East Anglia ONE North and East Anglia TWO Offshore Windfarms

Applicant's Comments on Relevant Representations

Appendix 3
Fish and Shellfish Ecology Clarification Note

Applicant: East Anglia TWO Limited
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Author: Royal HaskoningDHV

Applicable to East Anglia ONE North and East Anglia TWO

Revision Summary				
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01	08/06/2020	Paolo Pizzolla	Julia Bolton/Ian Mackay	Rich Morris

Description of Revisions			
Rev	**Page**	**Section**	**Description**
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Glossary of Acronyms

ES	Environmental Statement
ExA	Examining Authority
IFCA	Inshore Fisheries Conservation Authority
IHLS	International Herring Larvae Survey
MarESA	Marine Evidence-based Sensitivity Assessment
MMO	Marine Management Organisation
PEIR	Preliminary Environmental Information
SEL	Sound Exposure Level
SoCG	Statement of Common ground
SPL	Sound Pressure Level
SSC	Suspended Sediment Concentration

Glossary of Terminology

Applicant	East Anglia TWO Limited
Construction operation and maintenance platform	A fixed offshore structure required for construction, operation, and maintenance personnel and activities.
Development area	The area comprising the onshore development area and the offshore development area (described as the 'order limits' within the Development Consent Order).
East Anglia ONE North project	The proposed project consisting of up to 67 wind turbines, up to four offshore electrical platforms, up to one construction, operation and maintenance platform, inter-array cables, platform link cables, up to one operational meteorological mast, up to two offshore export cables, fibre optic cables, landfall infrastructure, onshore cables and ducts, onshore substation, and National Grid infrastructure.
East Anglia TWO project	The proposed project consisting of up to 75 wind turbines, up to four offshore electrical platforms, up to one construction, operation and maintenance platform, inter-array cables, platform link cables, up to one operational meteorological mast, up to two offshore export cables, fibre optic cables, landfall infrastructure, onshore cables and ducts, onshore substation, and National Grid infrastructure.
East Anglia TWO windfarm site	The offshore area within which wind turbines and offshore platforms will be located.
European site	Sites designated for nature conservation under the Habitats Directive and Birds Directive, as defined in regulation 8 of the Conservation of Habitats and Species Regulations 2017 and regulation 18 of the Conservation of Offshore Marine Habitats and Species Regulations 2017. These include candidate Special Areas of Conservation, Sites of Community Importance, Special Areas of Conservation and Special Protection Areas.
Generation Deemed Marine Licence (DML)	The deemed marine licence in respect of the generation assets set out within Schedule 13 of the draft DCO.
Horizontal directional drilling (HDD)	A method of cable installation where the cable is drilled beneath a feature without the need for trenching.
Inter-array cables	Offshore cables which link the wind turbines to each other and the offshore electrical platforms, these cables will include fibre optic cables.
Landfall	The area (from Mean Low Water Springs) where the offshore export cables would make contact with land, and connect to the onshore cables.
Meteorological mast	An offshore structure which contains metrological instruments used for wind data acquisition.
National Grid overhead line realignment works area	The proposed area for National Grid overhead line realignment works.
Offshore cable corridor	This is the area which will contain the offshore export cables between offshore electrical platforms and landfall.
Offshore development area	The East Anglia TWO windfarm site and offshore cable corridor (up to Mean High Water Springs).

Offshore electrical infrastructure	The transmission assets required to export generated electricity to shore. This includes inter-array cables from the wind turbines to the offshore electrical platforms, offshore electrical platforms, platform link cables and export cables from the offshore electrical platforms to the landfall.
Offshore electrical platform	A fixed structure located within the windfarm area, containing electrical equipment to aggregate the power from the wind turbines and convert it into a more suitable form for export to shore.
Offshore export cables	The cables which would bring electricity from the offshore electrical platforms to the landfall. These cables will include fibre optic cables.
Offshore infrastructure	All of the offshore infrastructure including wind turbines, platforms, and cables.
Offshore platform	A collective term for the construction, operation and maintenance platform and the offshore electrical platforms.
Platform link cable	Electrical cable which links one or more offshore platforms. These cables will include fibre optic cables.
Scour protection	Protective materials to avoid sediment being eroded away from the base of the foundations as a result of the flow of water.
Transmission DML	The deemed marine licence in respect of the transmission assets set out within Schedule 14 of the draft DCO.

1 Introduction

1. This clarification note is in response to Relevant Representations received from Natural England, Marine Management Organisation (MMO) and Eastern Inshore Fisheries Conservation Authority (IFCA) regarding Fish and Shellfish Ecology.

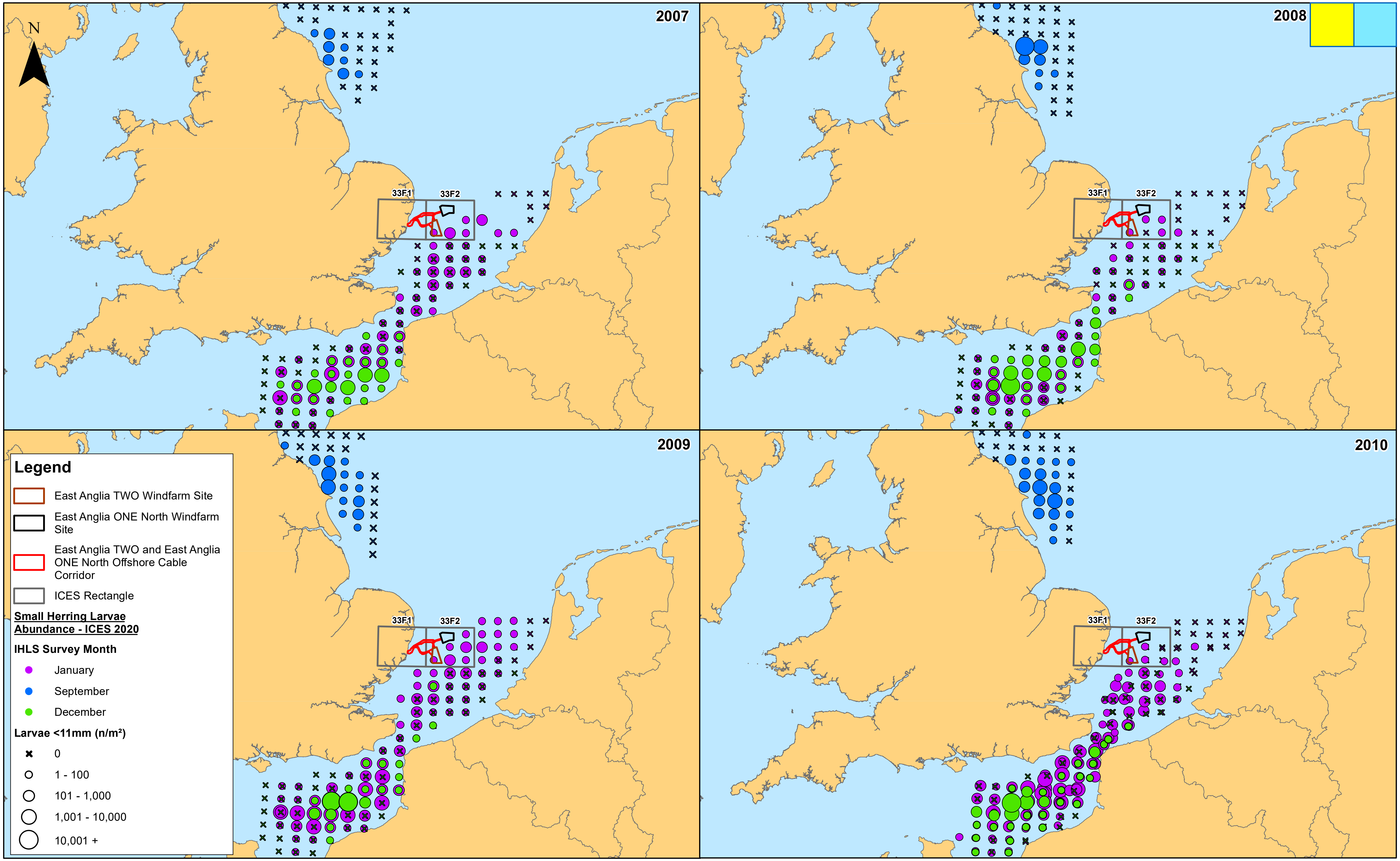
2. This document is applicable to both the East Anglia ONE North and East Anglia TWO applications, and therefore is endorsed with the yellow and blue icon used to identify materially identical documentation in accordance with the Examining Authority's (ExA) procedural decisions on document management of 23rd December 2019. Whilst for completeness of the record this document has been submitted to both Examinations, if it is read for one Project submission there is no need to read it again.

2 Herring Spawning Grounds

2.1 International Herring Larvae Survey (IHLS)

3. It was brought to the Applicant's attention that an error in the data processing stage meant that only data from the IHLS surveys undertaken in December had been used to provide information on larval abundance for the Downs herring stock as shown in ***Figures 10.15***, ***10.16*** and ***10.17*** of the Environmental Statement (ES) (APP-143, APP-144, APP-145).

4. These figures have now been updated with IHLS data from all three larvae surveys carried out in specific periods (January, September and December) and areas, following autumn and winter spawning activity of herring from north to south, as shown in ***Figure 1, Figure*** 2 and ***Figure*** 3 below. Within each figure, multiple months of IHLS survey are displayed using different colours for each month It should be noted that, three surveys were not necessarily conducted each year, as displayed in each relevant figure.



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1	19/02/2020	FC	First Issue.	Checked:	KC
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East Anglia TWO and East Anglia ONE North

IHLS Herring Small Larvae Abundance (2007 - 2010)

Drg No	EA1N-EA2-DEV-DRG-IBR-001085
Rev	1
Date	19/02/20
Figure	1

Datum: WGS 1984
Projection: Zone 31N

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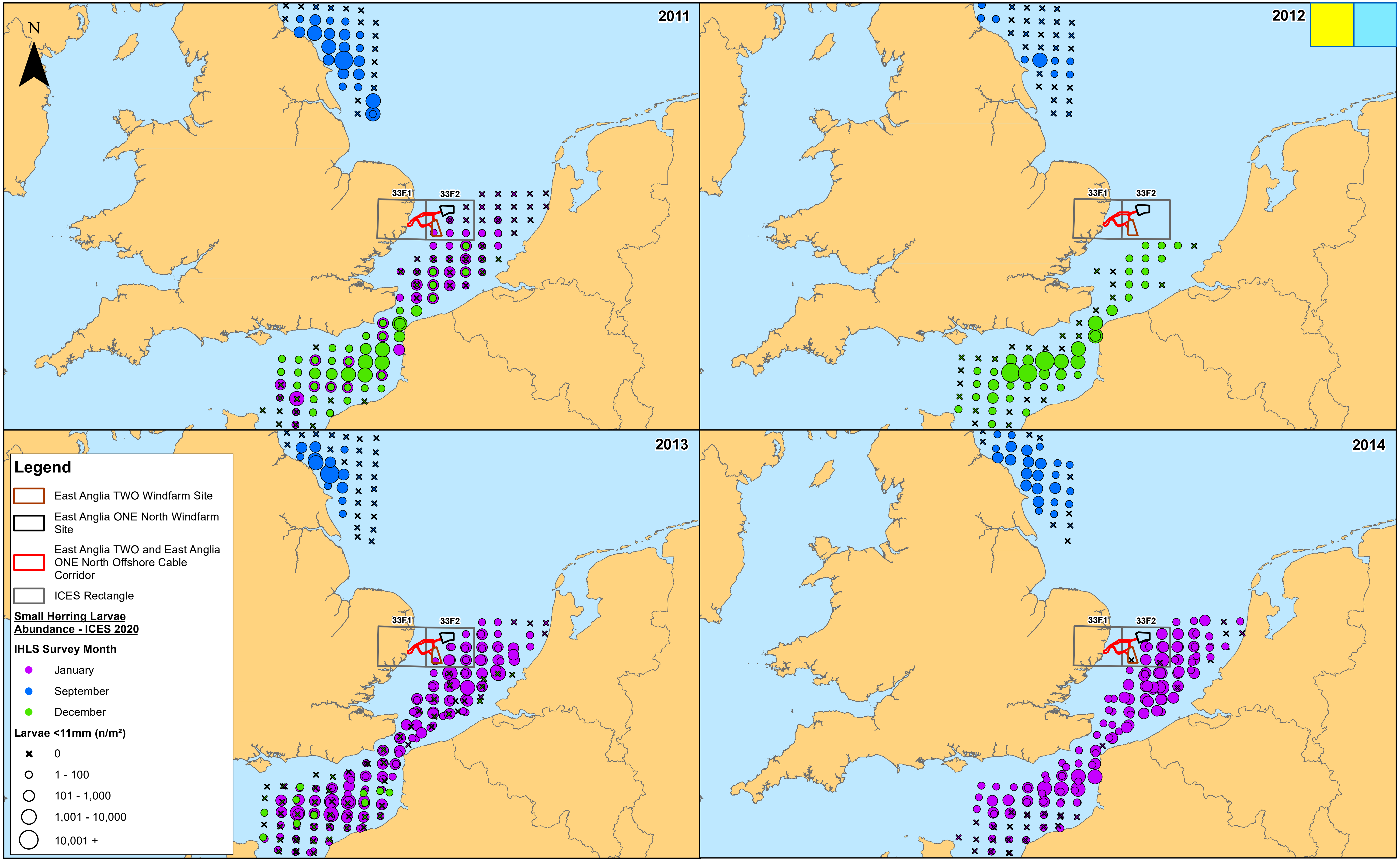

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East Anglia TWO and East Anglia ONE North

IHLS Herring Small Larvae Abundance (2011 - 2014)

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Date	19/02/20	
Figure	2	

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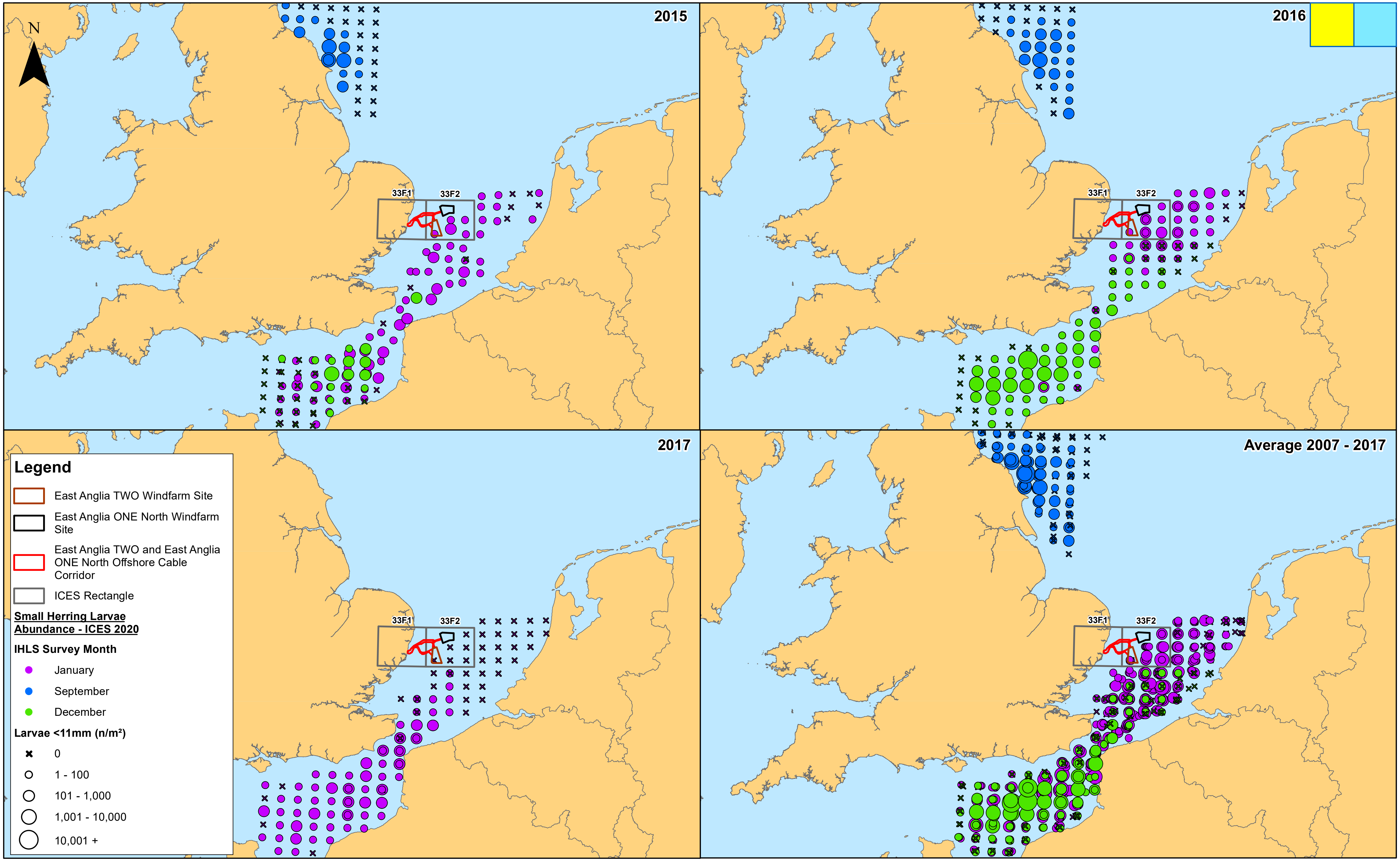

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East Anglia TWO and East Anglia ONE North

IHLS Herring Small Larvae Abundance (2015-2017) and all Herring Larvae (2007-2017)

Drg No	EA1N-EA2-DEV-DRG-IBR-001087	
Rev	1	Datum: WGS 1984 Projection: Zone 31N
Date	19/02/20	
Figure	3	

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2.2 Underwater Noise Modelling

5. Fleeing animal modelling was undertaken and presented within ***Chapter 10 Fish and Shellfish Ecology*** (APP-464) and in response to feedback provided by the MMO to the Preliminary Environmental Information Report (PEIR) stationary animal modelling for fish was also undertaken and presented in ***Appendix 10.3*** (APP-464) of the ES.

6. The spatial worst case scenario (i.e. the maximum impact range) associated with different foundation types, pin pile and monopiles, is different for fleeing and stationary receptors. The pin pile impact ranges are largest for fleeing animals whereas the monopile impact ranges are largest for stationary animals, this is presented in ***Table 1*** below.

7. The ranges calculated for fleeing animals are highly dependent on the noise received when they are close to the pile and rate at which the pile is struck. A faster strike rate means greater noise exposure is experienced when the receptor is close to the pile. The strike rate for pin piles is assumed to be 40 strikes per minute compared to monopiles of 30 strikes per minute, as shown in ***Table A11.3*** in ***Appendix 11.4*** (APP-468).

8. The stationary animal modelling assumes that the receptor stays in the same place throughout piling, therefore the strike rate is not important, and the number of strikes dictates the differences in impact ranges. 8850 strikes were assumed for monopiles compared to 6760 for pin piles (***Table A11.2*** in ***Appendix 11.4*** (APP-468)).

Table 1 Comparison of Worst Case Scenarios for Fleeing and Stationary Receptors

Fish Group	Impact Criteria	Potential Impact	Maximum Range (km)			
			Monopile (maximum hammer energy 4,000kJ)		Pin pile (maximum hammer energy 2,400kJ)	
			Fleeing	Stationary	Fleeing	Stationary
East Anglia TWO						
Fish (no swim bladder)	>186 dB SEL_{cum}	TTS	27	38	29	38
Fish (with swim bladder not involved in hearing)	>186 dB SEL_{cum}	TTS	27	38	29	38
Fish (with swim bladder involved in hearing)	186 dB SEL_{cum}	TTS	27	38	29	38
East Anglia ONE North						
Fish (no swim bladder)	>186 dB SEL_{cum}	TTS	27	39	29	38
Fish (with swim bladder not involved in hearing)	>186 dB SEL_{cum}	TTS	27	39	29	39

Fish Group	Impact Criteria	Potential Impact	Maximum Range (km)			
			Monopile (maximum hammer energy 4,000kJ)		Pin pile (maximum hammer energy 2,400kJ)	
			Fleeing	Stationary	Fleeing	Stationary
Fish (with swim bladder involved in hearing)	186 dB SEL_{cum}	TTS	27	39	29	39

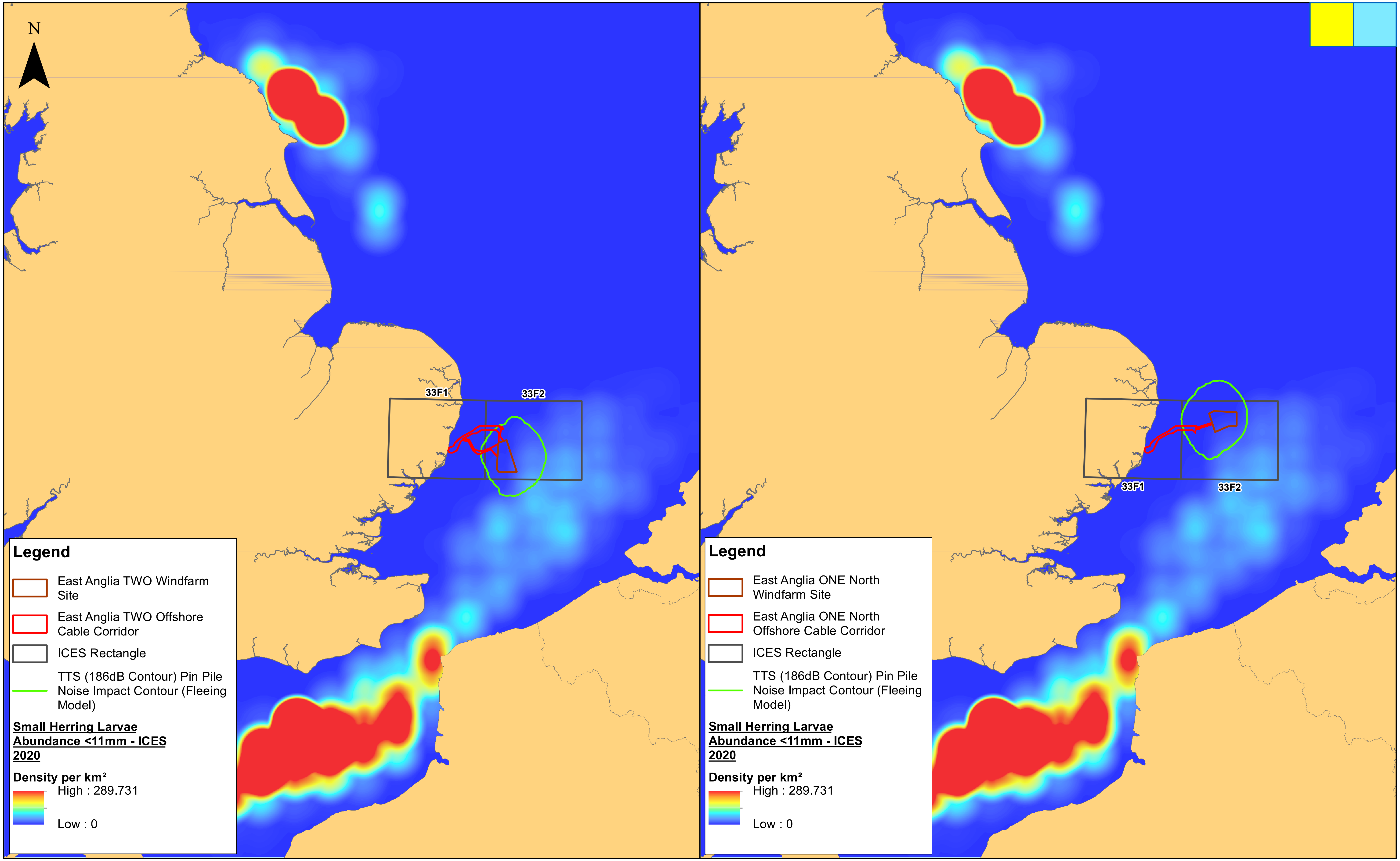
2.3 Downs Herring Stock

9. Due to amendments to the presentation of the IHLS dataset, ***Figures 10.45*** (APP-173) and ***Figure 10.3.12*** of ***Appendix 10.3*** (APP-464) have been updated with IHLS data from all three larvae surveys carried out in specific periods and areas and are shown in ***Figure 4*** and ***5*** respectively. These figures show the IHLS small herring larvae abundance (2007-2017) in relation to the worst case noise impact contour for a fleeing (pin pile, ***Figure 4***) and stationary (monopile, ***Figure 5***) receptor.

10. Following a request from the MMO during Statement of Common Ground (SoCG) meeting on 19th March 2020, additional figures displaying 10 years of IHLS data for the January surveys only have been mapped against noise contours for both the fleeing and stationary models, as shown in ***Figure 6*** and ***Figure*** 7, for both the fleeing (pin pile, ***Figure 6***) and stationary (monopile, ***Figure 7***) receptor.

11. In addition to modelling the cumulative sound exposure levels (SEL) as detailed in ***Table 1*** below, the underwater noise modelling was also undertaken to calculate the peak sound pressure level (SPL) ranges with the potential for mortality and potential mortal injury and recoverable injury. These are displayed for each category of fish and shellfish receptors ***Table 10.22 in Chapter 10 Fish and Shellfish Ecology*** (APP-058). As discussed with the MMO on 19th March 2020 during the SoCG meeting, these SPL_{peak} ranges (for both fleeing and stationary models) have been mapped against 10 years of IHLS data for the January surveys only to display potential impact on herring spawning grounds as displayed in ***Figures 8 and 9***.

12. The IHLS dataset presented in these figures shows that for all three months, and in January, the key area for herring spawning is located to the south of the windfarm sites towards the English Channel. This shows that there is no overlap with areas of high small larvae abundance associated with the Downs herring stock, therefore, the Applicant considers there to be no requirement for any seasonal piling restriction.



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Scale @ A3

0 25 50 100 Km

East Anglia TWO and East Anglia ONE North
IHLS Herring Small Larvae Abundance (2007 - 2017) in Relation to Worst Case Noise Impact Contour (Fleeing Model)

Drg No	EA1N-EA2-DEV-DRG-IBR-001088
Rev	1
Date	19/02/20
Figure	4

Datum: WGS 1984
Projection: Zone 31N

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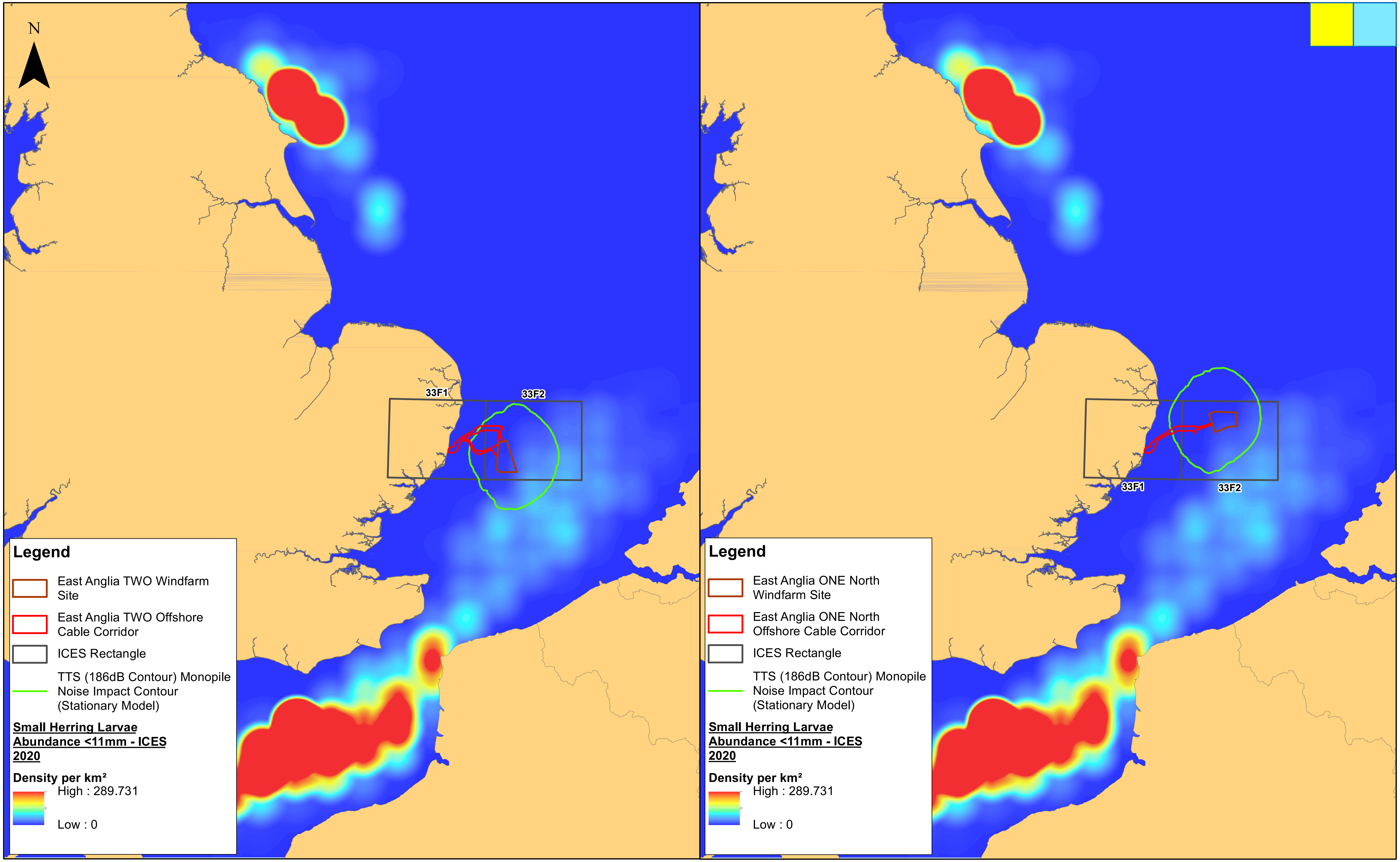

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East Anglia TWO and East Anglia ONE North

IHLS Herring Small Larvae Abundance (2007 - 2017) in Relation to Worst Case Noise Impact Contour (Stationary Model)

Drg No	EA1N-EA2-DEV-DRG-IBR-001089
Rev	1
Date	19/02/20
Figure	5

Datum: WGS 1984
Projection: Zone 31N

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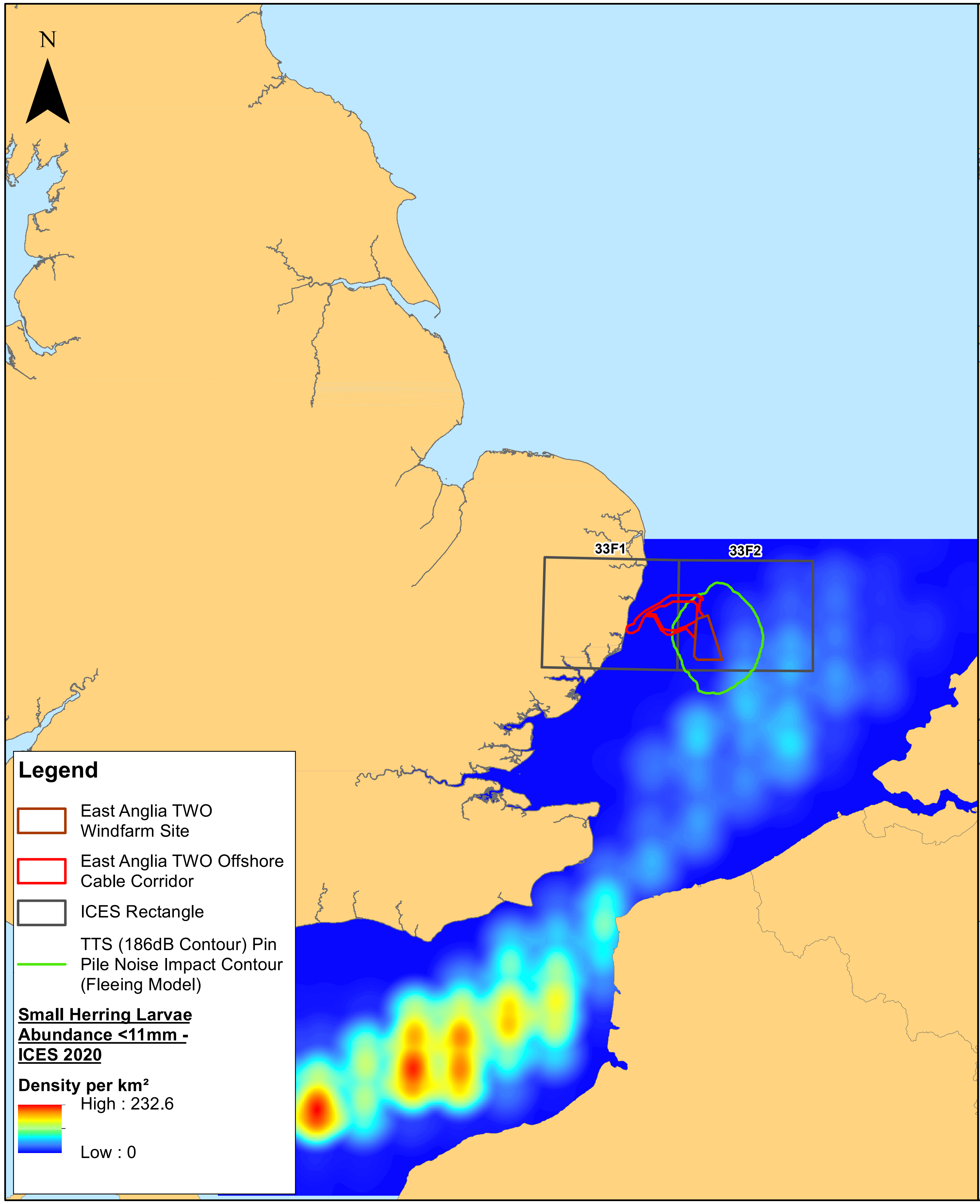

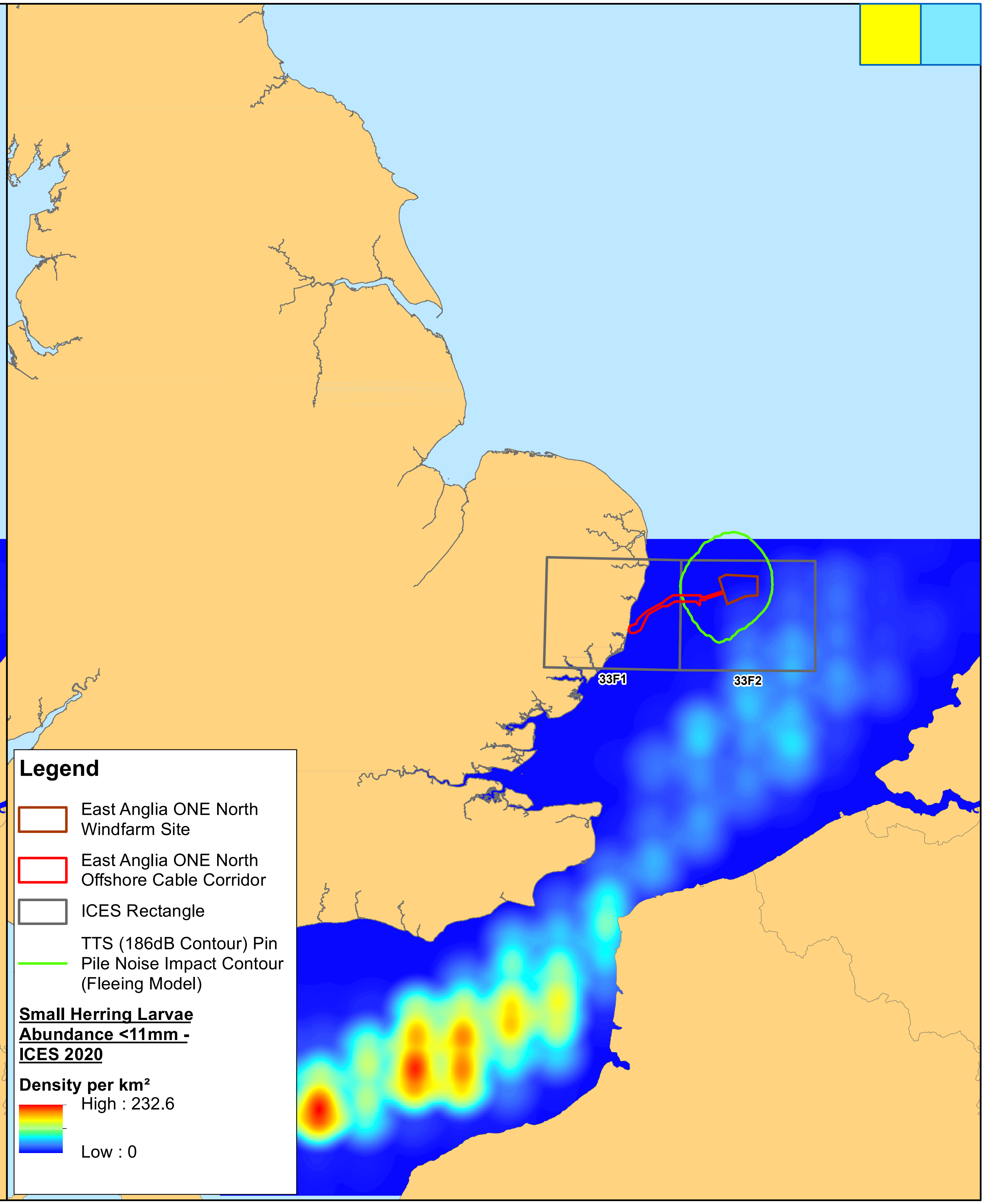

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0 25 50 100 Km

East Anglia TWO and East Anglia ONE North

IHLS Herring Small Larvae Abundance (January 2007 - 2017) in Relation to Worst Case Noise Impact Contour (Fleeing Model)

Drg No	EA1N-EA2-DEV-DRG-IBR-001100
Rev	1
Date	23/03/20
Figure	6

Datum: WGS 1984
Projection: Zone 31N

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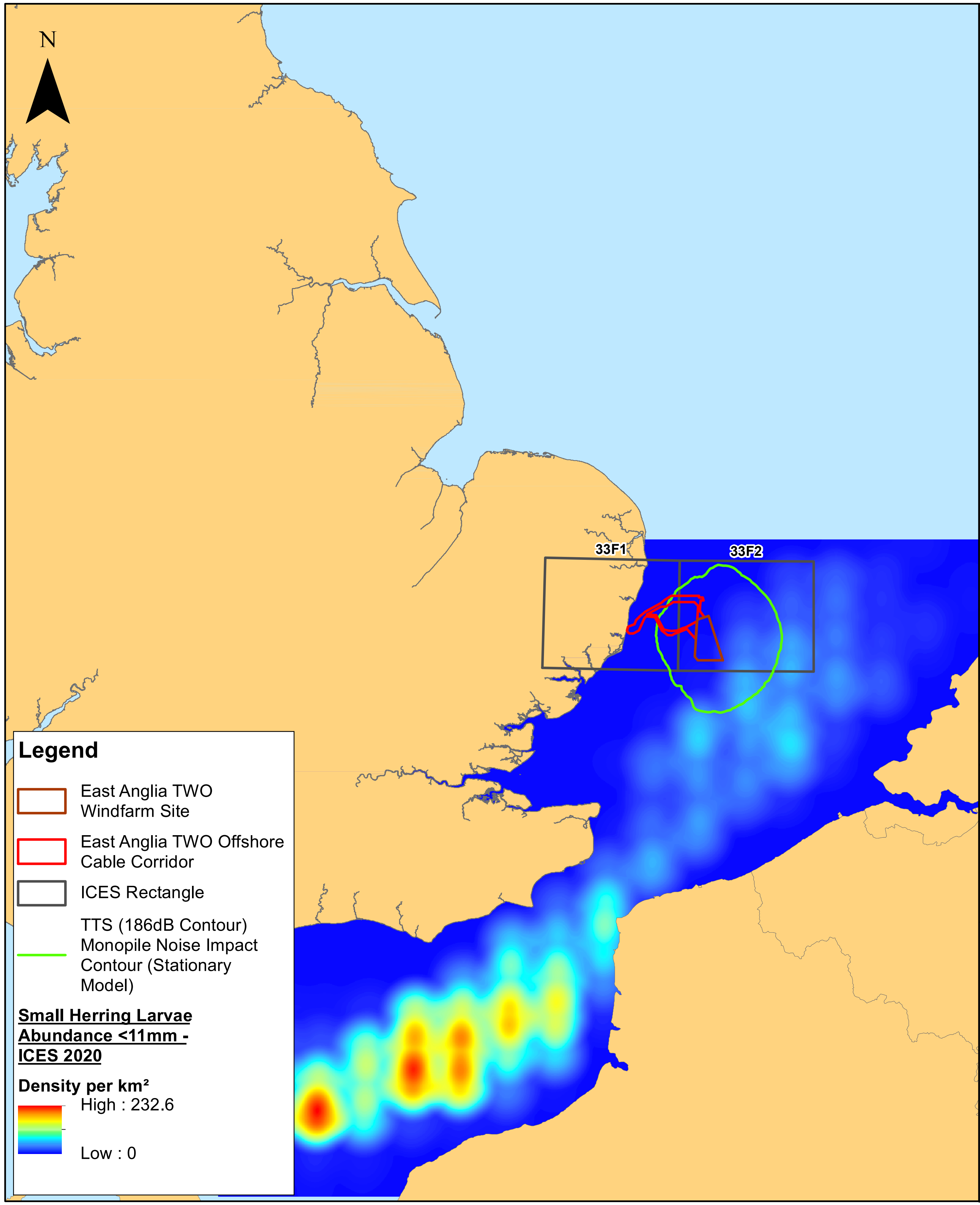

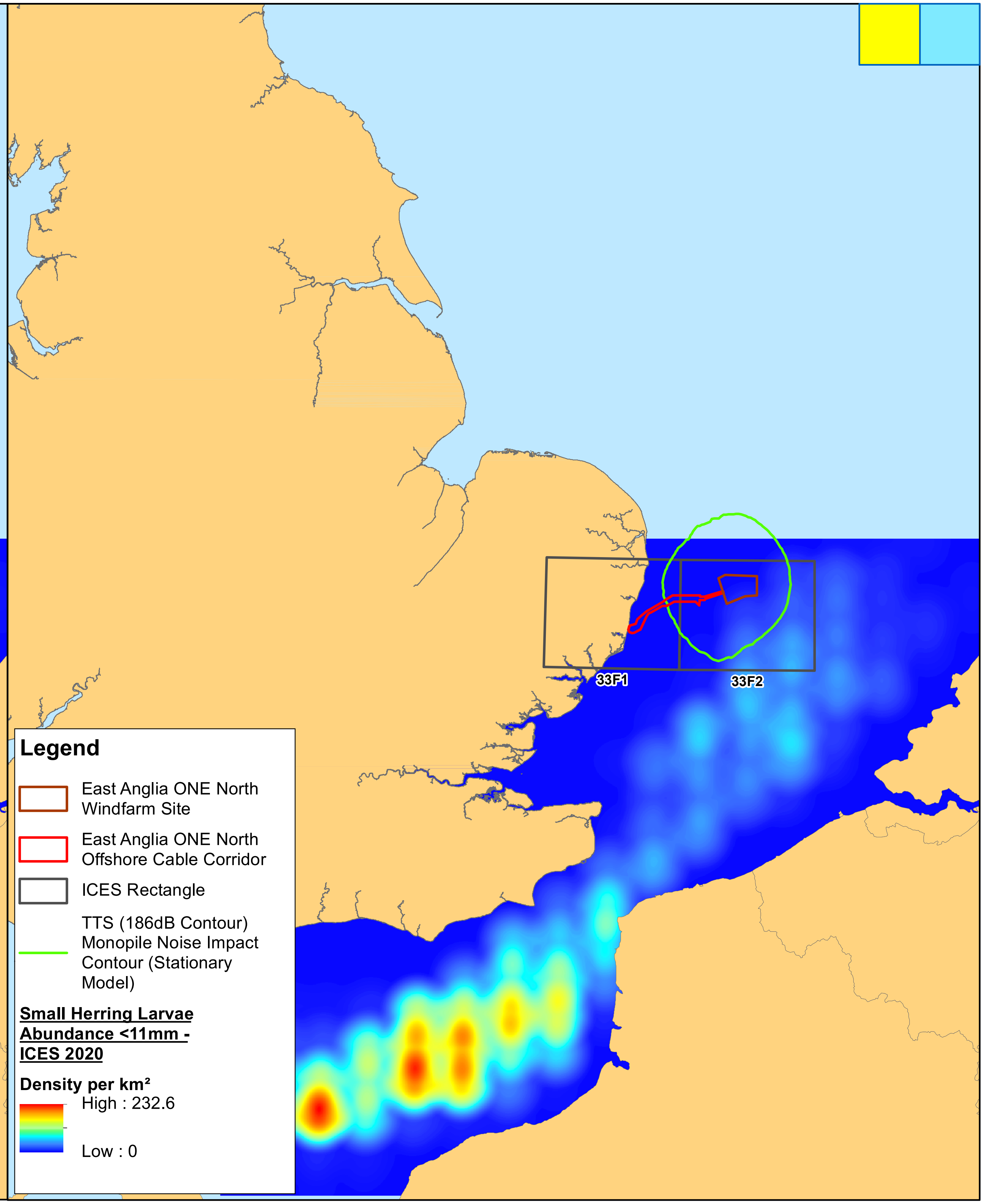

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East Anglia TWO and East Anglia ONE North
IHLS Herring Small Larvae Abundance (January 2007 - 2017) in Relation to Worst Case Noise Impact Contour (Stationary Model)

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Rev	1
Date	23/03/20
Figure	7

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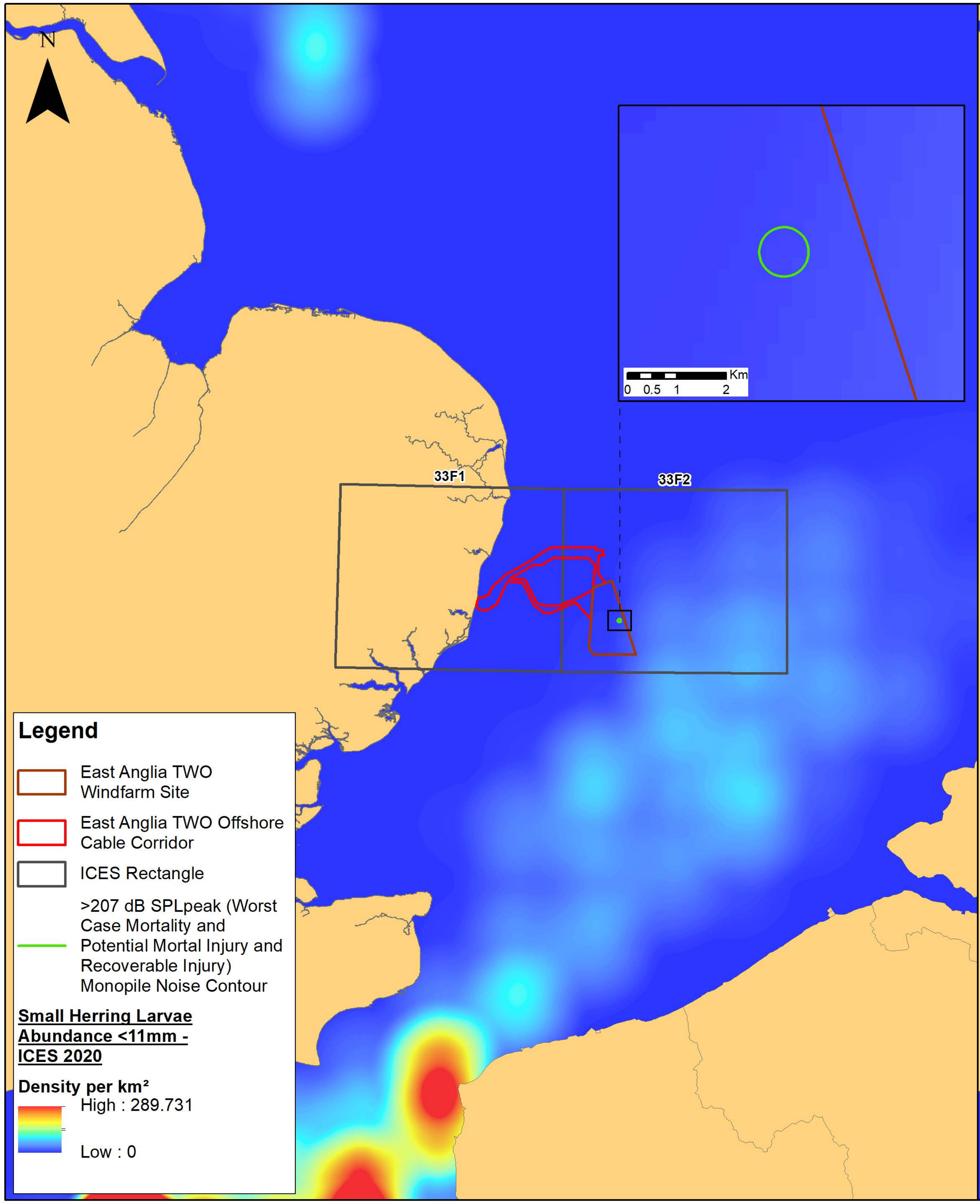

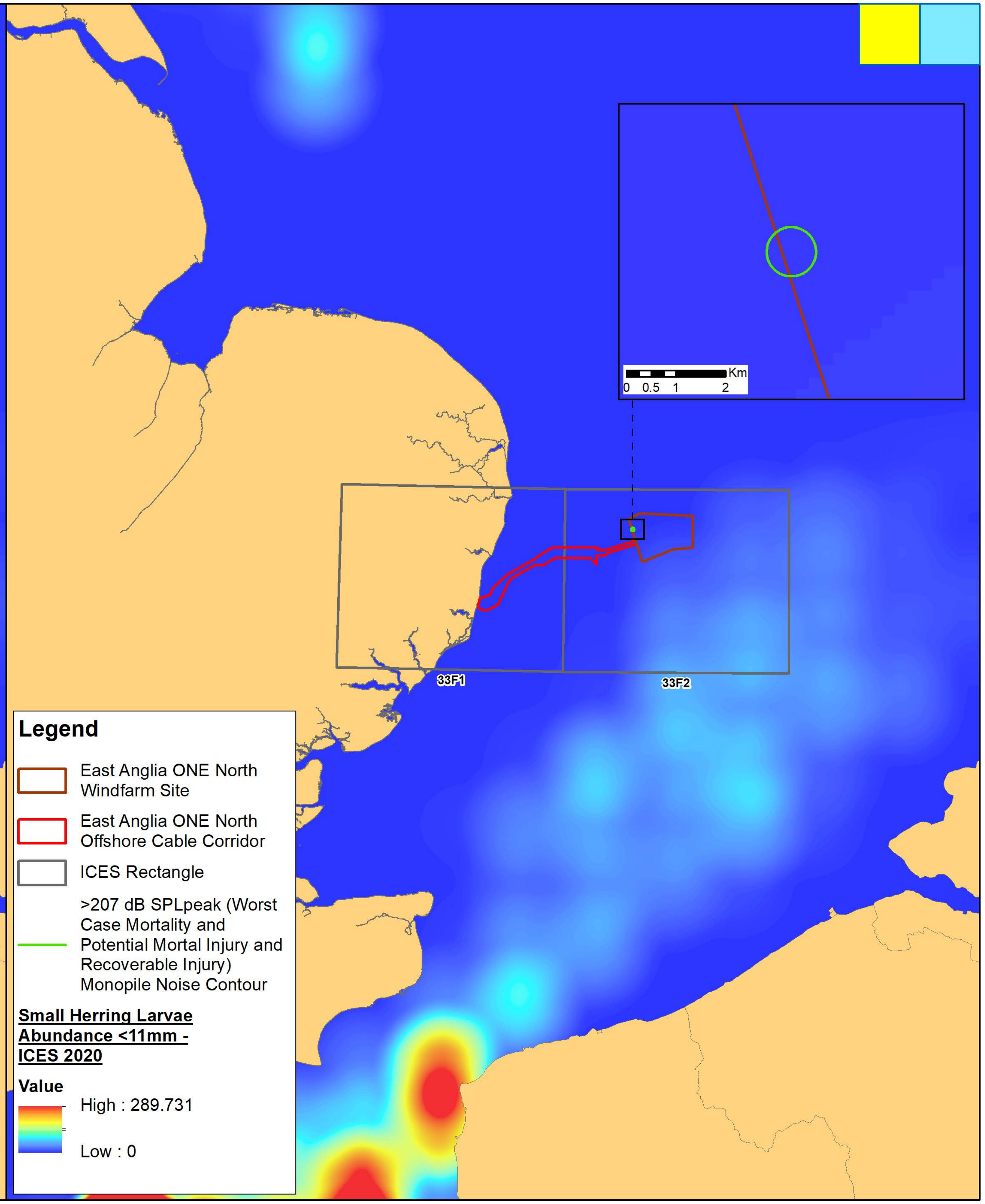

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East Anglia TWO and East Anglia ONE North
IHLS Herring Small Larvae Abundance (2007 - 2017) in Relation to Worst Case Peak Sound Pressure Level Contour

Drg No	EA1N-EA2-DEV-DRG-IBR-001103
Rev	1
Date	25/03/20
Figure	8

Datum: WGS 1984
Projection: Zone 31N

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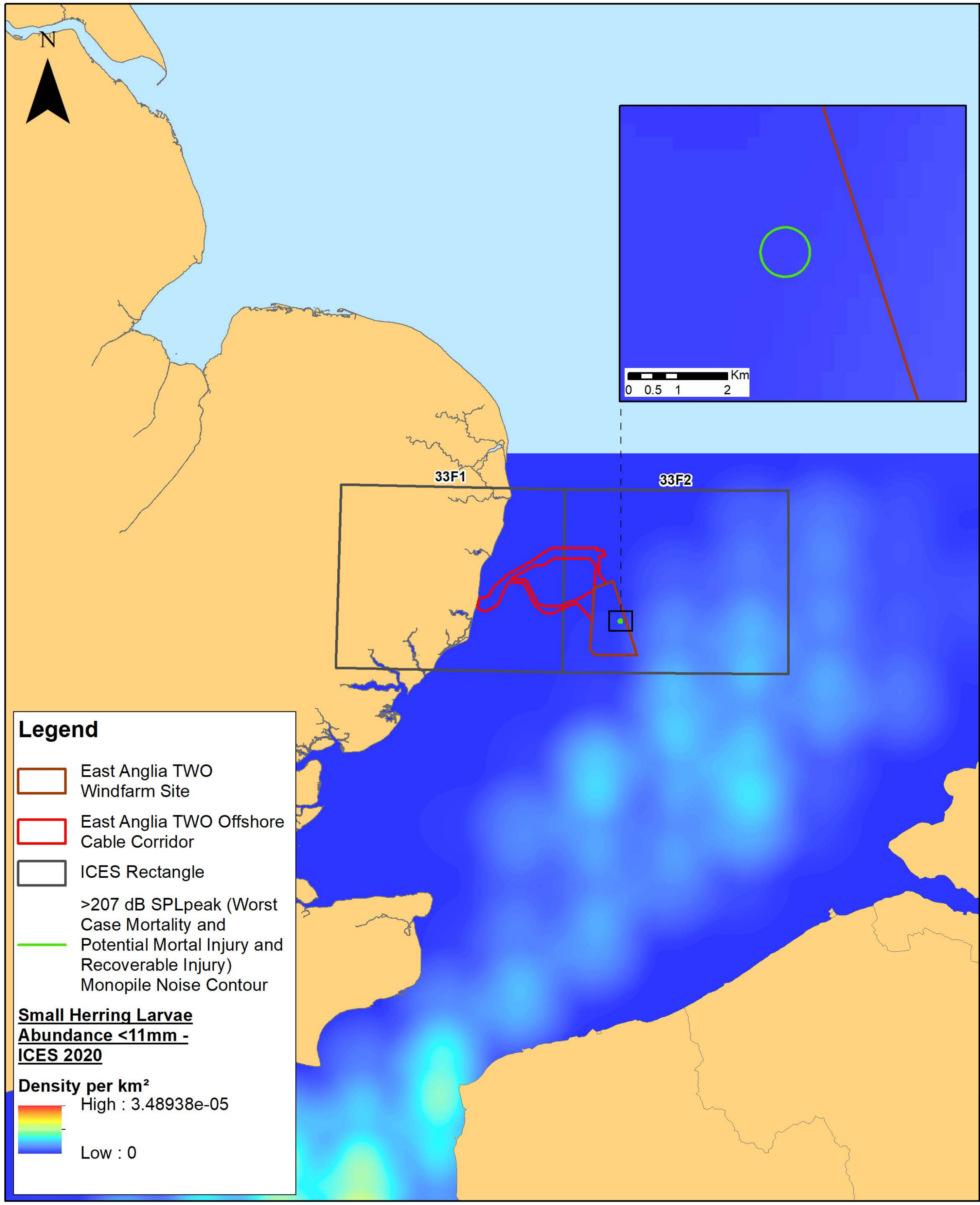

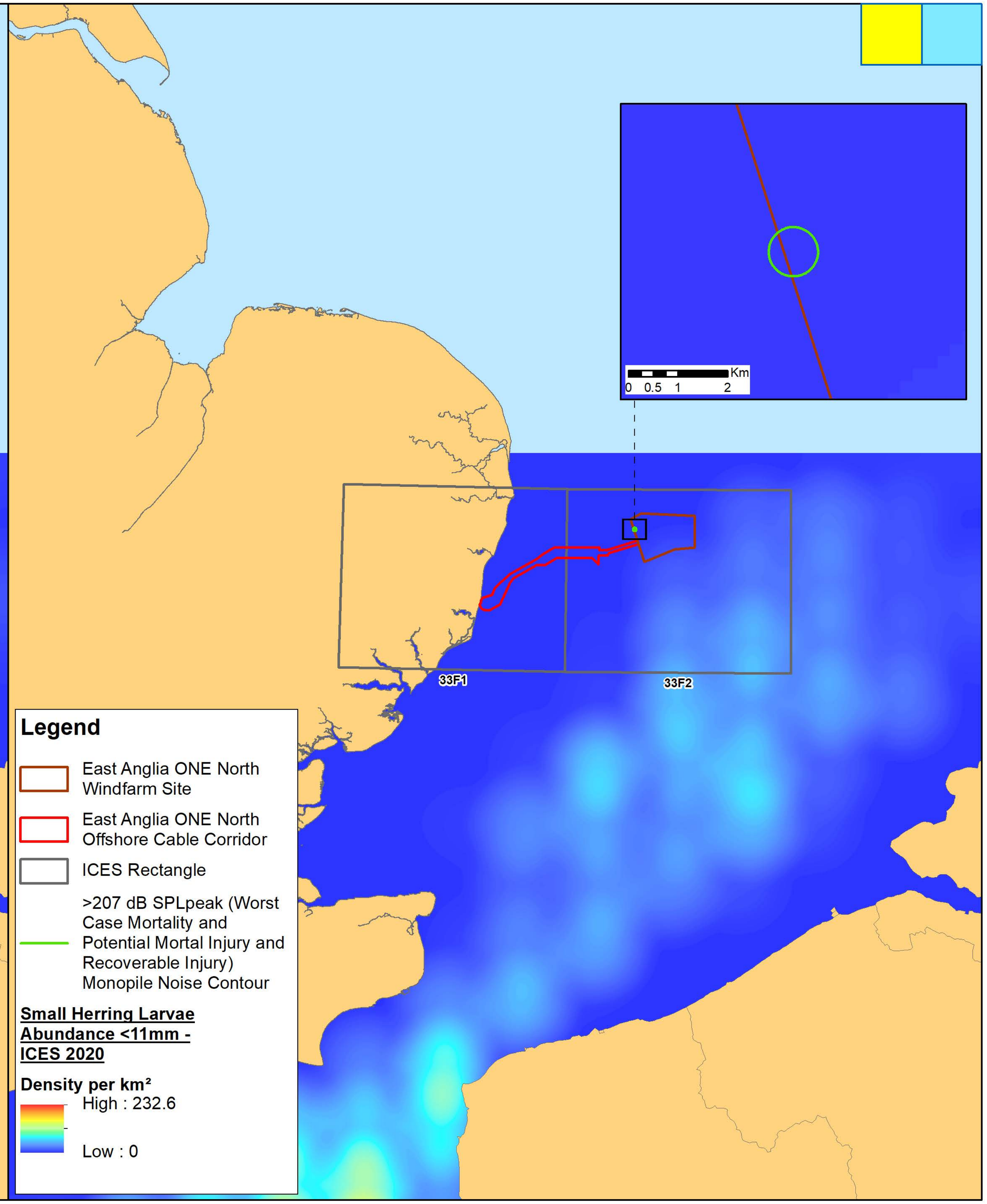

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1	25/03/2020	FC	First Issue.	Checked:	KC		
				Approved:	PP		

East Anglia TWO and East Anglia ONE North

IHLS Herring Small Larvae Abundance (January 2007 - 2017) in Relation to Worst Case Peak Sound Pressure Level Contour

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Rev	1	Datum: WGS 1984 Projection: Zone 31N
Date	25/03/20	
Figure	9	

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3 Shellfish

13. ***Section 10.6.1.2*** of ***Chapter 10 Fish and Shellfish Ecology*** (APP-058) assessed the potential impact of increased suspended sediments and sediment re-deposition during construction, operation and decommissioning on various shellfish species. As noted by the MMO in their relevant representation, the impact of increased suspended sediment concentrations (SSC) on whelk and King scallop *Pecten maximus* were not assessed within the ES, this was an Erratum. In order to address the representation made by the MMO, this section assesses the physiological effects of increased SSC on these two commercially valuable species.

14. Whelk lay demersal egg cases which are often found attached to subtidal rocks, stones or shells (Ager, 2008). For King scallop, the timing of spawning may be influenced by both internal and external factors such as age and temperature respectively (Barber and Blake, 1991). Dispersal potential in King scallop is high given that the length of the pelagic larval stage exceeds one month (Beaumont and Barnes, 1992)

15. There is limited information on the sensitivity of the common whelk to increased SSCs and deposition. The MarESA (Marine Evidence-based Sensitivity Assessment) assessment for the dog whelk *Nucella lapillus* (which belongs to the same taxonomic order (*Neogastropoda*)), however, indicates that the species is not sensitive to increased SSCs and smothering, albeit the evidence / confidence in the assessment is low (Tyler-Walters, 2007).

16. MarESA assigns a low sensitivity and high level of recoverability to increases in SCC for King scallop with a moderate evidence / confidence. Whilst the growth rates of adults are adversely affected by increases in SSCs (Bricelj and Shumway, 1991) they have the ability to swim and as such some individuals may be able to escape adverse conditions (Minchin and Buestel, 1983).

17. Given the relative tolerance of shellfish species to SSCs and smothering in the context of the small increases in SSCs and low level of re-deposition expected during the construction of the project, taking a precautionary approach, a medium sensitivity has been assigned for both whelk and King scallop.

18. As stated in ***section 10.6.1.2*** of ***Chapter 10 Fish and Shellfish Ecology*** (APP-058), the magnitude of effect for an increase in SSC from installation of the offshore infrastructure in the offshore development area is considered to be low given the localised and temporary nature of the effect, meaning that the area of habitat affected by the installation of the offshore cable corridor is small.

19. The impact of an increase in SSCs during construction on whelk and King scallops is therefore assessed to be of minor adverse significance.

20. As discussed in ***section 7.6.1*** of ***Chapter 7 Marine Geology Oceanography and Physical Processes*** (APP-055) Small volumes of sediment could be re-suspended during maintenance activities such as cable repair or from disturbance caused by jack up vessel legs and work vessel anchors. The volume of sediment disturbed would be lower than during construction and disturbance would be episodic. Scour due to the presence of foundations or cable protection may also cause localised SSC increases however it is not expected that this would result in large volumes being released. Therefore, the magnitude of effect would be negligible. Given the high recoverability of the species in the offshore development area to increases in suspended sediment, the sensitivity would be low (see ***section 10.6.1.2*** of ***Chapter 10 Fish and Shellfish Ecology*** (APP-058)). Therefore, an overall impact of **negligible** significance on whelk and King scallop would result due to increases in SSC during operation.

21. The sensitivity of receptors during the decommissioning is assumed to be the same as given for the construction phase. The magnitude of effect is considered to be no greater and in all probability less than that considered for the construction phase. Therefore, it is anticipated that any decommissioning impacts would be no greater, and probably less than those assessed for the construction phase.

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