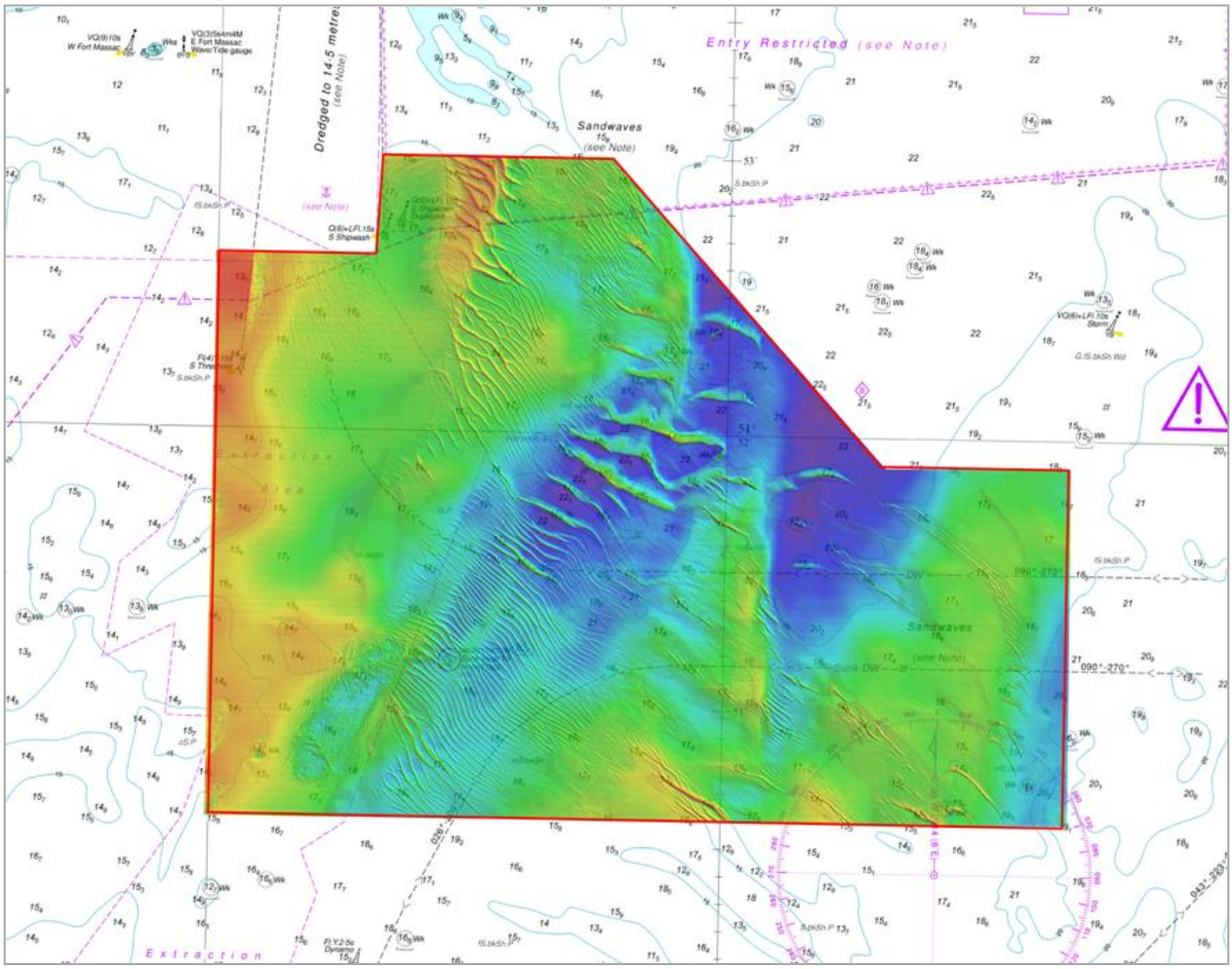
United Kingdom
Hydrographic Office

THAMES ESTUARY

SUNK

ASSESSMENT ON THE ANALYSIS OF ROUTINE RESURVEY AREA TE3A FROM THE 2014 SURVEY



July 2015

THAMES ESTUARY

SUNK

Assessment TE3A/2014

An assessment of the 2014 hydrographic survey of the area: to monitor recent seabed movement; to identify any implications for shipping; and to make recommendations for future surveys.

The Admiralty Chart extracts, other graphics and tables in this Report are included for illustrative purposes only and are NOT TO BE USED FOR NAVIGATION.

CONTENTS

ANNEXES

1. EXECUTIVE SUMMARY

The Area and Recent Changes

1.1 Area TE3A is fully surveyed every 2 years. In the intervening year, a focused survey is conducted covering most of the Harwich Deep Water track and shoal features in the vicinity. The 2014 survey was a full 2-year survey and most of the analysis in this report has been made against the previous full survey, conducted in 2012.

1.2 The area covers the approach to the Harwich Deep Water Channel, which is dredged to 14.5 metres. This forms the main approach to Felixstowe, which has berth depths of up to 16 metres. The area also covers part of the Sunk Deep Water track leading into Black Deep.

1.3 Sandwaves in the area are up to 5 metres high; most are migrating in a south-westerly direction across a gently undulating seafloor. Minimum depths over sandwaves are broadly similar to those found in the 2012 survey, but with ongoing migration of sandwaves. The minimum depth in the vicinity of the Harwich Deep Water Track is 14.9 metres.

Reasons for Continuing to Resurvey the Area

1.4 The area requires resurveying for the following reasons:

- Sandwaves cover much of the area, with most slowly migrating across the area. Their heights fluctuate with time and, near the Deep Water tracks, remain close to being critical to shipping.
- Shipping density in the area is high and the deepest draught vessels potentially transit the area with small under-keel clearances.
- The area requires regular resurveying to ensure the location and depth of sandwaves are adequately charted.

Recommendations

1.5 The full 2-year survey limits and frequency are still appropriate and should be retained.

2. INTRODUCTION

2.1 This Assessment is produced by the United Kingdom Hydrographic Office (UKHO) for the Maritime and Coastguard Agency (MCA).

2.2 Analysis of the Routine Resurvey Areas forms part of the Civil Hydrography Programme and the reports are made available to members of the Committee On Shipping Hydrography (COSH) through the UKHO website, before being presented to the Civil Hydrography Working Group. When approved, the recommendations are incorporated into the Routine Resurvey Programme. The report is governed by a Memorandum of Understanding between the DfT (including the MCA) and the MOD (including the UKHO).

3. HISTORY

3.1 TE3A was established in 1985, when the larger area TE3 was subdivided. This followed a full Report that recommended this important area should be resurveyed on an annual basis. The limits have since been modified, including the incorporation of TE3B into TE3A.

3.2 The assessment report on the 2005 survey recommended extending the survey frequency to 2 years. After consideration by the COSH Working Group, it was agreed that while much of

the area could be relaxed to a 2 year frequency, a focused area covering shoal sandwaves in the area of the Harwich Deep Water track should continue to be surveyed annually. The limits of this focused area were slightly revised following assessment of the 2006 and 2011 surveys.

3.3 Details of the area, including survey history, are at Annex A.

4. DESCRIPTION OF THE AREA

4.1 The full area covers 5.92 SQ NM (20.3 SQ km). It includes two recommended Deep Water tracks. Harwich Deep Water track leads to the entrance of the Harwich Deep Water Channel, which has a maintained depth of 14.5 metres. The Sunk Deep Water track is used by deep draught vessels as an approach to Black Deep and onwards into the Thames Estuary.

4.2 The northern limit includes the southern extremity of South Ship Head, which lies to the east of the dredged channel. The shallowest depths in TE3A are found in this area.

4.3 Further to the southeast, there is an area of large sandwaves up to 5 metres high. These are strongly asymmetrical with their steeper side facing towards the southwest. To the south of these lies an extensive area of megaripples and symmetrical sandwaves up to 2 metres in height.

4.4 The remainder of the area contains bands of megaripples and sandwaves and a gently undulating seabed with depths ranging from around 13 to 23 metres. In the southwest of the area there is an area where aggregate extraction has taken place since last survey in 2012.

4.5 The area limits are shown at Annex C.

5. SHIPPING IN THE AREA

5.1 Area TE3A lies at a crossroads for shipping, with constant streams of commercial traffic transiting east/west to and from Harwich Haven, Felixstowe, Ipswich and the continent; and north/south to and from the Thames, Scandinavia and beyond.

5.2 Trinity Container Terminal at Felixstowe has depths up to 15 metres alongside. Felixstowe South (Berths 8 & 9) has depths of 16 metres alongside, with the capability of being deepened to 18 metres.

5.3 Vessels drawing over 14.5 metres visit Felixstowe, but transit across the area is constrained by the dredged depth of the Harwich Deep Water Channel.

5.4 A general representation of the main shipping routes used by deep draught vessels is shown at Annex B, however, vessels cross the area on many different tracks where draught permits. A recommended track leads into the Deep Water Channel, but AIS data shows deep draught container vessels generally pass to the north prior to entering the channel. Entry restrictions apply to an area north of TE3A, between South Ship Head and the Sunk Deep Water Anchorage area to the east.

6. 2012 SURVEY DETAILS

6.1 The survey was conducted from 8 to 13 October. Sea states 2 to 4 were experienced in the survey area during data gathering, but with 2 days off site due to strong winds.

6.2 Survey data was acquired using a Kongsberg Maritime EM3000D multibeam echosounder. Observations calculated from the height component of the GPS solution were used to reduce soundings to Chart Datum. Ellipsoidal Height to Chart Datum values were taken from the Vertical Offshore Reference Framework (VORF), with positions referred to European Terrestrial Reference Framework 1989 (ETRF89). The final dataset was in the form of a 1-metre gridded CUBE surface.

6.3 The survey achieved IHO Order 1a standard.

7. 2014 SURVEY DETAILS

7.1 Most of the survey was conducted from 22 to 28 June in generally slight sea states, with infill lines gathered on 3 July.

7.2 The main survey data was acquired using a Kongsberg Maritime EM2040D multibeam echosounder, with a Kongsberg Maritime EM3002D multibeam echosounder used to gather data on 3 July. Observations calculated from the height component of the GPS position solution were used to reduce soundings to Chart Datum. Ellipsoidal Height to Chart Datum values were taken from the Vertical Offshore Reference Framework (VORF), with positions referred to International Terrestrial Reference Framework 2005 (ITRF05). The final dataset was in the form of a 1-metre gridded CUBE surface.

7.3 The survey achieved IHO Order 1a standard. The 2014 survey data overlaid on chart 2692 is at Annex C.

8. DESCRIPTION OF RECENT BATHYMETRIC CHANGE

8.1 Colour banded depth plots of the 2012 and 2014 surveys are at Annexes E and F respectively and allow visual comparisons.

8.2 A variability plot, at Annex G, shows the changes in depth between the 2012 and 2014 surveys. The variances generally reflect sandwave migration in the area and some change in sandwave heights. In the southwest of the area, there is a deepening in a region where aggregate extraction has taken place.

8.3 Comparison plots of the 15 and 20 metre contours are at Annexes H and I.

8.4 Sandwaves are generally migrating in a southwest direction, as shown in Annex D. Cross section comparisons of the 2012 and 2014 surveys are at Annex D.

8.5 The minimum depths in three selected areas containing potentially significant sandwaves on the approach to the Harwich Deep Water Channel have been extracted from multiple surveys and are shown in figure 8.1. The locations of these areas (A, B and C) are shown in Annex D. Figure 8.1 shows that the minimum depth over the sandwaves in area 'A', at 14.9 metres, is slightly deeper than Harwich Deep Water Channel dredged depth.

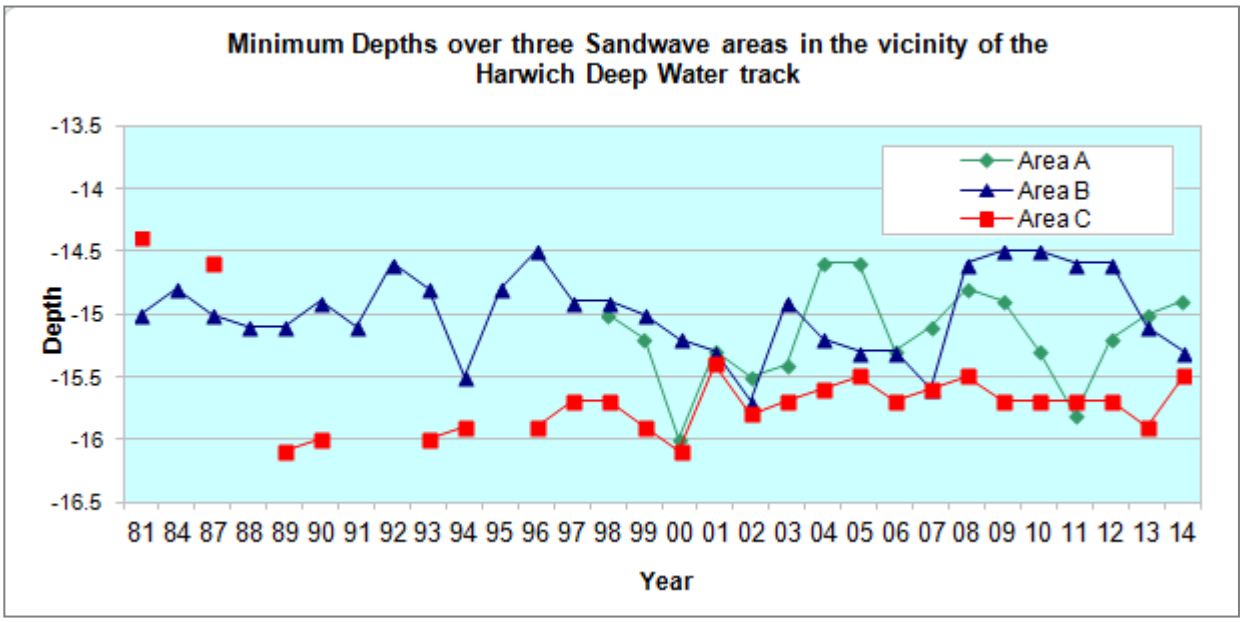


Figure 8.1: Minimum depth over sandwave areas A, B and C (see Annex D for locations)

8.6 Figure 8.2 shows that 950 metres to the north of the Harwich Deep Water track, the minimum depth over a large sandwave has shoaled from 15.2 metres to 14.4 metres over the last three surveys. In 1994, the first survey currently available in digital form, the minimum depth lay 300 metres further to the north, reflecting the long-term southerly migration of the sandwave.

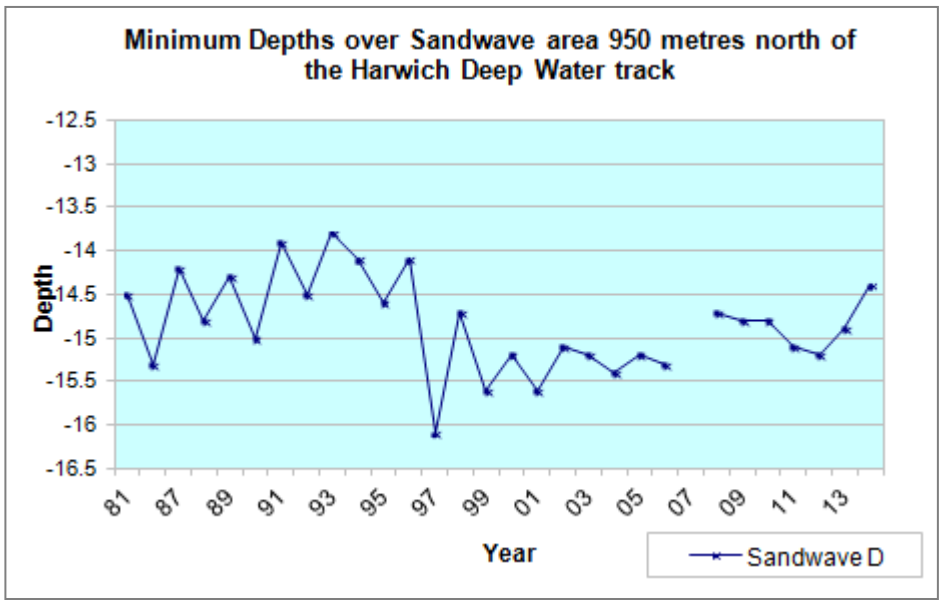


Figure 8.2: Minimum depth over sandwave area D (see Annex D for location)

8.7 Figure 8.3 shows that close to the Sunk Deep Water track the minimum depth is similar to that found in the previous three surveys.

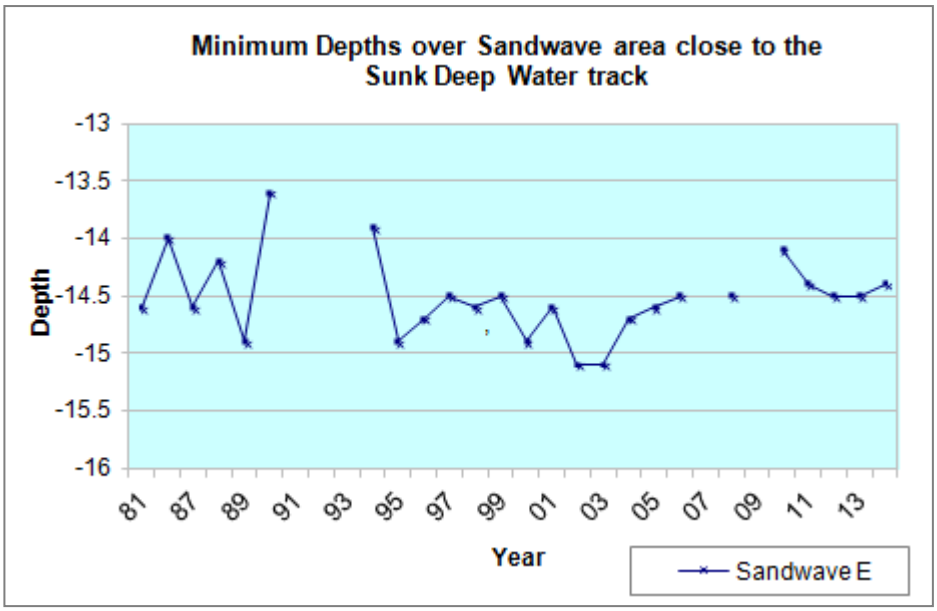


Figure 8.3: Minimum depth over sandwave area E (see Annex D for location)

9. IMPLICATIONS FOR SHIPPING

9.1 The Harwich Deep Water Channel is dredged to 14.5 metres and depths of less than this in the approach to the channel would be of potential concern to shipping. The minimum depth of 14.9 metres 300 metres north of the Harwich Deep Water track is deeper than the maintained depth in the Harwich Deep Water Channel.

9.2 The annual focused limits adequately cover shoal areas transited by deep draught container vessels.

10. RECOMMENDATIONS FOR FUTURE SURVEYS

10.1 The full 2-year survey limits and frequency are still appropriate and should be retained.

AREA SPECIFICATIONS
(Including Survey History)

REGION: Thames Estuary **NAME:** Sunk **AREA:** TE3A

LIMITS:

Full Area (2 yr)

A	51.88333°N	1.56583°E
B	51.88333°N	1.58833°E
C	51.86500°N	1.61500°E
D	51.86500°N	1.63333°E
E	51.84333°N	1.63333°E
F	51.84333°N	1.55000°E
G	51.87733°N	1.55000°E
H	51.87733°N	1.56533°E

Focused Area (1 yr)

A	51.863°N	1.604°E
B	51.863°N	1.629°E
C	51.854°N	1.629°E
D	51.854°N	1.586°E
E	51.862°N	1.566°E
F	51.865°N	1.566°E
G	51.865°N	1.584°E
H	51.870°N	1.584°E
I	51.867°N	1.604°E

Area co-ordinates are referred to WGS84

AREA SIZE: 5.92 SQ NM (20.30 SQ km) Focused Area 1.62 SQ NM (5.57 SQ km)

SURVEY INTERVAL: 1 yr / 2 yr

SURVEYS: (conducted at 1:25,000 scale (not applicable to multibeam surveys))

Year	Survey	File Ref	Data	Year	Survey	File Ref	Data
1989	M1386	H3933/88	s.t.d.	2002	M3739	HH090/993/01	s.t.d.
1990	M1580	HH090/494/01	s.t.d.	2003	M3942	HH091/023/01	s.d.
1991	M1797	HH090/515/01	s.d.	2004	M4183	HH091/087/01	m.
1992	M1888	HH090/548/01	s.d.	2005	M4356	HH091/116/01	m.
1993	M2129	HH090/573/01	s.d.	2006	M4576	HH091/165/01	m.
1994	M2257	HH090/625/01	s.d.	2007	M4639	2007-7600	m.
1995	M2504	HH090/653/01	s.d.	2008	HI1264	2008-26408	m.
1996	M2631	HH090/690/01	s.t.d.	2009	HI1293	2009-29528	m.
1997	M2822	HH090/742/01	s.d.	2010	HI1339	2010-175484	m.
1998	M3008	HH090/768/01	s.d.	2011	HI1368	2011-112084	m.
1999	M3225	HH090/851/01	s.d.	2012	HI1398	2012-117404	m.
2000	M3367	HH090/885/01	s.d	2014	HI1459	2014-153152	m
2001	M3543	HH090/935/01	s.d				

KEY: s = sonar sweep, t = seabed texture tracing, d = digital data, m = multibeam digital data

REPORTS: 1997 Latest survey included M2822 (HA145/002/003/07)

Reports and surveys of the area prior to 1987 are covered by Thames Area 3.

ASSESSMENTS:

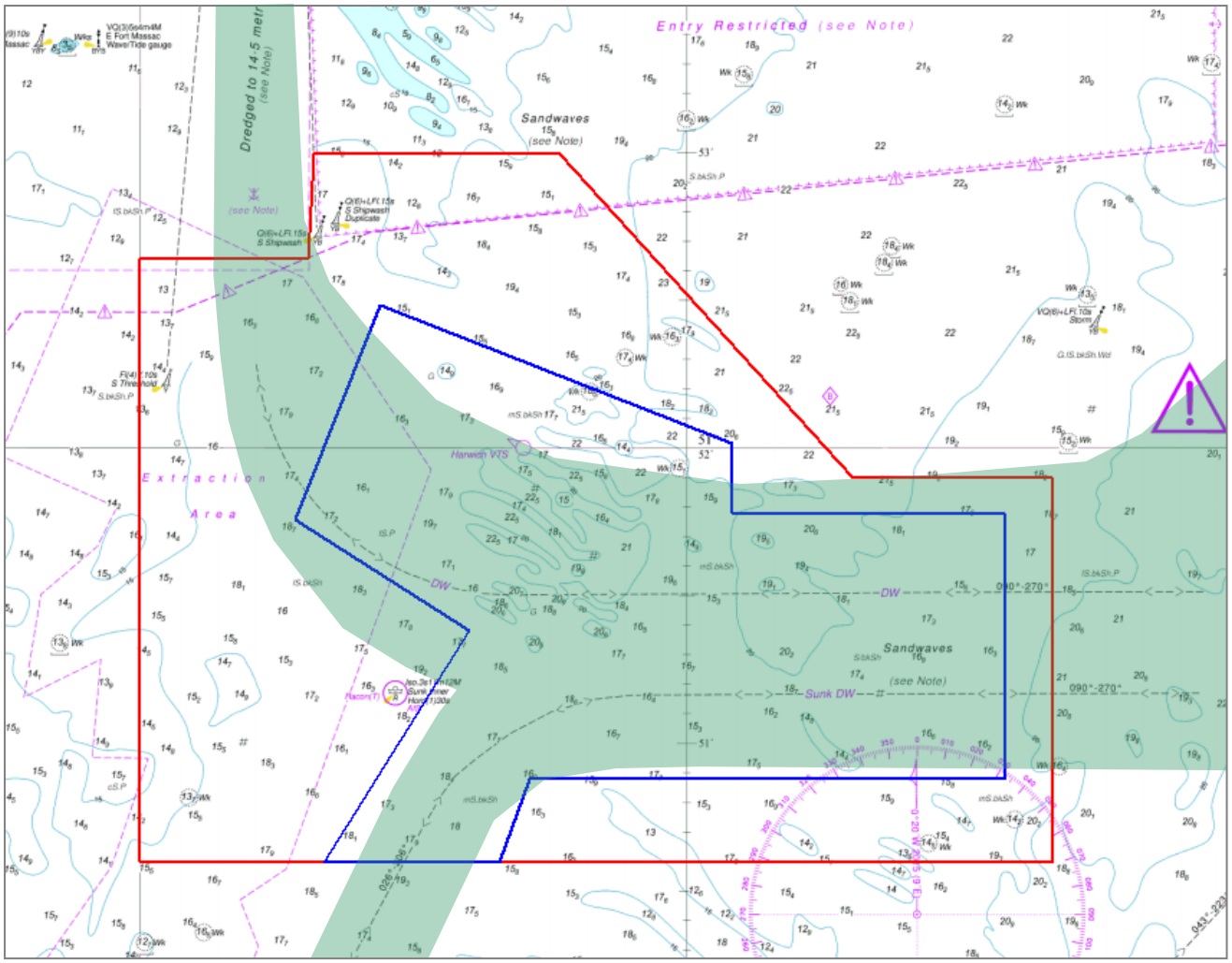
1995	M2504 (HA145/02/03/05-E11)	2004	M4183 (HA145/010/103/01)
1998	M3008 (HA145/010/020/01)	2005	M4356
1999	M3225 (HA145/010/038/01)	2006	M4576 (2007002069)
2000	M3367 (HA145/010/038/01)	2007	M4639 (2007007600)
2001	M3543 (HA145/010/038/02)	2008	HI1264
2002	M3739 (HA145/010/073/01)	2009	HI1293
2003	M3924 (HA145/010/110/01)	2010	HI1339

REMARKS:

1985	Area 3A established (H0423/85).
1989	Area 3B incorporated with area 3A.
1989	Harwich Harbour Authority limits extended; BA NM 1138/89 (HH242/470/01).
1993	Harwich Haven Authority further extension of limits; NM3018/93 (HH242/470/02).
1996	Dredging in this area (HH242/168/06 E23&43).
1998	Expansion of area (HA145/002/003/07 E27).
2003	Area Limits reduced.
2005	Focused area introduced.
2007	Minor revision to focused area.

LARGEST SCALE CHART: BA 2692 (1:25,000)

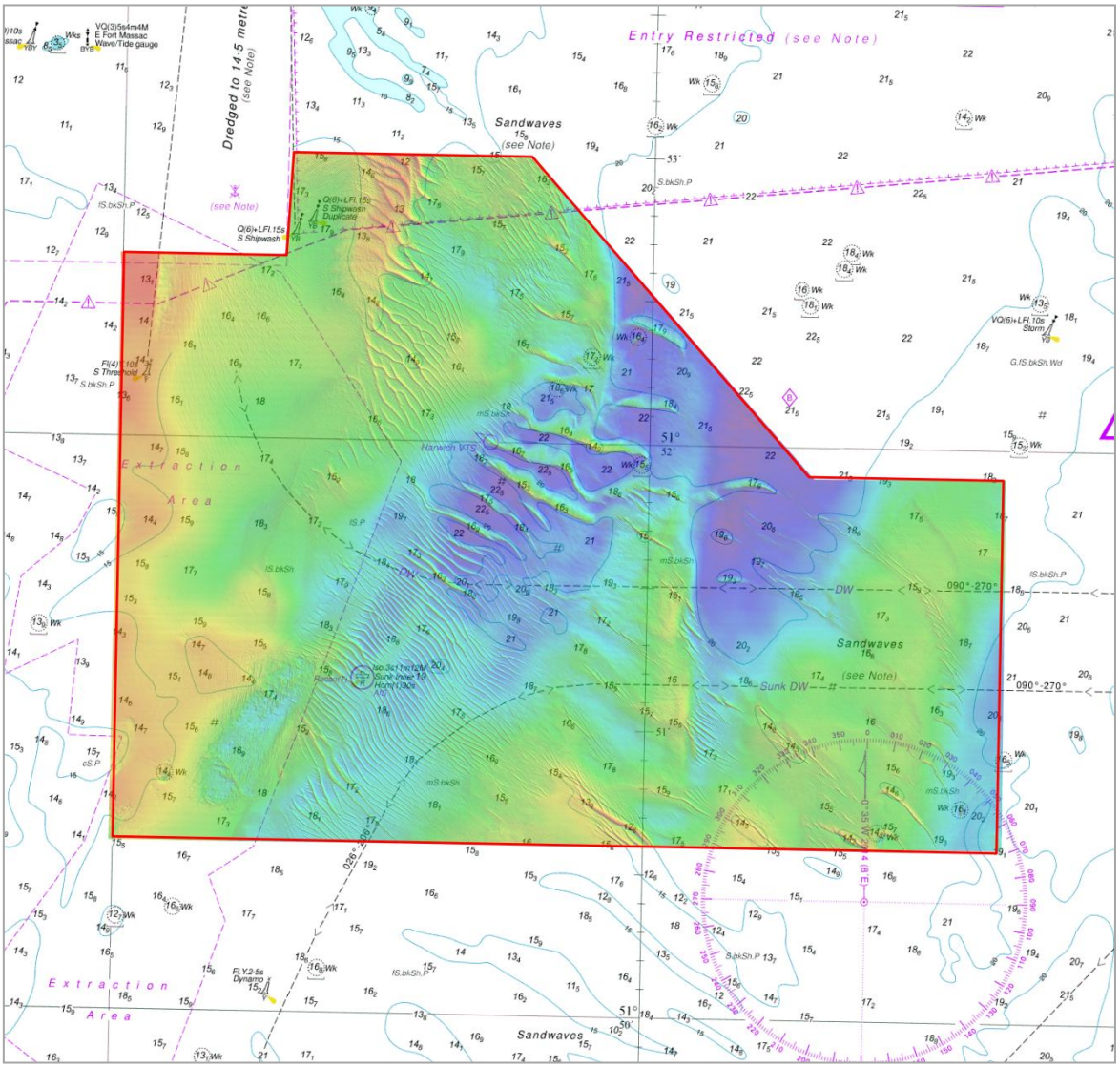
SHIPPING ROUTES



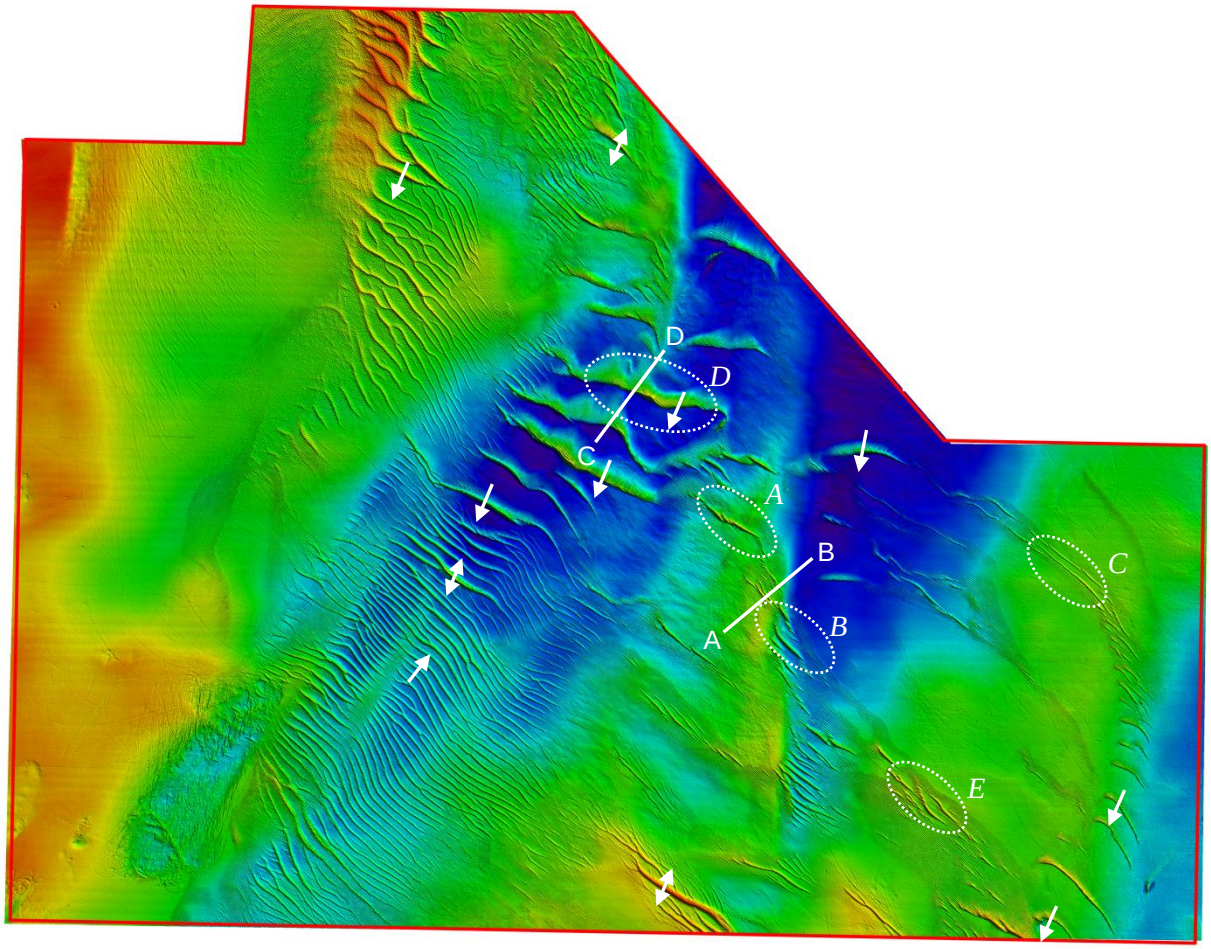
Main shipping routes through area TE3A

———	2 year resurvey limits
———	1 year focused survey limits

2014 SURVEY DATA OVERLAID ON CHART 2692

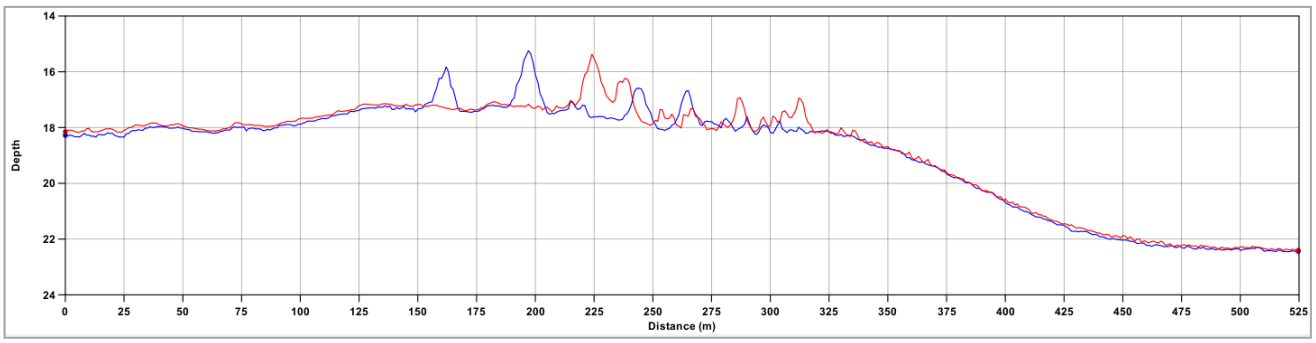


PROFILE COMPARISONS FROM 2012 & 2014 SURVEYS

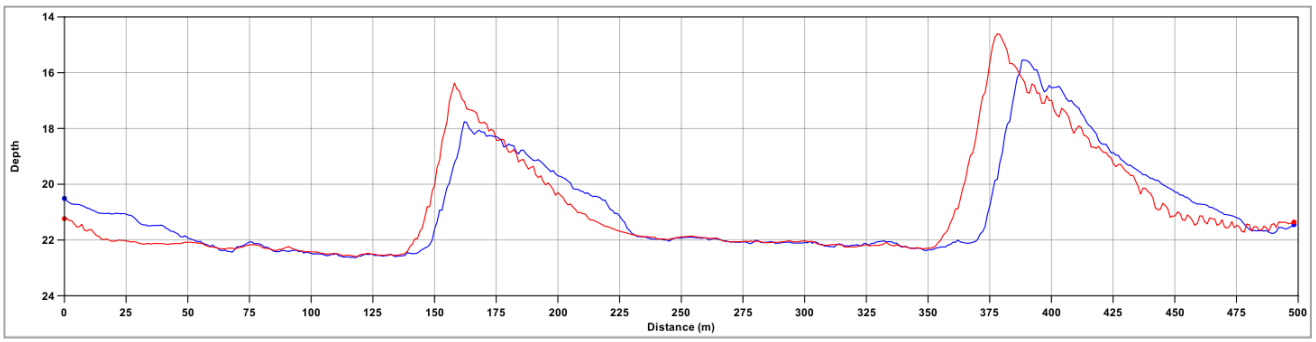


Sediment transport based on sandwave asymmetry and net migration.

Areas of long term depth comparisons (Section 8 of the report refers)



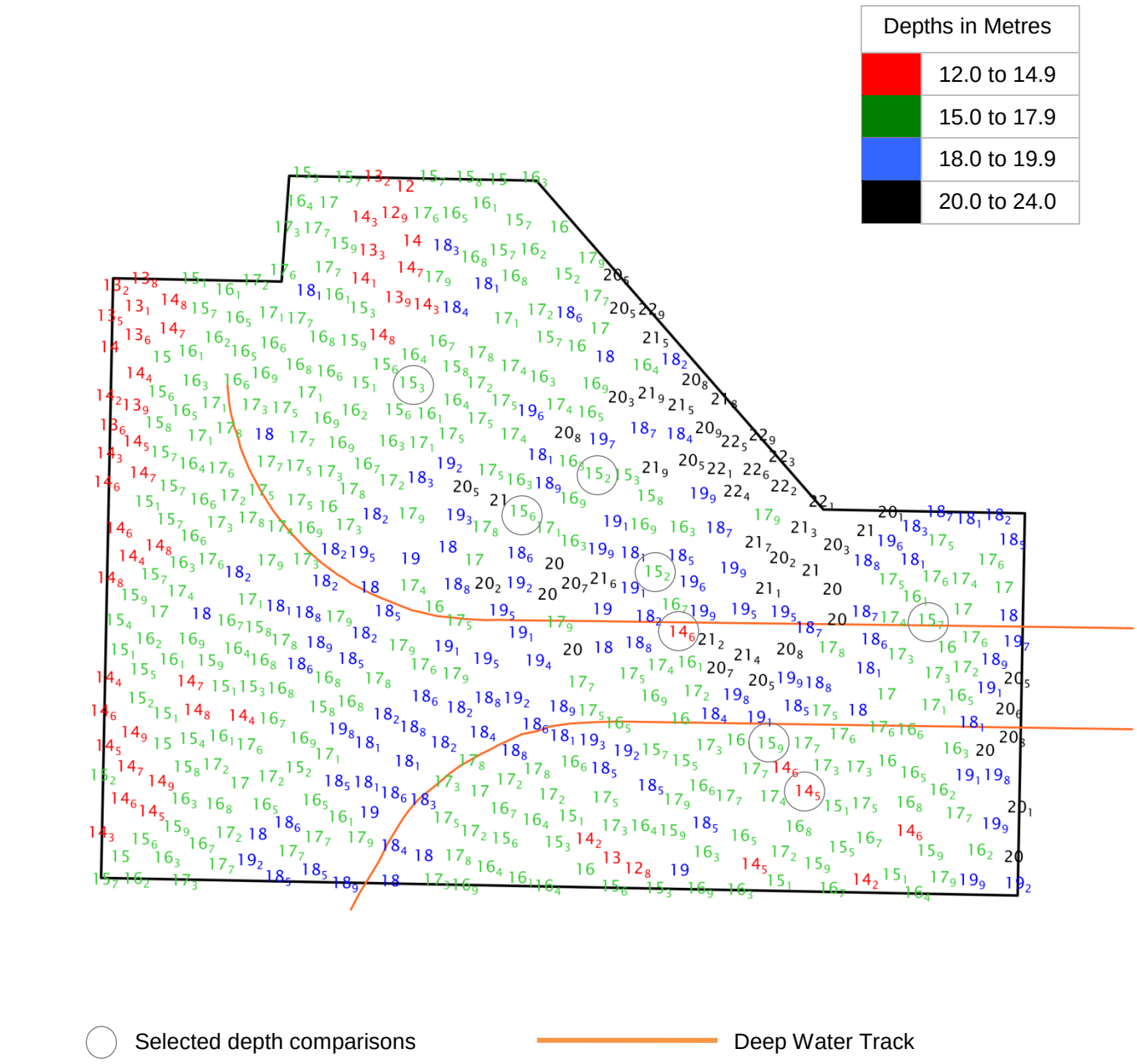
A Profile A-B B



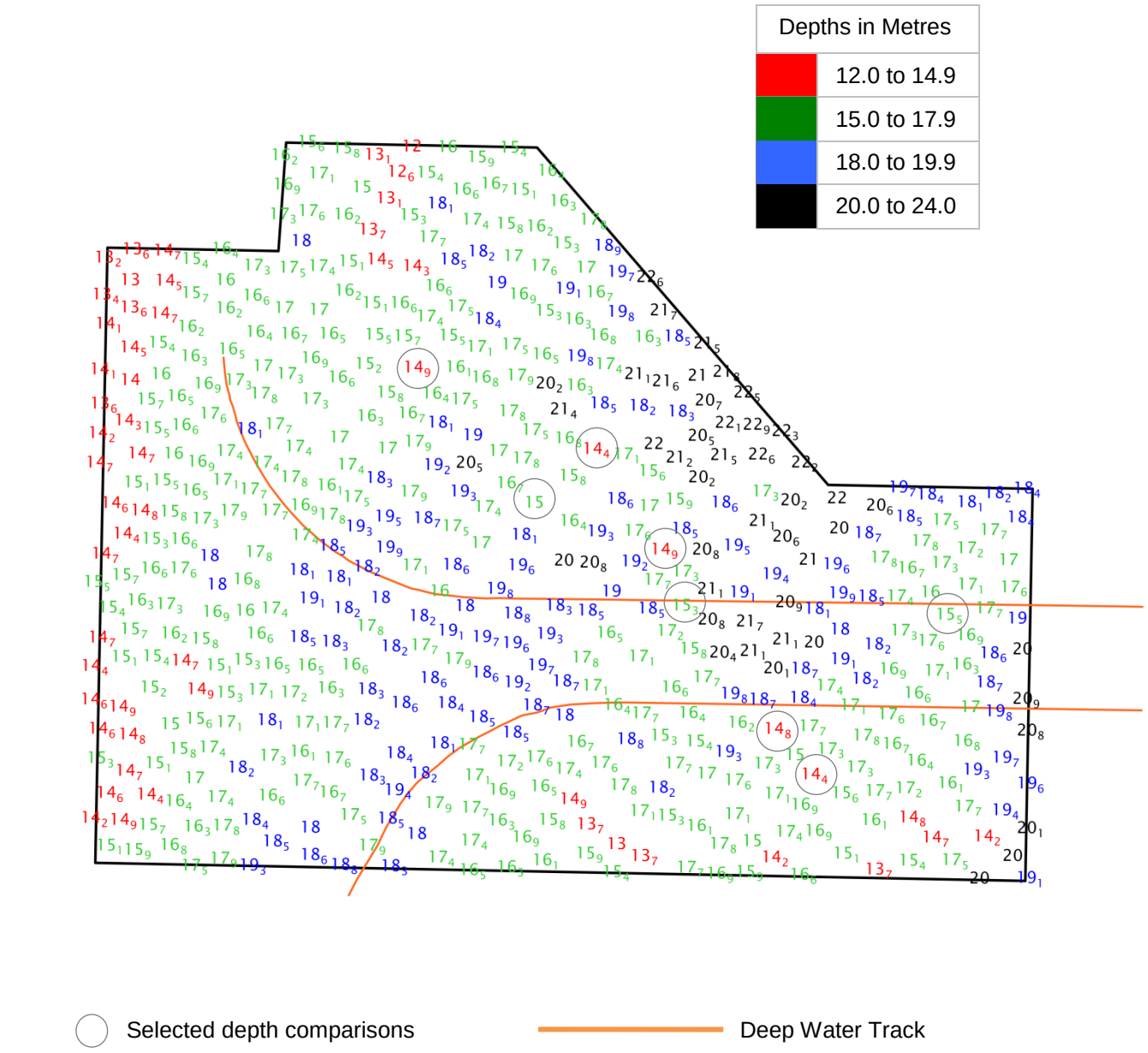
C Profile C-D D

Blue = 2012, Red = 2014

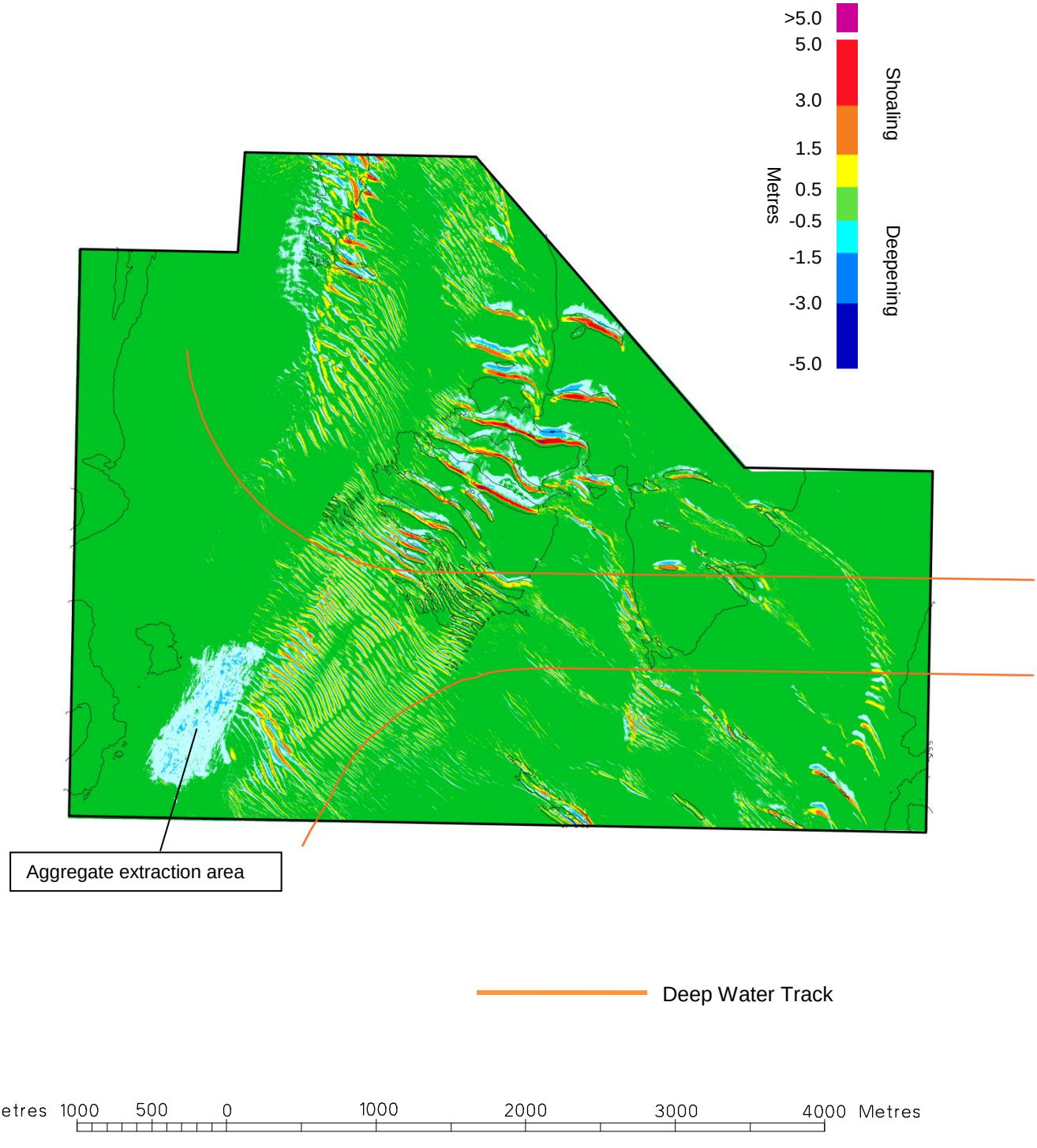
COLOUR BANDED DEPTH PLOT
FROM THE 2012 SURVEY
SHOWING SELECTED DEPTHS
SCALE 1:40,000



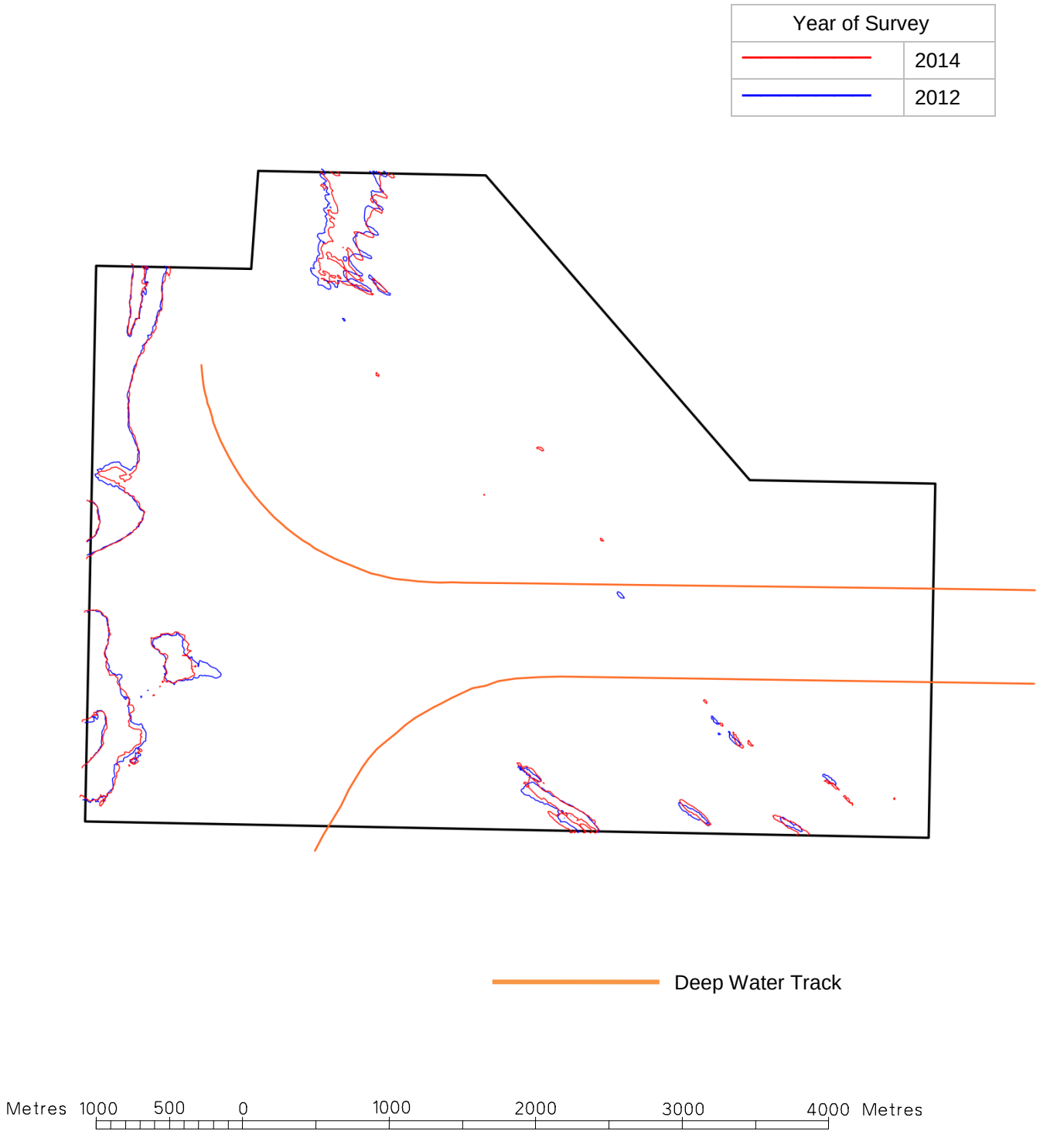
COLOUR BANDED DEPTH PLOT
FROM THE 2014 SURVEY
SHOWING SELECTED DEPTHS
SCALE 1:40,000



VARIABILITY PLOT SHOWING
BATHYMETRIC CHANGES BETWEEN THE 2012 AND 2014 SURVEYS
AND CHARTED CONTOURS FROM THE 2014 SURVEY
SCALE 1:40,000



COMPOSITE DIAGRAM OF THE
15 METRE CONTOUR FROM THE 2012 AND 2014 SURVEYS
SCALE 1:40,000



COMPOSITE DIAGRAM OF THE
20 METRE CONTOUR FROM THE 2012 AND 2014 SURVEYS
SCALE 1:40,000