East Anglia ONE North Offshore Windfarm

Appendix 9.1

Benthic Ecology Sampling Strategy

Preliminary Environmental Information
Volume 3
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East Anglia TWO
Offshore Windfarm

East Anglia TWO and East Anglia ONE North

Export Cable Corridor Benthic Ecology Sampling Strategy

December 2017

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REVISION CONTROL

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1c	14/12/2017	Final	BK	FF	pp.

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1 Introduction

1.1 Purpose of this document

1. This sampling strategy outlines the general approach to collecting benthic ecology and sediment samples from the East Anglia ONE North and East Anglia TWO export cable corridors in order to inform the environmental impact assessment (EIA).

2. Scottish Power Renewables (SPR) request confirmation from the MMO, Cefas and NE that the proposed sampling strategy will provide sufficient data to inform the benthic ecology and physical processes aspects of the EIA in respect to the projects export cable corridors.

3. It has previously been agreed via expert topic group (ETG) meetings that sufficient data is currently available for the windfarm sites and area of the export cable corridor previously surveyed as part of the former East Anglia Zone Environmental Appraisal (ZEA) in 2010, for EIA characterisation. Therefore, this strategy covers the collection of samples within previously un-surveyed areas of the cable corridors only. Further details of these agreements made via ETG are provided (paragraph 6) below.

4. This benthic sampling strategy has considered industry best practice guidance for collection of data to inform EIA, for example Cefas 2004[1], and OSPAR 2008 [2].

1.2 Background

5. An extensive benthic habitat and sediment sampling survey programme has previously been undertaken for the former East Anglia Zone as well as the East Anglia ONE and East Anglia THREE cable corridors. It was agreed in the benthic ecology expert topic group (ETG) meeting on the 12th of April, 2017, that sufficient data were available from the former East Anglia Zone Environmental Appraisal (ZEA, 2010) survey and subsequent project specific surveys to inform the East Anglia ONE North and East Anglia TWO EIAs.

6. A geophysical survey campaign of the windfarm sites was undertaken in summer 2017. New side-scan sonar and swath-bathymetry data was collected during that campaign; however, no new benthic samples were collected as agreed in the ETG meeting on the 12th of April.

7. Since August 2017, a new cable connection location (near Leiston) and a new export cable corridors for the East Anglia ONE North and East Anglia TWO projects have been proposed. The new cable corridors for each project are shown in Figure 1 and Figure 2.

8. A briefing note was submitted to MMO, Cefas and NE in August 2017 providing details of the change in export cable corridor and the updated approach to EIA data collection.

[1] Cefas 2004. Guidance Note for Environmental Impact Assessment in respect of FEPA and CPA requirements. Version 2, June 2004.

[2] OSPAR 2008. OSPAR Guidance on Environmental Considerations for Offshore Wind Farm Development. Ref 2008-3

Based on that note, it was agreed that benthic sampling of the export cable route would not include areas previously covered in the ZEA survey (Figure 1 and Figure 2) as sufficient benthic data were available.

1.3 Existing information

9. The area of the East Anglia ONE North and East Anglia TWO export cable corridors has been surveyed as part of a regional environmental characterisation (REC) for the aggregates industry which is covered in the following reports;

    - Thames Estuary Dredging Association (TEDA) Marine Aggregate Regional Environmental Assessment of the Outer Thames Estuary, TEDA 2010 (Northern boundary of surveyed area) (TEDA REC, 2010); and

    - The Outer Thames Estuary (OTE) Regional Environment Characterisation (Marine Aggregate Levy Sustainability Fund 2007 (Southern boundary of surveyed area) (OTE REC, 2007).

10. In addition, the eastern sections of the export cable corridors have previously been covered by geophysical and benthic surveys undertaken as part of the former East Anglia Zone ZEA (Figure 1 and Figure 2).

11. Data from these sources indicate that sediment types the East Anglia ONE North and East Anglia TWO export cable corridors are likely to be predominantly medium sand with some outcropping of underlying rock and clay features in places, particularly more inshore. Seabed sediments in the export cable corridors are expected to be highly mobile, and likely to include sand waves and mega-ripples.

12. Data suggest that the export cable corridors are unlikely to contain sensitive benthic ecology habitats due to the mobile nature of seabed sediments; however, there is the potential for *Sabellaria* reef to be present in some offshore areas of the East Anglia ONE North export cable corridor and northern route of the East Anglia TWO export cable corridor.

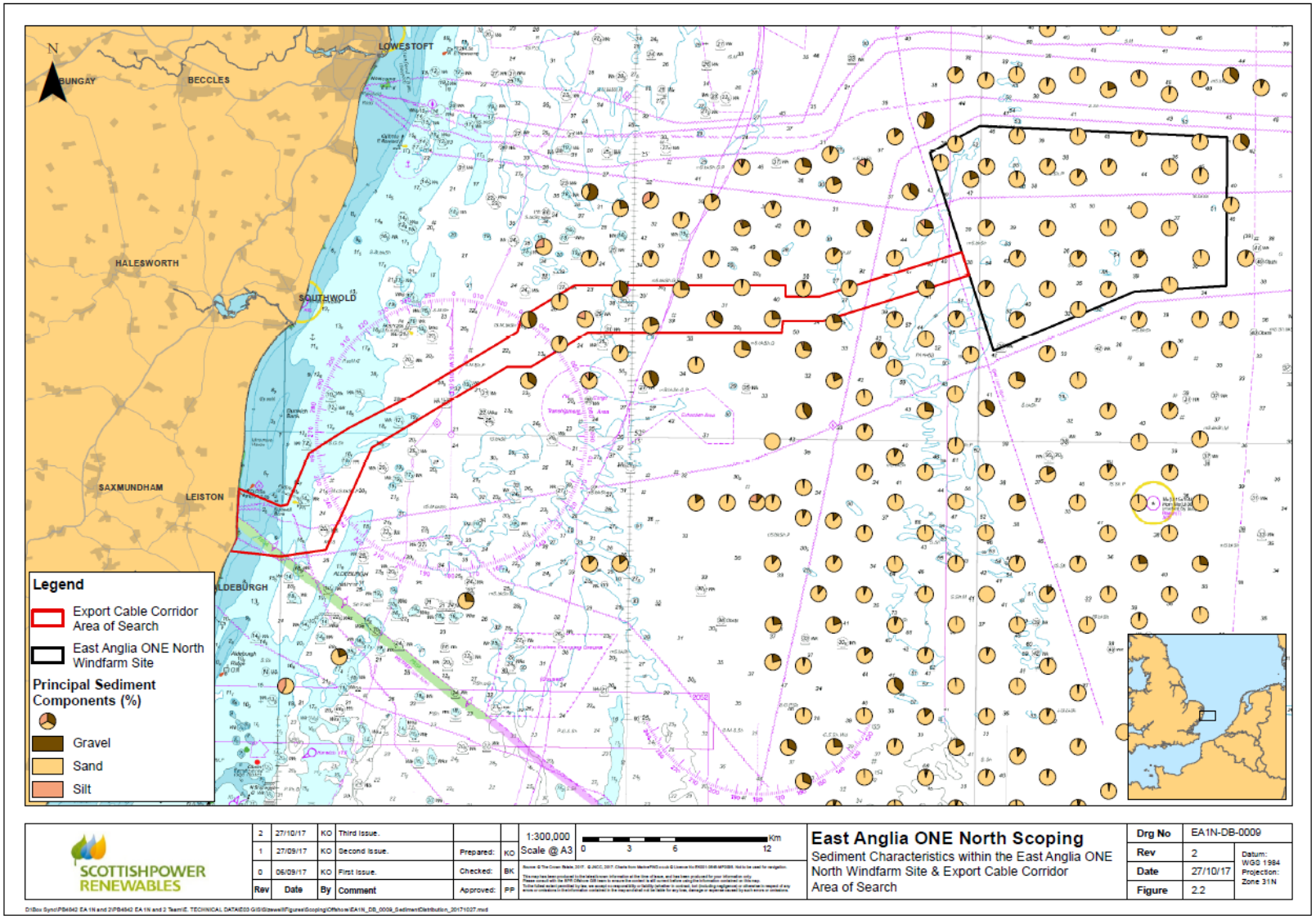

Figure 1 East Anglia ONE North export cable corridor and ZEA sampling coverage

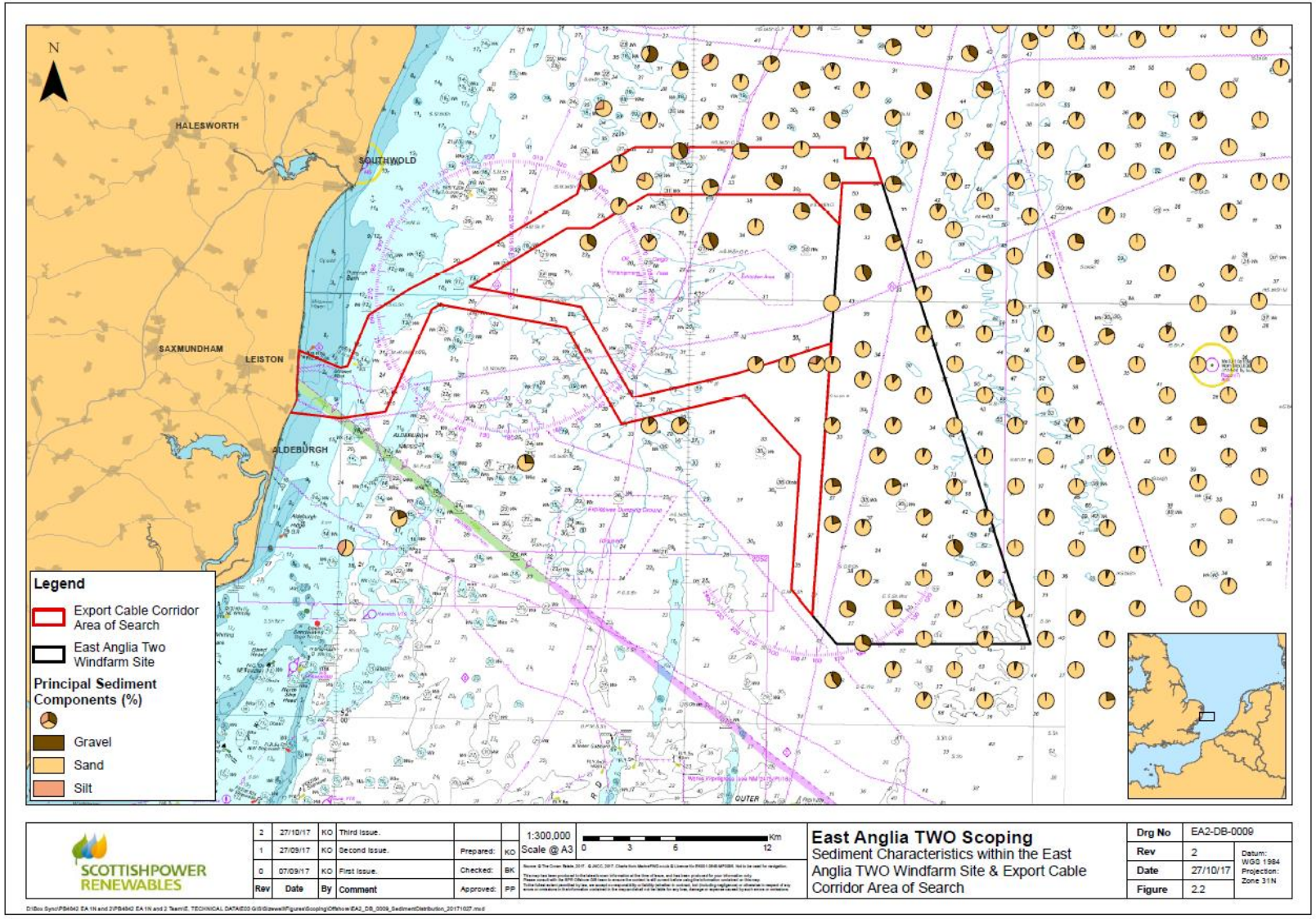

Figure 2 East Anglia TWO export cable corridor and ZEA sampling coverage

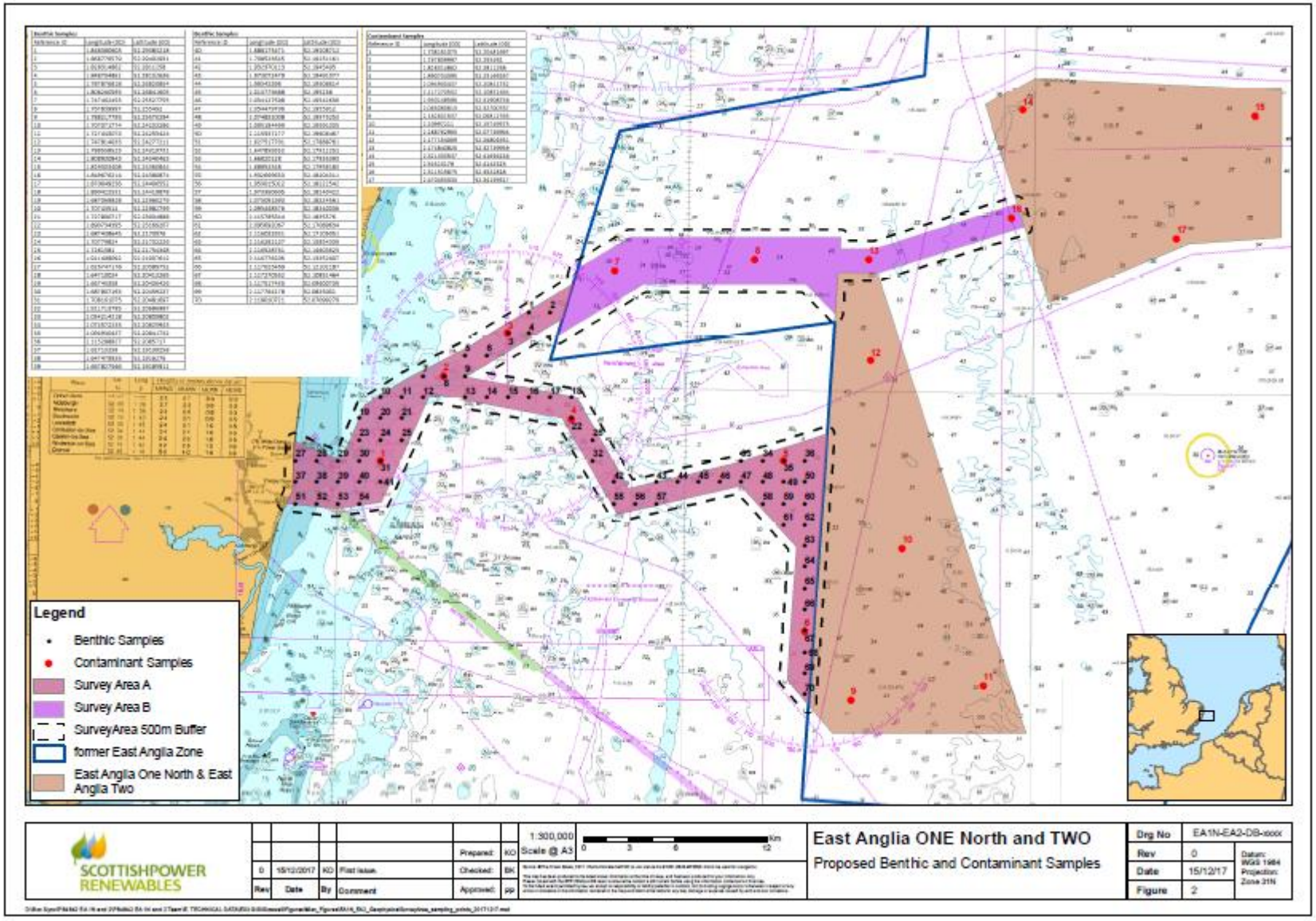

Figure 3 Geophysical and benthic sampling survey areas and proposed sampling locations (Enlarged version provided as in Appendix 2).

2 Approach to Survey

2.1 General approach

13. The benthic ecology and sediment sampling survey will be undertaken following a geophysical survey of the East Anglia ONE North and East Anglia TWO export cable corridors.

14. Figure 3 shows two separate survey areas that will be surveyed as part of the geophysical and benthic sampling campaign. Survey area A includes areas of the East Anglia ONE North and East Anglia TWO export cable corridors not previously surveyed as part of the ZEA surveys campaign. Survey area B was covered as part of the ZEA.

15. For Survey Area A, the following data will be collected;

- Side-scan sonar;
- Multi-beam Echo sounder;
- Sub-bottom profiler;
- Backscatter;
- Benthic Faunal sampling;
- Sediment sampling;
- Contaminant sampling.

16. For Survey Area B; the following data will be collected (as agreed by NE on the 16/08/2017 and MMO on 10/10/2017);

- Side-scan sonar;
- Multi-beam Echo sounder;
- Sub-bottom profiler;
- Backscatter;
- Contaminant sampling.

17. It is anticipated that the geophysical survey will be undertaken between March and May 2018, a dedicated benthic sampling survey will be undertaken following the geophysical survey.

18. This plan represents the proposed approach to sampling, based on the assumption that benthic habitats in the area are predominantly mobile sand habitats., Results from the geophysical survey will be used to ground-truth the sampling programme and where wrecks, areas of potential *Sabellaria spinulosa* aggregations or other sensitivities are identified, these will be crossed checked with proposed benthic sample locations. As a result of ground-truthing, the exact location of some of the proposed benthic sampling locations may require be adjustment to ensure characterisation is as full as possible and

also to avoid intrusive sampling within sensitive areas. SPR would only re-submit a revised version of the benthic sampling plan should:

- 20% or more of sample locations need to be re-located to avoid seabed sensitivities; or
- The geophysical survey data suggests benthic habitats are significantly more heterogeneous than previously predicted.

19. In the unlikely case that the benthic sampling plan will be re-submitted for approval prior to benthic survey commencement, SPR would engage with MMO, Cefas and NE as early as possible and will clearly mark-up the amended text within the document.

2.2 Benthic Sampling

2.2.1 Faunal Sampling

20. Benthic faunal sampling will be undertaken within Survey Area A only, up to 70 faunal samples (co-located with sediment samples) will be collected. Figure 3 presents locations for all proposed sediment and faunal samples, with a list of coordinates provided in Appendix 1. Benthic samples as marked on Figure 3 would include faunal and sediment samples. Survey Area A is approximately 140 km^2.
21. It is proposed that the benthic faunal survey will consist of sampling at up to 70 sample locations of 0.1 m^2. Existing data from the TEDA REC (2007) and OTE (2010) regional aggregate and ZEA study (Figure 1 and Figure 2) suggest that this area of seabed is expected to be largely homogenous and predominantly fine to medium sand. Sample locations have been identified using a 1km^2 grid, within which samples within 250m of the survey area have been evenly distributed. The density of sample locations is intended to provide sufficient information to be able to identify changes in benthic habitat and species composition.
22. It is proposed that single samples from each sampling location will be collected and used for both faunal and PSA analysis. Sampling would be undertaken using a benthic grab appropriate for the ground conditions with a mesh size for sieving of 1mm for faunal analysis in accordance with best practice guidance (Cefas, 2004).
23. Sampling locations will be determined using a 1km^2 grid based approach, with sampling locations evenly distributed over the cable corridor. Geophysical data will be cross-checked with proposed sampling locations to identify any potential changes in habitats. If required, sampling locations will either be micro-sited or additional samples will be added to ensure all habitats within the cable corridor are sampled.
24. All areas previously identified as having the potential for *Sabellaria* reef lie within Survey Area B (ZEA, 2010; TEDA 2010) and will not be sampled as part of this survey. However, to avoid intrusive sampling on previously unrecorded *Sabellaria* reef within Survey Area A, geophysical data will be analysed prior to sampling and sample locations will be micro-sited to avoid areas where *Sabellaria* reef maybe present.
25. Faunal sample analysis will be undertaken in an NMBAQC accredited laboratory with experience undertaking marine faunal analysis. Faunal data will include taxonomic identification of species present in samples, biomass and total organic carbon.

26. Faunal samples will be analysed using a multi-dimensional scaling technique, for example, PRIMER, to determine statistical similarities between species and communities across the cable corridor. Statistical analysis will include relevant faunal data from the ZEA benthic survey.

2.2.2 Sediment sampling

27. It is proposed that up to 70 sediment samples will be collected in total from Area A. Sediment samples will be collected from the same location as faunal samples, where possible from sub-samples of 0.1m^2 faunal samples. Where insufficient sediment is collected, sediment will be collected from a dedicated 0.1m^2 grab.

28. Sediment samples will be analysed using particle size analysis (PSA) and if required, laser size analysis (if greater than 5% of sediment material is less than 63µm). Analysis will be undertaken by an accredited laboratory.

2.2.3 Contaminant sampling

29. Contaminant samples will be collected from Survey Area A and Survey Area B. It is proposed that six contaminant samples will be collected from Survey Area A and four samples collected from Survey Area B. Four contaminant samples will also be collected from the East Anglia TWO windfarm site and three contaminant samples will be collected from East Anglia ONE North. Proposed locations for contaminant samples are provided in Figure 3 and Appendix 1.

30. Samples will be collected from dedicated 0.1m^2 grab samples. Samples will be collected and stored in a manner that allows for identification of metal and hydrocarbon contaminants within the samples. Samples will be analysed by an accredited laboratory.

31. A full suite of metal and hydro-carbon contaminants will be tested for, including but not limited to;

- Arsenic;
- Mercury;
- Cadmium;
- Chromium;
- Copper;
- Nickel;
- Lead;
- Zinc;
- Poly-aromatic hydrocarbons (PAH);
- Tributyltin (TBT) and
- Dibutyltin (DBT).

2.2.4 Survey data collection

32. In addition to faunal, sediment and contaminant data, the following survey data will be collected for each sample;

- Date, time and weather;
- XY Location;
- Depth;
- Photographs of pre-treated samples;
- Details of failed grabs;
- Depth of anoxic layer.

33. All data gathering and analysis will be undertaken by experienced contractors and conforming with best practice guidance.

2.2.5 Timescales

34. The geophysical survey is planned to commence in March 2018 (weather dependant). All notifications and stakeholders will be informed about the survey prior to the commencement of the survey. The benthic survey is planned to follow ground-truthing the the geophysical survey data with the proposed benthic sample locations.

Appendix 1- Sample Location Coordinates

Faunal/Sediment sample locations;

Faunal/Sediment Samples		
Reference ID	Longitude (DD)	Lattitude (DD)
1	1.848380603	52.29383218
2	1.868776579	52.29402931
3	1.828314862	52.2811258
4	1.848704861	52.28132636
5	1.787876818	52.26820854
6	1.808260595	52.26841605
7	1.747462453	52.25527755
8	1.767839997	52.255492
9	1.788217795	52.25570294
10	1.707071774	52.24233286
11	1.727443073	52.24255424
12	1.747814633	52.24277211
13	1.788558523	52.24319731
14	1.808930843	52.24340463
15	1.829303408	52.24360844
16	1.849676214	52.24380874
17	1.870049256	52.24400552
18	1.890422531	52.24419878
19	1.687069828	52.22960279
20	1.70743514	52.22982759
21	1.727800717	52.23004888
22	1.890734395	52.23169267
23	1.687438645	52.2170976
24	1.70779824	52.21732229
25	1.7281581	52.21754348
26	1.911408092	52.21937612
27	1.626747178	52.20389752
28	1.64710024	52.20413265
29	1.66745358	52.20436426
30	1.687807193	52.20459237
31	1.708161075	52.20481697
32	1.911713785	52.20686987
33	2.054214218	52.20809802
34	2.074572233	52.20825943
35	2.094930437	52.20841732
36	2.115288827	52.2085717
37	1.62713258	52.19139258
38	1.647479935	52.1916276
39	1.667827566	52.19185911

40	1.688175471	52.19208712
41	1.708523645	52.19231161
42	1.932370113	52.1945495
43	1.973072479	52.19491077
44	1.99342398	52.19508614
45	2.013775688	52.195258
46	2.034127598	52.19542636
47	2.054479706	52.1955912
48	2.074832008	52.19575253
49	2.095184499	52.19591035
50	2.115537177	52.19606467
51	1.627517701	52.17888761
52	1.647859352	52.17912252
53	1.66820128	52.17935393
54	1.68854348	52.17958183
55	1.932669653	52.18204311
56	1.953015022	52.18222542
57	1.973360605	52.18240422
58	2.075091593	52.18324561
59	2.095438376	52.18340336
60	2.115785344	52.1835576
61	2.095692067	52.17089634
62	2.116033331	52.17105051
63	2.116281137	52.15854339
64	2.116528761	52.14603625
65	2.116776205	52.13352907
66	2.117023469	52.12102187
67	2.117270552	52.10851464
68	2.117517455	52.09600739
69	2.117764178	52.0835001
70	2.118010721	52.07099279

Contaminant Sample Locations

Contaminant Samples		
Reference ID	Longitude (DD)	Lattitude (DD)
1	1.708161075	52.20481697
2	1.767839997	52.255492
3	1.828314862	52.2811258
4	1.890734395	52.23169267
5	2.094930437	52.20841732
6	2.117270552	52.10851464
7	1.930148586	52.31908756
8	2.065060615	52.32700767
9	2.162631537	52.06812765
10	2.20997211	52.15749575
11	2.288762965	52.07736964
12	2.177154069	52.26804551
13	2.174840826	52.32739959
14	2.321333537	52.41656246

15	2.54513178	52.4143325
16	2.311515675	52.3532818
17	2.470453333	52.34159317

Appendix 2- Sample Location Map

Benthic Samples		
Reference ID	Longitude (DD)	Lattitude (DD)
1	1.848380603	52.29383218
2	1.868776579	52.29402931
3	1.828314862	52.2811258
4	1.848704861	52.28132636
5	1.787876818	52.26820854
6	1.808260595	52.26841605
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13	1.788558523	52.24319731
14	1.808930843	52.24340463
15	1.829303408	52.24360844
16	1.849676214	52.24380874
17	1.870049256	52.24400552
18	1.890422531	52.24419878
19	1.687069828	52.22960279
20	1.70743514	52.22982759
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22	1.890734395	52.23169267
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25	1.7281581	52.21754348
26	1.911408092	52.21937612
27	1.626747178	52.20389752
28	1.64710024	52.20413265
29	1.66745558	52.20436426
30	1.687807193	52.20459237
31	1.708161075	52.20481697
32	1.911713785	52.20686987
33	2.054214218	52.20809802
34	2.074572233	52.20825943
35	2.094930437	52.20841732
36	2.115288827	52.2085717
37	1.62713258	52.19139258
38	1.647479935	52.1916276
39	1.667827566	52.19185911

Benthic Samples		
Reference ID	Longitude (DD)	Lattitude (DD)
40	1.688175471	52.19208712
41	1.708523645	52.19231161
42	1.932370113	52.1945495
43	1.973072479	52.19491077
44	1.99342398	52.19508614
45	2.013775688	52.195258
46	2.034127598	52.19542636
47	2.054479706	52.1955912
48	2.074832008	52.19575253
49	2.095184499	52.19591035
50	2.115537177	52.19606467
51	1.627517701	52.17888761
52	1.647859352	52.17912252
53	1.66820128	52.17935393
54	1.68854348	52.17958183
55	1.932669653	52.18204311
56	1.953015022	52.18222542
57	1.973360605	52.18240422
58	2.075091593	52.18324561
59	2.095438376	52.18340336
60	2.115785344	52.1835576
61	2.095692067	52.17089634
62	2.116033331	52.17105051
63	2.116281137	52.15854339
64	2.116528761	52.14603625
65	2.116776205	52.13352907
66	2.117023469	52.12102187
67	2.117270552	52.10851464
68	2.117517455	52.09600739
69	2.117764178	52.0835001
70	2.118010721	52.07099279

Contaminant Samples		
Reference ID	Longitude (DD)	Lattitude (DD)
1	1.708161075	52.20481697
2	1.767839997	52.255492
3	1.828314862	52.2811258
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6	2.117270552	52.10851464
7	1.930148586	52.31908756
8	2.065060615	52.32700767
9	2.162631537	52.06812765
10	2.20997211	52.15749575
11	2.288762965	52.07736964
12	2.177154069	52.26804551
13	2.174840826	52.32739959
14	2.321333537	52.41656246
15	2.54513178	52.4143325
16	2.311515675	52.3532818
17	2.470453333	52.34159317

Place	Lat N	Long E	Heights in metres above datum MHWS	MHWN	MLWN	MLWS
Orford Ness	52°05	1°35	2·8	2·7	0·9	0·5
Aldeburgh	52 09	1 36	2·7	2·3	0·9	0·3
Minsmere	52 14	1 38	2·4	2·0	0·8	0·3
Southwold	52 19	1 40	2·4	2·1	0·9	0·5
Lowestoft	52 28	1 45	2·4	2·1	1·0	0·5
Gorleston-on-Sea	52 34	1 44	2·4	2·1	1·0	0·5
Caister-on-Sea	52 39	1 44	2·4	2·0	1·0	0·5
Winterton-on-Sea	52 43	1 42	3·2	2·6	1·2	0·6
Cromer	52 56	1 18	5·0	4·0	1·9	0·9

For offshore data, see Co-Tidal Chart 5058.

Legend

- Benthic Samples
- Contaminant Samples
- Survey Area A
- Survey Area B
- SurveyArea 500m Buffer
- former East Anglia Zone
- East Anglia One North & East Anglia Two

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Rev	Date	By	Comment
0	15/12/2017	KO	First Issue.

Prepared: KO
Checked: BK
Approved: PP

1:300,000 Scale @ A3

0 3 6 12 Km

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East Anglia ONE North and TWO

Proposed Benthic and Contaminant Samples

Drg No	EA1N-EA2-DB-xxxx
Rev	0
Date	15/12/17
Figure	2

Datum: WGS 1984
Projection: Zone 31N

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