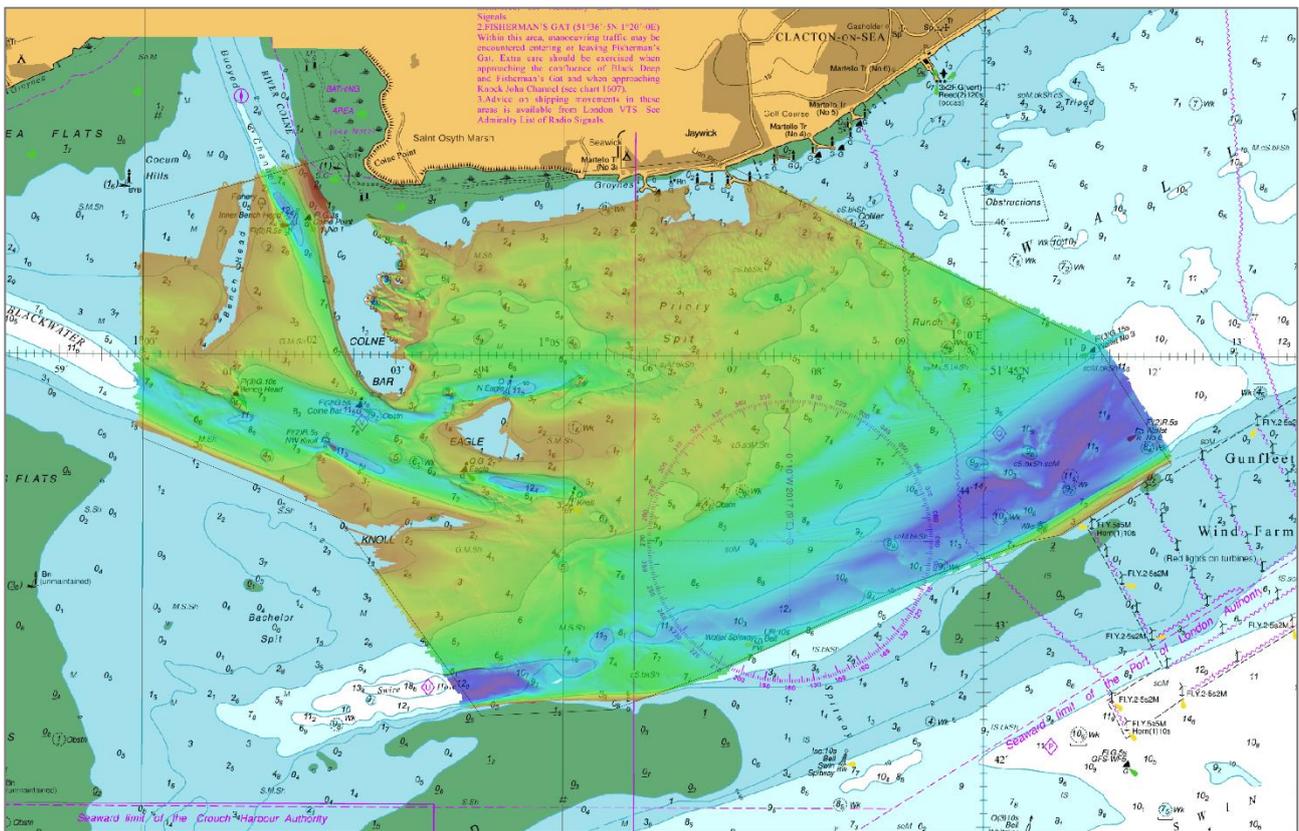




THAMES ESTUARY BUXEY SAND (TE10) ASSESSMENT TE10/2016-V3

An assessment of the 2016 hydrographic survey of the area TE10: to monitor recent seabed movement; to identify any implications for shipping; and to make recommendations for future surveys.



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BUXEY SAND TE10, 2016

1. EXECUTIVE SUMMARY

The Area and Recent Changes

- 1.1 The area was removed from the Routine Resurvey Programme in 1994 following the 1993 report with the caveat that the area would need resurveying again in the future.
- 1.2 The minimum depth is -2m (drying height) in the northwest part of the survey area close to the entrance to River Colne. This is similar to the last survey of this river in 2015.
- 1.3 AIS data indicates the largest draught of vessel transiting TE10 was 13.5m, however it is unlikely to have been fully loaded when transiting TE10 and therefore unlikely to have had maximum draught. Most vessels transiting from the east towards River Colne had a draught less than 6m.
- 1.4 Along the approach route that most vessels use there is a sandbank between the Knoll and Eagle buoys, which has migrated 30m southwest since 1985 and has a minimum depth of 3.7m (compared to 4.7m in 1985). The channel to the southwest of this sandbank has shoaled by up to 5.9m since 1985.

Reasons for Continuing to Resurvey the Area

- 1.5 To provide detail on the possible migration of the sandbank between Knoll and Eagle buoys.
- 1.6 To examine the rate of change occurring within the channel between Knoll and Eagle buoys. Shoaling depths along the narrow approach route between Knoll and Eagle buoys are a concern to vessels with the largest draughts.
- 1.7 To see if and where shoaling or other sediment movement is occurring across the TE10 area.

Recommendations

- 1.8 The area (TE10) should be removed from the Routine Resurvey Programme.

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 all interested parties through the UKHO website, before being presented to the Civil Hydrography Working Group. When approved, the recommendations are incorporated into the Routine Resurvey Programme.
- 2.3 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.
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web site (www.ukho.gov.uk), by e-mail to intellectualproperty@ukho.gov.uk or in writing to Intellectual Property, UK Hydrographic Office, Admiralty Way, Taunton, Somerset, TA1 2DN.

3. AREA HISTORY

3.1 Summary of Surveys:

Year	Survey	Scale	Line Spacing	Area Surveyed	Reference
1965	K4772	1:25,000	62.5/125m	Majority of area (RN surveys). All navigable channels	
1967	K5287	1:25,000	125/250m	Majority of area (RN surveys). All navigable channels	
1974	K6914	1:25,000	62.5/125m	Majority of area (RN surveys). All navigable channels	
1974	K7056	1:25,000	62.5/250m	Majority of area (RN surveys). All navigable channels	
1985	K9790 (HI197)	1:25,000	62.5/250m	Whole survey area (RN survey)	2006-360383

Key: s = sonar sweep, t = seabed texture tracing, d = digital data, m = multibeam digital data
Single-beam surveys (prior to 2004) conducted at 1:25,000 scale

3.2 Summary of historical recommendation enacted

Year	Remarks
1980	Area 10 established at a 12 year resurvey interval following a re-scheming of the Routine Resurvey Programme (Previously called area G on a 10 resurvey interval) with the area extended to cover the outer channels of rivers Blackwater and Colne
1993	Area removed from the Routine Resurvey Programme with the caveat that the area will need to be surveyed at a later date. The deepest draught of any vessel known to have used the area in the past was 7.6m with the majority of vessels traversing this area have draughts of 5.5m or less. The area remaining essentially stable and the statistical analysis shows that the area has a tendency to deepen with the exception of Whitaker Channel.
2009	A review of areas removed from the Routine Resurvey Programme made no recommendations on its re-inclusion of resurvey interval on Area 10 but has been included here for records

4. DESCRIPTION OF THE AREA

4.1 Area TE10 covers the buoy-marked approaches to River Blackwater leading to Maldon harbour, and the River Colne leading to Brightlingsea and Colchester harbours. The Port of Colchester closed to commercial shipping in 2001, but since 2013 regeneration in the harbour has encouraged leisure craft to continue to use the harbour and a seasonal foot passenger ferry service is operated by Brightlingsea Harbour Commissioners from Colchester to other local communities. Maldon and Brightlingsea still maintain commercial shipping activities such as support vessel for the offshore windfarm industry. Gunfleet Sands Wind Farm lies to the east of the survey area. The area contains the shoal areas of Priory Spit, Bachelor Spit and Colne Bar. The area lies north of Buxey Sand – a shoal sandy area with drying heights.

- 4.2 The shoalest depth is -2m (drying height) in the northwest of the survey area close to the entrance to River Colne.
- 4.3 Within the approach channel between Knoll and Eagle buoys there is a sand ridge with a controlling depth of 3.7m, which has shoaled by 1m since 1985.
- 4.4 Area Covered: 21 NM² (72 km²) as shown in Figure 1 below.

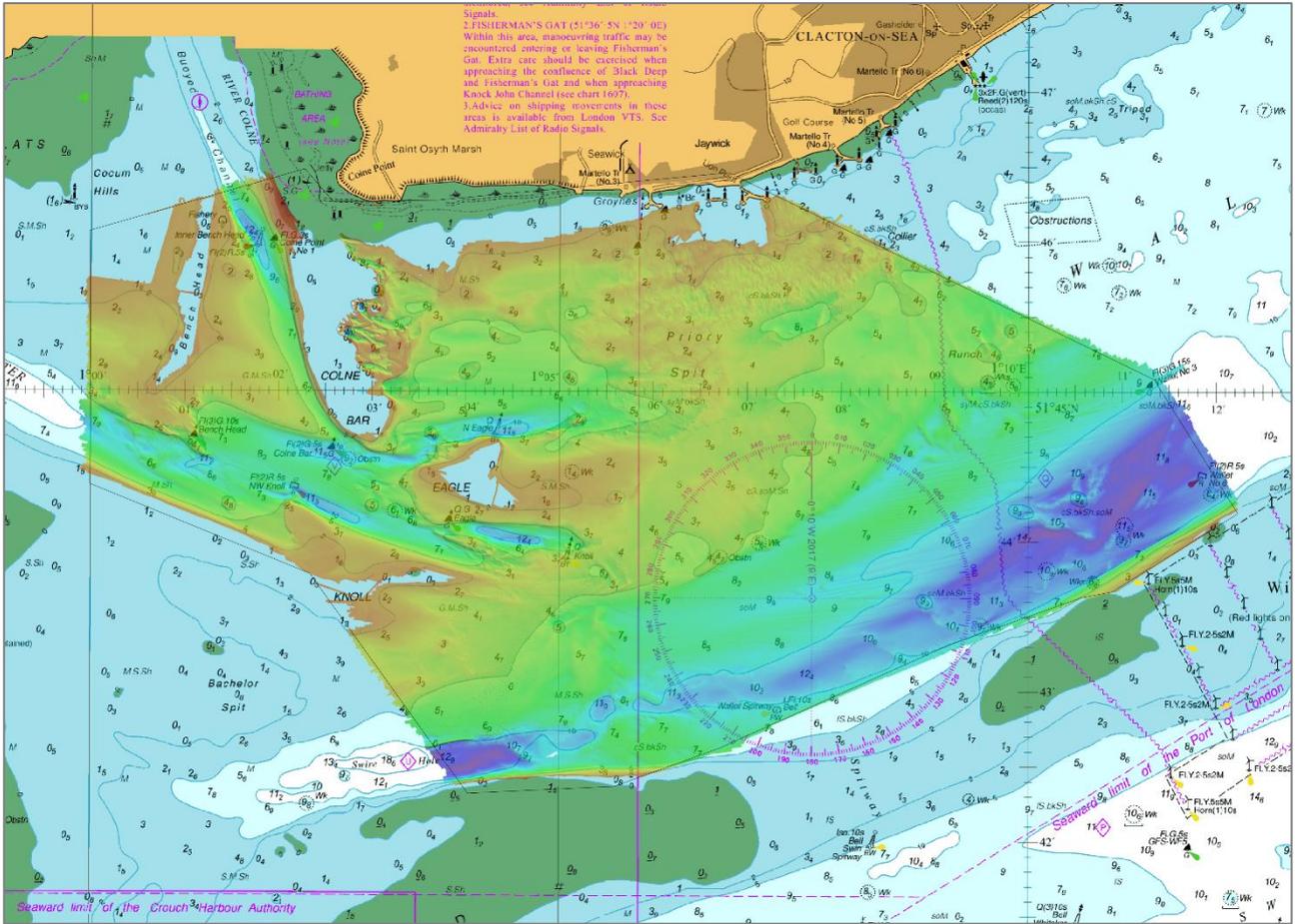


Figure 1 – 2016 survey data sun-illuminated view overlaid on BA Chart 1975

4.5 The geographic limits at the time of resurvey are shown in the Table 1 below and coordinates are in Decimal Degrees referenced to WGS84:

Point	Latitude (N)	Longitude (E)
01	51.71037	1.11177
02	51.70611	1.09321
03	51.70531	1.06716
04	51.72970	1.03899
05	51.73961	0.99985
06	51.76775	0.99981
07	51.77466	1.03789
08	51.77103	1.04296
09	51.77122	1.06125
10	51.77436	1.11325
11	51.75144	1.18899
12	51.73655	1.20387
13	51.72783	1.18153
14	51.72719	1.17607
15	51.72198	1.15284
01	51.71037	1.11177

4.6 Survey interval at time of resurvey: Not Applicable

4.7 Largest scale chart: BA1975 (Scale 1:50,000)

5. SHIPPING IN THE AREA

5.1 Shipping data from satellite AIS data for 2016 of vessels larger than 2000GT indicates the maximum draught vessel to transit through the TE10 area was 13.5m. However, large draught vessels are infrequent in this area so this particular container vessel may not have been fully loaded and therefore not had its maximum draught when transiting TE10.

5.2 In Figure 2 AIS data indicates most vessels transiting TE10 had a draught between 4 and 6m, and followed the buoyed approach from the east towards River Colne. Broadly vessels with similar draughts continue to transit the areas as reported in 1985 but with most vessel traffic indicated to be heading towards the River Colne. Brightlingsea Harbour accepts vessels with draughts up to 5m and is reported to be used by various windfarm support vessels. The available AIS data indicates no vessels with the above parameters transited towards River Blackwater.

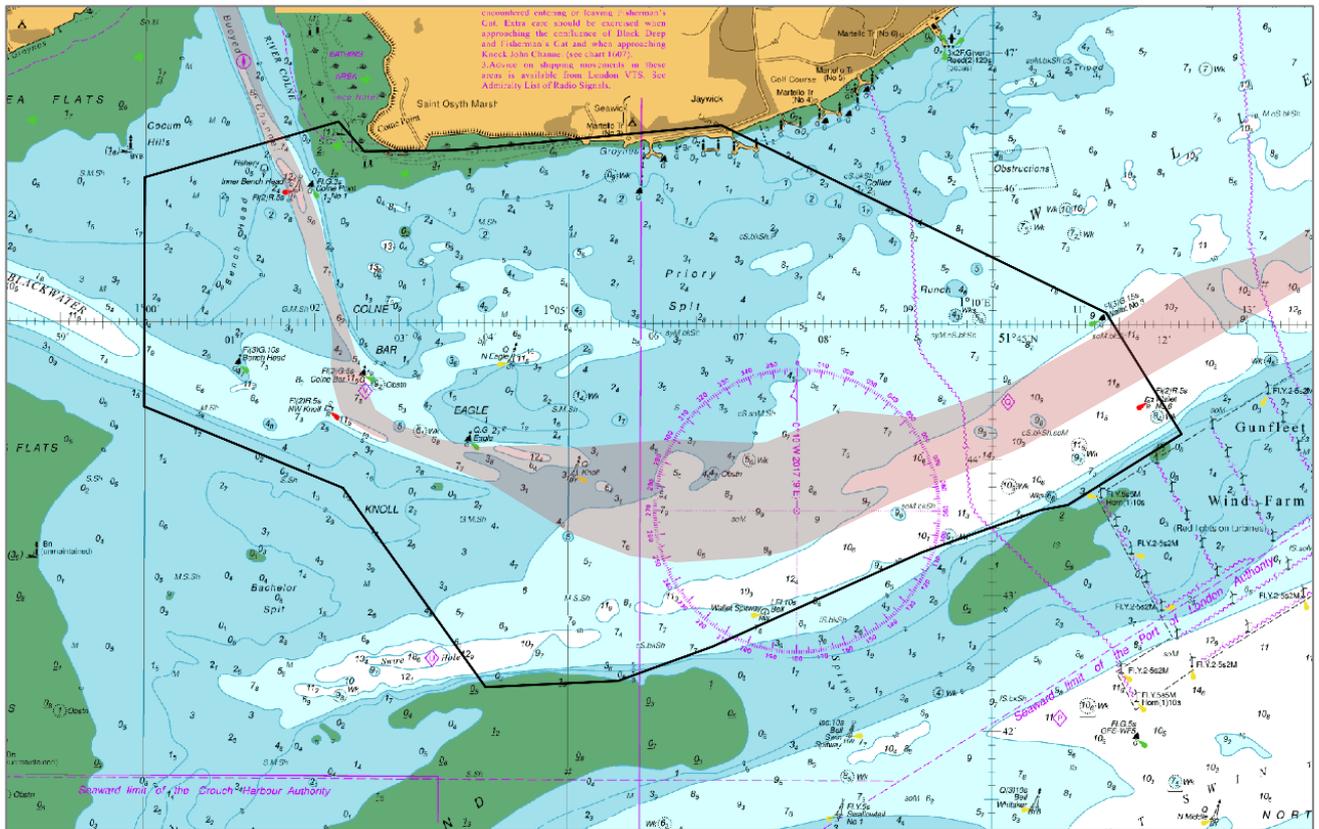


Figure 2 – Indicative shipping routes overlaid on BA Chart 1975

—	Limits of TE10 survey area
■	Indicative shipping routes through TE10 of vessels with <10m draught

6. REFERENCE SURVEY DETAIL

- 6.1 The last historical survey of area TE10, which has been used as the reference to compile this assessment, was Hydrographic Instruction (HI) 197 which was gathered between 19th September and 28th October 1985 by the Royal Navy.
- 6.2 The survey data was acquired using a single beam echosounder. The survey is referred to the OSGB (1936). Depths were reduced to Chart Datum at Clacton-on-Sea which 2.29m below Ordnance Datum (Newlyn). The final product stored by UKHO was a 140m bin point cloud.
- 6.3 Given the lower density of soundings available in the survey compared to the recent 2016 survey described in the following section it will be necessary to interpolate between data points. This reduced resolution will limit the detail in later sections of this report.
- 6.4 The Report of Survey is not available but the bathymetric surfaces are available to download from INSPIRE portal and MEDIN Bathymetry Data Archive Centre.

7. COMPARISON SURVEY DETAIL

- 7.1 The latest survey undertaken as part of the Civil Hydrography Programme (CHP) Routine Resurvey Programme was in 2016 under HI1522. Area TE10 was surveyed between 7th and 10th September.
- 7.2 The survey data was acquired using multibeam echosounder system. The primary reference position system used GNSS and was supplemented by a dynamic GNSS Precise Point measuring system. The survey is referred to the European Terrestrial Reference Frame 1989 (ETRF89) datum.
- 7.3 Observations from GNSS 3D positioning were combined with the UKHO Vertical Offshore Reference Frame (VORF) to reduce depths to Chart Datum. The final deliverable was a 1m resolution CUBE (Combined Uncertainty and Bathymetry Estimator) surface.
- 7.4 The survey was validated by UKHO and met IHO S44 (5th Edition) Order 1a standards.
- 7.5 The Report of Survey for this surveys is available upon request from the UKHO and the validated bathymetric surfaces are available to download from INSPIRE portal and MEDIN Bathymetry Data Archive Centre.

8. DESCRIPTION OF RECENT BATHYMETRIC CHANGE

- 8.1 Please note that the reference survey dated 1985 used a single beam echo sounder with relatively low data density compared to modern techniques. For the comparison against the 2016 survey it was necessary to create a surface using Triangular Irregular Network (TIN) to interpolate between the single beam echo sounder data points.
- 8.2 The Variability Plot in Figure 3 indicates that there has been a variety of bathymetric change across area TE10 between 1985 and 2016. Depths have generally shoaled along approach routes towards River Colne where AIS indicates most vessels have transited in 2016. Depths have also shoaled between Colne Bar and Colne Point buoys by up to 3m along the approach that shipping uses. Given the conclusion of the 1993 Routine Resurvey Assessment that the area remaining essentially stable and the statistical analysis shows that the area tends to deepen, this shows a complete reversal. However, due to the time since the last survey this assessment is unable to make comment on when this reversal has begun nor the rate at which the changes are occurring.

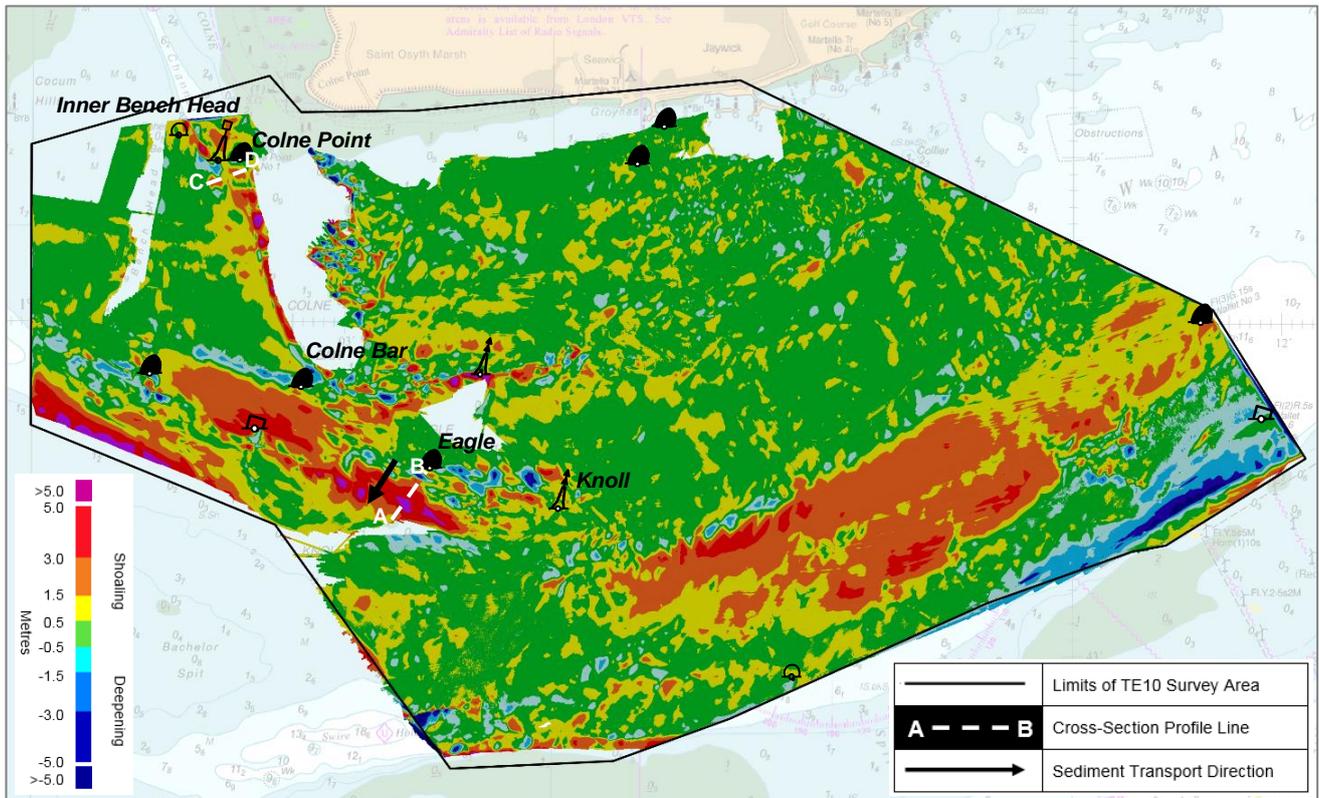


Figure 3 – Variability Plot showing Bathymetric Changes between the 1985 and 2016 surveys of TE10

8.3 The Profile Comparison in Figure 4 shows that the sand ridge between the Knoll and Eagle buoys has migrated southwest by approximately 30m between 1985 and 2016. It also shows that depths within the channel southwest of Eagle buoy have shoaled by up to 5.9m since 1985.

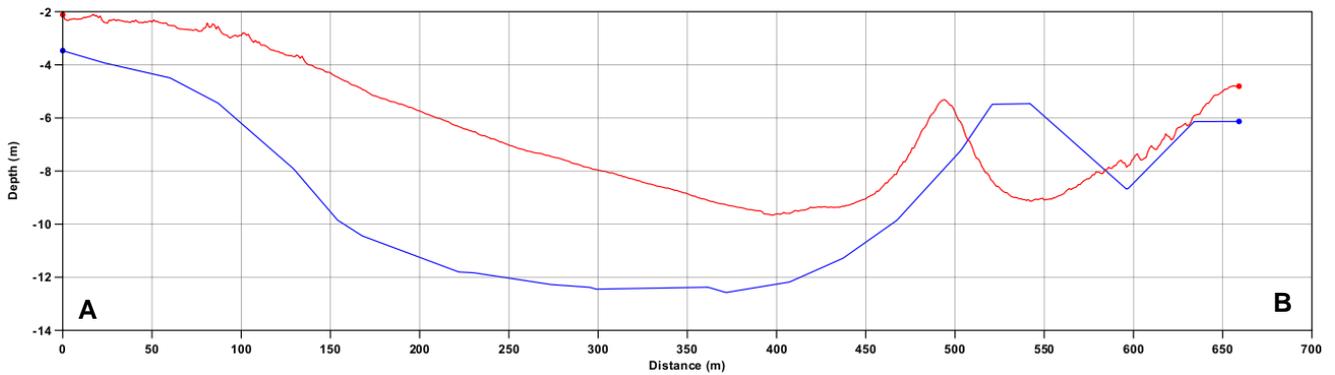


Figure 4 – Profile Comparison (A to B) between 1985 and 2016 survey data

8.4 The Profile Comparison in Figure 5 is an example of where depths have shoaled within the approach channel that shipping uses between Colne Bar and Colne Point buoys towards River Colne.

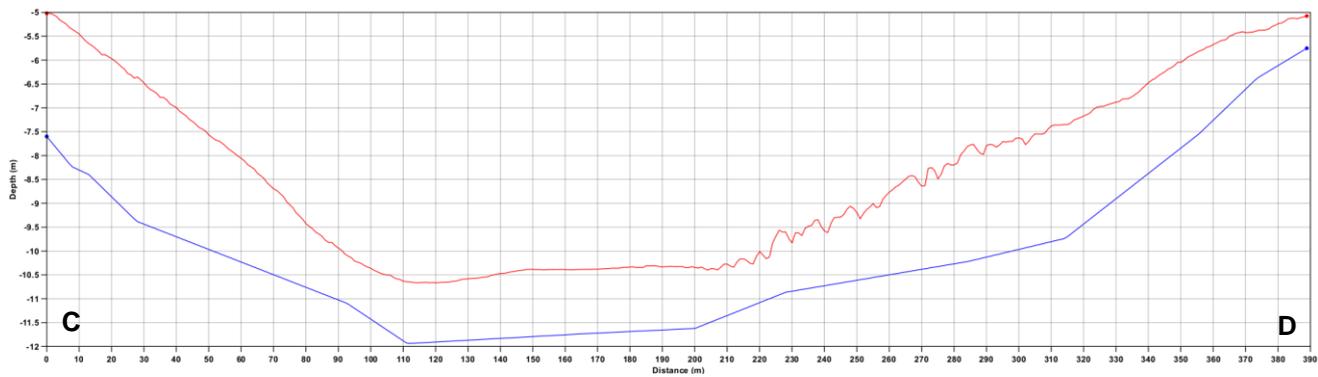


Figure 5 – Profile Comparison (C to D) between 1985 and 2016 survey data

8.5 Figure 6 shows how some of the controlling depths between the Eagle and Knoll buoys have shoaled since 1985. For example, the shoal depth close to Knoll buoy has shoaled from 4.2m to 3.1m.

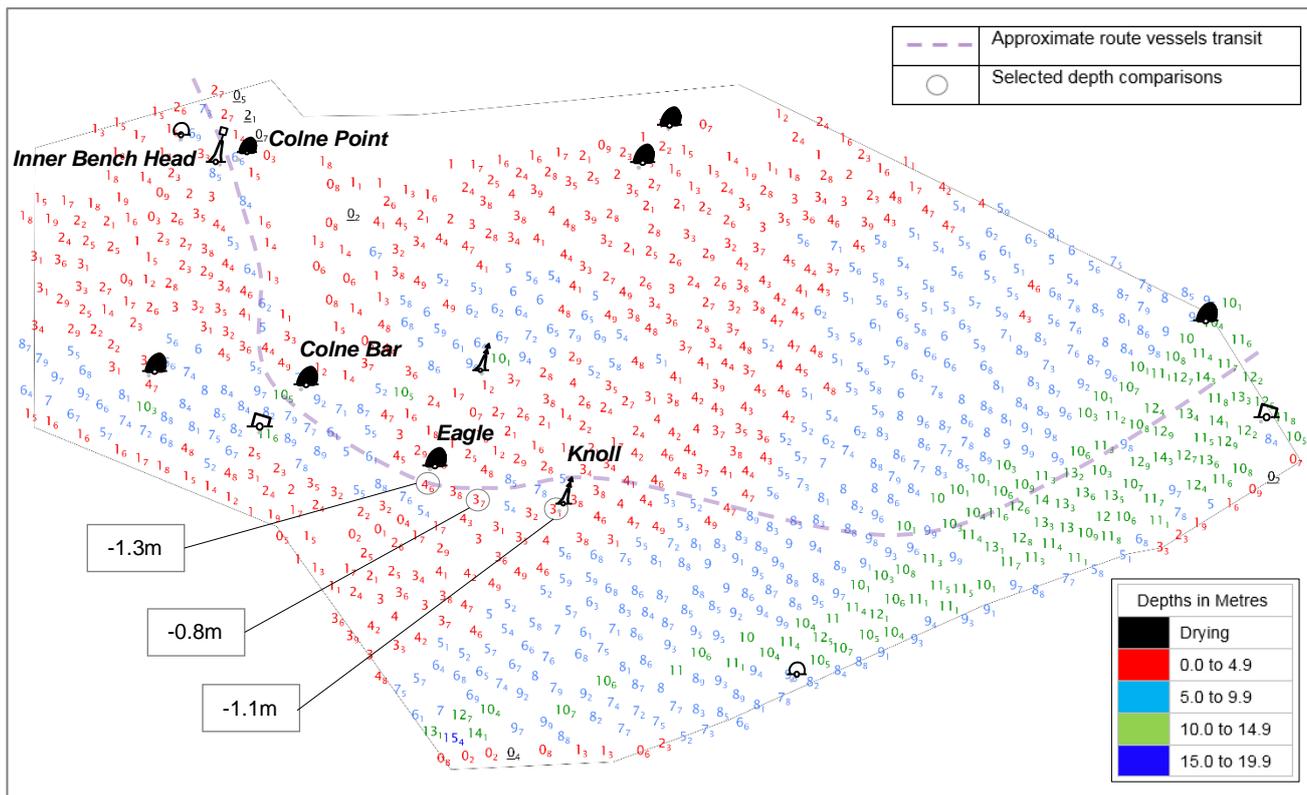


Figure 6 – Colour Banded Depth Plot from the 2016 survey with selected depths (Scale 1:40,000)

Depth changes indicated above are from the closest corresponding 1985 sounding available. Hence depth differences will be from different positions from the 2016 sounding selection as an automatic shoal bias sounding selection tool has been utilised which produces a representation of the shoal values in a data set. Positive values (+) represent deepening. Negative values (-) represent seabed depths becoming shallower.

9. IMPLICATIONS FOR SHIPPING

- 9.1 The 2016 survey shows a complete reversal from the conclusions of the 1993 Routine Resurvey Assessment which described the area was stable and the statistical analysis showing the area tended to deepen. The areas that have seen the most shoaling since 1985 are along the approach route that most shipping has used in 2016 with most vessels transiting TE10 in 2016 had a draught between 4 and 6m. The areas of most concern to vessels with this draught range are the shoal areas along the approach route close to the Eagle and Knoll buoys where there are depths shoaler than this draught range, so therefore only passable at certain stages of the tide. Broadly, vessels with similar draughts continue to transit the areas as reported in 1985 but with most vessel traffic indicated to be heading towards the River Colne.
- 9.2 Southwest of Eagle buoy depths have shoaled by up to 5.9m since 1985 so a future multibeam survey would be required to confirm if the area is still becoming shallower as well as the rate which this is occurring and what implication this may have for shipping.

10. RECOMMENDATIONS FOR FUTURE SURVEYS

- 10.1 The 2016 survey shows a reversal of the trend reported in 1993 with the area generally becoming shallower. This is most noticeable in the areas that AIS data shows vessel traffic. However, due to there being no reported issues with the vessel transiting the area this area, as well as the types of vessel in the areas, it is recommended not to include this area within the RRS Programme.