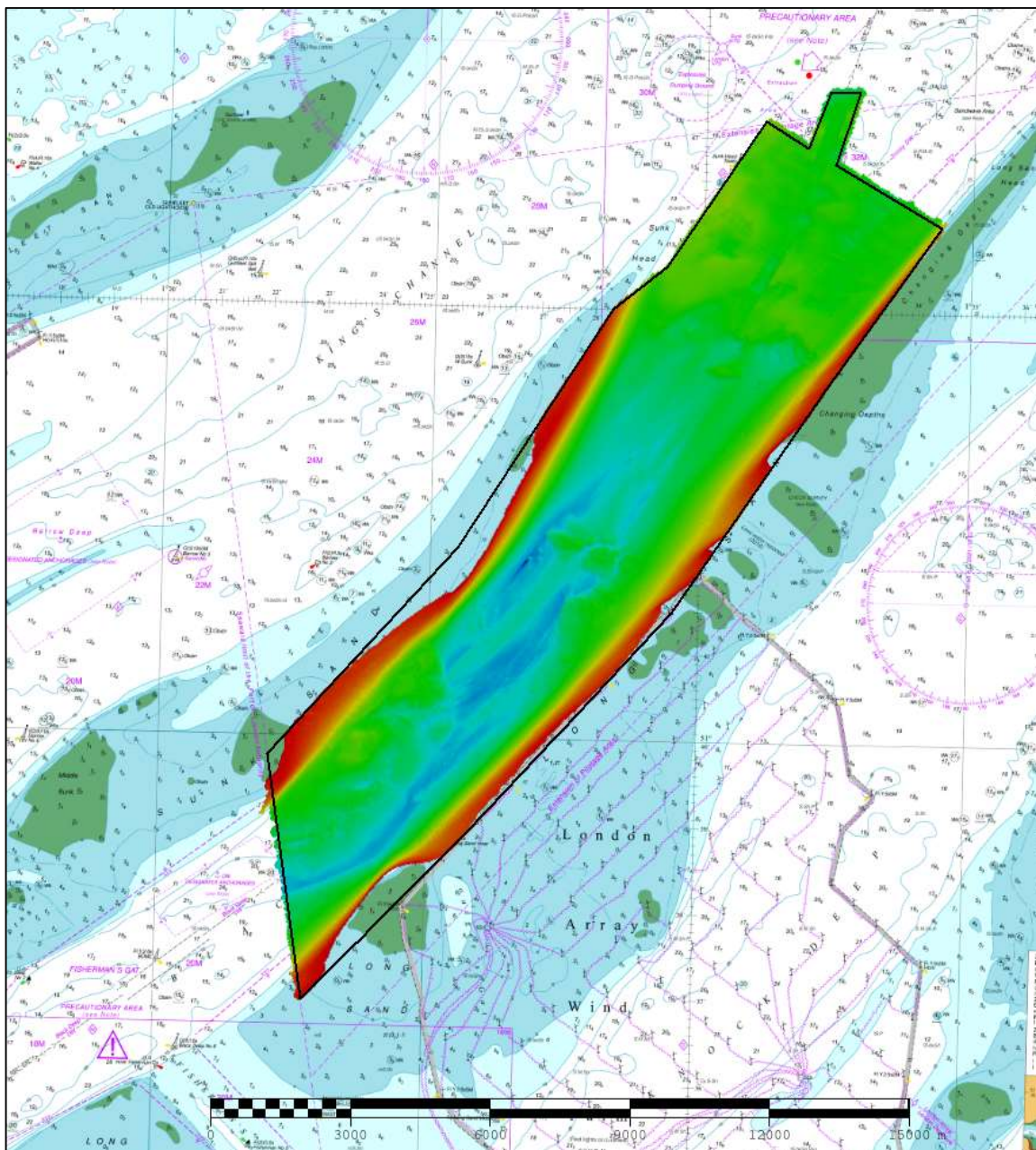




UK Hydrographic
Office

THAMES ESTUARY BLACK DEEP (TE6) 2022 ASSESSMENT

An assessment of the 2022 hydrographic survey of the area TE6: to monitor recent seabed movement; to identify any implications for shipping; and to make recommendations for future surveys.



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Notes

This Assessment is produced by the UK Hydrographic Office (UKHO) for the Maritime and Coastguard Agency (MCA). Analysis of the Routine Resurvey Areas forms part of the Civil Hydrography Programme and the reports are made available through the UKHO website and are 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).

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No analysis of shipping traffic has been included within this report due to no AIS data being supplied by MCA.

All depths are to Chart Datum, defined using the UKHO Vertical Offshore Reference Frame (VORF) Model.

BLACK DEEP, 2022

1. SUMMARY

Changes Detected

- 1.1 Significant depths in the area have been highlighted in Figure 3, and are all situated along the fairway, Trinity DWR and Black Deep DWR. The 15.9m and 16.2m soundings are the shoalest in the Black Deep DWR region, just adjacent to the DWR itself (both approx. 225m SE from the charted route). Trinity DWR has a sounding of 15.1m adjacent to the DWR, and a sounding of 15.3m directly on it. The 15.6m seen in Figure 3 is along the western bank of the fairway channel.
- 1.2 Difference surfaces in Figures 4-6 demonstrate that the overall trends in the Black Deep region show most movement from the 20m contour, and the Sunk and Long Sand sandbanks are migrating in a rotational direction, with some areas moving away from the DWR, and in some areas migrating slowly towards the DWR.
- 1.3 There is general deepening along the DWR, with a couple of isolated areas of shoaling.
- 1.4 Recent changes in the fairway/Trinity DWR region are on a smaller scale over the last 2 years, with little shoaling along sandwaves, and further migration of Long Sand Head away from the main shipping routes.

Reasons for Continuing to Resurvey the Area

- 1.5 Though the data shows mostly stable or deepening depths in the main Black Deep DWR, tracking the sandbank movement, shoal patches and the fairway remains of importance to marine traffic in the area.

Recommendations

- 1.6 It is recommended that the whole area that was surveyed for 2022 be established as 'TE6', removing any focused areas, and surveyed on an 8-yr interval.

2. LOCATION

- 2.1 Survey interval at time of resurvey: **To be determined**. The northern section of survey area covering the fairway and part of Trinity DWR was previously referred to as the TE6 Black Deep Full area until recently, and was surveyed at a frequency of 12 years. A smaller focused area (TE6A) of the fairway area was on an interval of 6 years.

The current (2022) survey area is based on a combination of the older 2008 large area, encompassing much more of the Black Deep DWR, and the old TE6 area, after discussion at CHWG 2022. The frequency of this area has been recommended in this report and will be determined at CHWG 2023.

- 2.2 Area Covered: 84.6 km²

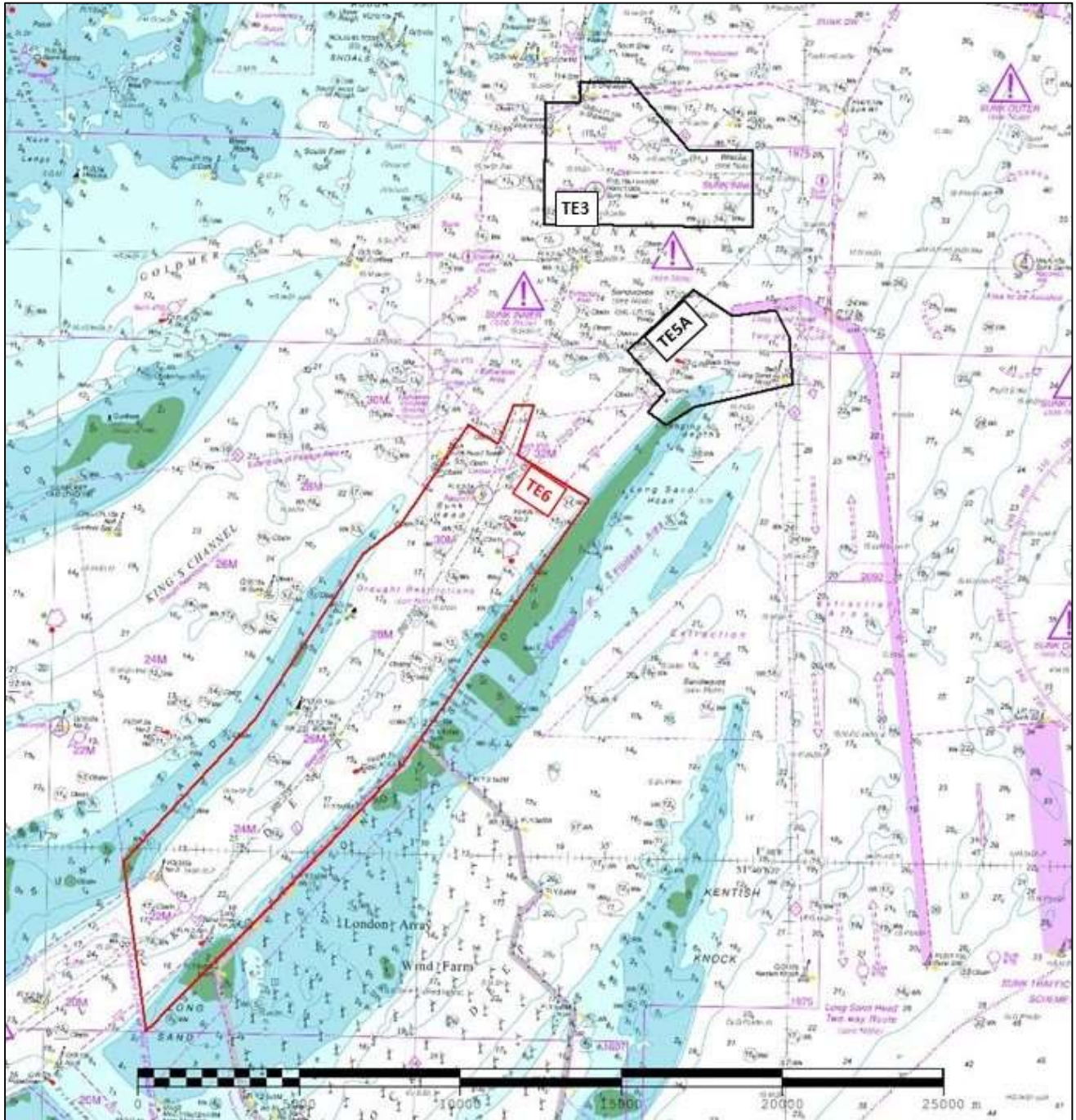


Figure 1: 2022 Thames Estuary Routine Resurvey areas overlaid on BA Chart 1183-0 with area TE6 in red.

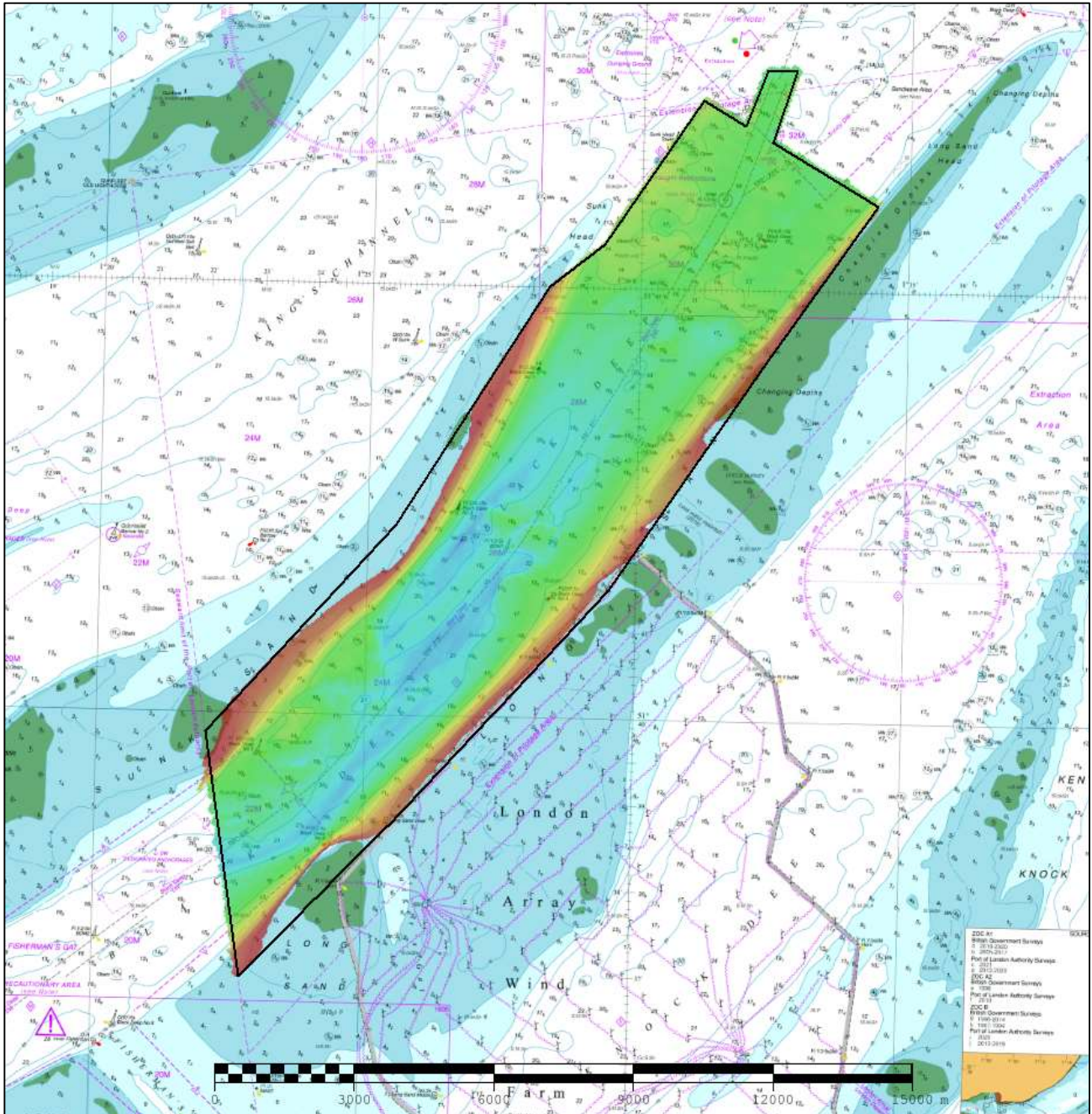


Figure 2: 2022 survey data overlaid on BA Chart 1975-0.

3. REFERENCE SURVEY DETAIL

- 3.1 The previous focused survey was conducted as part of the 2020 Routine Resurvey Programme, CHP between August and September 2020 as part of HI1693 (this was the former TE6 full area polygon). The previous full survey that encompassed the original larger area was conducted within the 2008 Routine Resurvey Programme between June and September 2008 as part of HI1266 and HI1267. A checkline of this area was also completed between June and July 2014, as part of HI1459.
- 3.2 The Report of Survey for these surveys are available upon request from the UKHO and the validated bathymetric surfaces are available to download from the Admiralty Marine Data Portal.

4. NEW SURVEY DETAIL

- 4.1 The latest survey from the current Routine Resurvey Programme was conducted between October and December 2022 as part of HI1765.
- 4.2 The Report of Survey for this survey is available upon request from the UKHO and the validated bathymetric surfaces are available to download from the Admiralty Marine Data Portal.

5. DESCRIPTION OF RECENT BATHYMETRIC CHANGE

- 5.1 **Please note:** the area previously referred to as the TE6 full area in fact only covered the NE area (2020 survey area). It appears that this was in fact a focused area that had been misnamed and the former larger full area (2008/14) was not used. The naming conventions and subsequent survey frequency for the TE6 Black Deep full and focused areas will be determined at the CHWG 2023 meeting.
- 5.2 Figure 3 shows that the significant depths in the 2022 survey area are all located along the Trinity and Black Deep DWRs. In the fairway channel, the shoalest points within that area are 15.6m (which has deepened by 0.3m since 2020) and 15.9m at the beginning of the Black Deep DWR. The Trinity DWR approach has a shoal sounding of 15.1m adjacent to the route, and a depth of 15.3m on the marked route itself. In the main Black Deep DWR, a shoal area is directly across the main route, with a nearby depth of 16.2m ~650m NE of the BDM1 Buoy.
- 5.3 The difference surface in Figure 4 shows depth changes between the 2022 and 2008 surveys, in the Black Deep/SW of the survey area. Much of the significant shoaling over the last 14 years can be seen along the two main sandbanks; Sunk Sand and Long Sand, as they have migrated/built up over time. Both sandbanks appear to have a rotational movement shown, with shoaling in the upper NE of Sunk Sand towards the DWR, but deepening in the lower SW area, away from the DWR. Long Sand/Head is showing the same overall direction, with the NE migrating in the same direction away from the DWR, and the SW section migrating towards the DWR. The upper section of Black Deep DWR shows some slight shoaling in the surrounding seabed, but the bottom half shows slight deepening.
- 5.4 A checkline survey was completed of the southern area in 2014. A difference surface was generated to show changes in the area over the last 8 years in Figure 5. It can be seen again that the majority of shoaling was seen in the surrounding sandbanks, with little significant change along the crucial Black Deep DWR, aside from some slight shoaling in the NE upper section of the DWR.
- 5.5 Figure 6 shows the difference surface of the NE/fairway area between 2020 and 2022. This area shows that in the last two years, there has been very little change, aside from some slight shoaling in the fairway channel, where sandwave mobility is likely contributing to the shoaling. The deepening at the East side of the survey area shows the movements of the Long Sand Head sandbank as it migrates Eastward.
- 5.6 Figure 7 shows the 20m contour between 2008 and 2022 surveys. Contours for 5m, 10m, and 15m did not show significant changes, however the 20m contour shows the most mobility in the area. This aligns with the difference surface in Figure 4, where the area of the 20m contour has widened with progressive deepening in the bottom half of the DWR, and migrated in the upper area.
- 5.7 The colour-banded depth plot in Figure 8 shows soundings across the survey, with selected depths highlighted and displaying changes since previous surveys. Overall, the majority of changes are on a small scale of +/- 0.1-0.3m between 2022, 2020 and 2008, with one or two showing larger changes (due to sandbank movements and the mobility of the shoal area in the middle section of Black Deep DWR, near BDM1 Buoy).

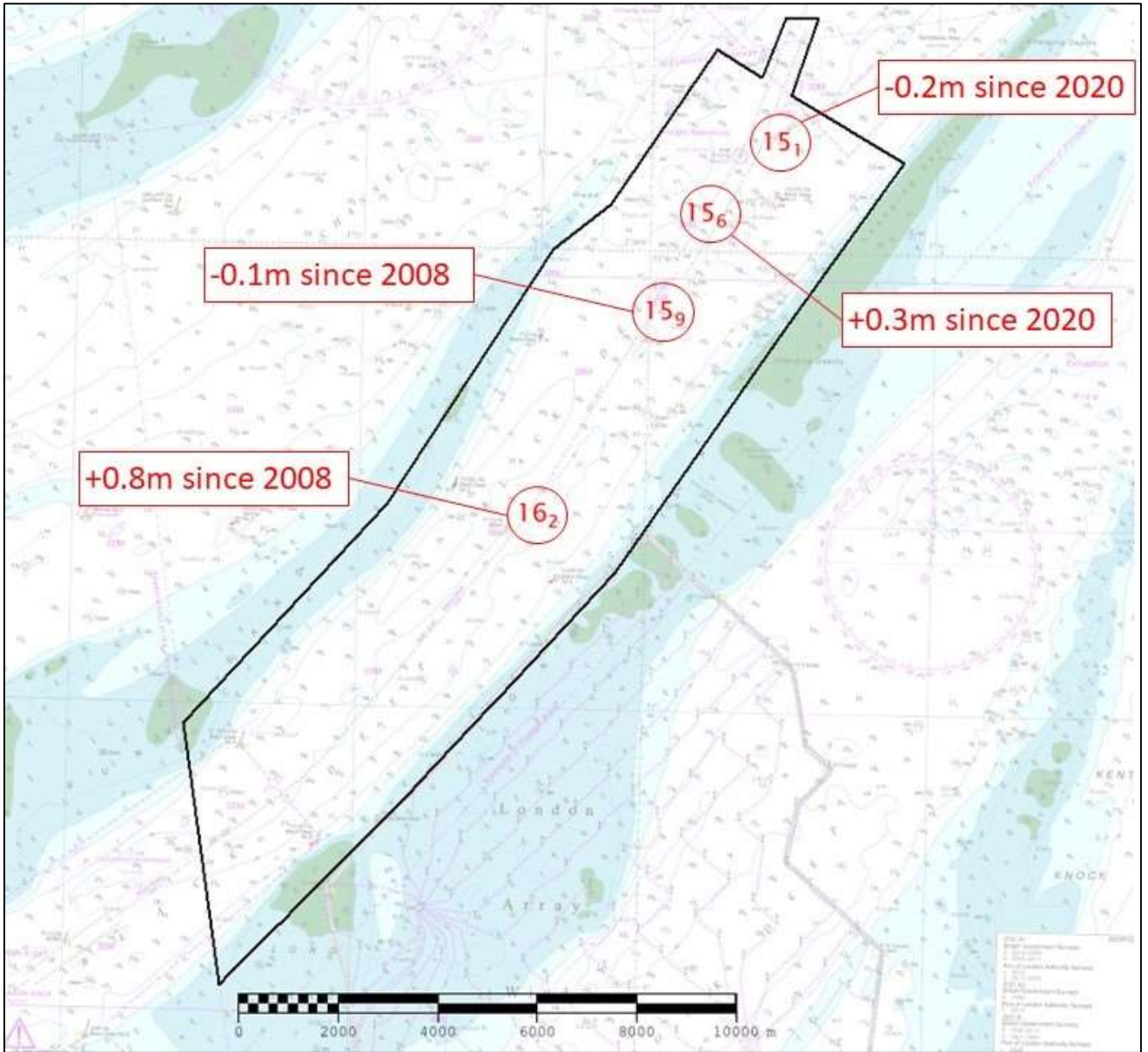


Figure 3: Significant/Controlling Depth soundings highlighted, overlaid on BA Chart 1975-0.

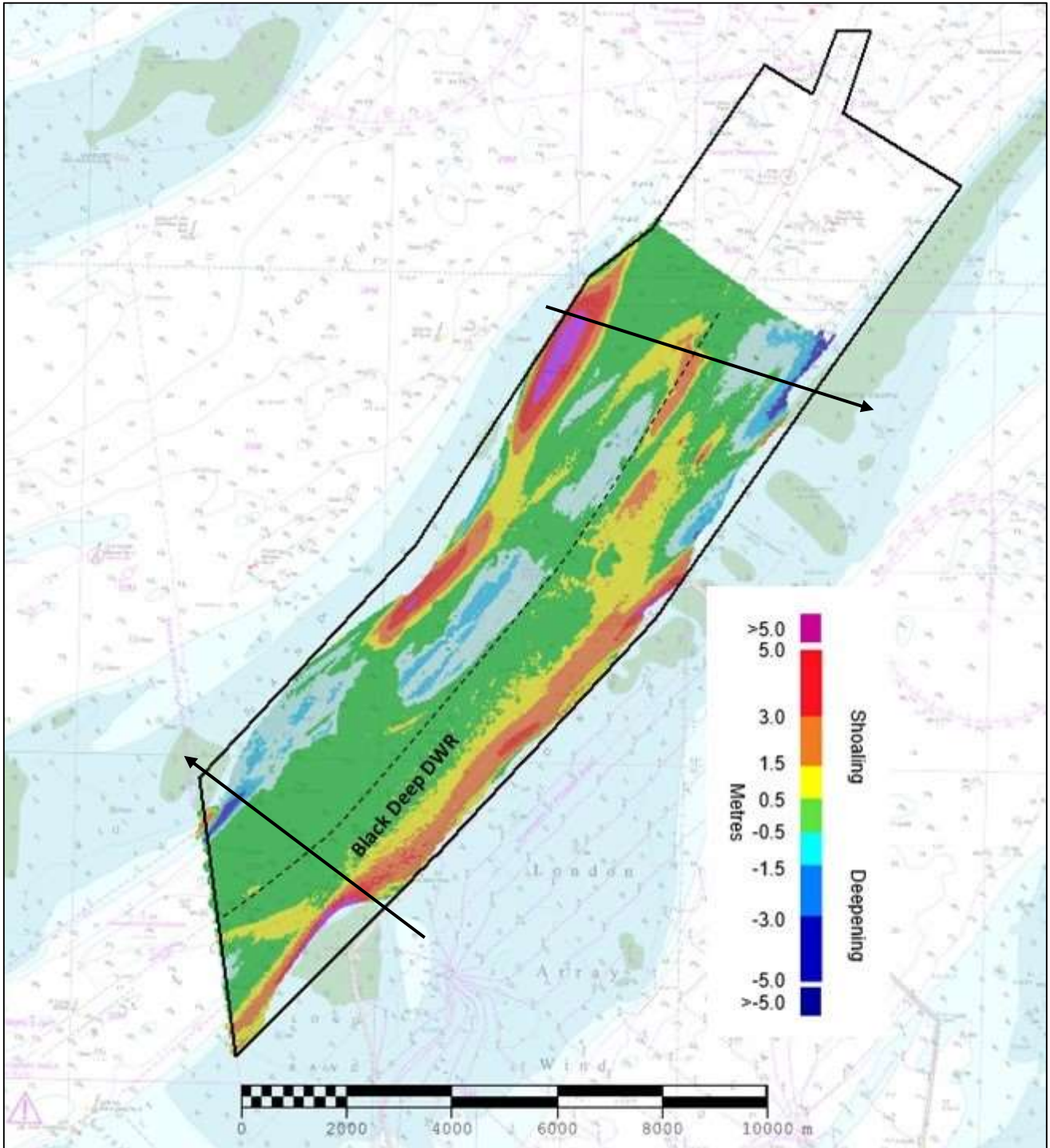


Figure 4: Difference surface showing bathymetric changes between the 2022 and 2008 surveys overlaid on BA Chart 1975-0. Black arrows represent general direction of the Sunk and Long Sand sandbanks migration since 2008 survey.

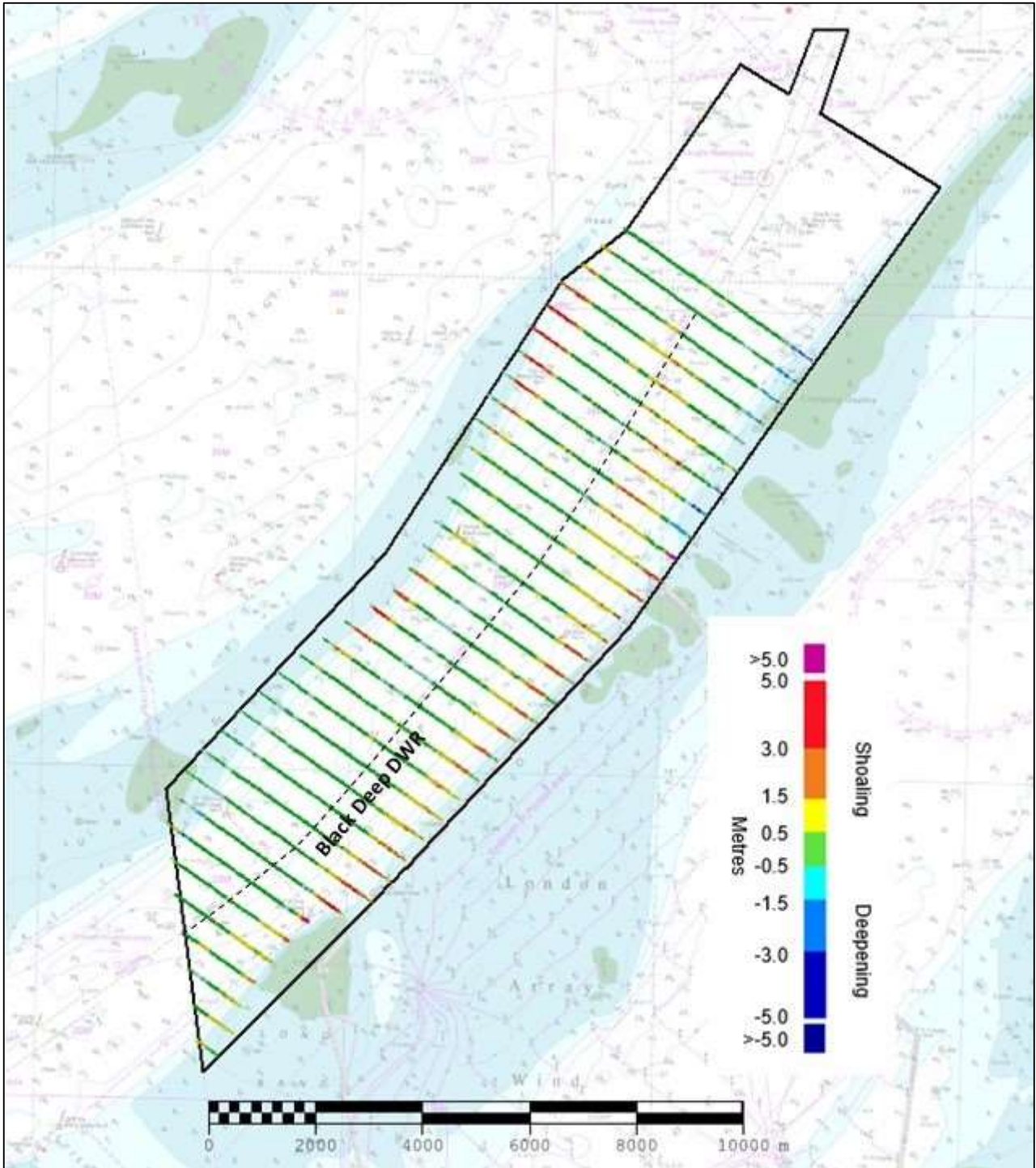


Figure 5: Difference surface showing bathymetric changes between the 2022 and 2014 checkline surveys overlaid on BA Chart 1975-0.

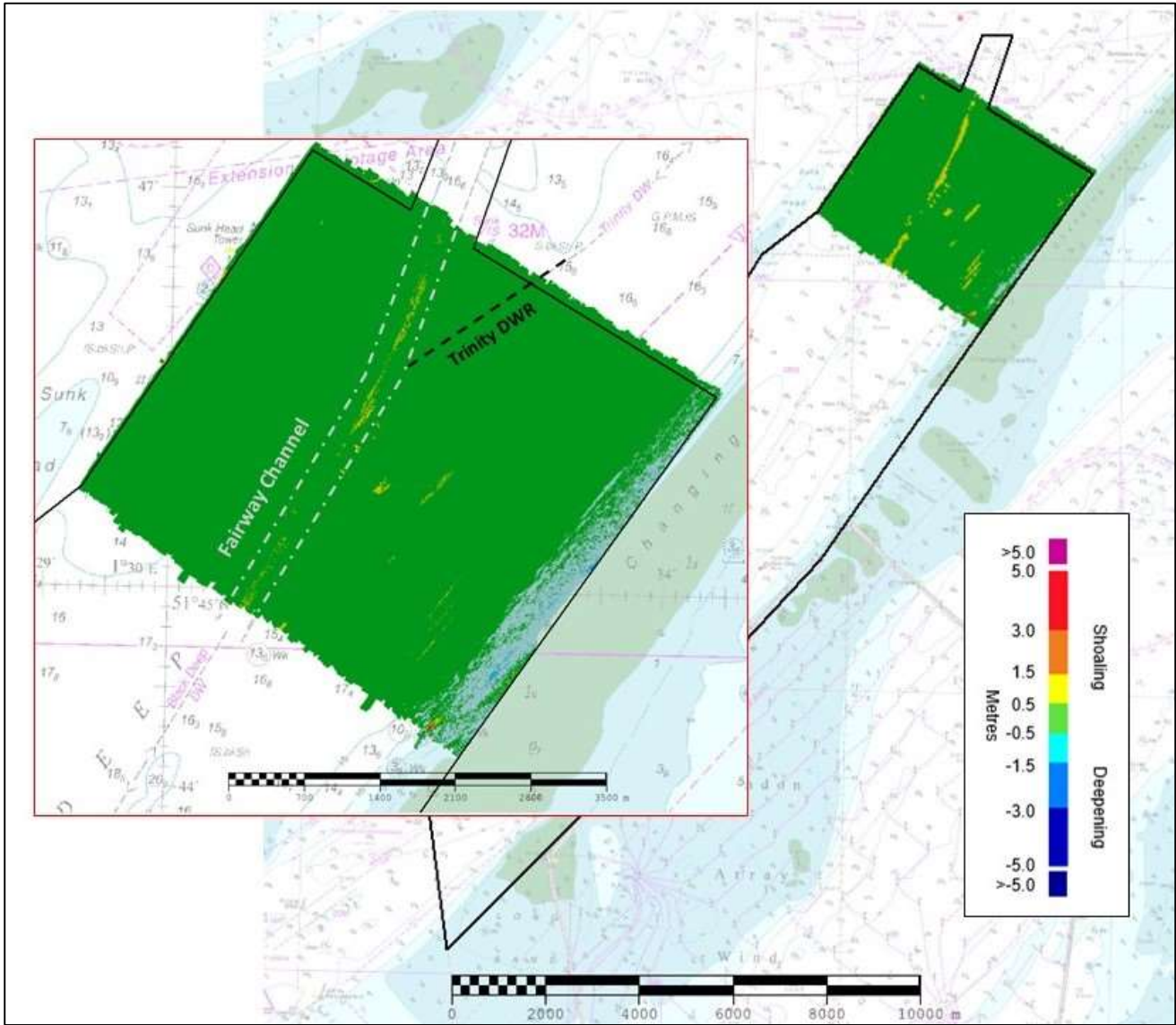


Figure 6: Difference surface showing bathymetric changes between the 2022 and 2020 surveys overlaid on BA Chart 1975-0.

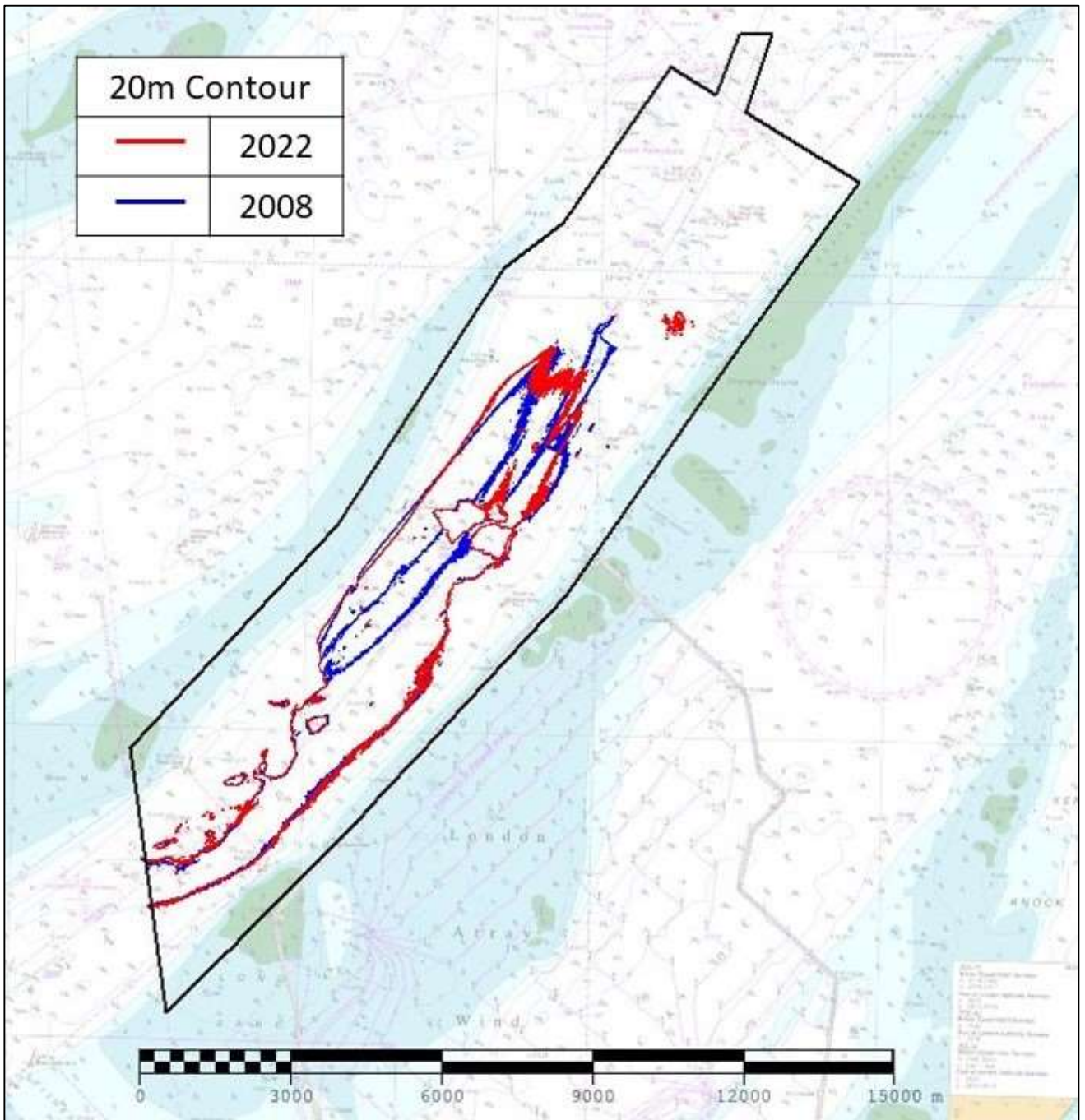


Figure 7: Contour plot showing changes in the 20m contours between 2022 (red) and 2008 (blue) surveys overlaid on BA Chart 1975-0.

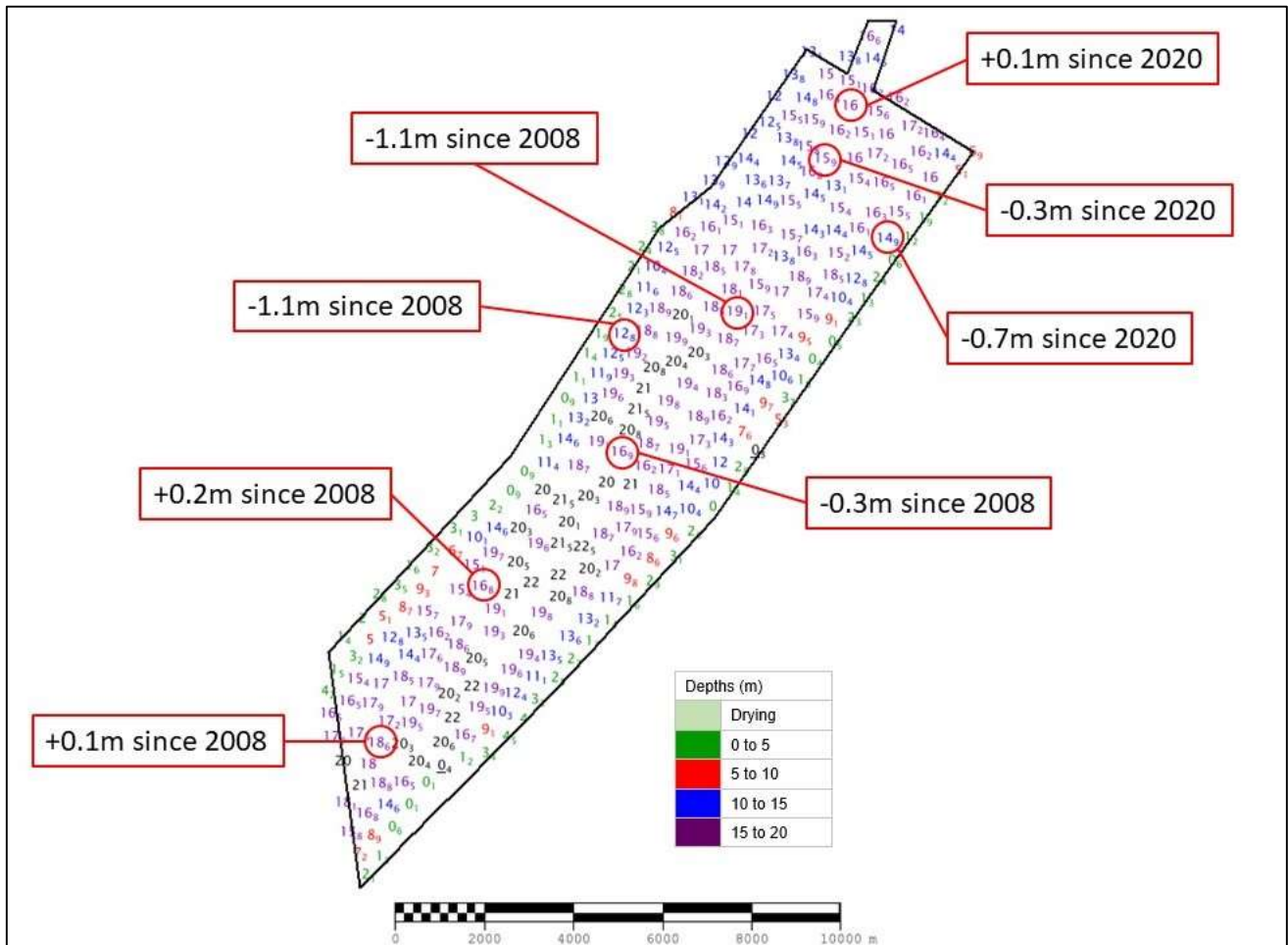


Figure 8: Colour banded depth plot from the 2022 survey with selected depth changes since the 2008, 2020 survey. Positive values (+) represent deepening. Negative values (-) represent shoaling.

6. RECOMMENDATIONS FOR FUTURE SURVEYS

Survey Interval

- 6.1 Though the data shows mostly stable or deepening depths in the main Black Deep DWR, tracking the sandbank movement and shoal patches remains of importance to marine traffic in the area. Trinity House also performs frequent surveys to monitor the sandbanks and Black Deep buoys (see Appendix for Trinity House areas of frequent survey).
- 6.2 The smaller 2020 area (which focused on the fairway and part of the Trinity DWR) also shows relative stability over the last 2 years, but remains of navigational significance to traffic approaching the port entry. This DWR/fairway is also frequently monitored by PLA (see Appendix for PLA areas of frequent survey).
- 6.3 Therefore, going forward with the Black Deep RRS area, it is recommended that the whole area that was surveyed for 2022 be established as 'TE6', and any previous focused areas removed. As the areas of main concern are frequently surveyed by PLA and Trinity House, the full area should be surveyed on an 8-year interval in order to capture longer term trends and monitor the movement of Sunk and Long Sand sandbanks.

Survey Area

6.4 As mentioned in Sections 6.3, TE6 should encompass both the Fairway area and Black Deep DWR on an 8-yearly cycle. An image showing this area has been created and shown in Figure 9 below:

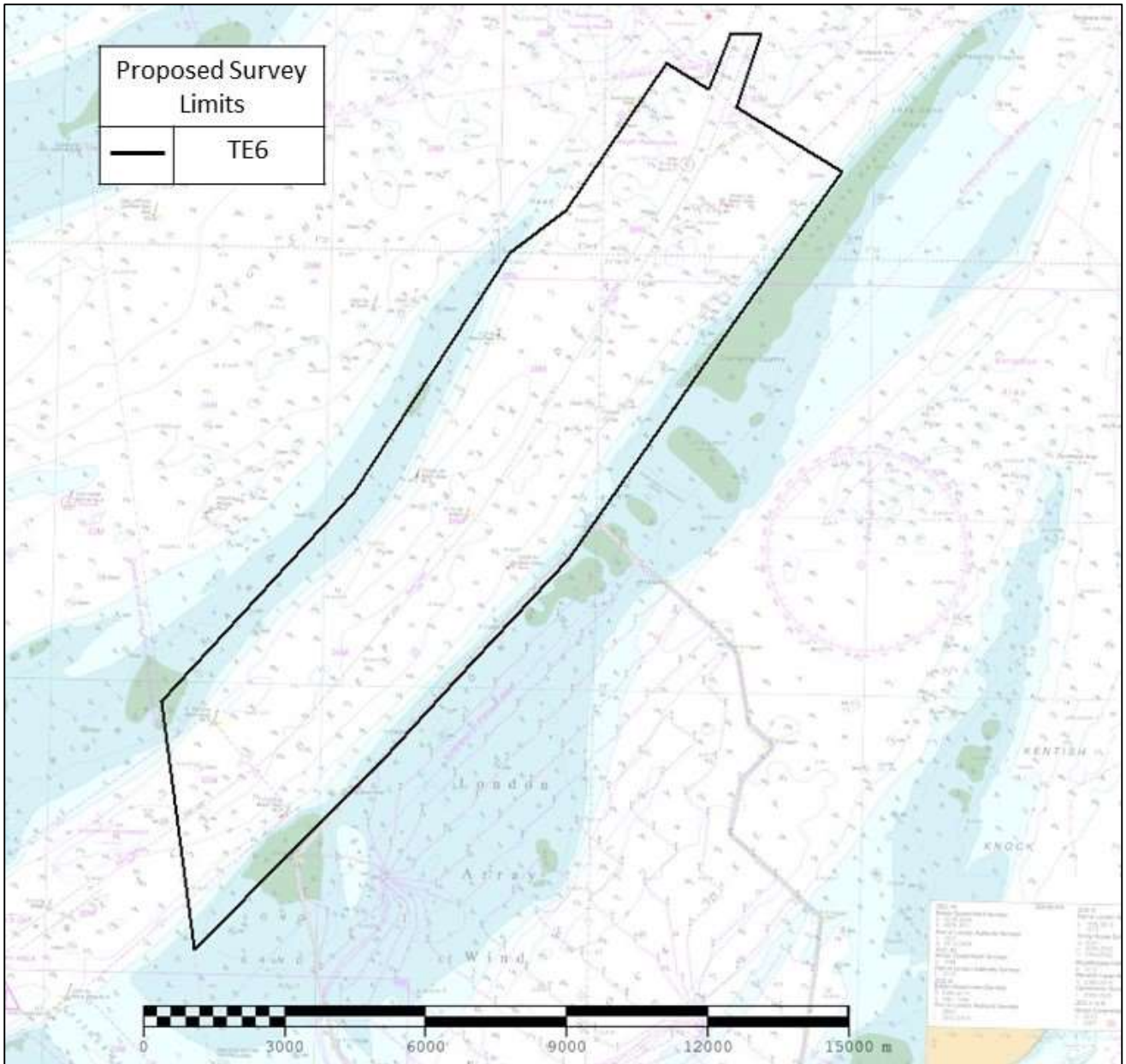


Figure 9: Recommended survey limits for overall TE6 Black Deep surveys overlaid on BA Chart 1975-0.

The coordinates of the recommended survey area limits for the area TE6 are shown below:

TE6 total area: 86.83 km²

	Latitude	Longitude
1	51-39.772230N	001-22.029780E
2	51-42.199644N	001-25.500210E
3	51-45.000030N	001-28.300194E
4	51-45.499794N	001-29.299800E
5	51-47.200104N	001-31.099836E
6	51-46.908084N	001-31.903662E
7	51-47.566530N	001-32.292984E
8	51-47.560974N	001-32.851620E
9	51-46.722708N	001-32.413770E
10	51-46.000200N	001-34.399794E
11	51-44.200284N	001-32.399898E
12	51-41.500194N	001-29.500194E
13	51-40.090170N	001-27.479754E
14	51-39.169692N	001-26.149314E
15	51-38.134548N	001-24.583884E
16	51-36.935694N	001-22.747164E

7. APPENDIX

Figure below shows the areas that are frequently surveyed by PLA and Trinity House in the Black Deep area.

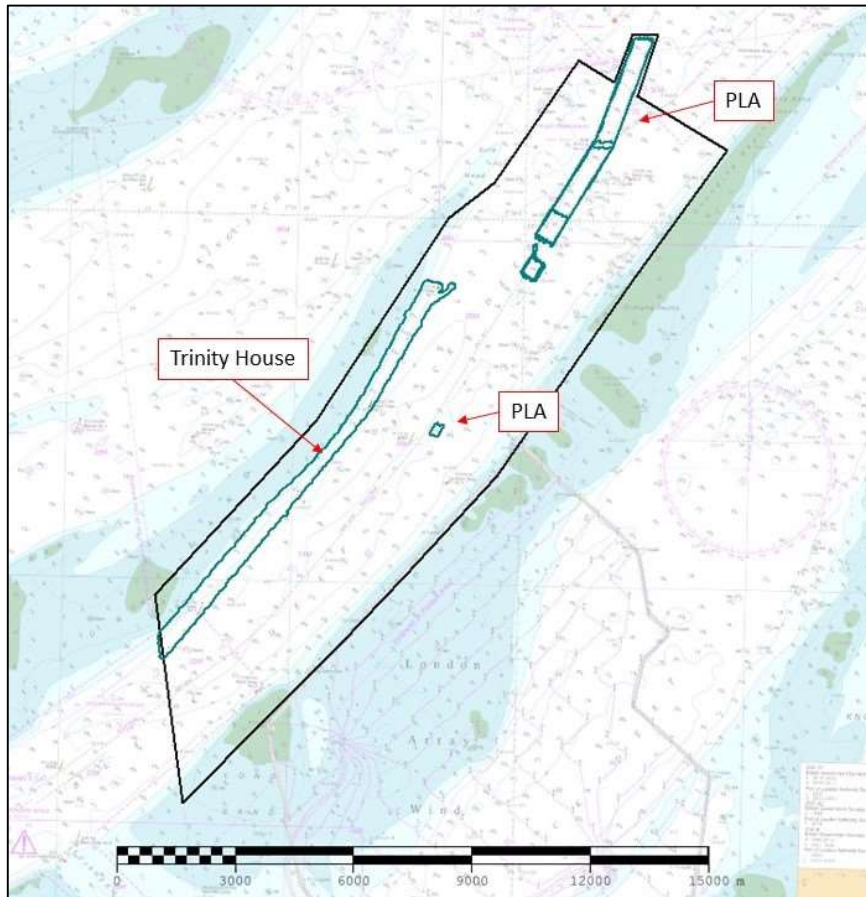


Figure 10: Image showing PLA and Trinity House survey areas in TE6 Black Deep overlaid on BA Chart 1975-0.