East Anglia
Offshore Wind

VATTENFALL

SCOTTISHPOWER
RENEWABLES

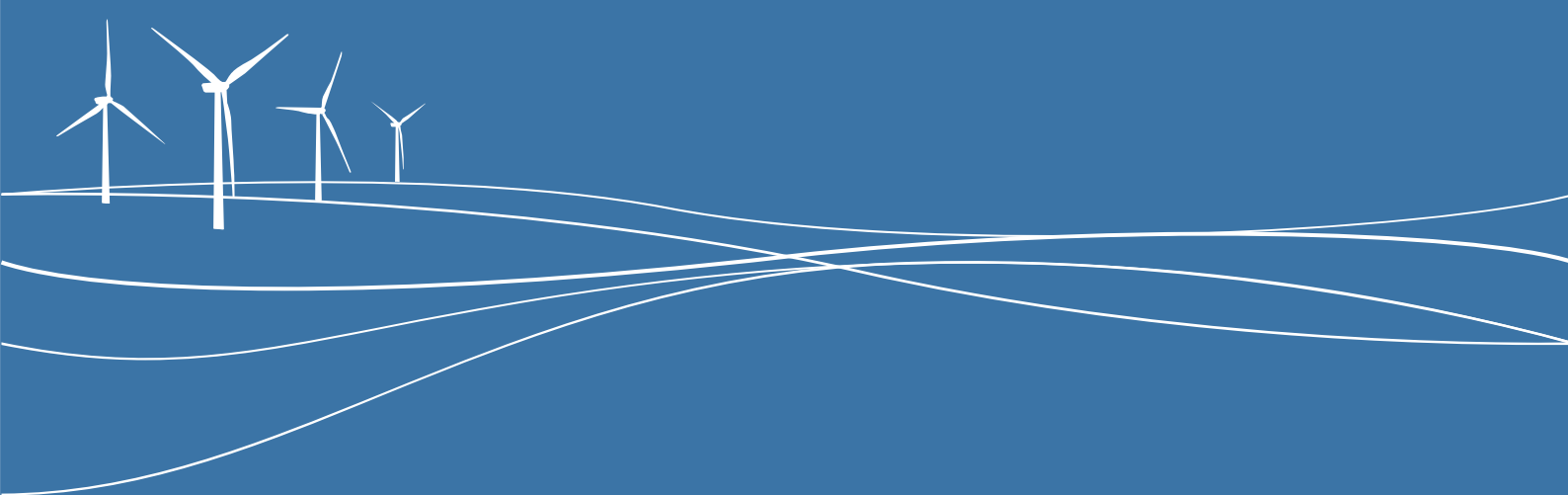
East Anglia THREE

Appendix 12.4

Netherlands seal telemetry data

Environmental Statement
Volume 3
Document Reference – 6.3.12 (4)

Author – IMARES
East Anglia THREE Limited
Date – November 2015
Revision History – Revision A



This Page Is Intentionally Blank

Table of Contents

12.4 NETHERLANDS SEAL TELEMETRY DATA

1. This appendix contains a report produced by IMARES for EATL which outlines the use of the East Anglia THREE site by seals tracked from the Netherlands.

Use of the East Anglia Offshore windfarm area, UK, by seals tracked from the Netherlands

Roger Kirkwood, Sophie Brasseur, Elze Dijkman and Geert Aarts

Report number C061/14

IMARES Wageningen UR

(IMARES - Institute for Marine Resources & Ecosystem Studies)

Client: Royal Haskoning DHV
Rightwell House, Bretton
Peterborough PE3 8DW, United Kingdom

IMARES project number - 4306123601

Publication date: 10 April 2014

IMARES WAGENINGEN UR

IMARES is:

- an independent, objective and authoritative institute that provides knowledge necessary for an integrated sustainable protection, exploitation and spatial use of the sea and coastal zones;
- an institute that provides knowledge necessary for an integrated sustainable protection, exploitation and spatial use of the sea and coastal zones;
- a key, proactive player in national and international marine networks (including ICES and EFARO).

P.O. Box 68
1970 AB IJmuiden
Phone: +31 (0)317 48 09 00
Fax: +31 (0)317 48 73 26
E-Mail: imares@wur.nl
www.imares.wur.nl

P.O. Box 77
4400 AB Yerseke
Phone: +31 (0)317 48 09 00
Fax: +31 (0)317 48 73 59
E-Mail: imares@wur.nl
www.imares.wur.nl

P.O. Box 57
1780 AB Den Helder
Phone: +31 (0)317 48 09 00
Fax: +31 (0)223 63 06 87
E-Mail: imares@wur.nl
www.imares.wur.nl

P.O. Box 167
1790 AD Den Burg Texel
Phone: +31 (0)317 48 09 00
Fax: +31 (0)317 48 73 62
E-Mail: imares@wur.nl
www.imares.wur.nl

A_4_3_2-V13.3

Contents

Summary

1. This report presents data on use by seals tracked from the Netherlands of a zone of the North Sea off the east coast of the UK, the East Anglia Zone, where it is proposed to develop offshore windfarms.

2. For this report, three areas of interest are distinguished within the East Anglia Zone: East Anglia THREE Offshore Windfarm (East Anglia THREE); East Anglia FOUR Offshore Windfarm (East Anglia FOUR) and the combined cable corridor for both projects.

3. In the Netherlands, seals have been tracked from two *Natura2000* areas: the Wadden Sea to the north and the Delta region to the south.

4. Approval was sought from current clients of IMARES to incorporate data from seal research they have sponsored. All clients supported sharing of the data.

5. Of 273 harbour seals fitted with trackers in the Netherlands between 1998 and 2013, ten came within 20km of an East Anglia area of interest and seven of those entered an area of interest.

6. Of 77 grey seals fitted with trackers in the Netherlands, six came within 20km of an East Anglia area of interest and four of those entered an area of interest.

7. Of the seals that entered an East Anglia area of interest, all but one probably spent >2% of their time-at-sea within that area. The exception was a harbour seal tracked from the Dutch Delta region (Zeeland) in 2007, which spent at least 2% and up to 17% of its time-at-sea within an area of interest.

Aims

1. To assess use of the East Anglia Zone, UK, by seals tracked from the Netherlands.

Introduction

2. East Anglia Zone for offshore windparks is located in the North Sea, close to the edge of the UK EEZ, and 70 to 90 km off the coast of Norfolk. For this report, three areas of interest are identified within the zone: East Anglia THREE Offshore Windfarm (East Anglia THREE); East Anglia FOUR Offshore Windfarm (East Anglia FOUR) and the combined cable corridor for both projects.

3. Harbour seals (*Phoca vitulina*) and grey seals (*Halichoerus grypus*) in the North Sea region represent single-species populations with movement by individuals and genetic exchange through the region. Grey seals particularly can travel long distances (hundreds of kilometres) between foraging and breeding sites. Most data available on movement at sea of seals comes from back-mounted devices (Argos transmitters or GPS receivers that transmit their data).

4. Compared with the total populations of harbour and grey seals, very few individuals have been tracked. However, those tracked provide useful traces to movement at the population level. The best data on movement and habitat use by the seals comes from compilations of all available data, and such data sets are continually growing. In the Netherlands, the Institute for Marine Resources and Ecosystem Studies (IMARES) have tracked seals since 1997. Most seals tracked by IMARES have remained in waters adjacent to the European mainland coast. Some have entered the EEZ of the United Kingdom, however, and a few of these have crossed the North Sea to reside for periods in coastal waters of the United Kingdom.

5. Tracking data of seals from the Netherlands augments tracking data from the UK. Much of the UK data is collected and compiled by the Sea Mammal Research Unit (SMRU), St Andrews, using tracking devices that are built by SMRU. In the Netherlands, IMARES have used the same or comparable tracking devices for all satellite tracking studies.

6. This project component provides data on grey and harbour seals tracked from the Netherlands that have entered or come close to entering the East Anglia THREE and East Anglia FOUR sites, including the combined cable corridor.

7. All seals in the Netherlands haul-out in Natura2000 designated sites, either in the Waddenzee (SCI NL1000001) or the Delta region (Voordelta SCI NL400017, Oosterschelde SCI NL300916 and Westerschelde & Saeftinghe SCI NL9803061). Individual harbour and grey seals have been tracked between the two regions, and to other national waters, including into other Natura2000 sites.

Assignment

8. RHDHV provided shapefiles of the areas of interest (East Anglia THREE, East Anglia FOUR, and the combined cable corridor), and map templates. The tasks for this project were:

- Seek permission from current IMARES clients to incorporate tracking data collected for them and relevant to the East Anglia areas of interest.
- Analyse existing IMARES data in seal tracking – extract data pertinent to the area of interest.
- From available data, relate movement of seals from the Netherlands to the East Anglia areas of interest (i.e East Anglia THREE, East Anglia FOUR and the combined cable corridor).
- Submit a summary report. The report was to be brief, providing methods and results, without interpretation.

Acknowledgements

9. Approval was sought from current IMARES clients to incorporate data from seal research they had sponsored. All, including Groningen Seaports and several energy companies, supported the data sharing and we acknowledge their support.

Methods

10. Between 1998 and 2013, seals were caught at haul-out sites using a large seine net, and transmitters were glued to the fur on their shoulders using quick setting epoxy. Captured seals were sexed, weighed and measured before release. Transmitters were not recovered and were shed as the seals approached their next moult, which is in mid-winter for grey seals and in mid-summer for harbour seals. All tracking studies received ethical approval from the Dutch Animal Ethics Committee of the Royal Netherlands Academy of Sciences, and received all required governmental licences.

11. Durations of location data acquisition varied between seals. For some, no data were collected, whereas for others more than 180 days of location data were collected.

12. Several types of devices were used (Table 1.1).

Table 1.1. Tracking devices attached to seals in the Netherlands, 1997 to 2013

Year	Company	Location determination
1997 to 2004	Wildlife Computers	Argos linked
2004 to 2007	Sea Mammal Research Unit	Argos linked
2007 to 2013	Sea Mammal Research Unit	Fastloc GPS - GSM phone link

13. Location predictions by Argos devices are based on transmission of a code to polar orbiting satellites (http://www.cls.fr/). The locations are calculated by measuring the Doppler shift on the transmitter signals. Location estimates range in accuracy depending on geometry of the satellite relative to transmitter, the number of uplinks received and the stability of the frequency.

14. 'Fastloc' GPS-GSM devices determine location 'on-board' then relay the data through a GSM (phone) network. The Fastloc devices collect and store a location (approximately) every 20 min. and can store location data for up to 3 months.

15. Argos location estimates generally are not as accurate as GPS location estimates and are received less frequently. Errors associated with Argos location estimates have been predicted. Using these, a method for data processing (Geert Arts, unpublished data) was adopted to overcome biases caused by potential inclusion of false locations or exclusion of true locations, which can be an issue with some filtering procedures. The method combines information on land-features, the magnitude of Argos error associated with each telemetry observation (Vincent et al. 2002) and speed with which animals can travel. Based on error estimates, random locations were generated around every Argos location and the probability of the seal being at each location was calculated. When a random location fell on land, it was not accepted. A speed filter then removed unrealistic locations. By repeatedly generating random locations, it was possible to find the location that was most likely to be true. The final product of this algorithm was a new set of positions. All Argos tracks presented in this report were subjected to this treatment.

16. Totals of 273 harbour seals and 77 grey seals have been fitted with location determination devices in the Netherlands (Table 1.2 and 1.3).

Table 1.2. Harbour seals tracked from sites in the Netherlands up to 2013

Year	Month	Natura2000 SCI	Location	Female	Male	Total
1997	Sept	Voordelta	Brielse Gat	4	4	8
1998	March	Waddenzee	Lauwerswal	12	8	20
1998	March	Voordelta	Brielse Gat	4	4	8
1998	Sept	Oosterschelde		4	2	6
1999	March	Oosterschelde		2	4	6
1999	April	Voordelta	Brielse Gat	4	2	6
2000	Feb/Mar	Oosterschelde		6	4	10
2000	Aug/Sep	Oosterschelde		2	6	8
2002	Nov	Waddenzee	Texel	4	4	8
2003	Feb	Waddenzee	Texel	6	8	14
2004	Oct	Waddenzee	Texel	2	4	6
2004	Oct	Waddenzee	Lauwerswal	4	6	10
2005	Oct	Waddenzee	Hansweert	10	2	12
2005	Nov	Waddenzee	Steenplaat	2	10	12
2007	March	Waddenzee	Hansweert	0	12	12
2007	March	Waddenzee	Steenplaat	4	8	12
2007	Sept	Waddenzee	Steenplaat	2	10	12
2007	Sept	Waddenzee	Hansweert	0	9	9
2009	March	Waddenzee	Eems	12	10	22
2009	Sept	Waddenzee	Eems	15	11	26
2010	Nov	Waddenzee	Eems	12	12	24
2013	March	Waddenzee	Eierlandse Gat	2	4	6
2013	March	Voordelta	Renesse	3	3	6
2013	Sept	Waddenzee	Pinkengat	4	6	10
TOTAL				108	141	273

Table 1.3. Grey seals tracked from sites in the Netherlands up to 2013

Year	Month	Natura2000 SCI	Site	Female	Male	Total
2005	April	Waddenzee	Razende Bol	8	4	12
2005	Nov	Waddenzee	Steenplaat	3	3	6
2006	May	Waddenzee	Steenplaat	6	6	12
2007	April	Waddenzee	Steenplaat	8	2	10
2008	Sept	Waddenzee	Noorderhaaks	2	10	12
2013	March	Waddenzee	Eierlandse Gat	6	0	6
2013	March	Voordelta	Brouwersdam	2	4	6
2013	May	Waddenzee	Eierlandse Gat	2	1	3
2013	Sept	Waddenzee	Pinkengat	6	4	10
TOTAL				43	34	77

17. Data were processed in a Microsoft Access data base, analysed using the R-statistical framework, and tables were prepared in Microsoft Excel. Maps were prepared in ArcGIS version 10.

18. Data were filtered to extract at-sea data and remove time spent on land at haul-outs and colonies. Prior knowledge and 'wet-dry' sensors in the trackers were used in the determination of on-land sites. Seals were assumed to be at on land if located within 5km or 200m, respectively for the Argos and Fastloc GPS trackers.

19. Overlap was determined between seal tracks and the three areas of interest: East Anglia THREE; East Anglia FOUR and the combined cable corridor. The time seals spent within the zones was estimated then converted to a percentage of each seal's recorded time-at-sea.

20. An estimate of each seal's maximum time in a zone of interest was determined as the period between the location preceding entry into the zone and the first location on exiting the zone. Minimum times were determined as the period between the first and last location recorded in the zone.

Results

21. Of the seals tracked from the Netherlands between 1998 and 2007, those that came within 20km of an East Anglia area of interest included eight harbour seals captured in the Delta region, and two harbour seals plus six grey seals captured in the Wadden Sea (Table 1.4).

Table 1.4. Capture location and biological data on Dutch seals for which locations <20km from East Anglia areas of interest were recorded.

Species	ID	Year	Tracker	Natura2000 SCI	Location	Sex	Length	Weight
							cm	kg
Harbour	5BX	1998	Argos	Voordelta	Brielse Gat	M		50
Harbour	7BX	1998	Argos	Voordelta	Brielse Gat	F		45
Harbour	1B3	1999	Argos	Voordelta	Brielse Gat	M	106	46
Harbour	150S	2000	Argos	Oosterschelde		F	133	85
Harbour	180S	2000	Argos	Oosterschelde		M	150	93
Harbour	210S	2000	Argos	Oosterschelde		F	125	51
Harbour	G	2007	GSM	Voordelta	Zeeland	M	104	27
Harbour	J	2007	GSM	Voordelta	Zeeland	M	116	40
Harbour	32	2010	GSM	Waddenzee	Eems			
Harbour	912	2013	GSM	Waddenzee	Ameland	F	141	75
Grey	12147	2005	Argos	Waddenzee	Eierlandse Gat	F	154	68
Grey	5162	2005	Argos	Waddenzee	Eierlandse Gat	F	158	62
Grey	717	2008	GSM	Waddenzee	Eierlandse Gat	M	168	111
Grey	T730b	2013	GSM	Waddenzee	Razende Bol	M	125	42
Grey	T737	2013	GSM	Waddenzee	Eierlandse Gat	F	137	130
Grey	911	2013	GSM	Waddenzee	Eierlandse Gat	F	216	96

22. Locations within an East Anglia area of interest were recorded for seven harbour seals and four grey seals (Table 1.5).

Table 1.5. Seals tracked from sites in the Netherlands for which locations <20km from the East Anglia areas of interest were recorded, and the closest locations to an area estimated for those seals. Zero indicates the data suggest the seal entered the area.

Species	ID	Year	Tracker	Closest location (km)		
				Corridor	East Anglia THREE	East Anglia FOUR
Harbour	5BX	1998	Argos	0.00	0.00	0.00
Harbour	7BX	1998	Argos	0.00	65.75	45.39
Harbour	1B3	1999	Argos	0.00	61.27	36.13
Harbour	150S	2000	Argos	18.74	12.84	14.24
Harbour	180S	2000	Argos	1.74	110.66	83.61
Harbour	210S	2000	Argos	0.00	67.47	48.95
Harbour	G	2007	GSM	0.00	15.44	6.32
Harbour	J	2007	GSM	0.00	1.66	7.02
Harbour	32	2010	GSM	7.25	0.00	0.07
Harbour	912	2013	GSM	41.54	13.69	25.28
Grey	12147	2005	Argos	29.93	2.16	20.19
Grey	5162	2005	Argos	0.00	0.00	7.38
Grey	717	2008	GSM	27.53	0.30	12.49
Grey	T730b	2013	GSM	0.00	0.49	10.90
Grey	T737	2013	GSM	0.00	62.69	61.13
Grey	911	2013	GSM	0.26	0.00	4.18

23. Of the seals that entered an East Anglia area of interest, all but one are likely to have spent less than 2% of their time-at-sea within the area (Table 1.6). The exception, harbour seal 'G' (2007), spent at least 2% and up to 17% of its time-at-sea within an East Anglia area of interest. The broad range of the estimate is because this seal frequently crossed the areas of interest but provided few locations at sea.

Table 1.6. Percentage of sea time that was within or near (including within) the East Anglia areas of interest (see Appendix Table for more detail). Maxima and minima are based on available locations and times (see text). *Yes* indicates time within the area was brief and could not be estimated due to low quality of location data.

Species	ID	Year	Tracker	At sea	Within EA areas of interest		Near EA areas of interest (20km)	
				days	max%	min%	max%	min%
Harbour	5BX	1998	Argos	93	*yes*	*yes*	*yes*	*yes*
Harbour	7BX	1998	Argos	70	0.93	0.43	8.19	5.28
Harbour	1B3	1999	Argos	55	*yes*	*yes*	7.24	3.37
Harbour	150S	2000	Argos	142			0.29	0.07
Harbour	180S	2000	Argos	100			3.89	2.01
Harbour	210S	2000	Argos	145	*yes*	*yes*	*yes*	*yes*
Harbour	G	2007	GSM	100	16.94	2.00	33.57	24.65
Harbour	J	2007	GSM	80	2.61	0.58	19.75	18.60
Harbour	32	2010	GSM	116	0.39	0.34	2.49	2.23
Harbour	912	2013	GSM	46			0.91	0.87
Grey	12147	2005	Argos	50			1.66	0.10
Grey	5162	2005	Argos	230	*yes*	*yes*	*yes*	*yes*
Grey	717	2008	GSM	8			8.68	8.19
Grey	T730b	2013	GSM	12	1.31	0.12	67.24	55.26
Grey	T737	2013	GSM	250	0.82	0.33	7.43	6.22
Grey	911	2013	GSM	7	0.25	0.20	8.80	8.20

24. Data on percentage of time seals spent in individual areas of interest are presented in Appendix A.

25. Maps of the tracks of seals that had locations within 20km of the East Anglia areas of interest are presented in Appendix B (regional and local sets of maps).

26. Further information on recent status and tracking studies of seals in the Netherlands can be obtained from the following: (Reijnders et al. 2000, Härkönen et al. 2007, Brasseur et al. 2010, Brasseur et al. 2011, McCarthy et al. 2011, Brasseur et al. 2012a, Brasseur et al. 2012b, Galatius et al. 2012, Aarts et al. 2013, Brasseur et al. 2013a, Brasseur et al. 2013b, Brasseur et al. in prep.).

References

Aarts G, Brasseur S, Geelhoed S, van Bemmelen R, Leopold M (2013) Grey and harbour seal spatiotemporal distribution along the Dutch West coast. In. Report to ENECO, IMARES Wageningen UR

Brasseur S, Aarts G, Meesters E, van Polanen Petel T, Dijkman E, Cremer J, Reijnders P (2012a) Habitat preferences of harbour seals in the Dutch coastal area: analysis and estimate of effects of offshore wind farms. In. Report C043-10, IMARES Wageningen UR

Brasseur S, Reijnders P, Meesters E, Aarts G, Cremer J (2011) Harbour seals, *Phoca vitulina*, in relation to the wind farm site OWEZ, in the Netherlands. In. Report IMARES Wageningen UR, Wageningen

Brasseur S, van Polanen Petel T, Aarts G, Meesters E, Dijkman E, Reijnders P (2010) Grey seals (*Halichoerus grypus*) in the Dutch North Sea: population ecology and effects of wind farms. In. Report C137/10, IMARES Wageningen UR

Brasseur S, van Polanen Petel T, Aarts G, Meesters E, Reijnders P (in prep.) Development and expansion of the grey seal population in the Dutch Wadden Sea. Marine Mammal Science

Brasseur SMJM, Borchardt T, Czeck R, Jensen LF, Galatius A, Ramdohr S, Siebert U, Teilman J (2012b) Aerial surveys of grey seals in the Wadden Sea in 2011-2012: increase in Wadden Sea grey seals continued in 2012. In. Common Wadden Sea Secretariate (CWSS)

Brasseur SMJM, Cremer JSM, Dijkman EM, Verdaat JP (2013a) Monitoring van gewone en grijze zeehonden in de Nederlandse Waddenzee, 2002-2012. In: WOt-werkdocument, Book 352. Wageningen UR, Wageningen

Brasseur SMJM, Diederichs B, Czeck R, Jensen LF, Galatius A, Ramdohr S, Siebert U, Teilman J, Körber P, Klöpper S (2013b) Trilateral Seal Expert Group (TSEG). Aerial surveys of grey seals in the Wadden Sea in 2012-2013: Mixed messages. In, http://www.waddensea-secretariat.org/sites/default/files/downloads/TMAP_downloads/Seals/aerial_surveys_of_grey_seals_in_the_wadden_sea_in_the_season_of_2012-13.pdf

Galatius A, Brasseur SMJM, Reijnders PJH, Borchardt T, Siebert U, Stede M, Ramdohr S, Jensen LF, Teilman J (2012) Aerial Surveys of Harbour Seals in the Wadden Sea in 2012: substantial increases in moult counts. In. Common Wadden Sea Secretariate, http://www.waddensea-secretariat.org/sites/default/files/downloads/trilateral_seal_counts_report_2012.pdf

Härkönen T, Brasseur S, Teilmann J, Vincent C, Dietz D, Abt K, Reijnders P (2007) Status of grey seals along mainland Europe from the southwestern Baltic to France. NAMMCO Sci Publ 6:57-68

McCarthy AJ, Shaw MA, Jepson PD, Brasseur SMJM, Reijnders PJH, Goodman SJ (2011) Variation in European harbour seal immune response genes and susceptibility to phocine distemper virus (PDV). Infect Genet Evol 11:1616-1623

Reijnders PJH, Brasseur SMJM, Brinkman AG (2000) Habitatgebruik en aantalsontwikkelingen van gewone zeehonden in de Oosterschelde en het overige Deltagebied. In, Book 78. Alterra, Research Instituut voor de Groene Ruimte, Wageningen

Vincent C, McConnell BJ, Fedak MA, Ridoux V (2002) Assessment of Argos location accuracy from satellite tags deployed on captive grey seals. Marine Mammal Science 18:301-322

Quality Assurance

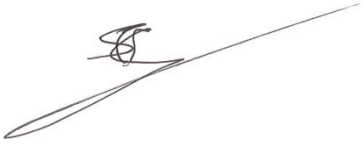
IMARES utilises an ISO 9001:2008 certified quality management system (certificate number: 124296-2012-AQ-NLD-RvA). This certificate is valid until 15 December 2015. The organisation has been certified since 27 February 2001. The certification was issued by DNV Certification B.V. Furthermore, the chemical laboratory of the Fish Division has NEN-EN-ISO/IEC 17025:2005 accreditation for test laboratories with number L097. This accreditation is valid until 1th of April 2017 and was first issued on 27 March 1997. Accreditation was granted by the Council for Accreditation.

Justification

Rapport: C061/14

Project Number: 4306123601

The scientific quality of this report has been peer reviewed by the a colleague scientist and the head of the department of IMARES.

Approved:	Ir Steve C. V. Geelhoed Researcher
Signature:	
Date:	10 April 2014

Approved:	Jakob Asjes Head Ecosystems Department
Signature:	
Date:	10 April 2014

Appendix A. Percentage of sea time that seals tracked from the Netherlands spent in and within 20km of the East Anglia zone for offshore windparks.

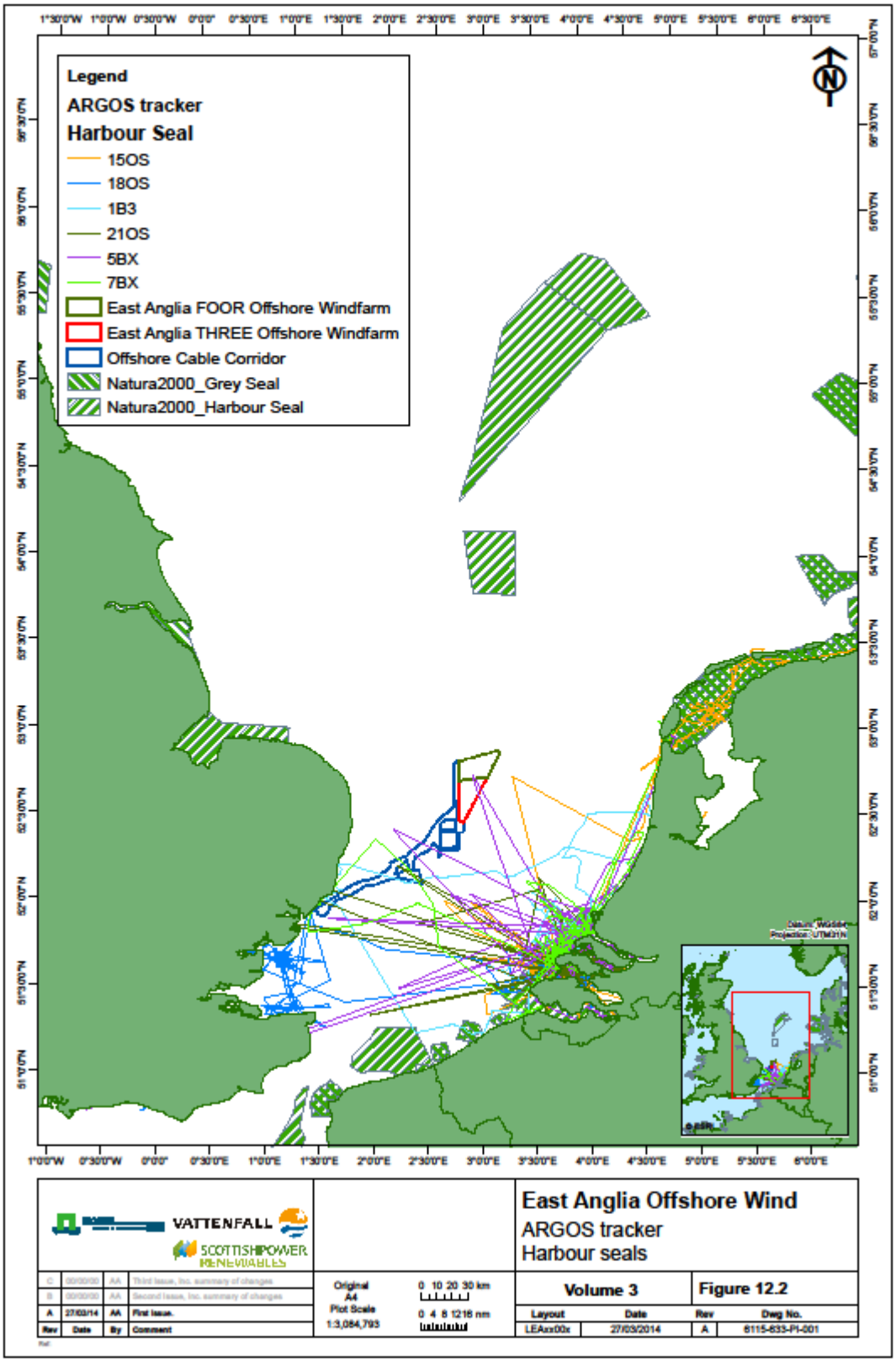
Maxima and minima are based on available locations and times (see text). *Yes* indicates time within the area was brief and could not be estimated due to a low quality of location data.

Species	ID	Year	Sea	Percentage of sea time spent within an area								Percentage of sea time spent within 20km from and in an area							
			days	Corridor		EA4		EA3		ALL		Corridor		EA4		EA3		ALL	
				max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min
Harbour	5BX	1998	93	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*
Harbour	7BX	1998	70	0.93	0.43					0.93	0.43	8.19	5.28					8.19	5.28
Harbour	1B3	1999	55	*yes*	*yes*					*yes*	*yes*	7.24	3.37					7.24	3.37
Harbour	150S	2000	142									0.29	0.07					0.29	0.07
Harbour	180S	2000	100									3.89	2.01					3.89	2.01
Harbour	210S	2000	145	*yes*	*yes*					*yes*	*yes*	*yes*	*yes*					*yes*	*yes*
Harbour	G	2007	100	16.94	2.00					16.94	2.00	33.57	24.65	3.26	0.30	3.26	0.30	33.57	24.65
Harbour	J	2007	80	2.61	0.58					2.61	0.58	19.75	18.60	4.41	0.65	4.41	0.65	19.75	18.60
Harbour	32	2010	116					0.39	0.34	0.39	0.34	1.11	1.08	2.49	2.23	1.42	1.38	2.49	2.23
Harbour	912	2013	46											0.91	0.87			0.91	0.87
Grey	12147	2005	50											1.66	0.10			1.66	0.10
Grey	5162	2005	230	*yes*	*yes*			*yes*	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*
Grey	717	2008	8											8.68	8.19	2.95	1.29	8.68	8.19
Grey	T730b	2013	12	10.56	0.99					1.31	0.12	63.35	52.77	28.25	5.94	41.40	11.23	67.24	55.26
Grey	T737	2013	250	0.33	0.13					0.82	0.33	7.43	6.22					7.43	6.22
Grey	911	2013	7	0.27	0.27	3.35	2.67			0.25	0.20	4.93	4.53	6.50	5.73	8.52	7.64	8.80	8.20

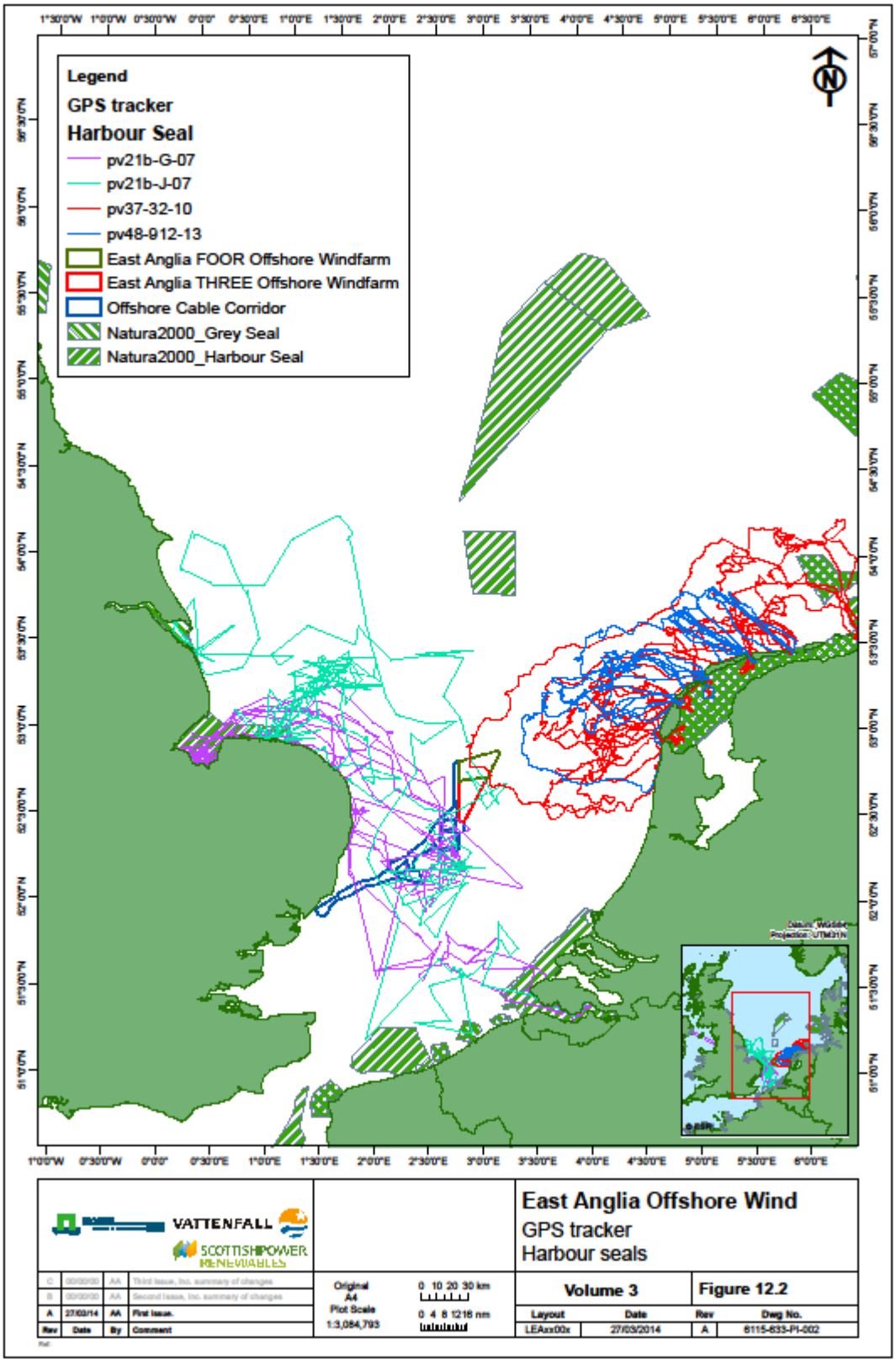
Appendix B. Maps of routes determined for seals that were tracked from the Netherlands and entered or came within 20km of the East Anglia zone for offshore windparks.

Regional maps

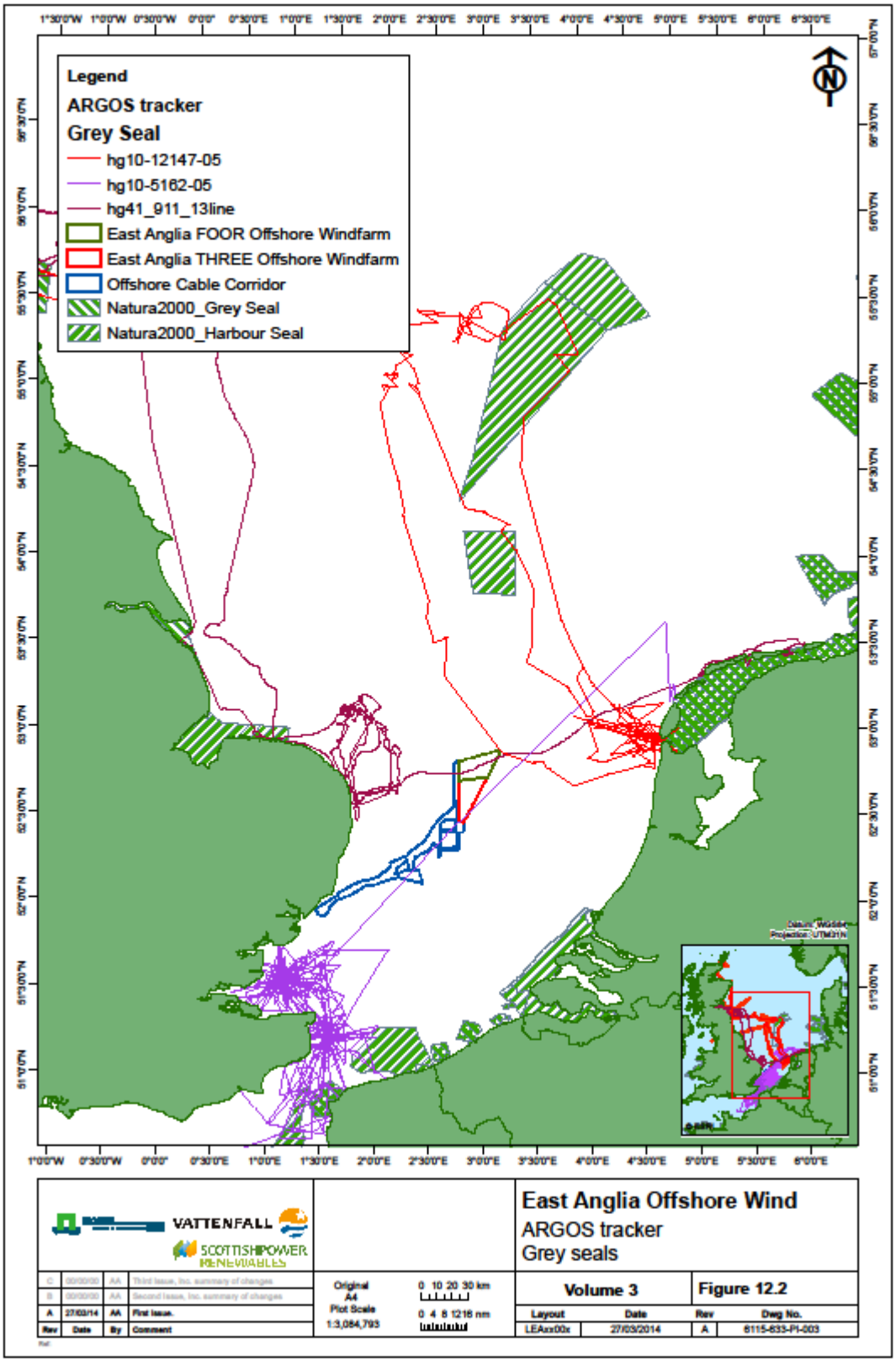
Local maps



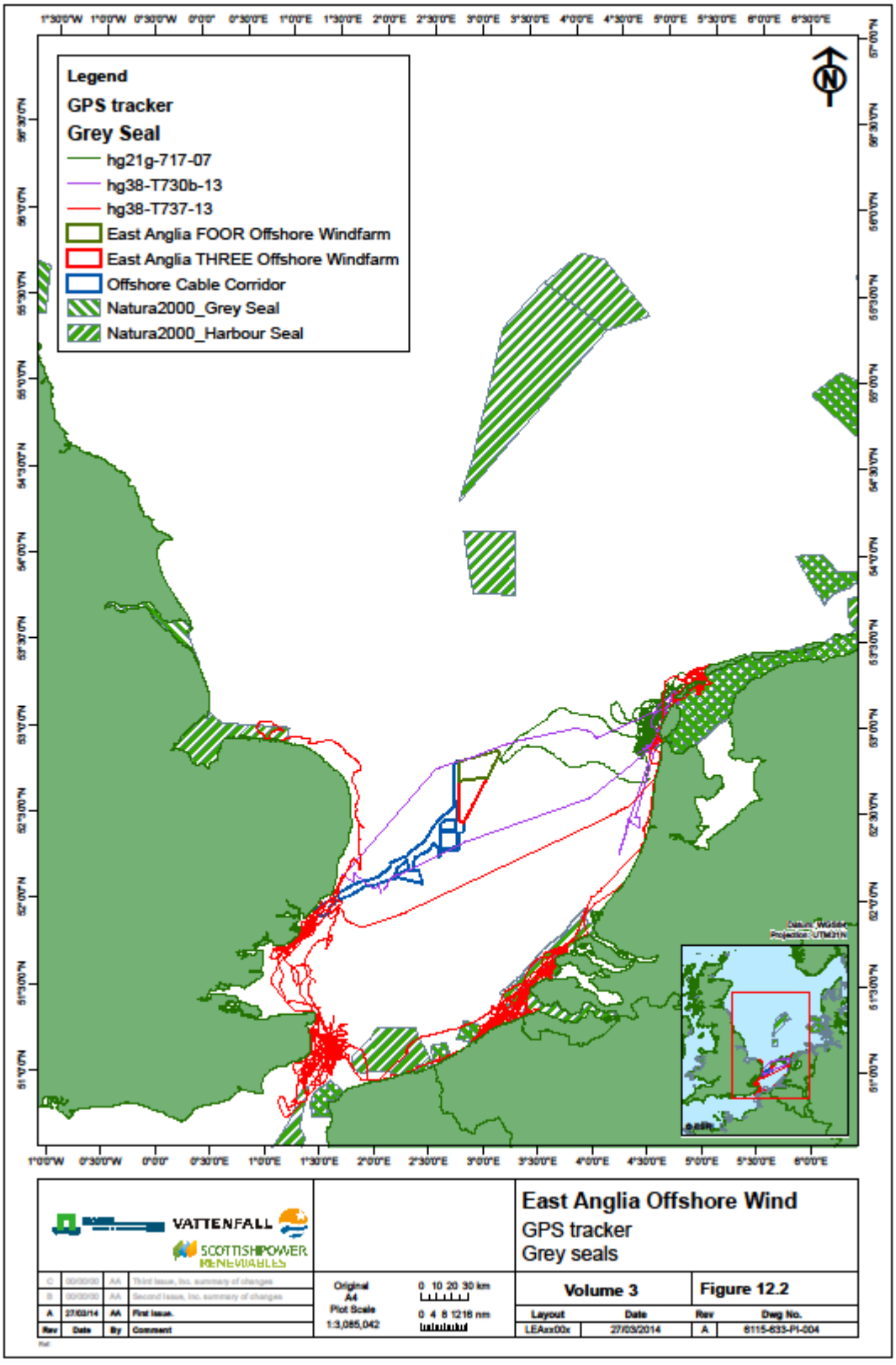
Appendix B. Figure a1. Harbour seals tracked using the Argos location system – regional.



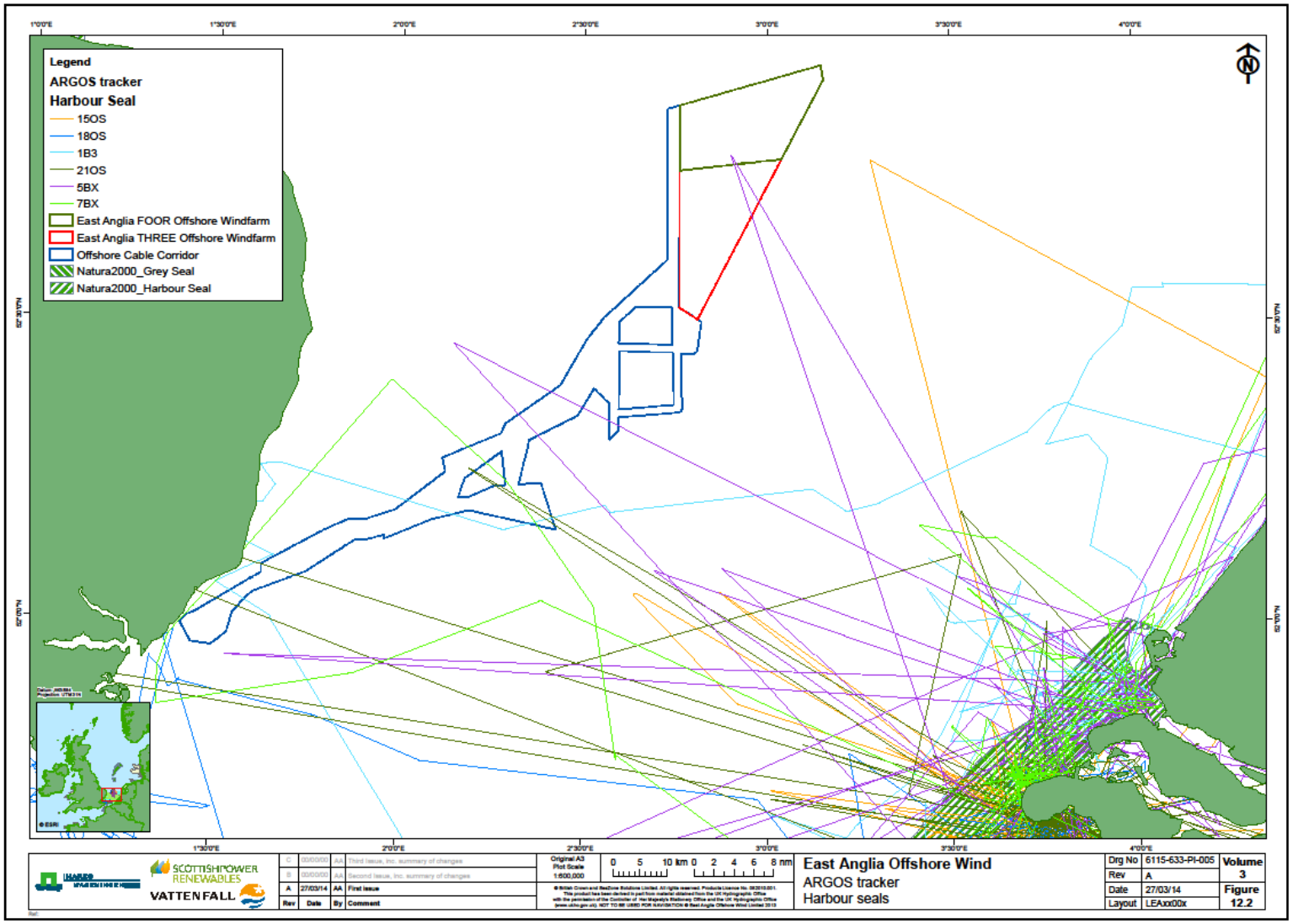
Appendix B. Figure a2. Harbour seals tracked using the GPS-GSM location system – regional.



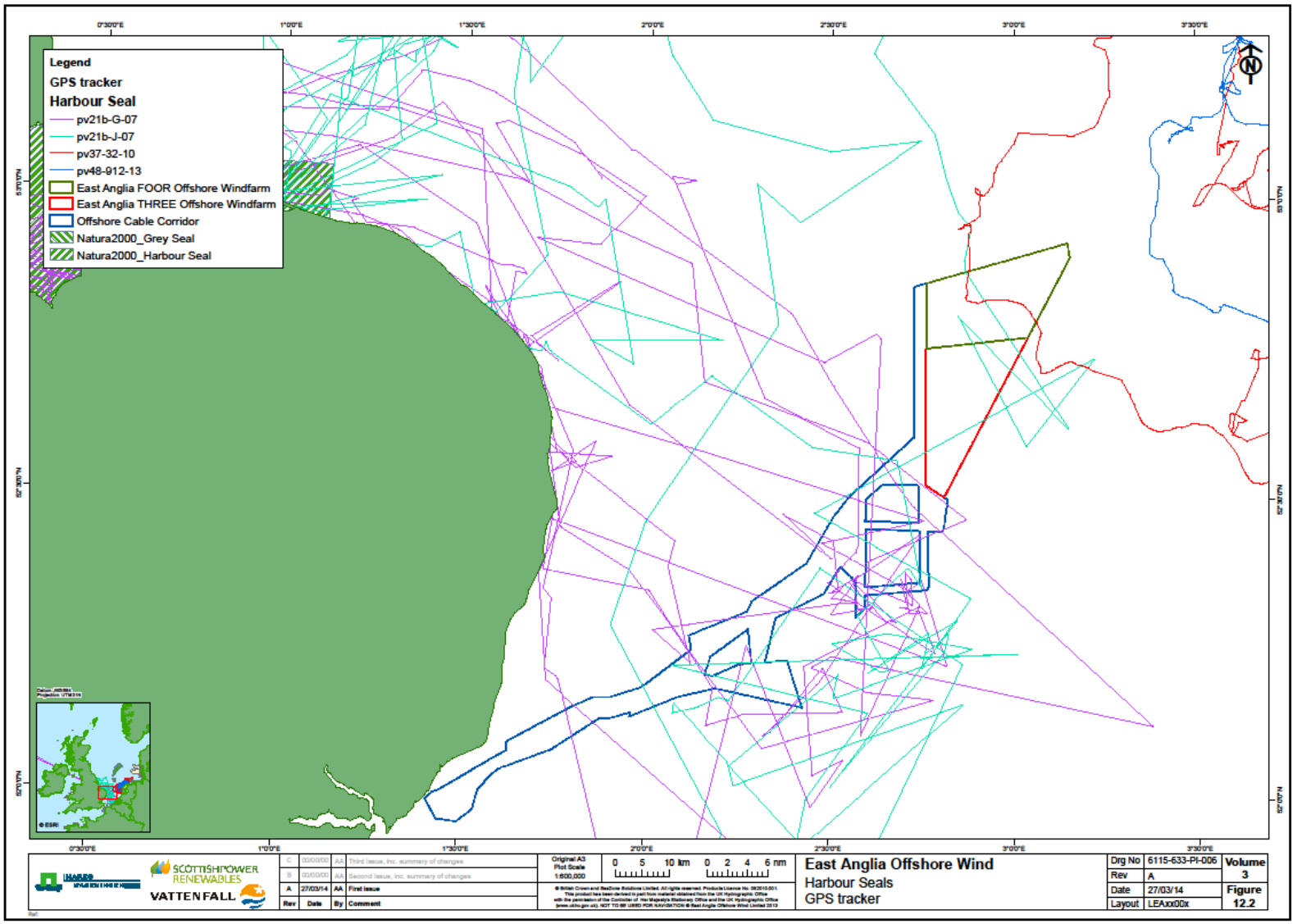
Appendix B. Figure a3. Grey seals tracked using the Argos location system – regional.



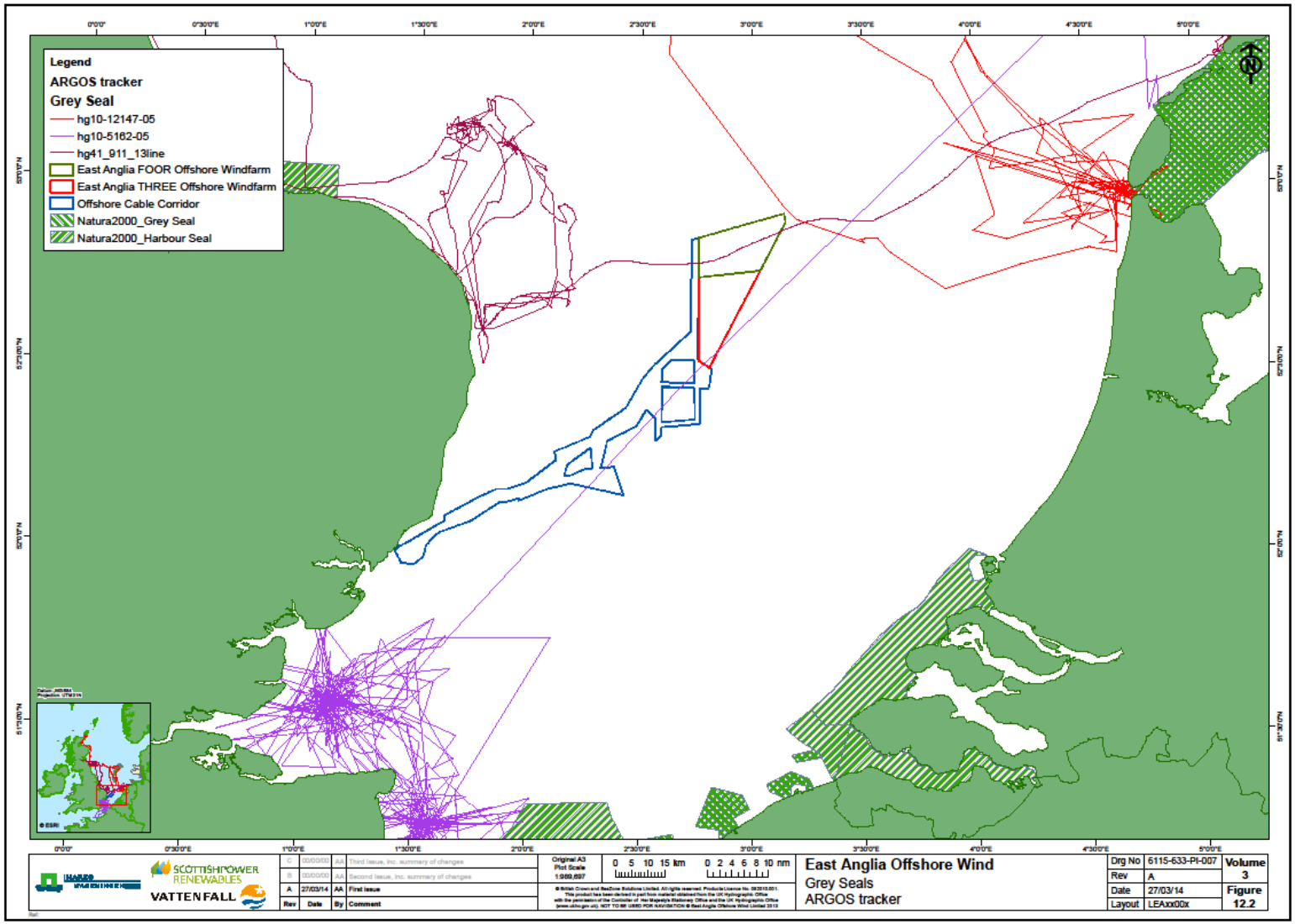
Appendix B. Figure a3. Grey seals tracked using the GPS-GSM location system – regional.



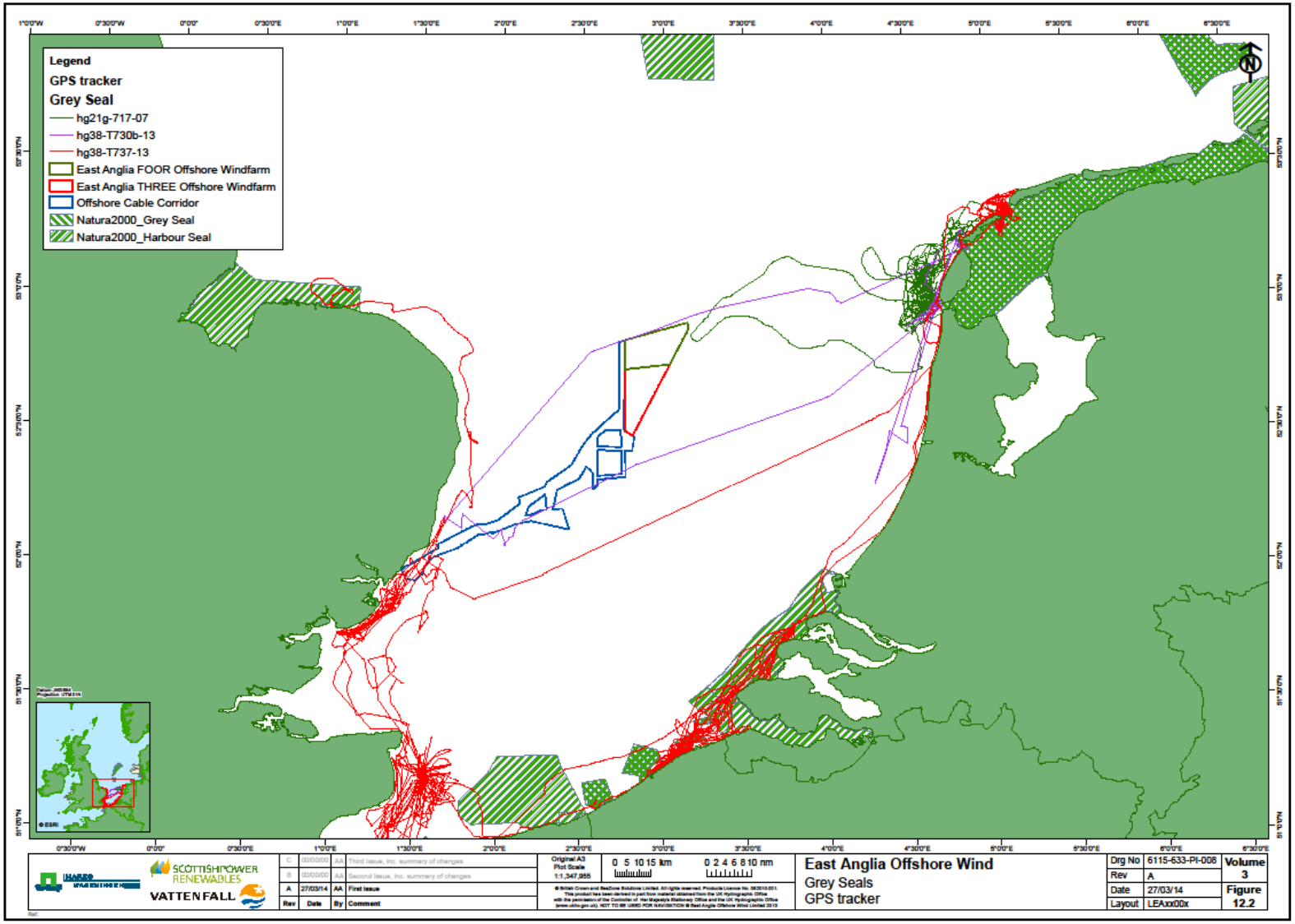
Appendix B. Figure b1. Harbour seals tracked using the Argos location system – local.



Appendix B. Figure b2. Harbour seals tracked using the GPS-GSM location system – local.



Appendix B. Figure b3. Grey seals tracked using the Argos location system – local.



Appendix B. Figure b4. Grey seals tracked using the GPS-GSM location system – local.