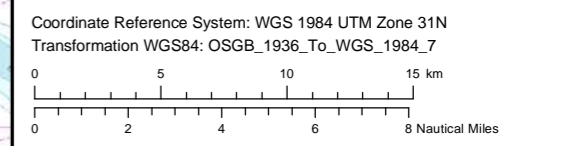
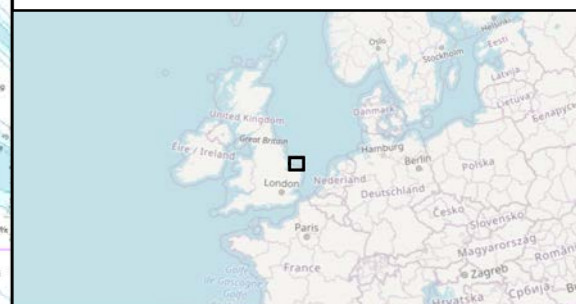
-  Sheringham North Noise Contour
-  Dudgeon North East Noise Contour

### Noise Impact Contours (1st Strike Monopile Hammer Energy)

-  Sheringham North Noise Contour
-  Dudgeon North East Noise Contour



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