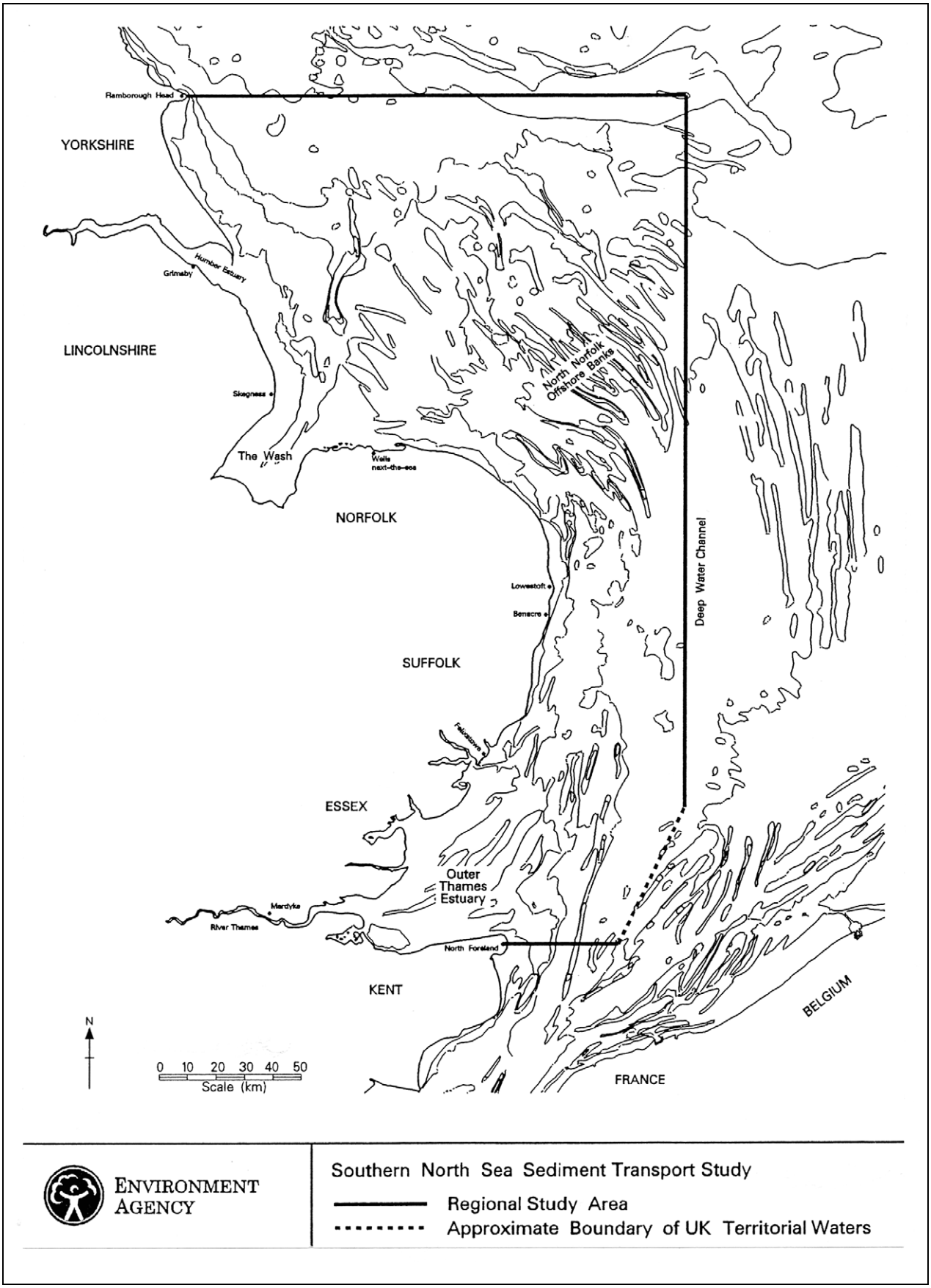


Figure 1 The study area as defined in the Study Brief (Great Yarmouth Borough Council, 2000)

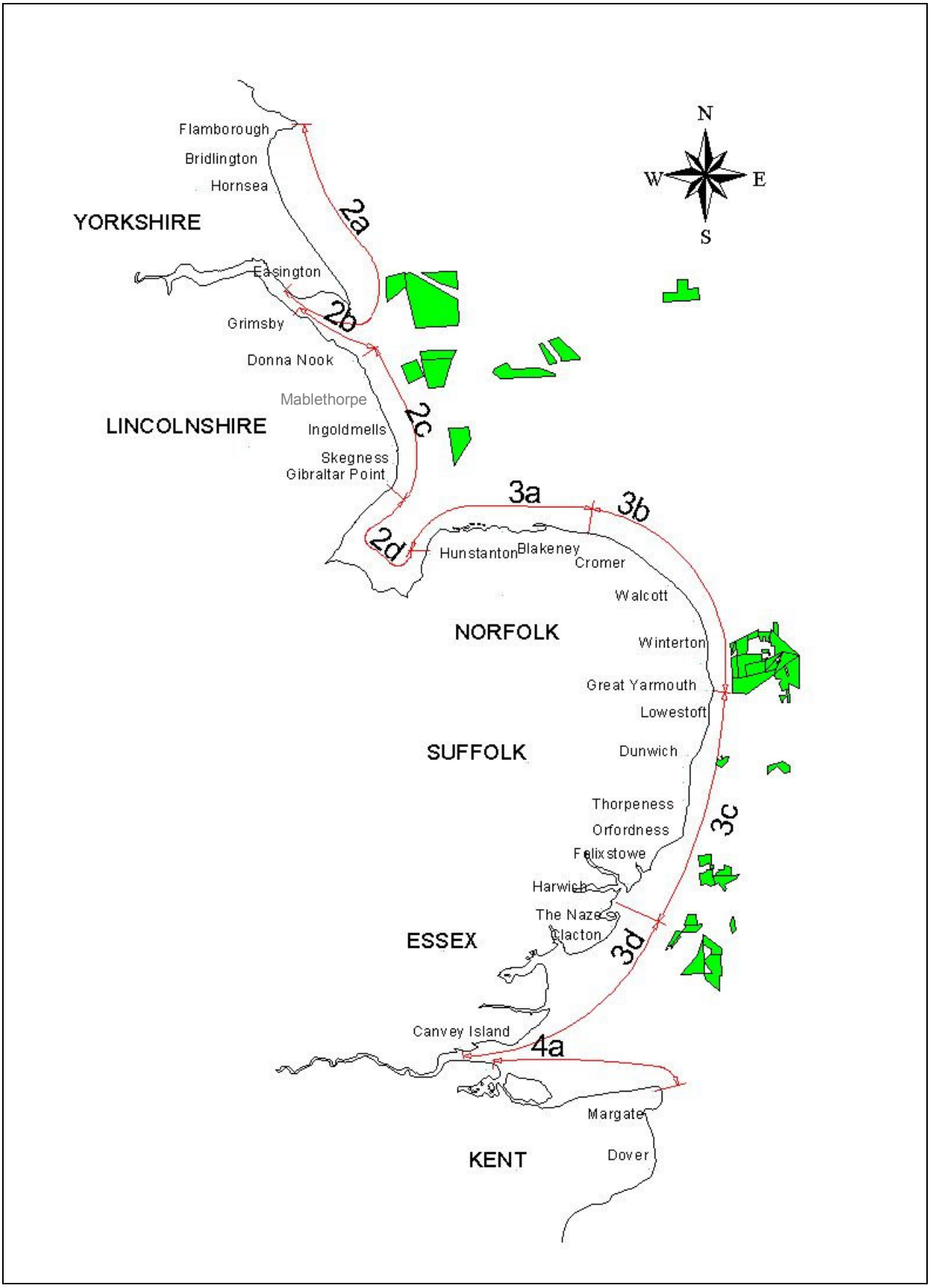


Figure 2 Coastal cells, subcells and licensed dredging areas on the east coast of England

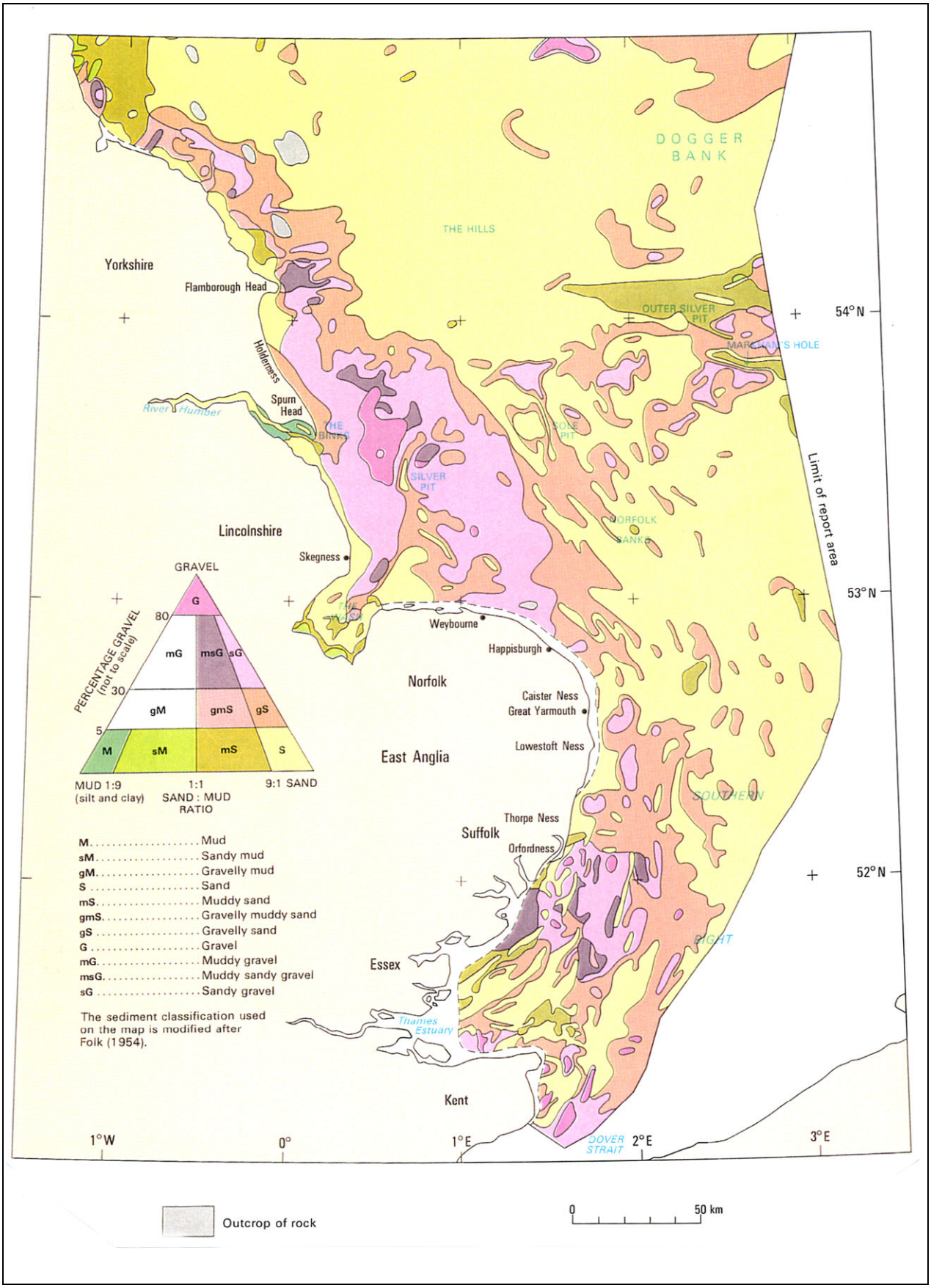


Figure 3 Seabed sediment distribution (based upon Cameron et al, 1992, by permission of the British Geological Survey, IPR/13-15C)

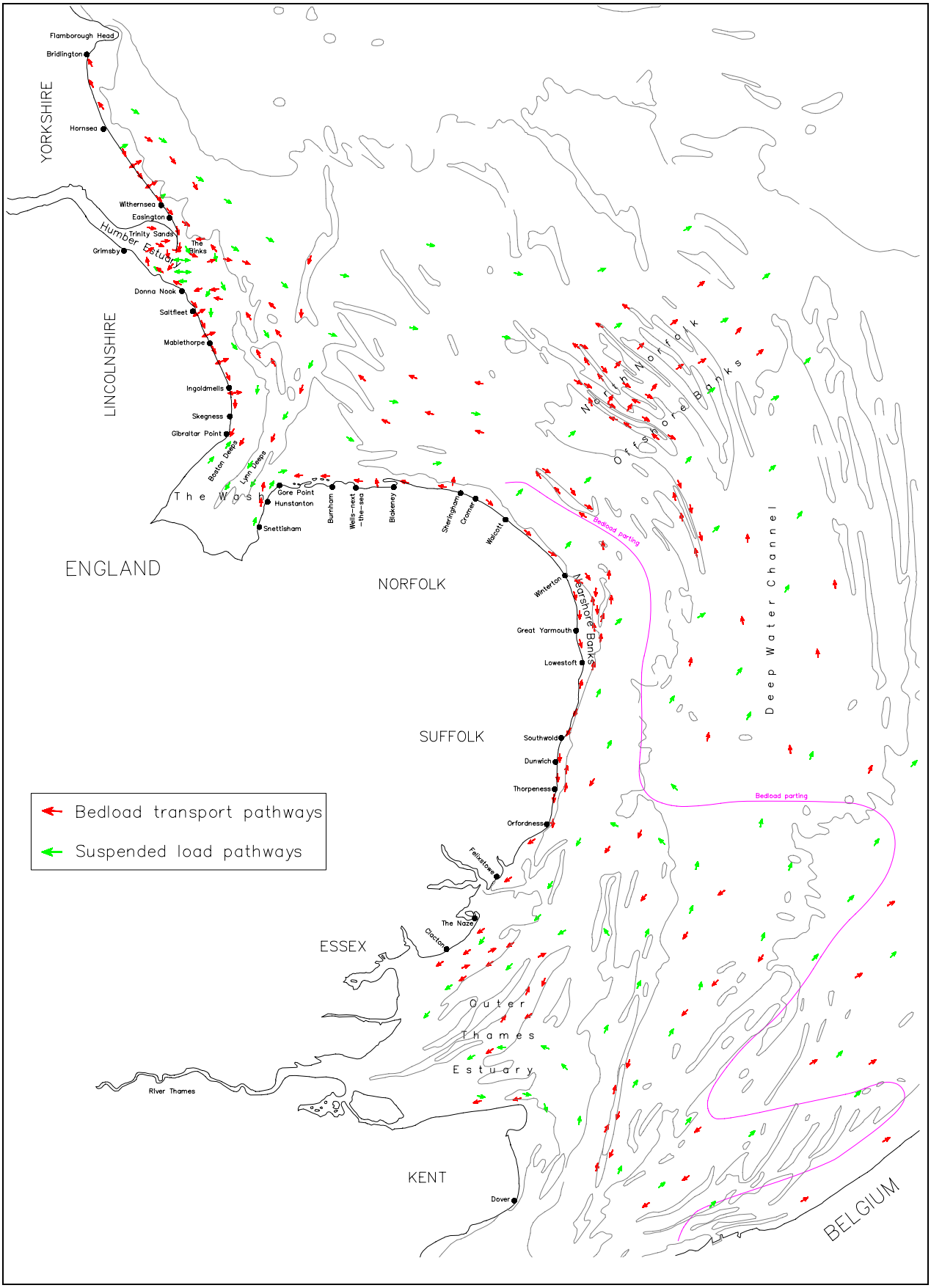


Figure 4 Conceptual map of sediment transport in the Southern North Sea produced from Phase 1 SNSSTS (ABP, 1996a). Bathymetry digitised from Admiralty Chart 2182A

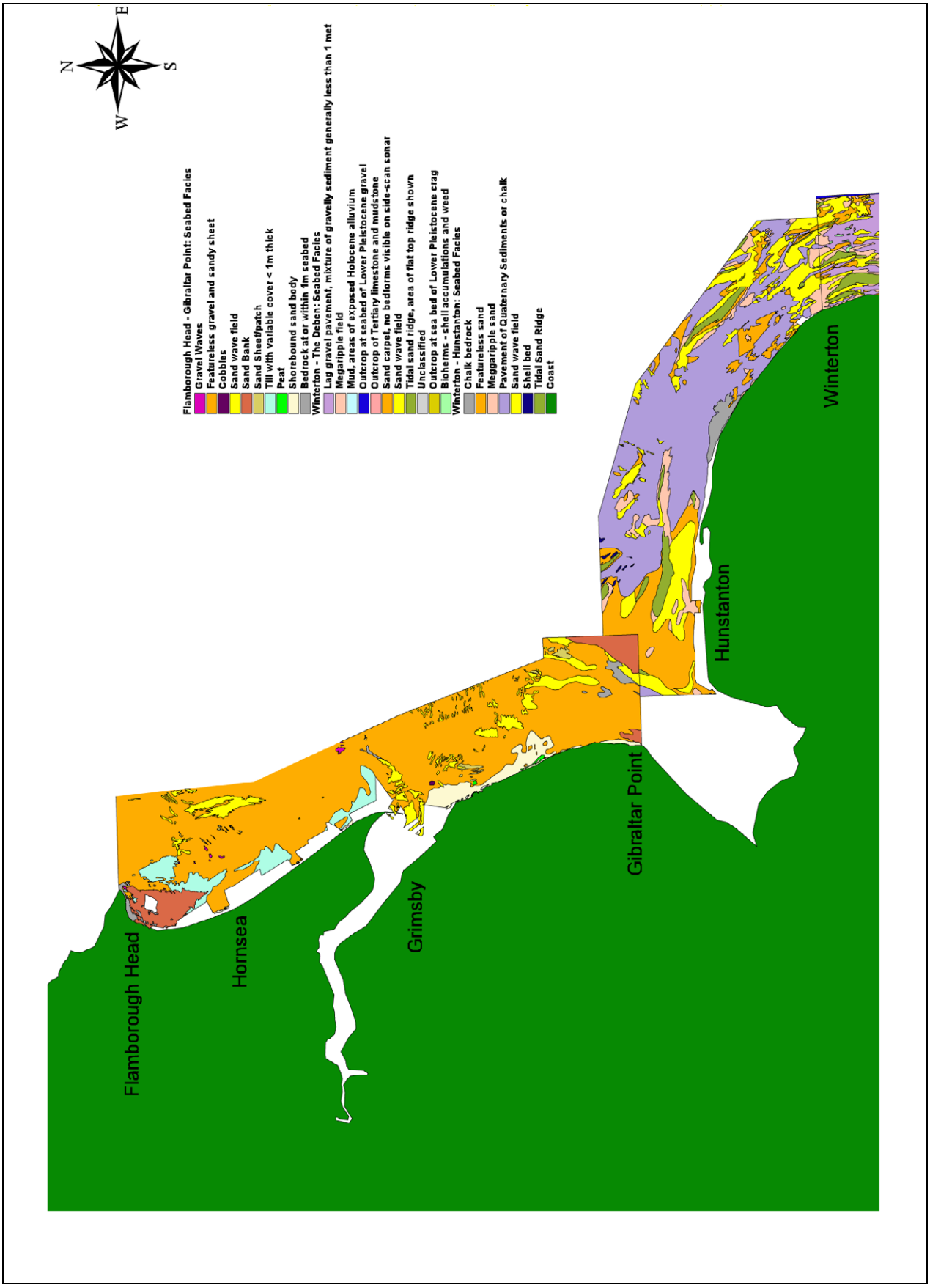


Figure 5a Seabed facies map: Flamborough Head – Winterton. (Reproduced by permission of British Geological Survey)

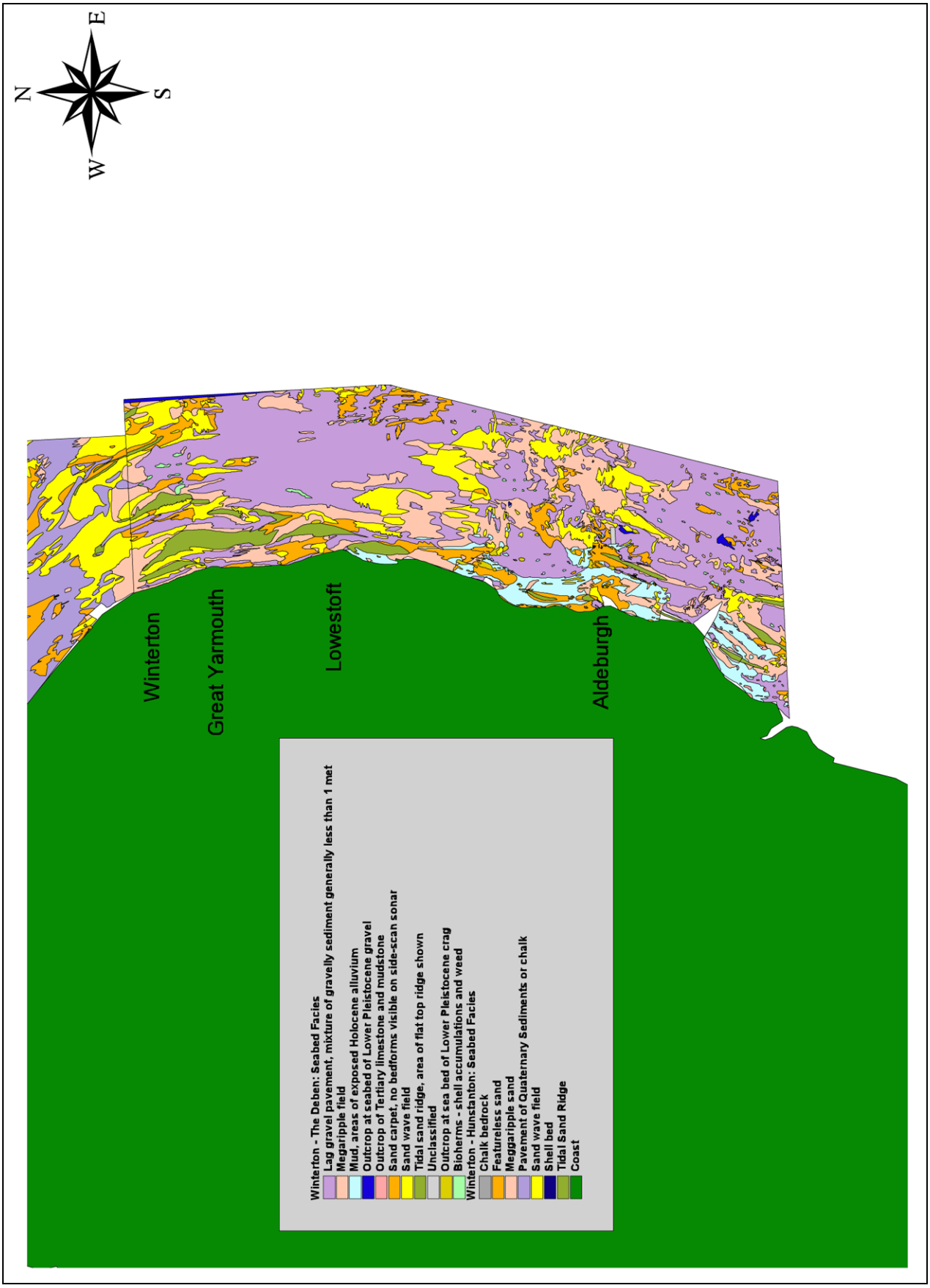
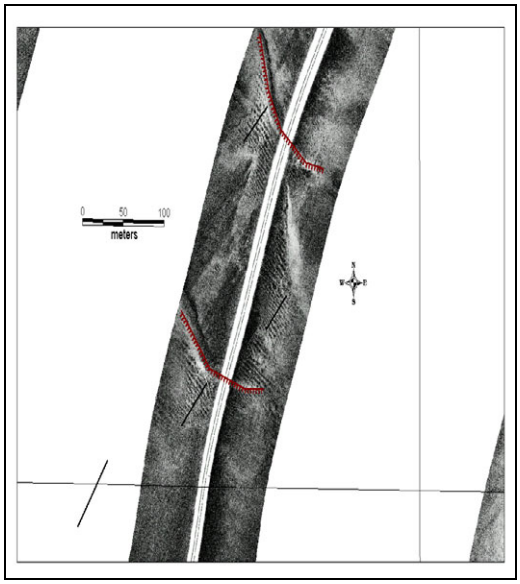
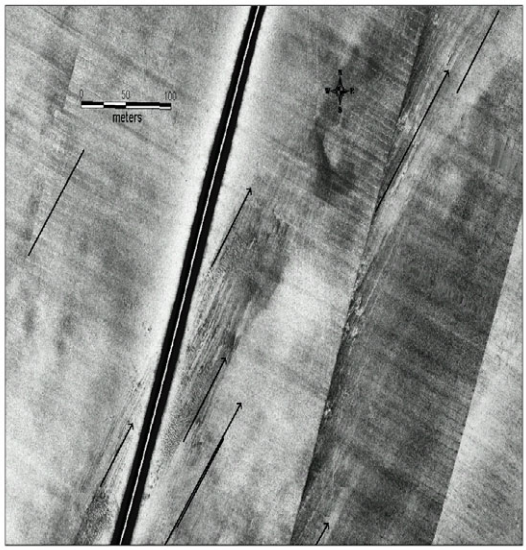


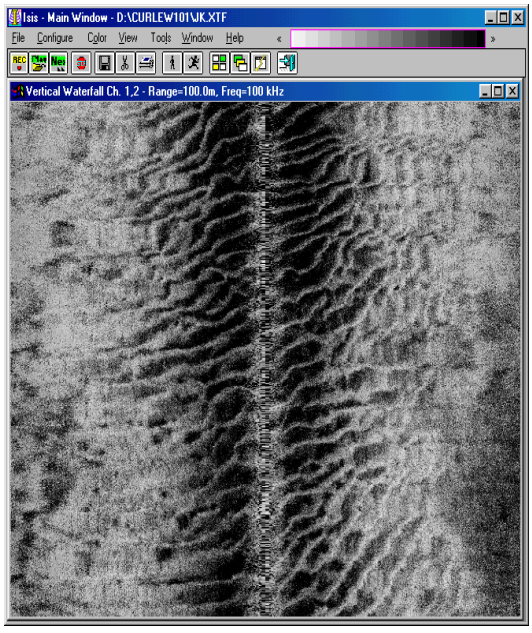
Figure 5b Seabed facies map: Winterton – The Deben. (Reproduced by permission of BritishGeological Survey)



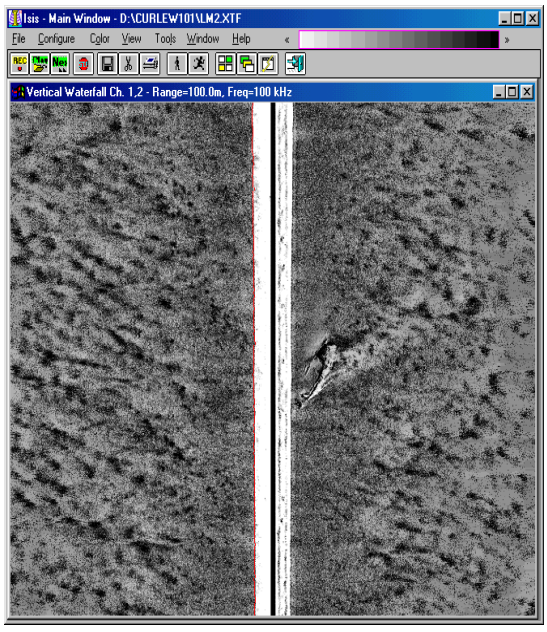
Sidescan sonar image showing sandwaves



Sidescan sonar image showing evidence of tidal scouring on the seabed.



Sidescan sonar image showing a megaripple field on the seabed



Sidescan sonar image showing the remains of a sunken vessel.

Figure 6 Sidescan sonar images

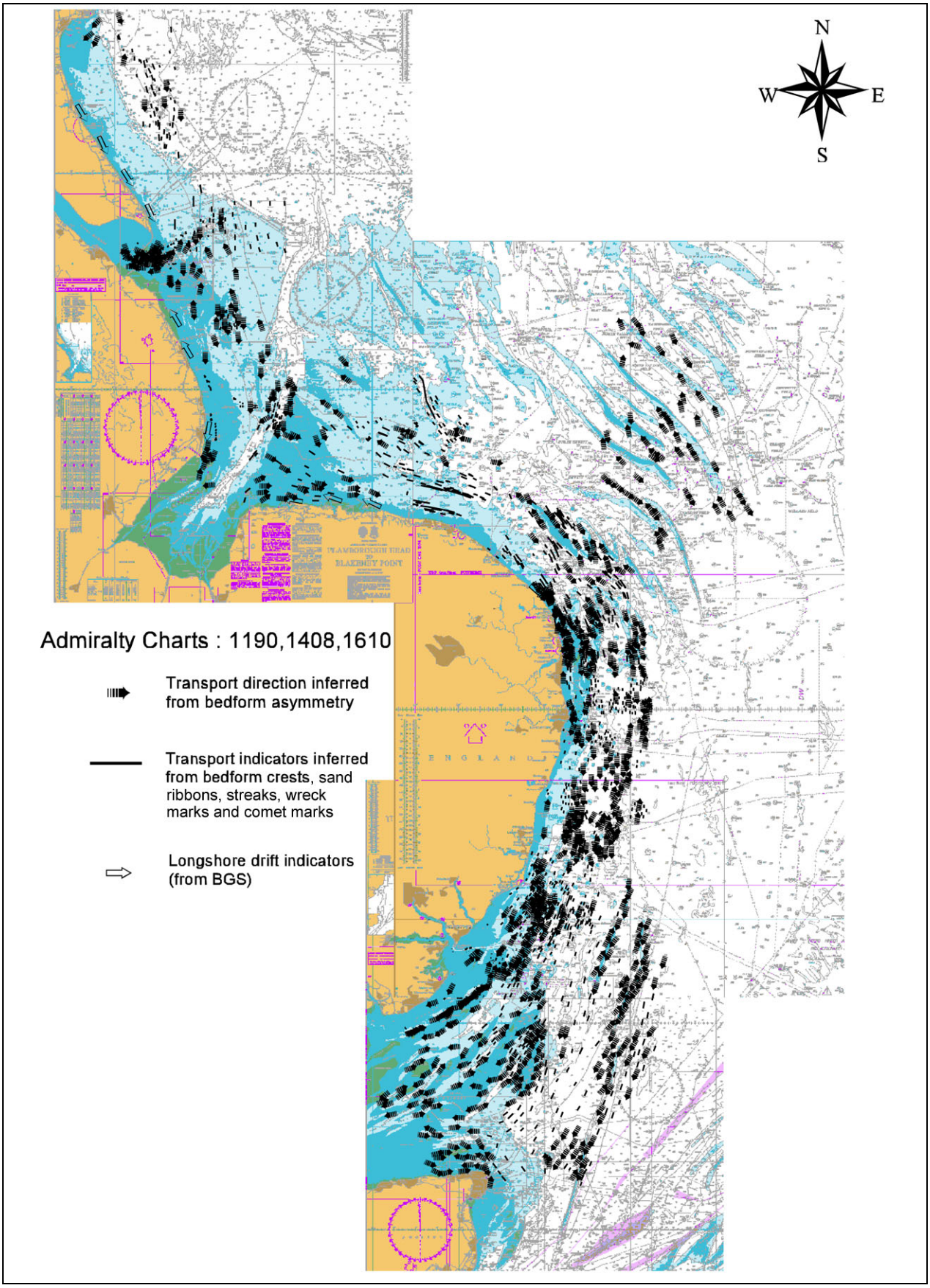


Figure 7 Map showing coverage of combined interpretation for seabed sediment transport indicators

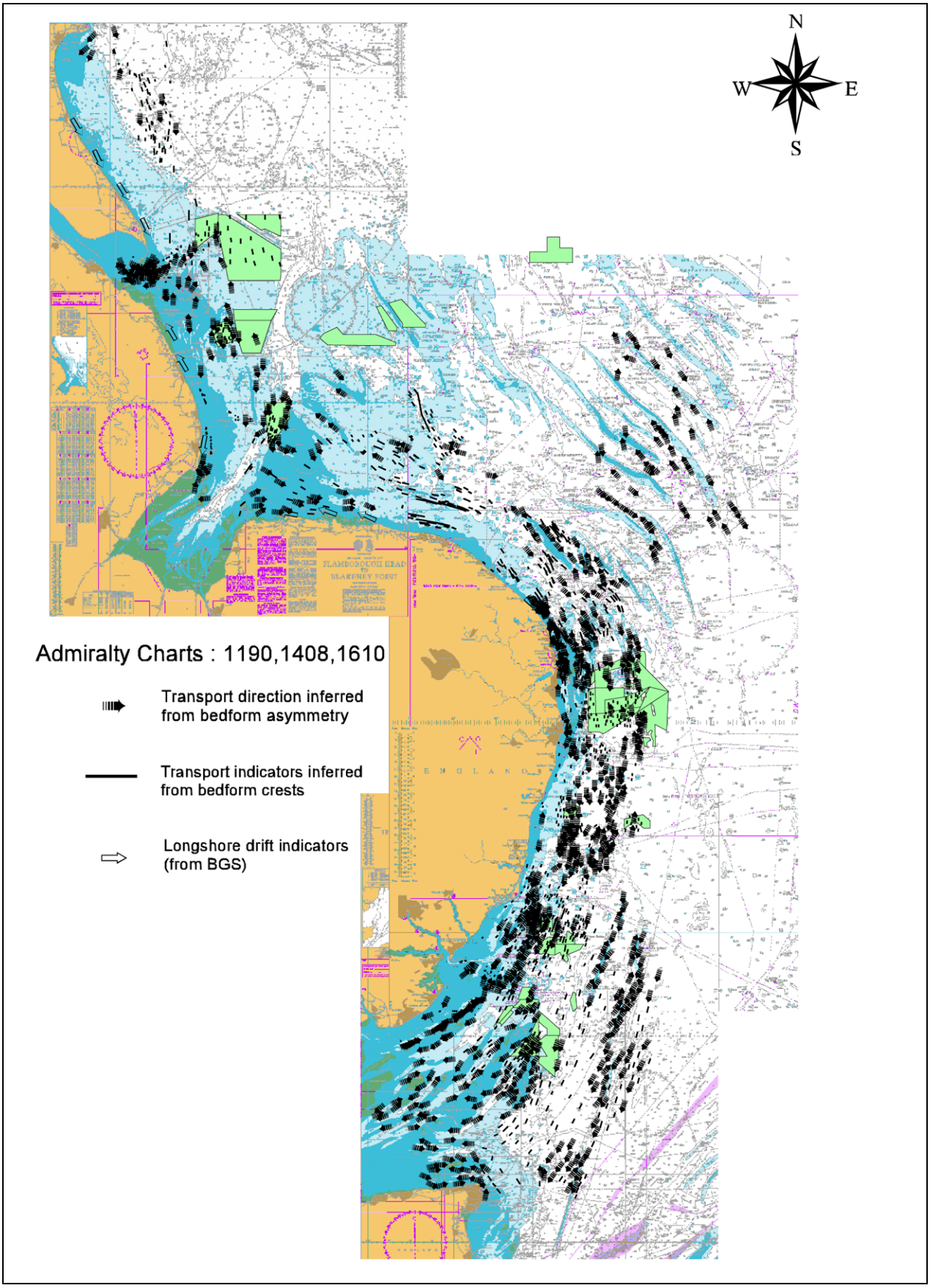


Figure 8 **Combined seabed sediment transport indicator map showing licensed dredging areas from Crown Estates**

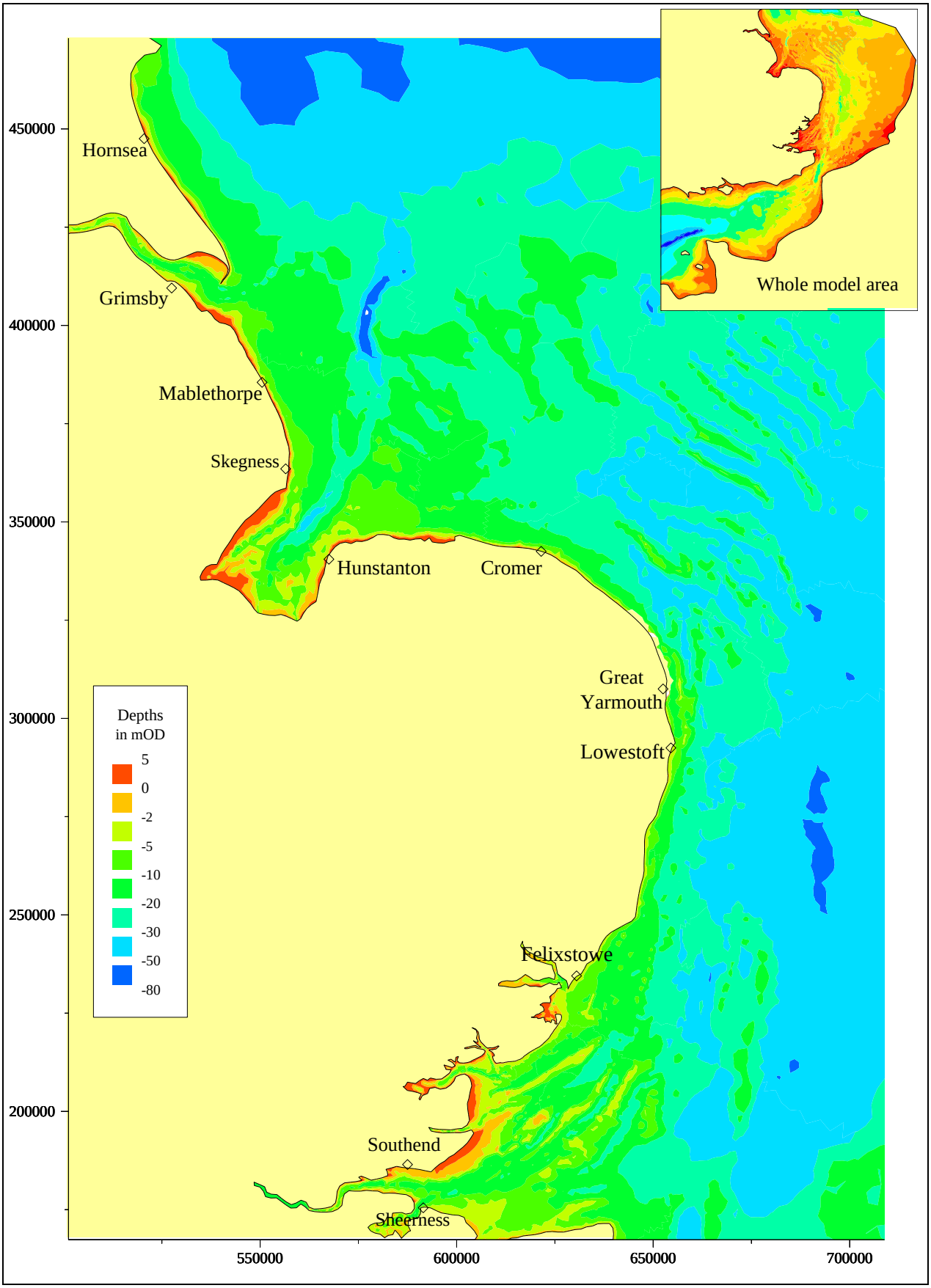


Figure 9 Study area, showing model bathymetry, and insert showing whole model area

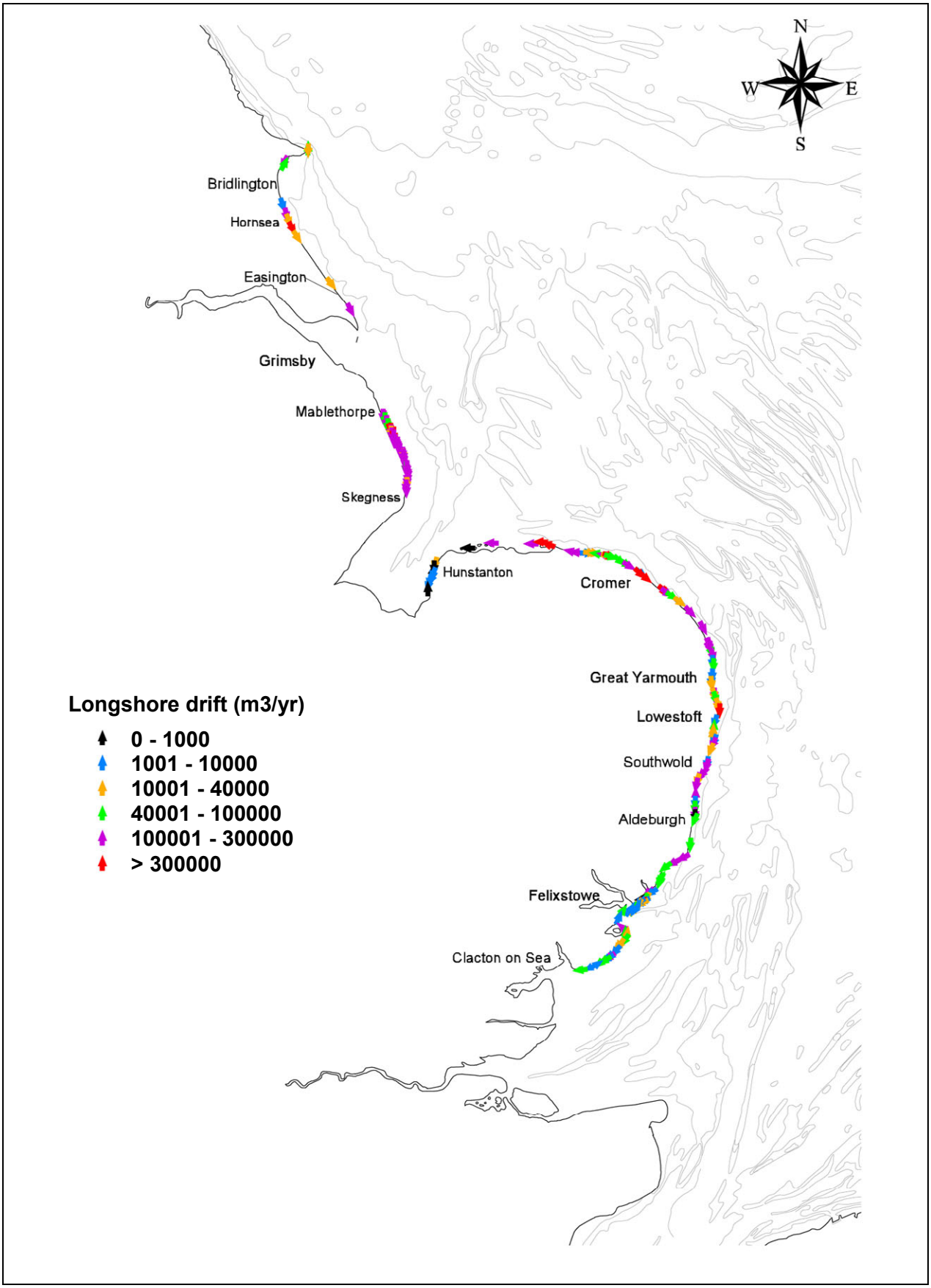


Figure 10 Longshore sediment transport (interpreted version)

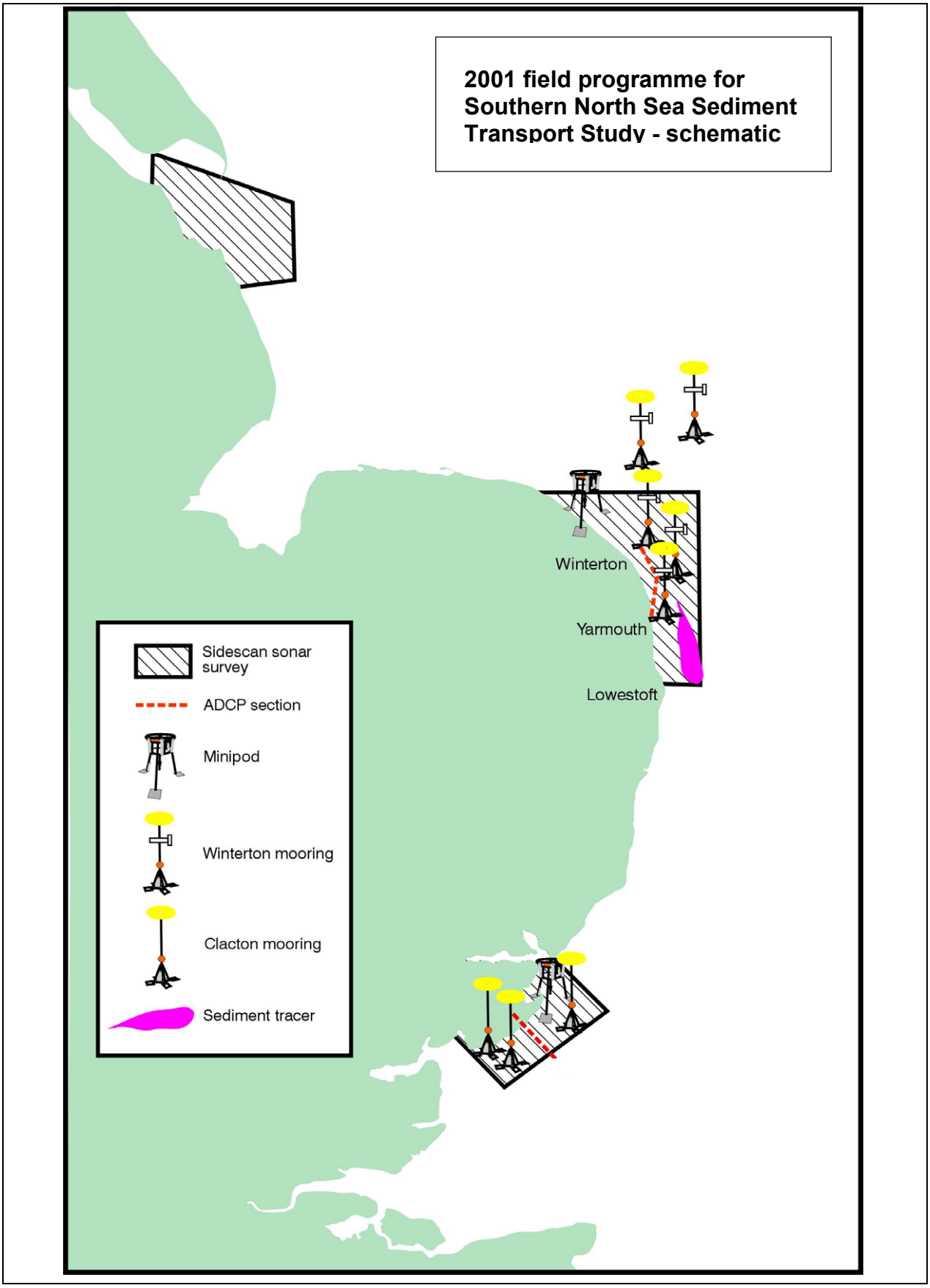


Figure 11 Locations of fieldwork sites

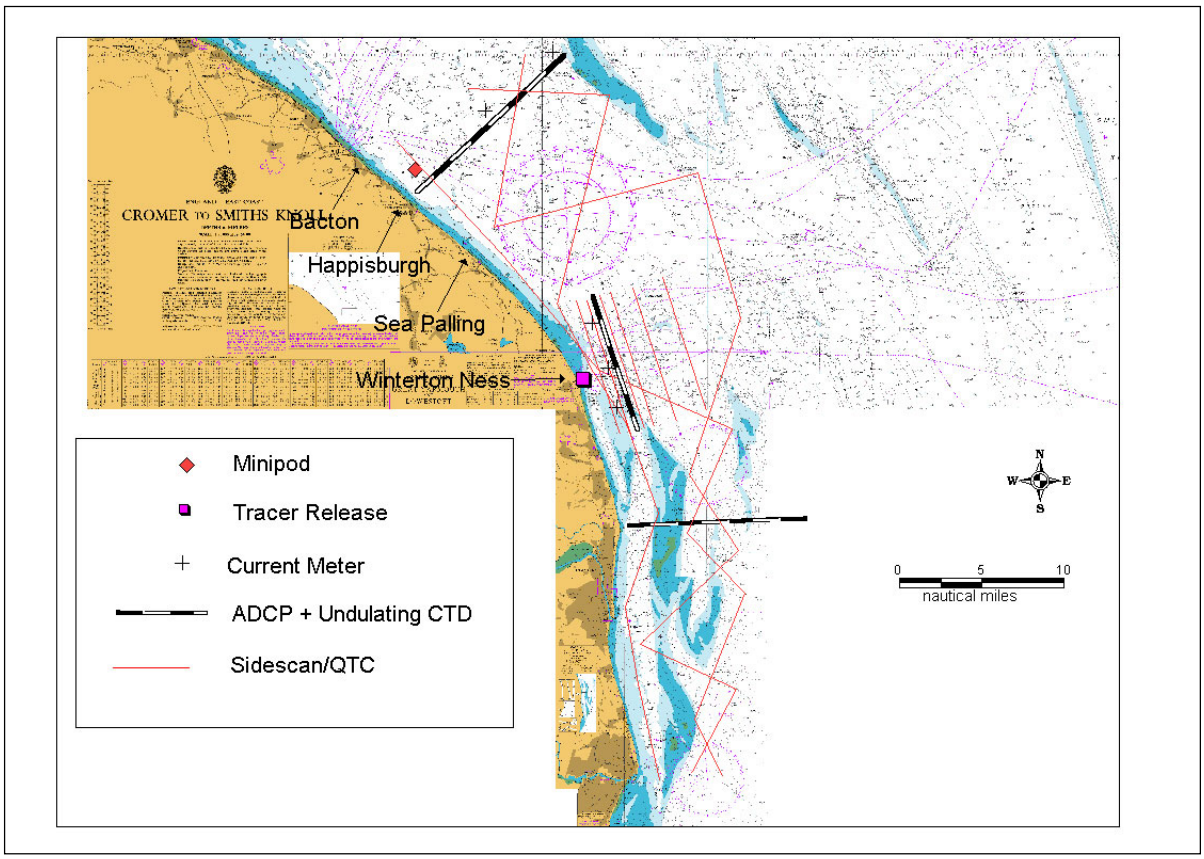


Figure 12 Survey plan for Winterton – Spring 2001 (Admiralty Charts 106 and 1516)

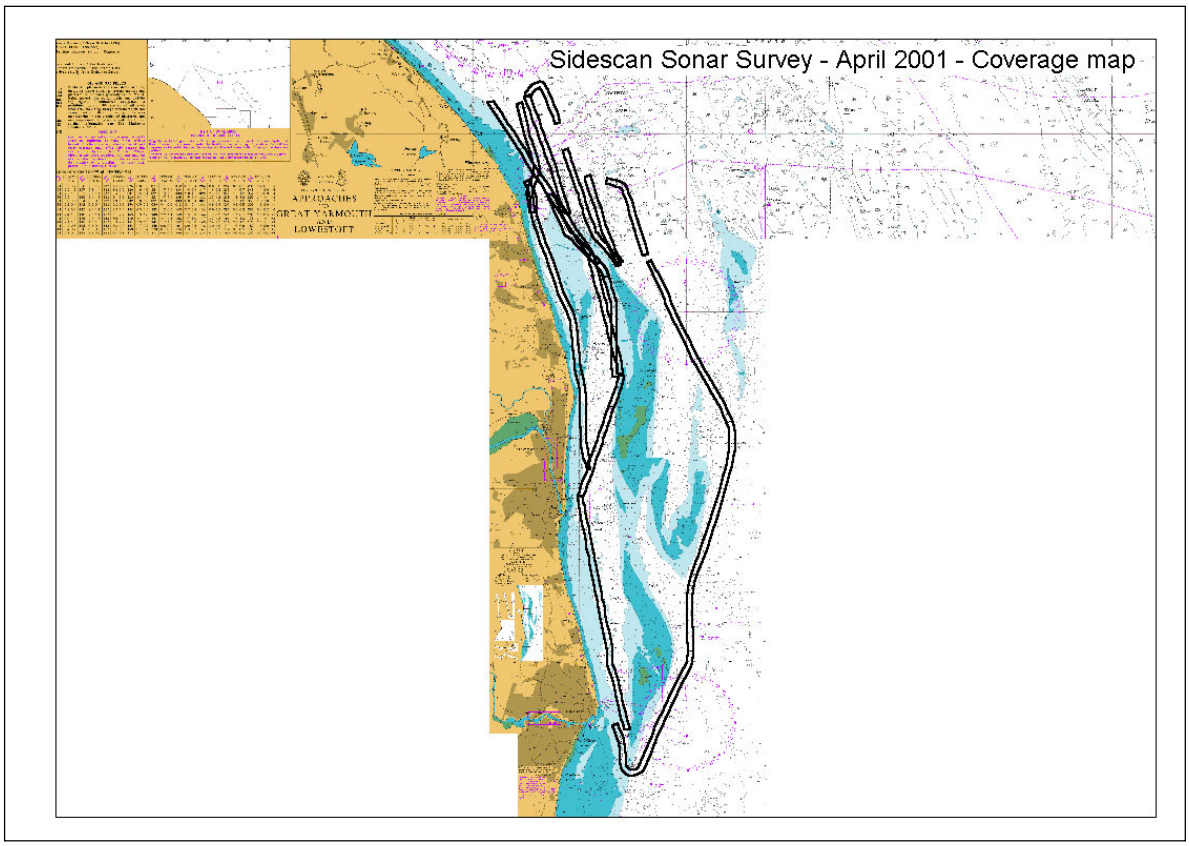


Figure 13 Winterton Sidescan Sonar coverage – April 2001 (Admiralty Charts 106 and 1516)

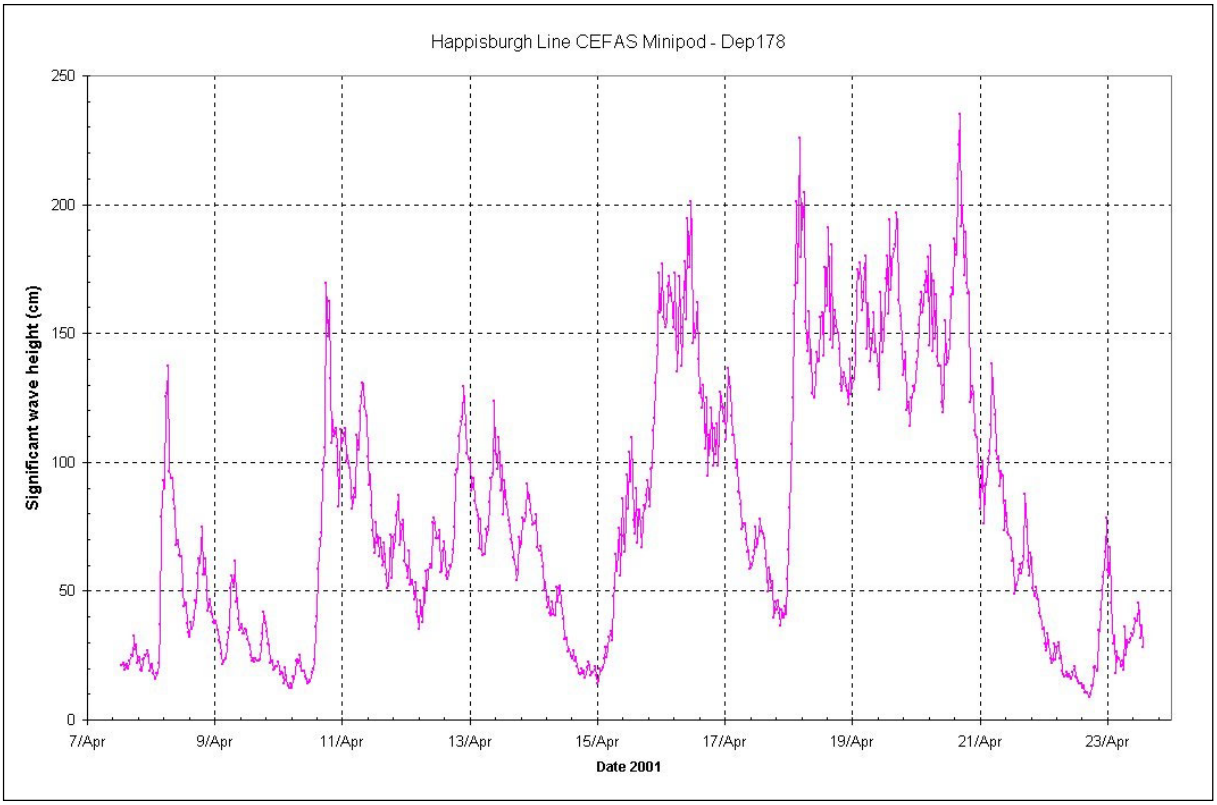


Figure 14 Significant wave height from Happisburgh Minipod deployment

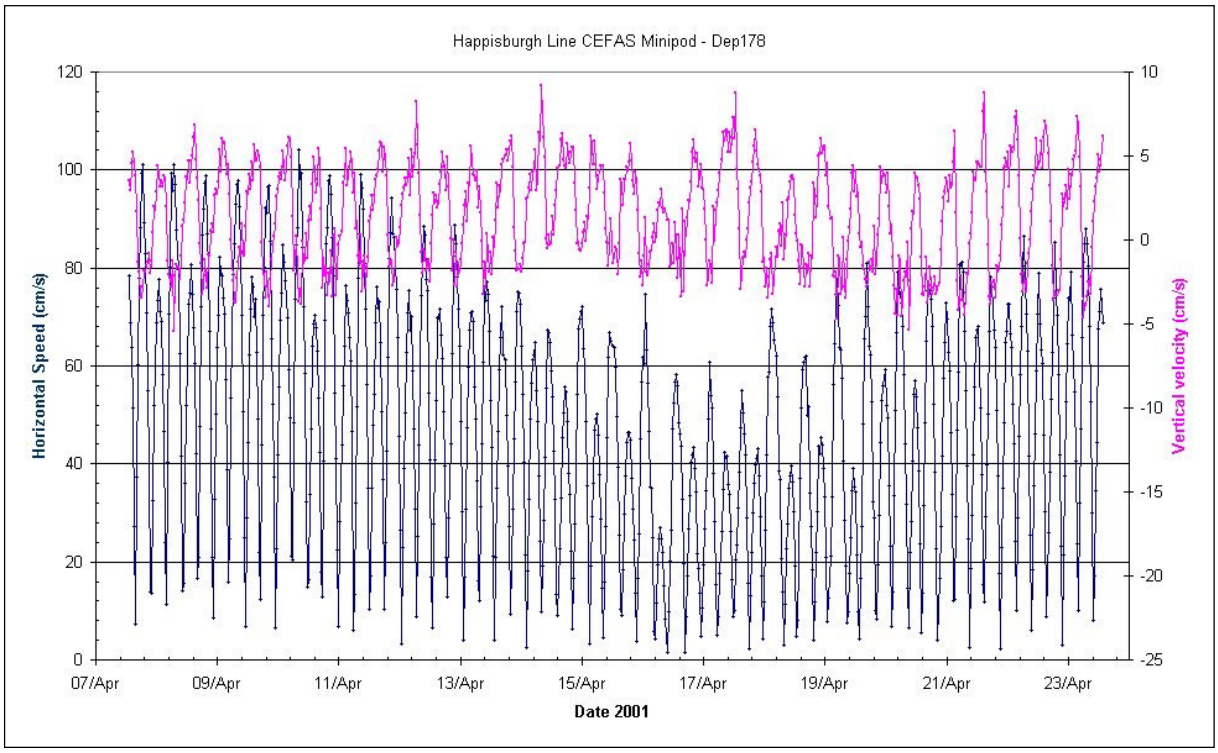


Figure 15 Vertical and horizontal current velocity from Happisburgh Minipod deployment

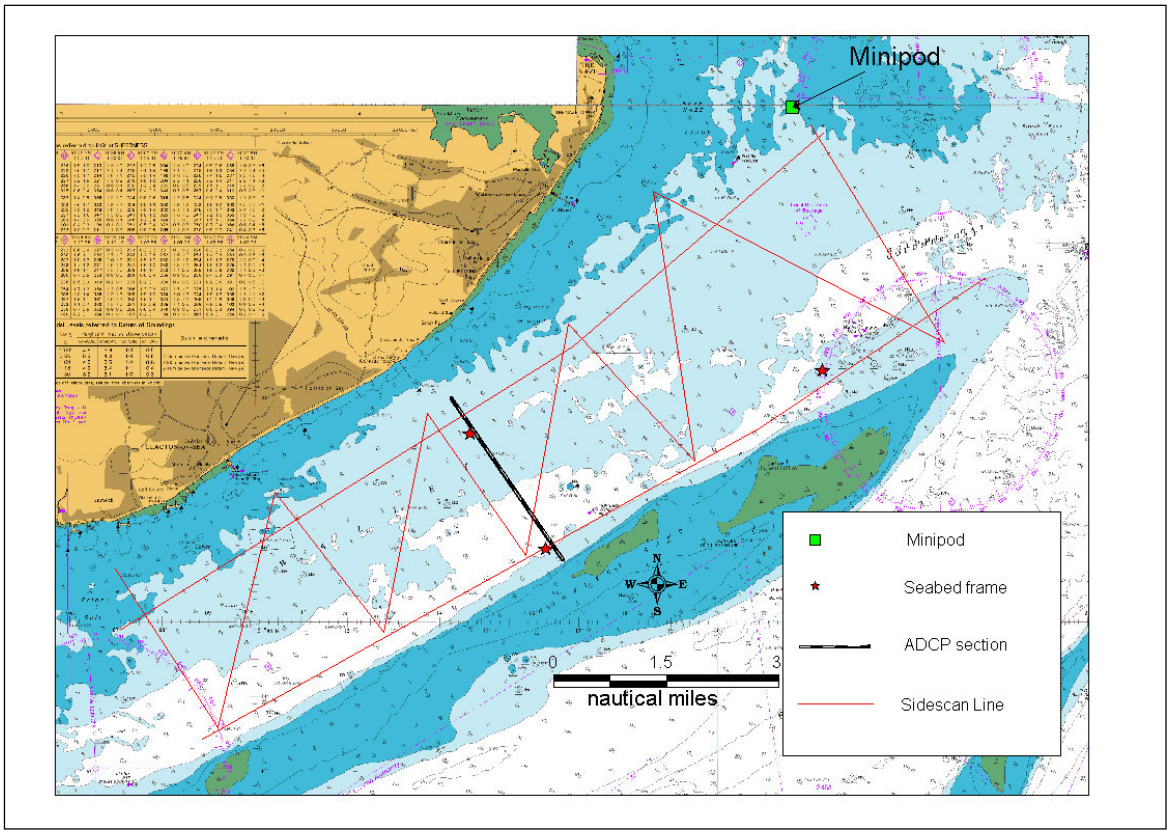


Figure 16 Survey plan for Clacton/Gunfleet area for Summer 2001 (Admiralty Chart 1183)

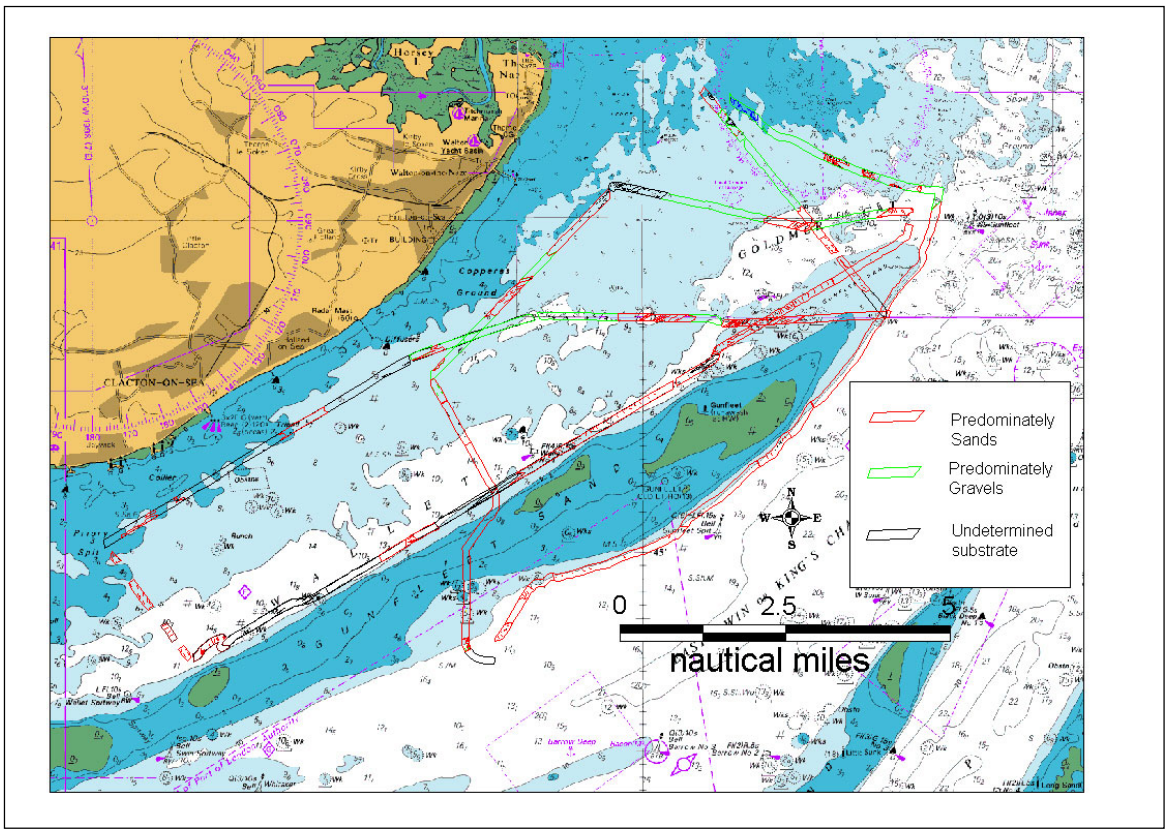


Figure 17 Sidescan Sonar coverage of the Clacton/Gunfleet Survey (Admiralty Chart 1183)

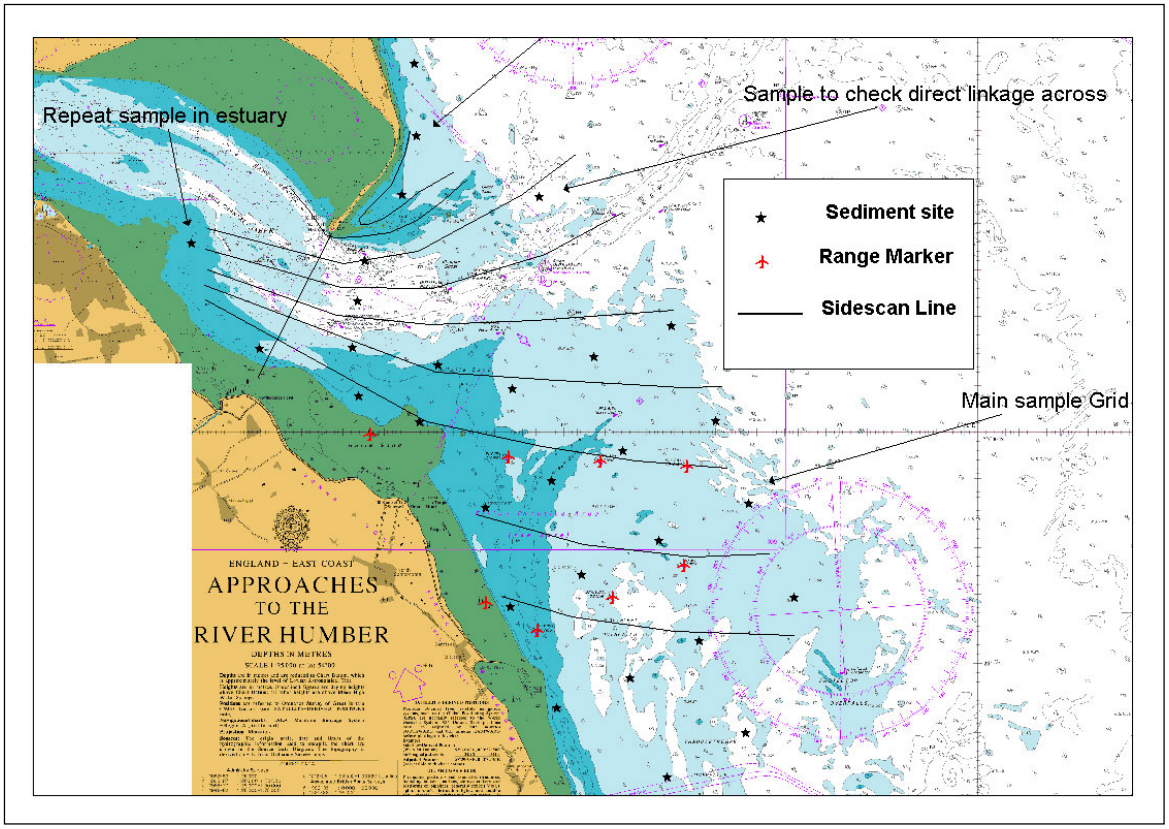


Figure 18 Survey plan for Humber/Donna Nook area – Winter 2001 (Admiralty Charts 107 and 1188)

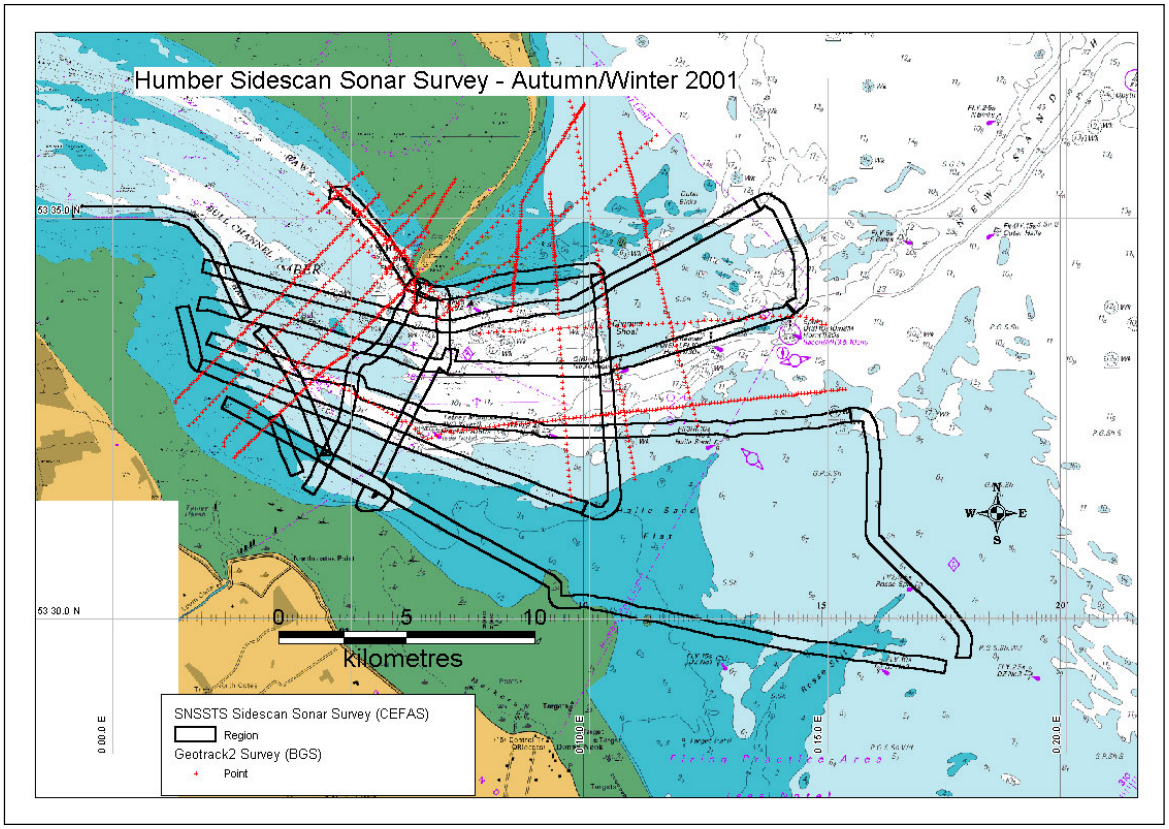


Figure 19 CEFAS and BGS sidescan sonar survey of the mouth of the Humber and the Donna Nook area during December and September 2001 respectively (Admiralty Charts 107 and 1188)

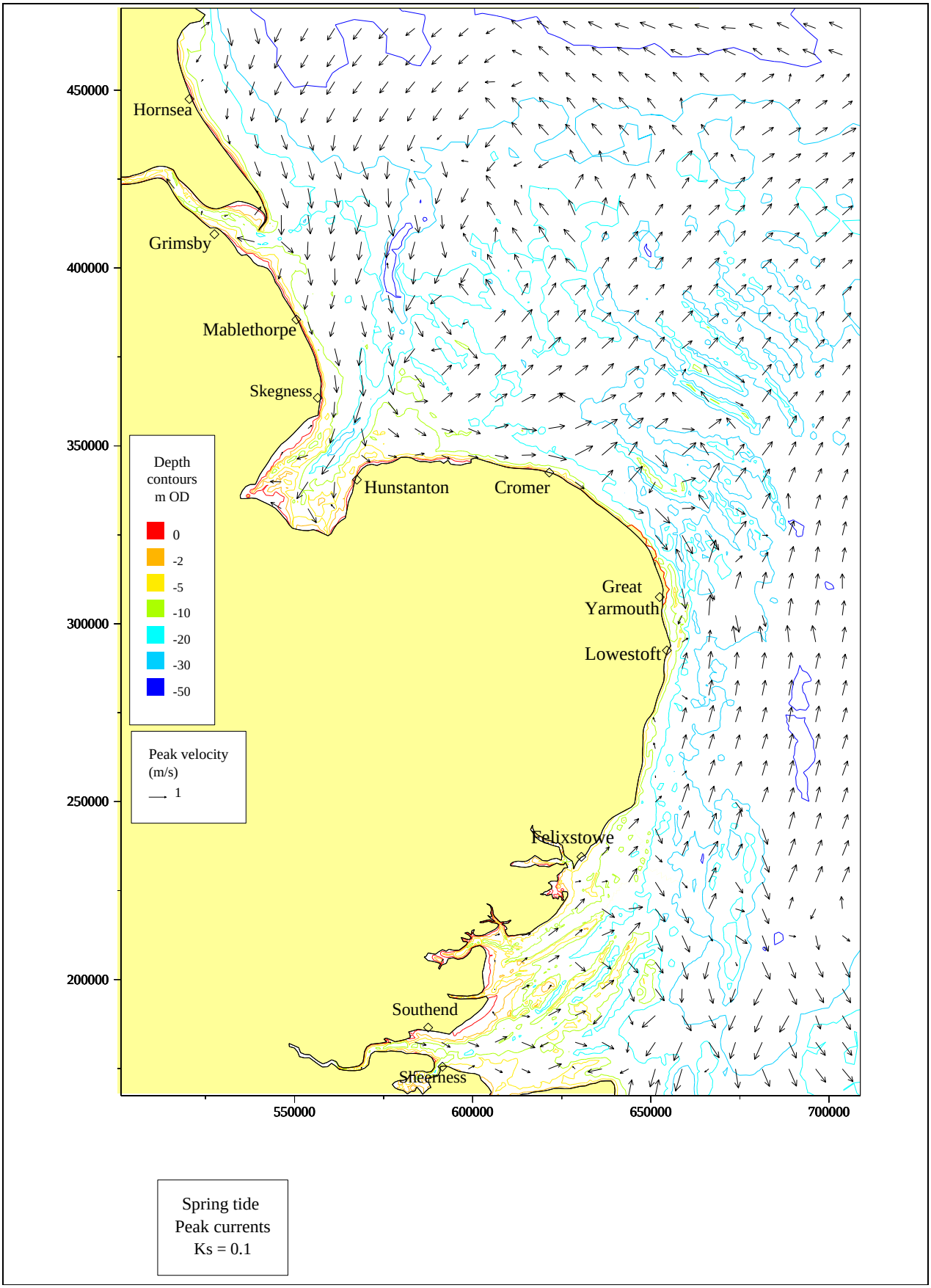


Figure 20 Spring tide peak depth-averaged currents

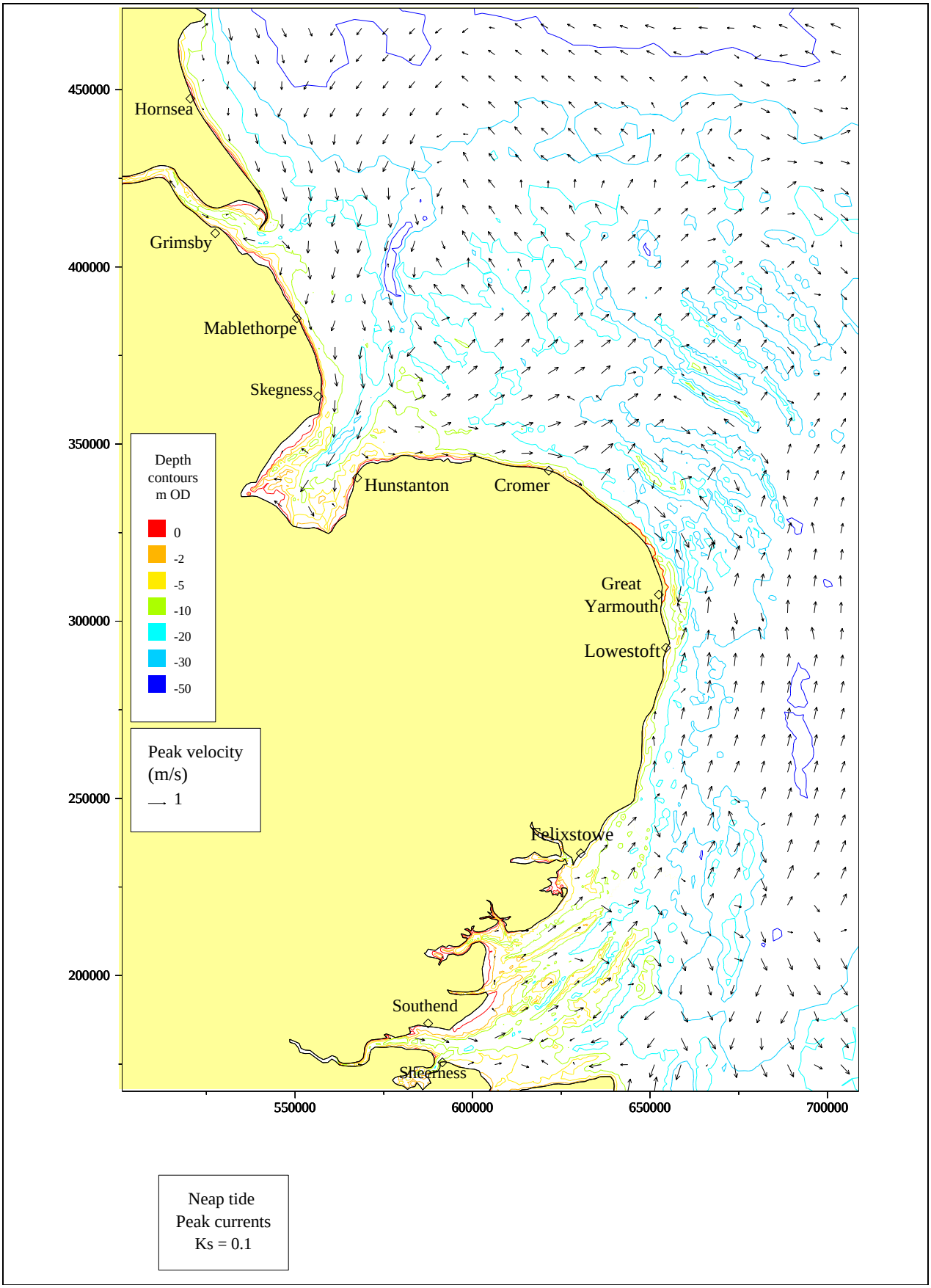


Figure 21 Neap tide peak depth-averaged currents

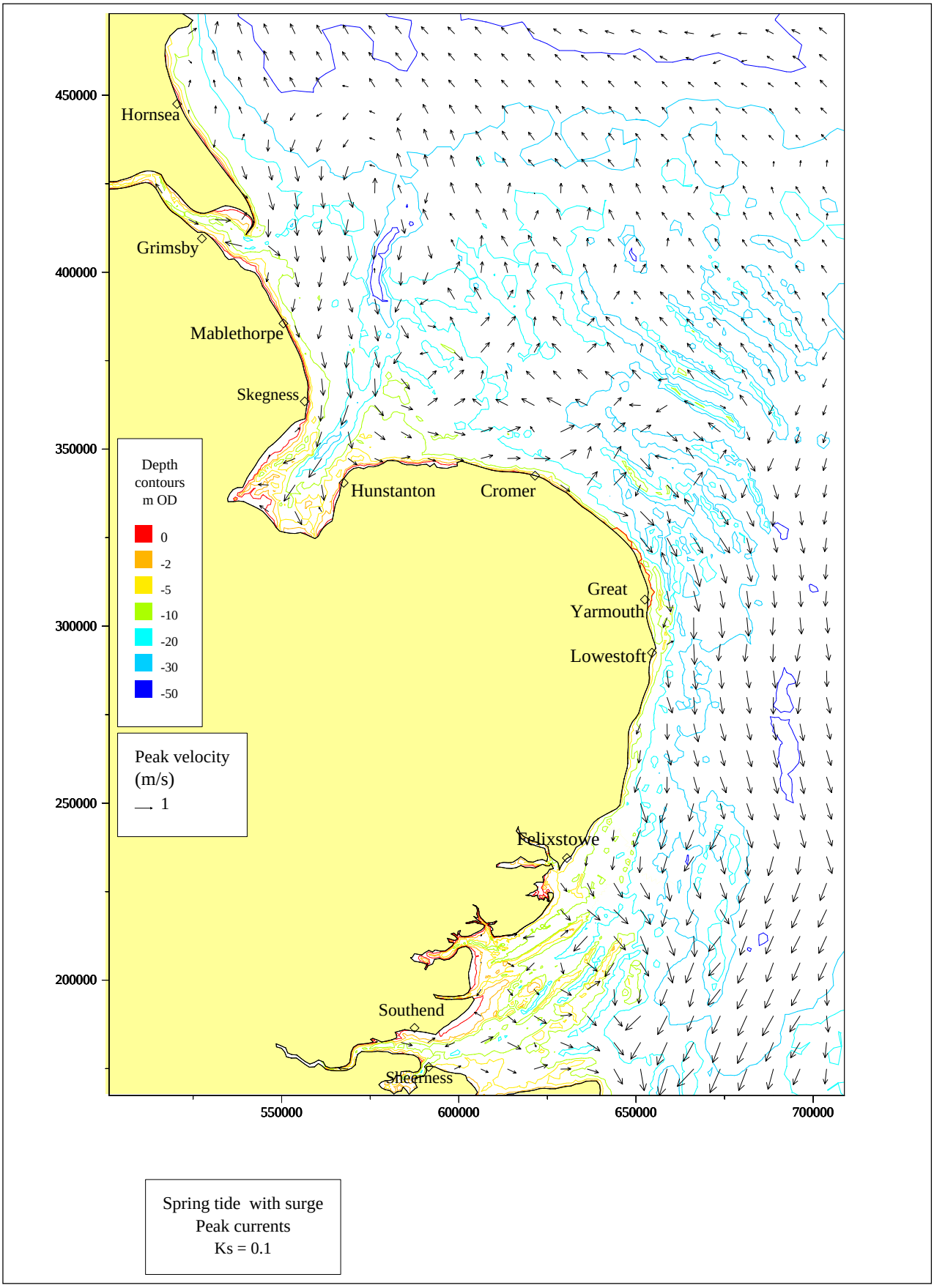


Figure 22 Spring tide with surge peak depth-averaged currents

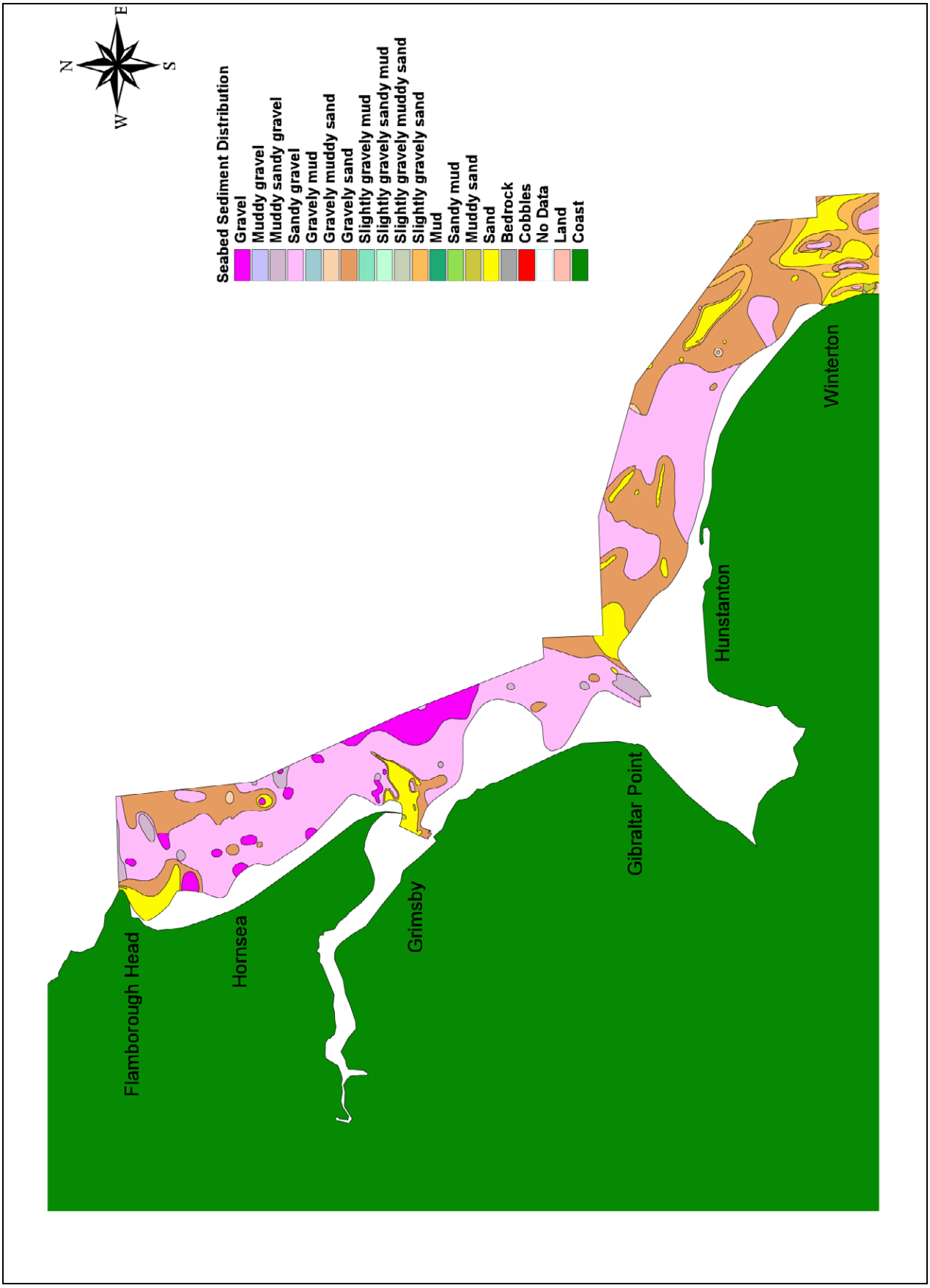


Figure 23a Seabed sediment types: Flamborough Head – Winterton. (Reproduced by permission of British Geological Survey)

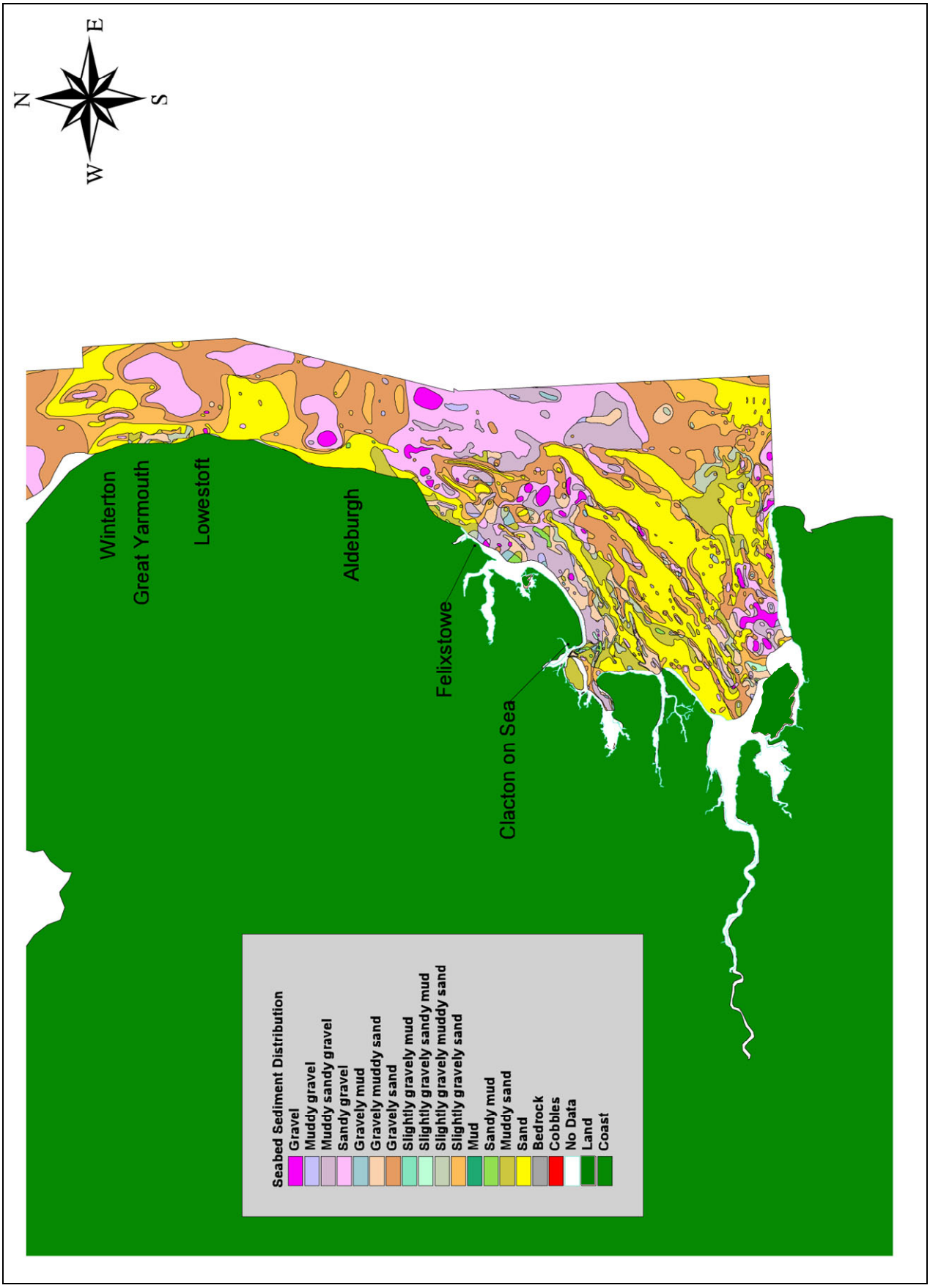


Figure 23b Seabed sediment types: Winterton – The Thames Estuary. (Reproduced by permission of British Geological Survey)

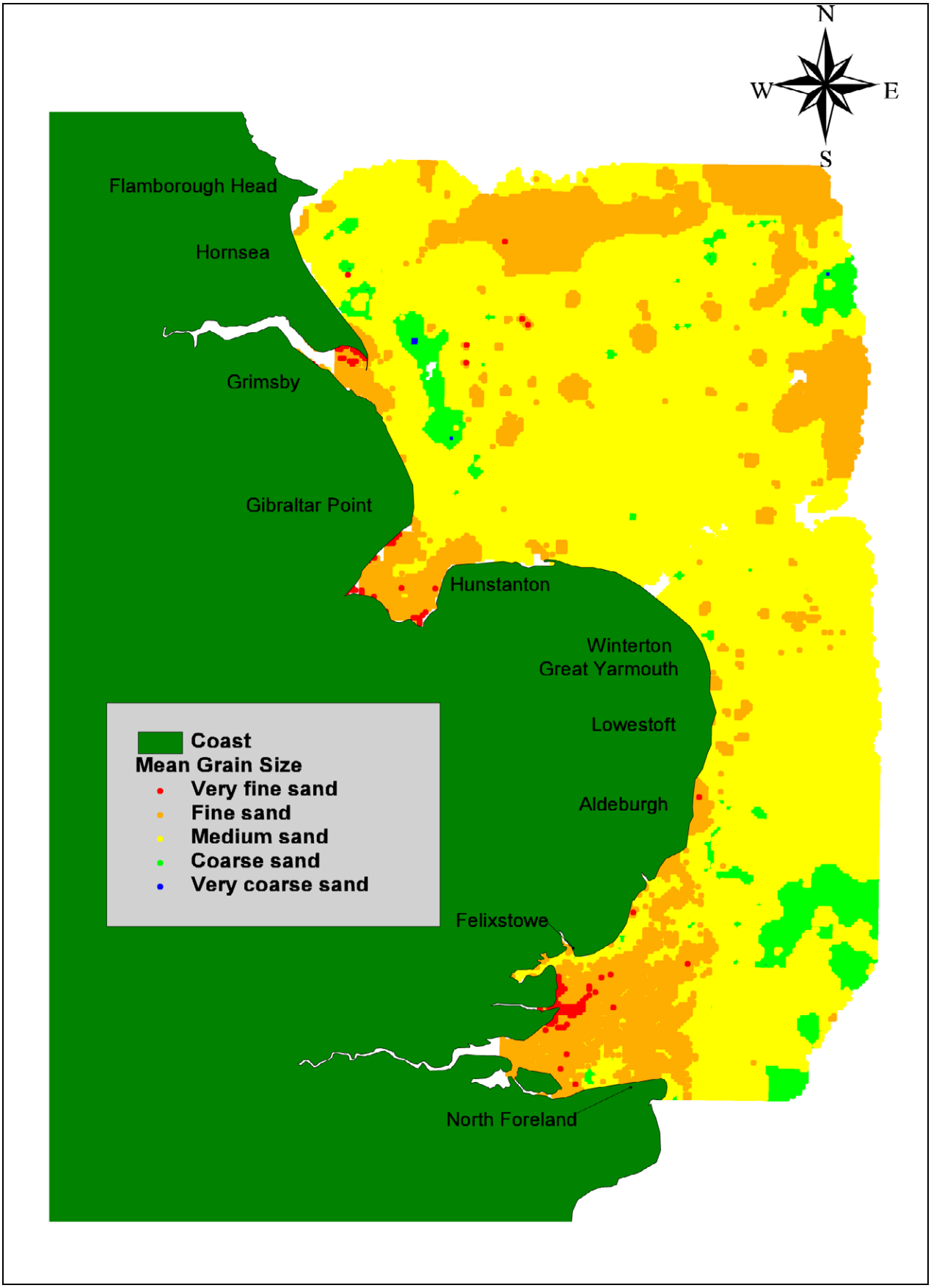


Figure 24 Grainsize distribution on the seabed (source: British Geological Survey data)

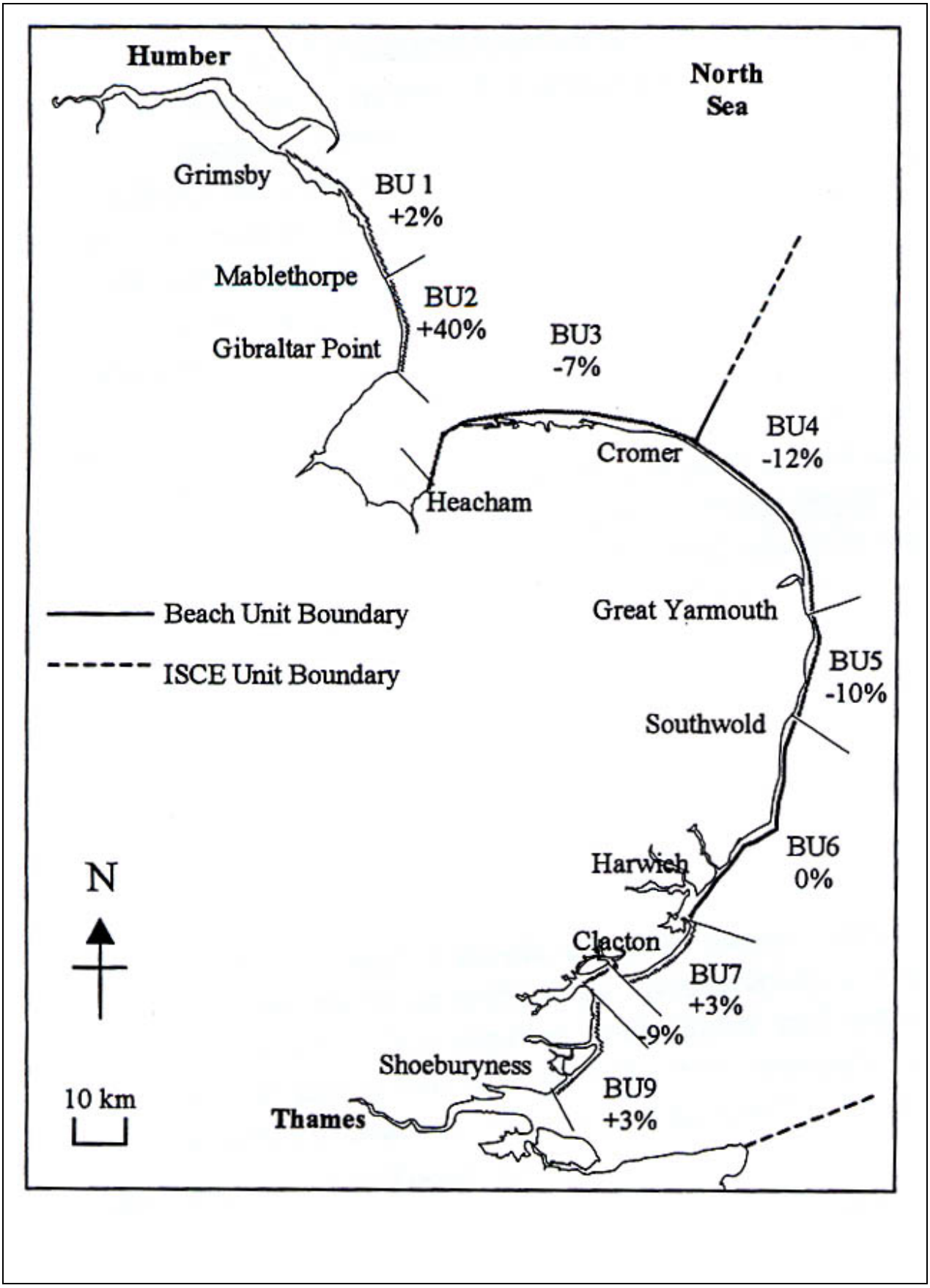


Figure 25 Average change in profile volume, 1991 to 1996 (Leggett et al, 1998). With permission from ASCE

Figure 26 Distribution of sandwaves (dark shading) on the North West European continental shelf. Reproduced from Stride, 1982, with permission from Chapman and Hall

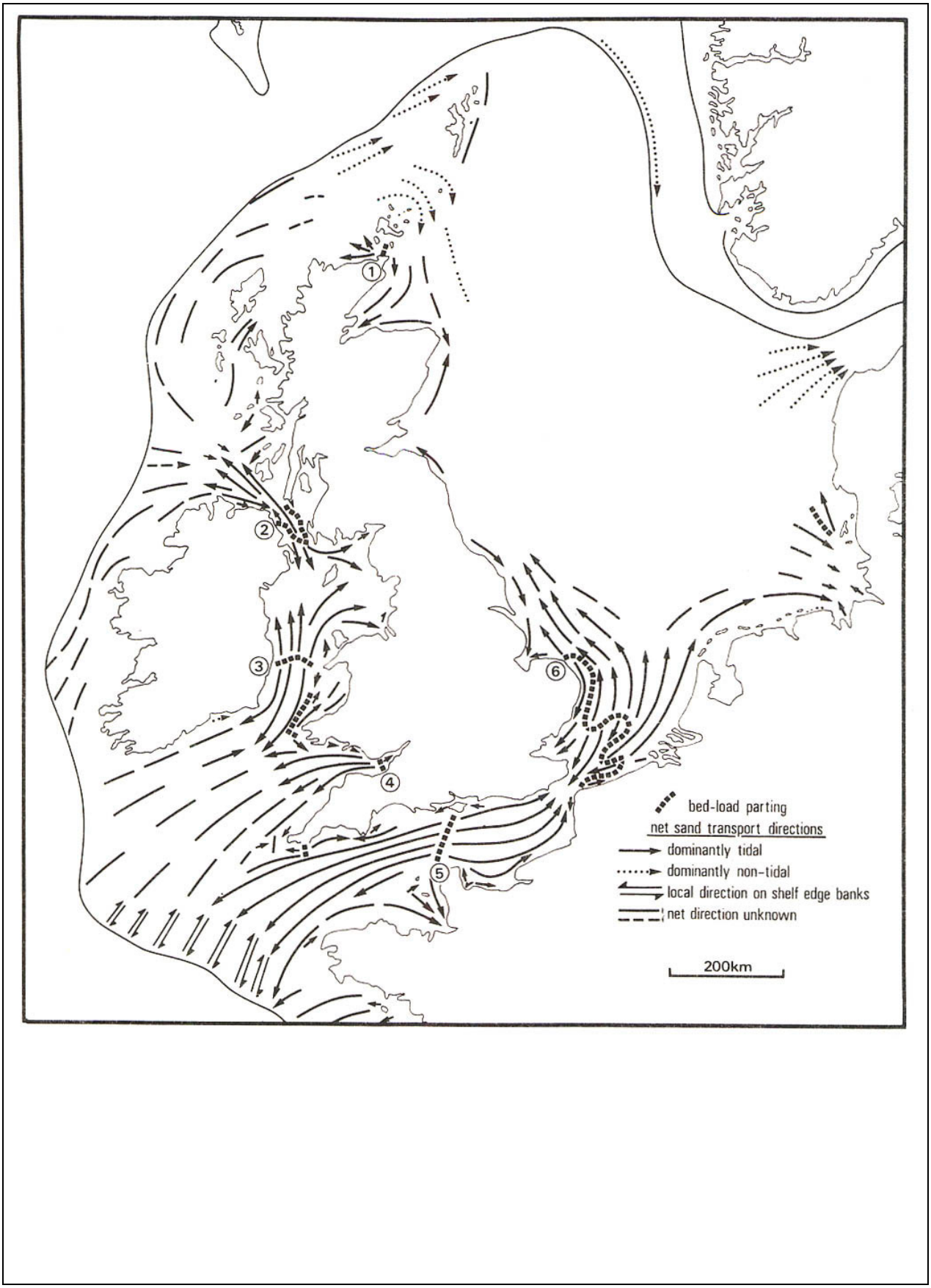


Figure 27 The net sand transport directions on the continental shelf around the British Isles, based on IOS bedform data, tidal current data, published bedform data. Reproduced from Stride, 1982, with permission from Chapman and Hall

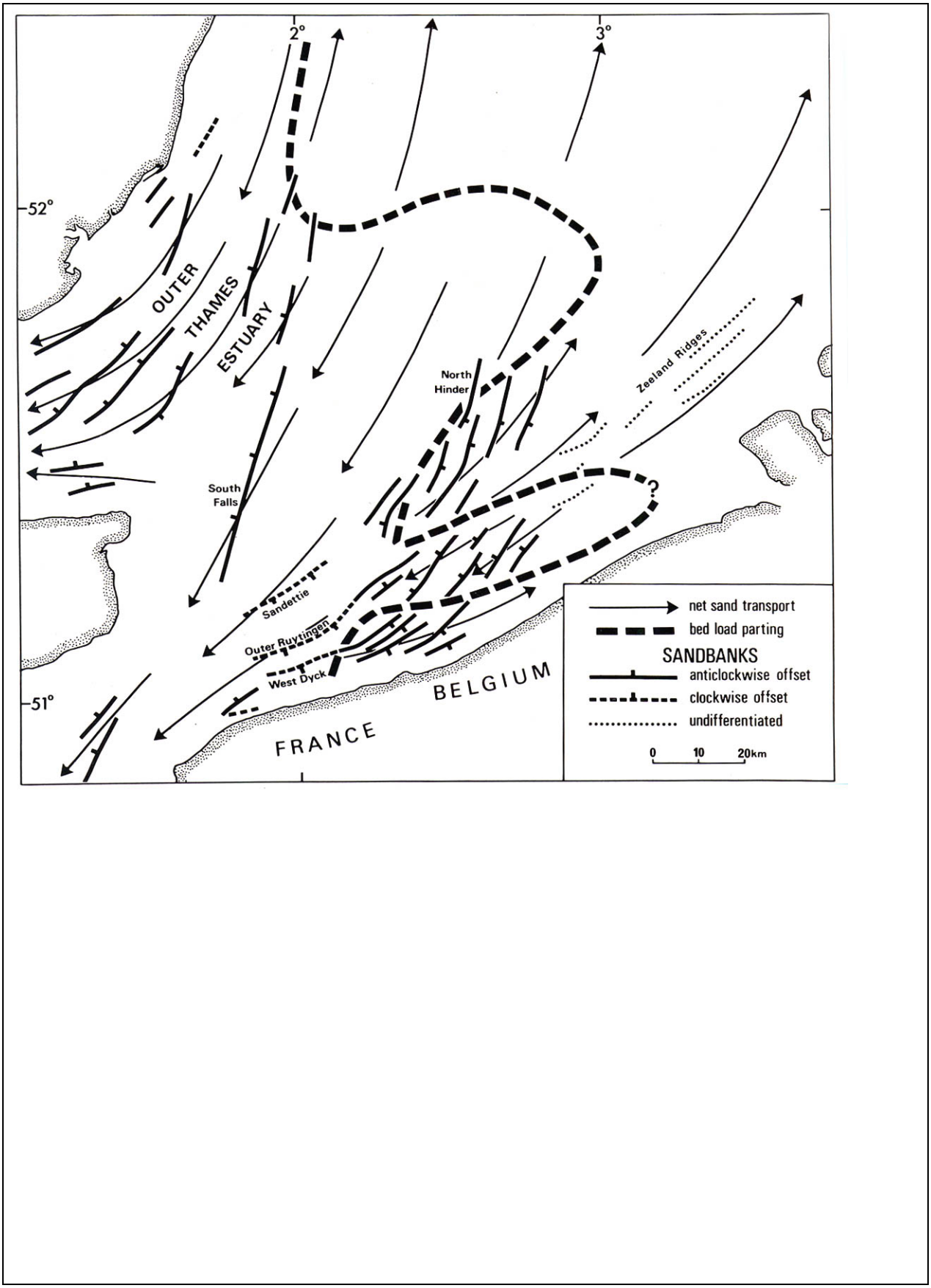


Figure 28 Offshore tidal sandbanks and net sand transport directions in the Southern Bight of the North Sea. The steeper sides of the sandbanks are indicated with a tick. Reproduced from Kenyon et al, 1981, with permission from Blackwell

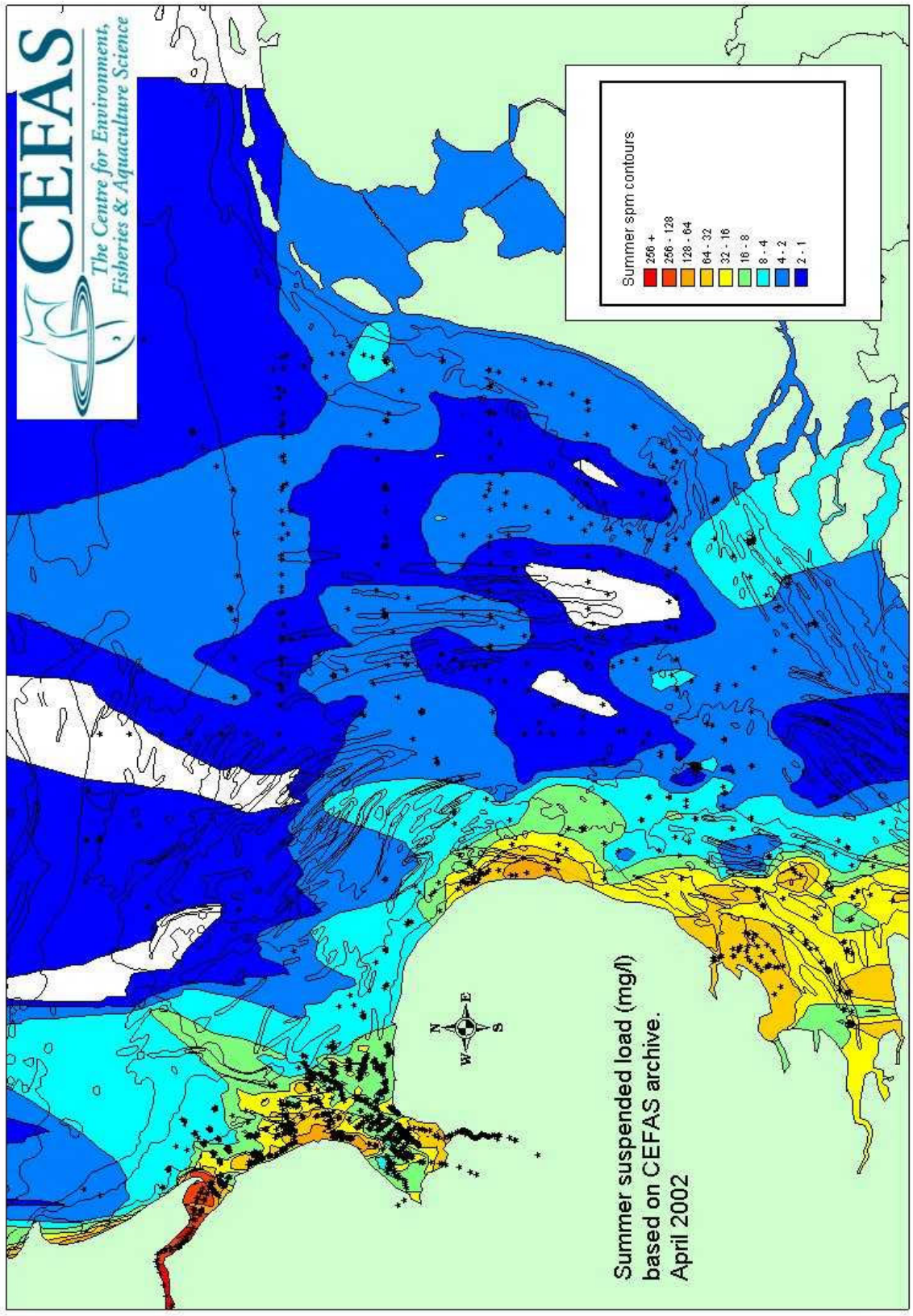


Figure 29 "Climate mean" summer suspended sediment concentrations (units: mg/l)

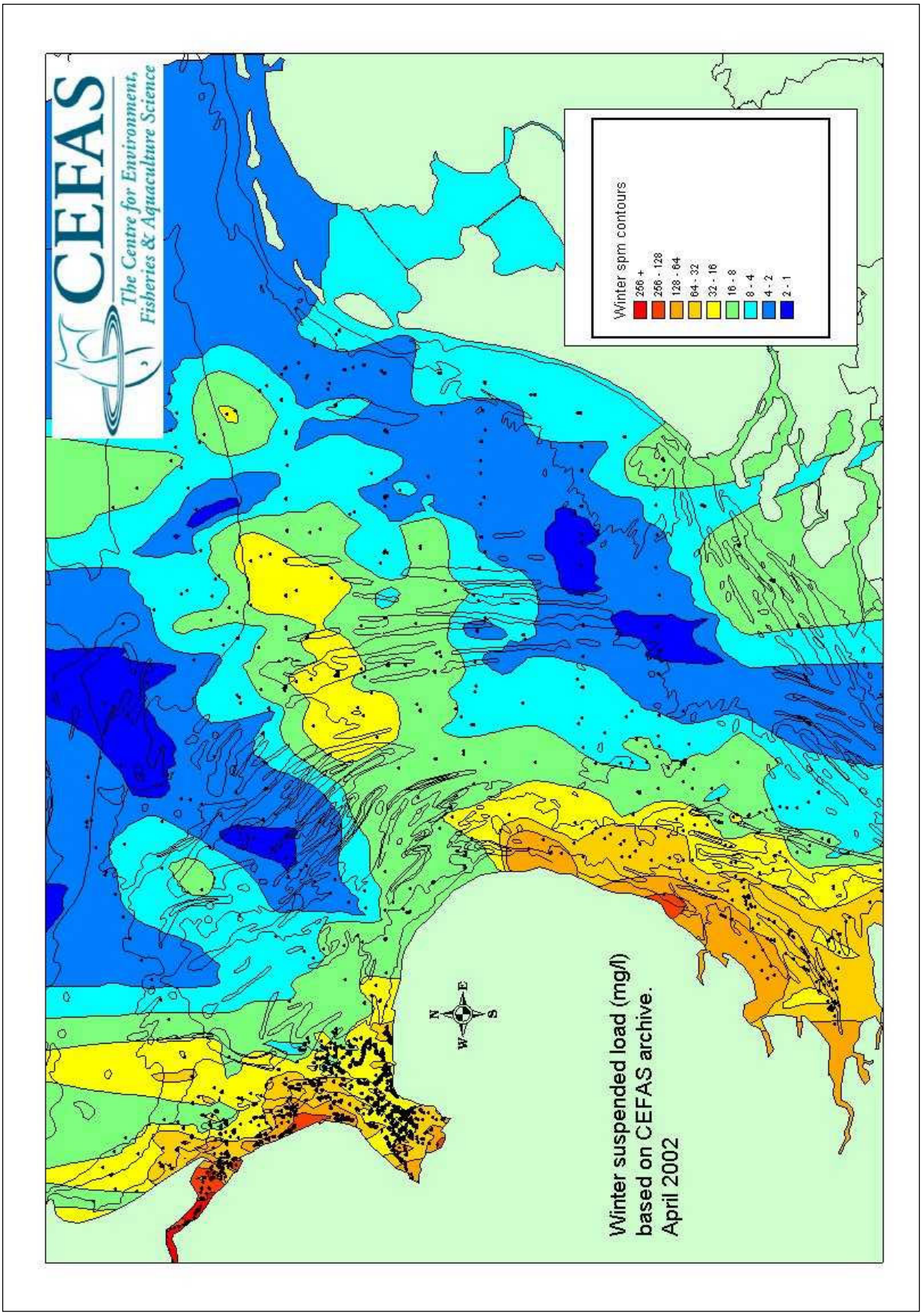


Figure 30 "Climate mean" winter suspended sediment concentrations (units: mg/l)

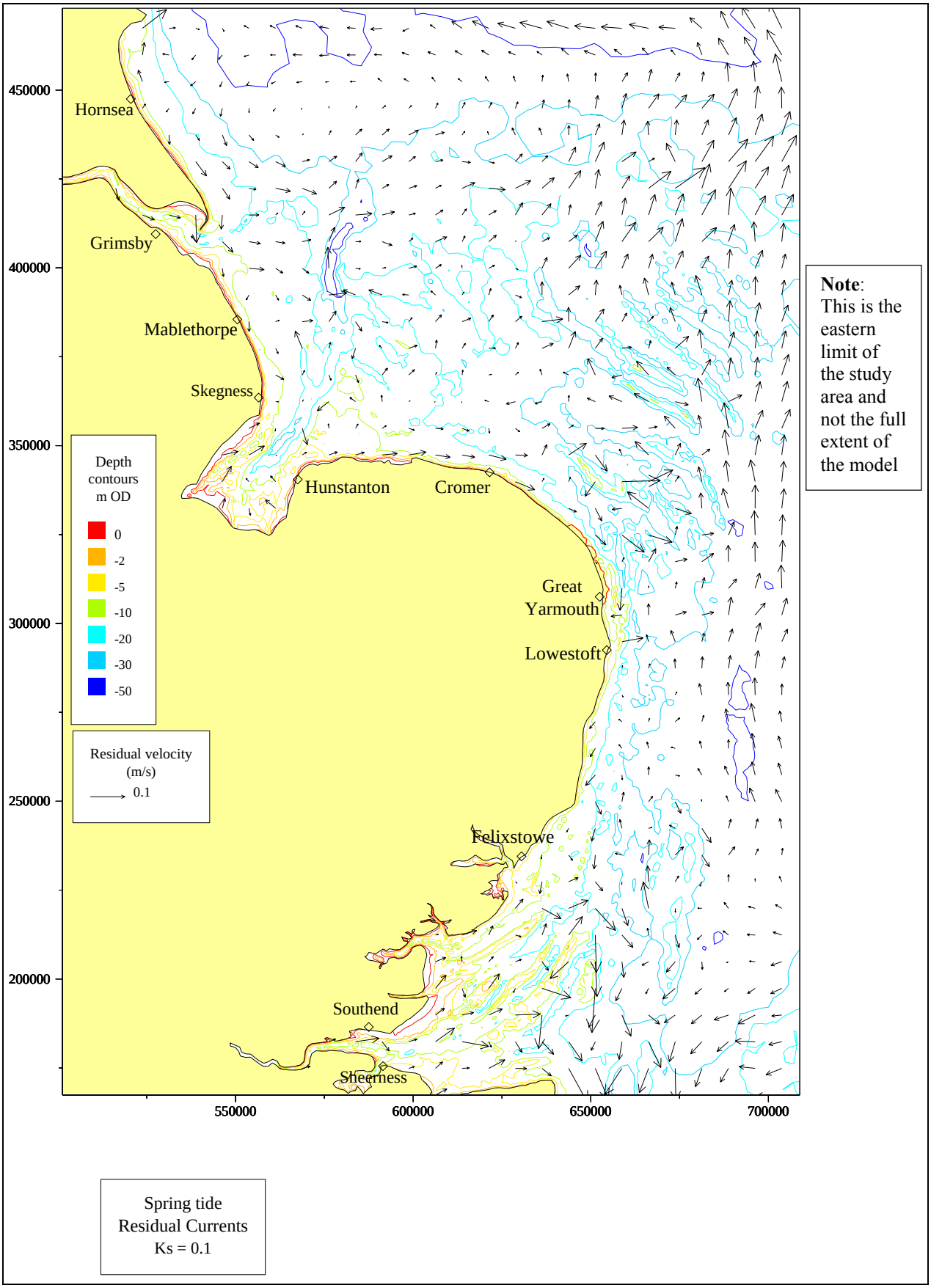


Figure 31 Spring tide depth-averaged residual velocity

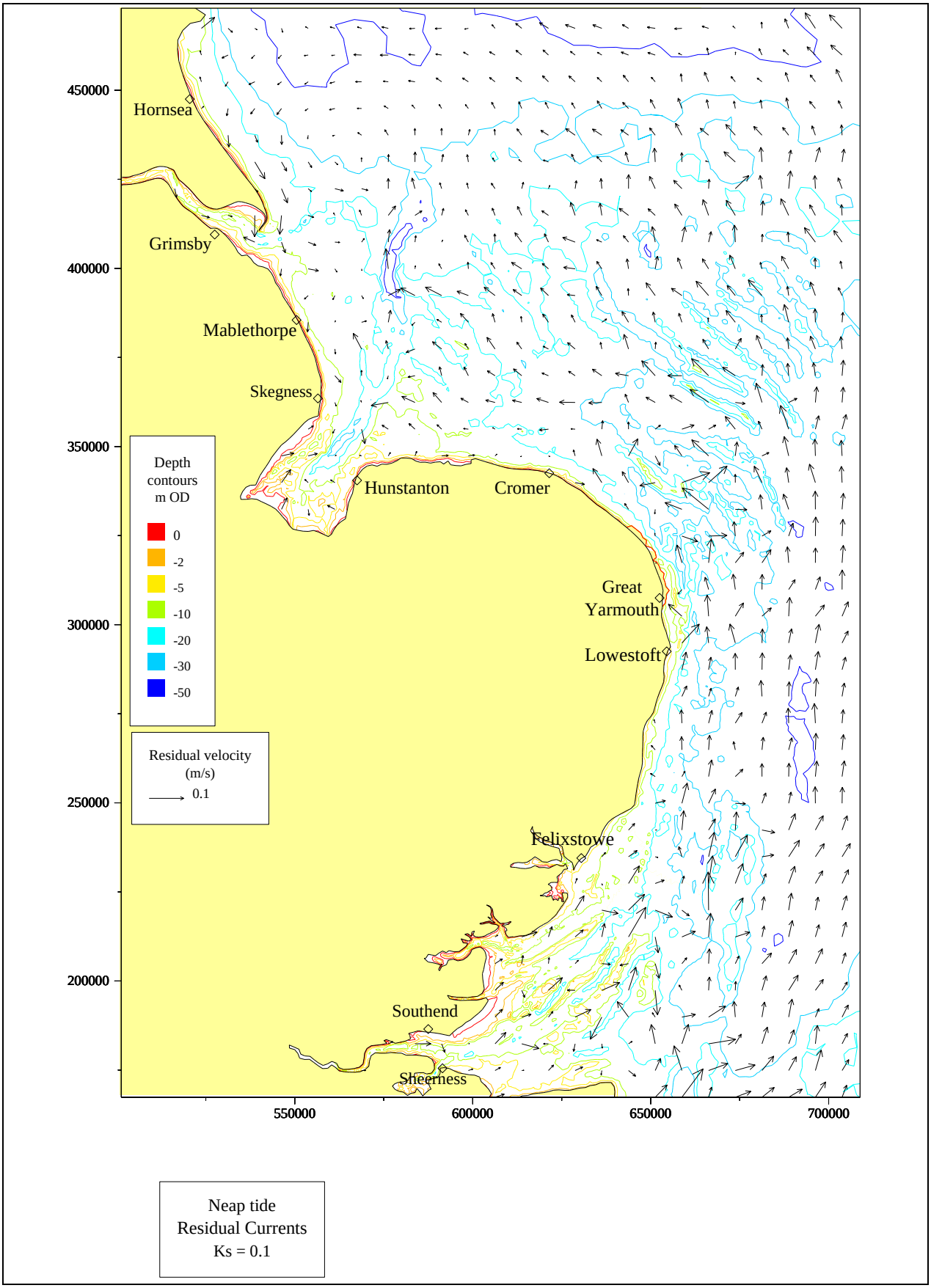


Figure 32 Neap tide depth-averaged residual velocity

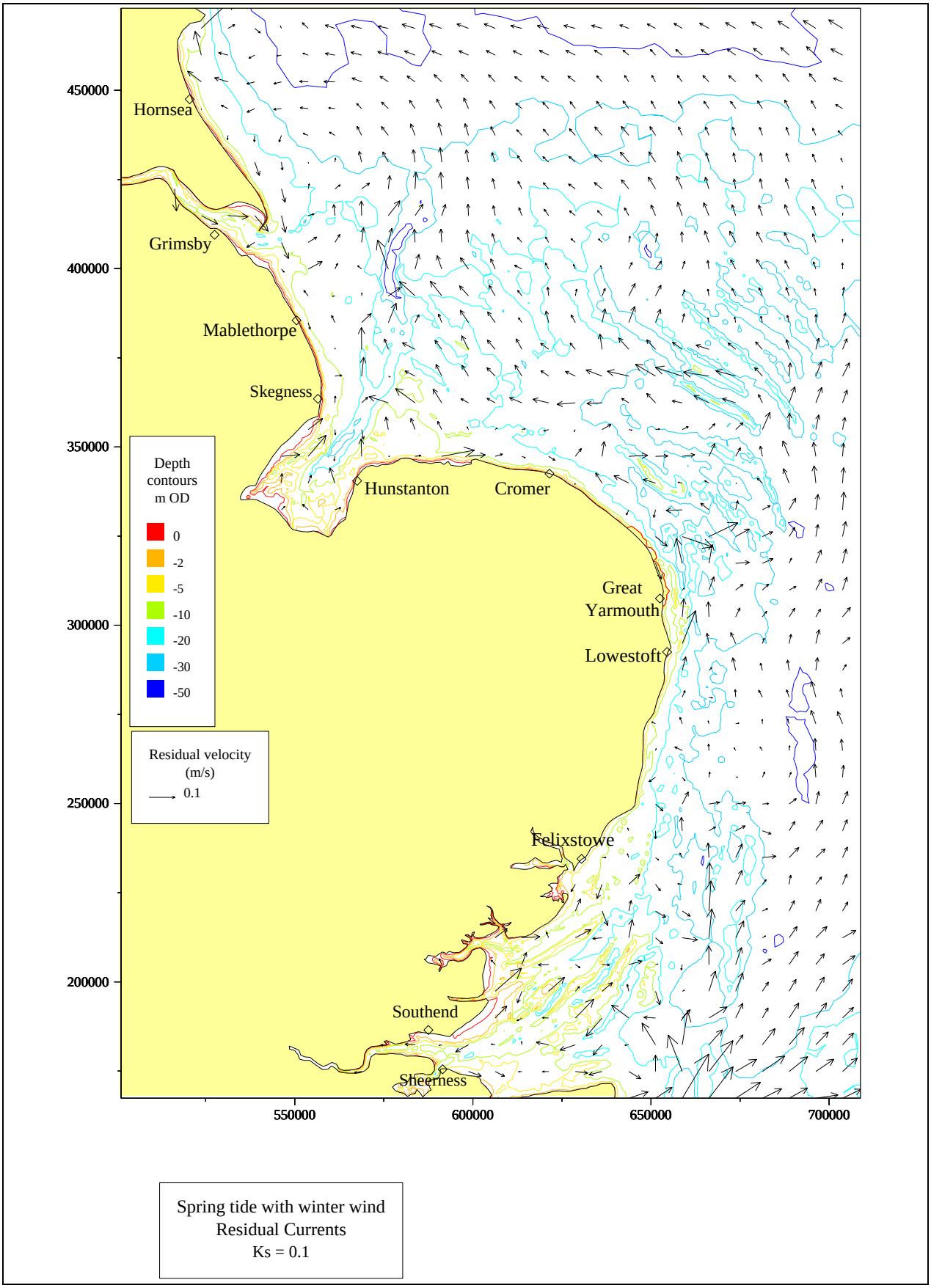


Figure 33 Net spring tide depth-averaged residual velocity with winter wind (speed 10m/s from west)

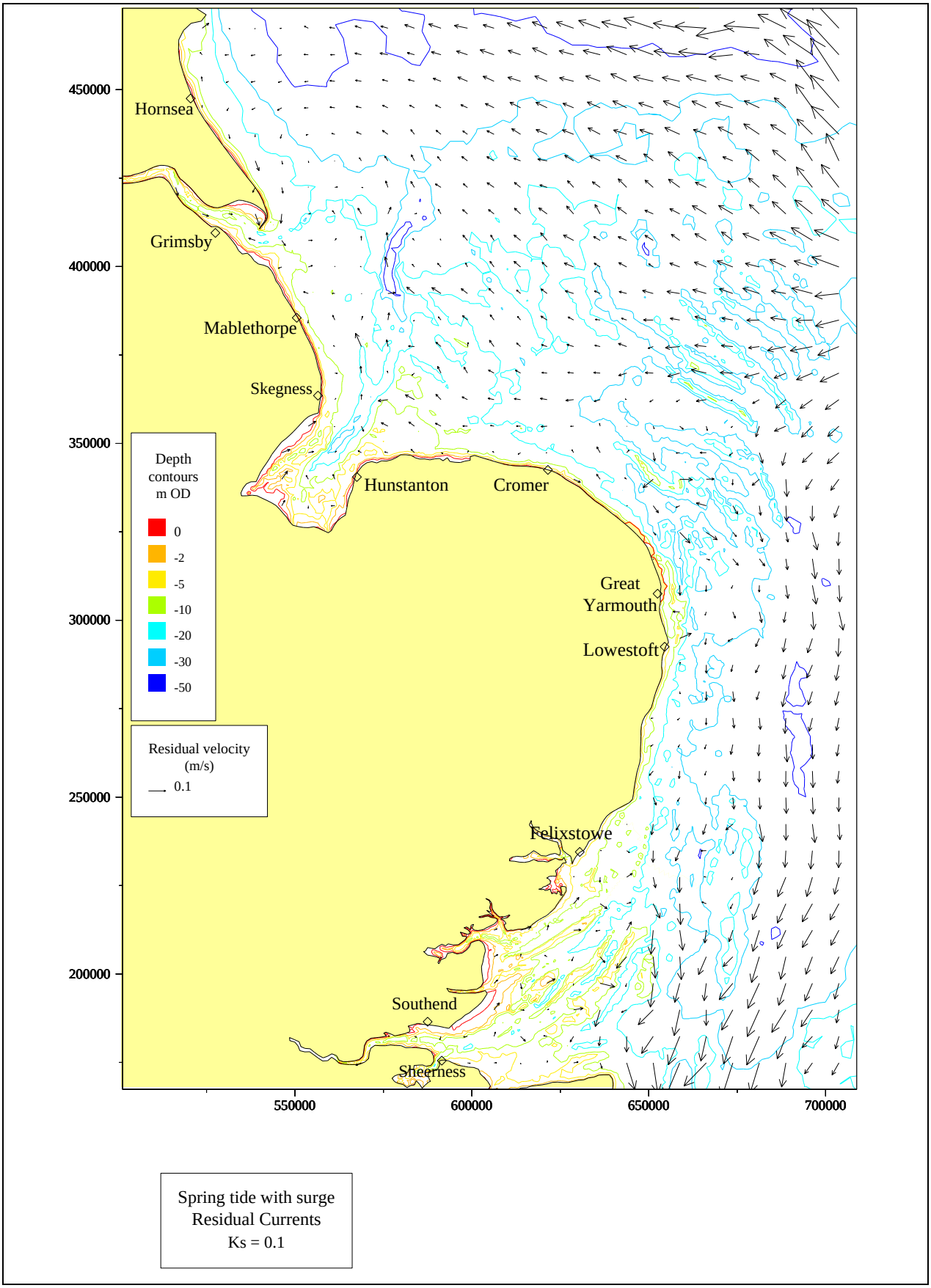


Figure 34 Net spring tide depth-averaged residual velocity with surge and wind

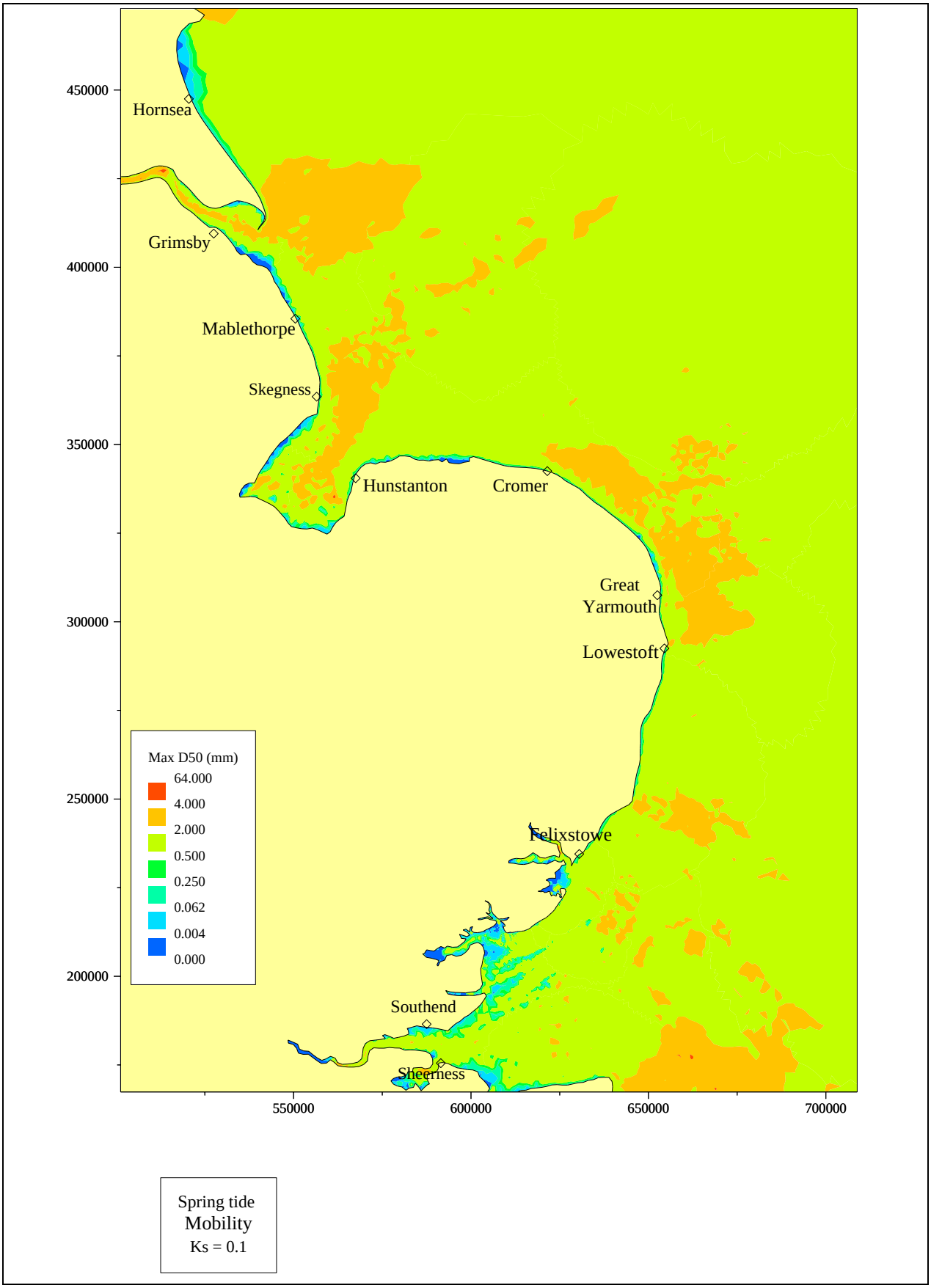


Figure 35 Seabed mobility: maximum mobile grain size under spring tides

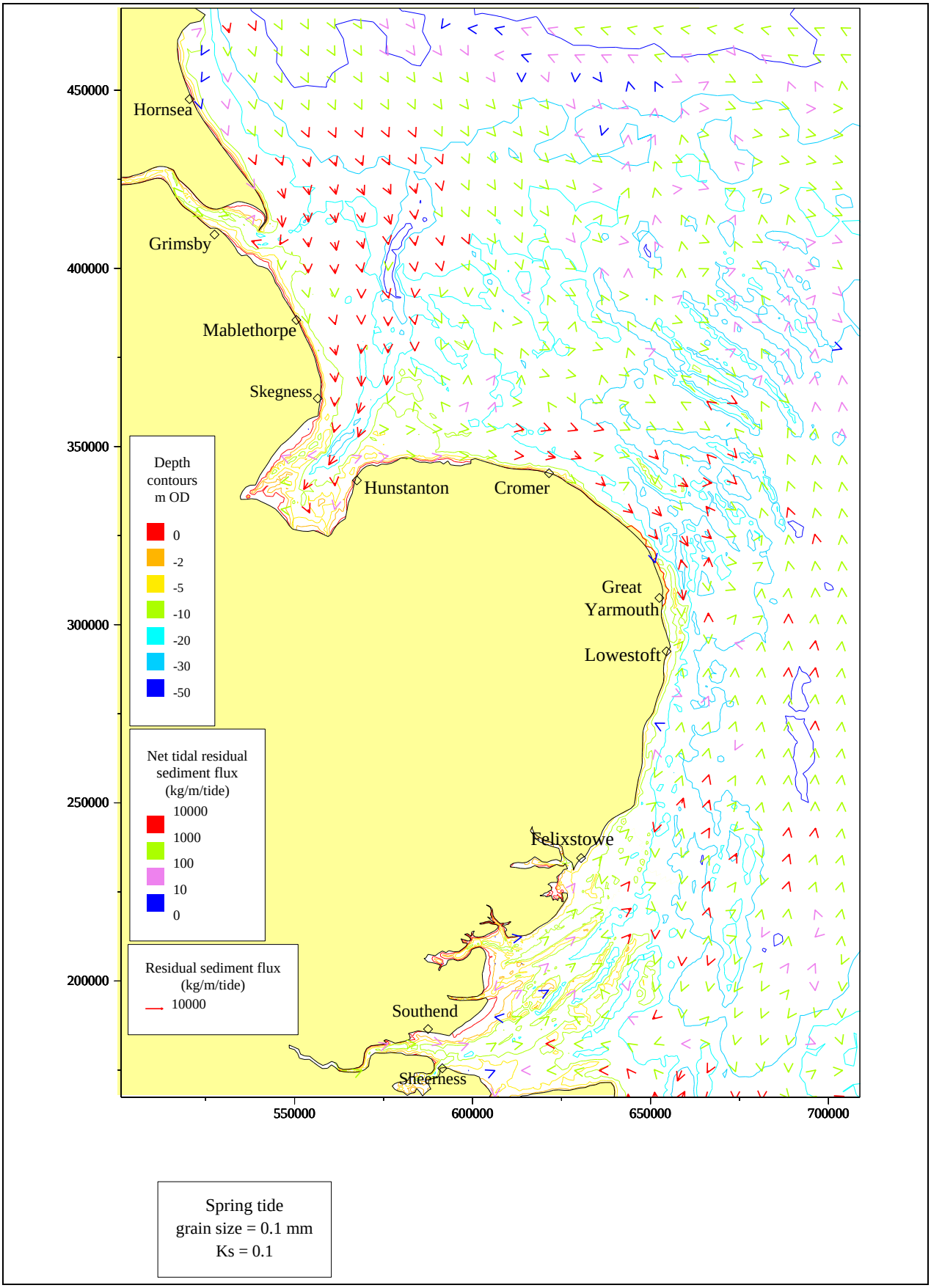


Figure 36 Spring tide net sediment flux patterns (0.1mm sand)

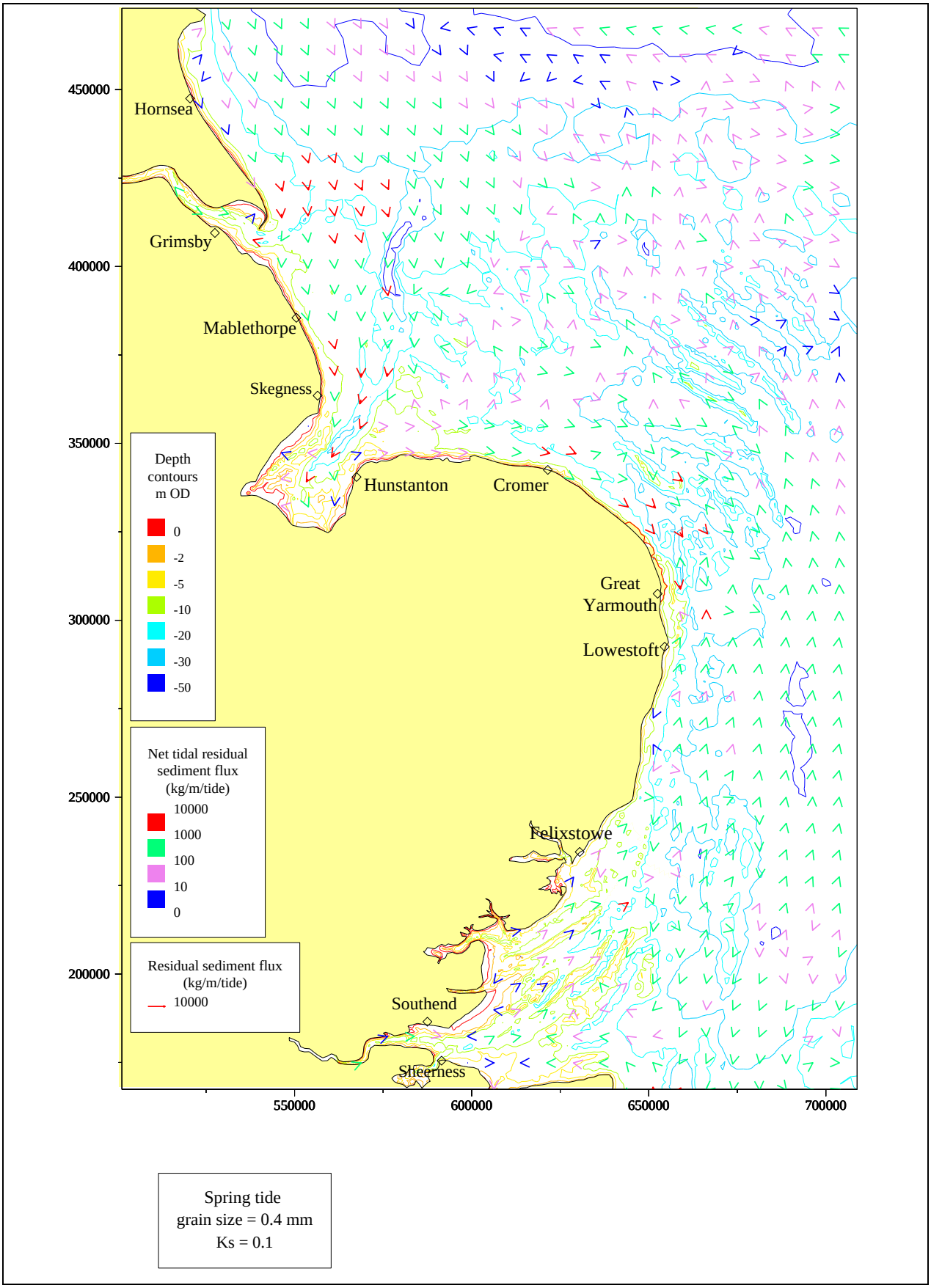


Figure 37 Spring tide net sediment flux patterns (0.4mm sand)

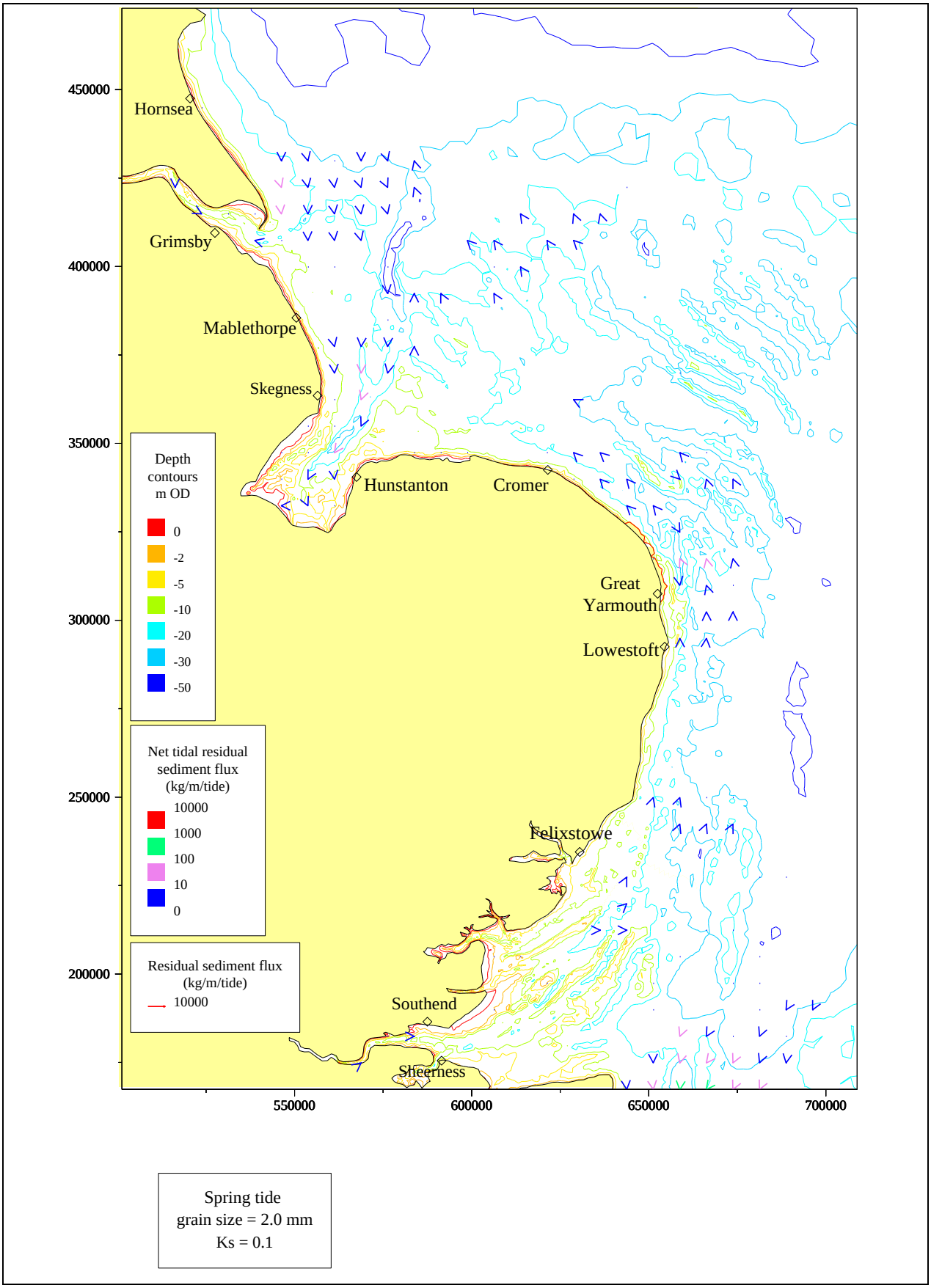


Figure 38 Spring tide net sediment flux patterns (2mm gravel)

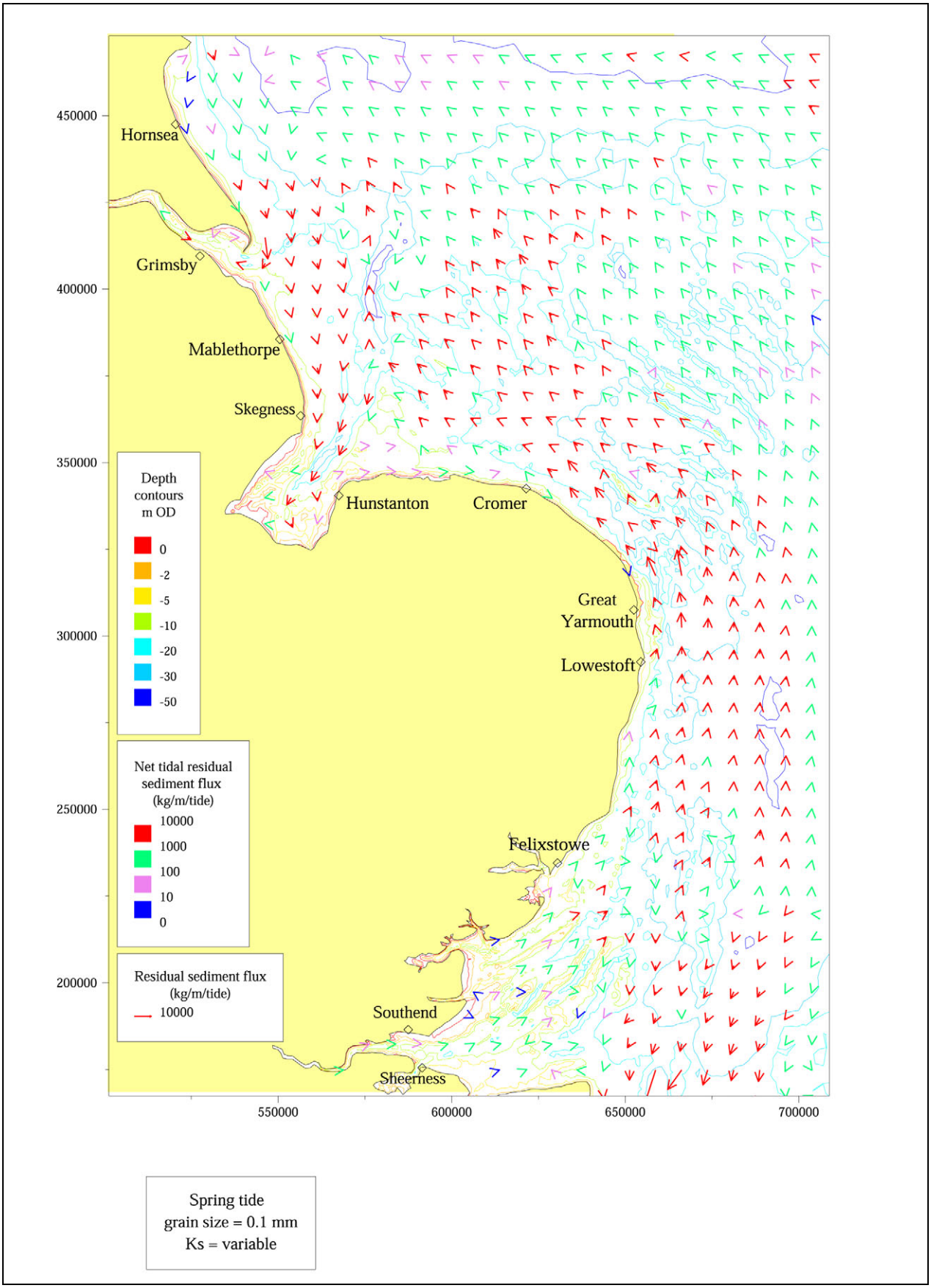


Figure 39 Spring tide net sediment flux patterns (0.1mm sand): sensitivity test with variable seabed roughness based on sediment distribution in Cameron et al (1992) and corresponding seabed roughness (Soulsby, 1997)

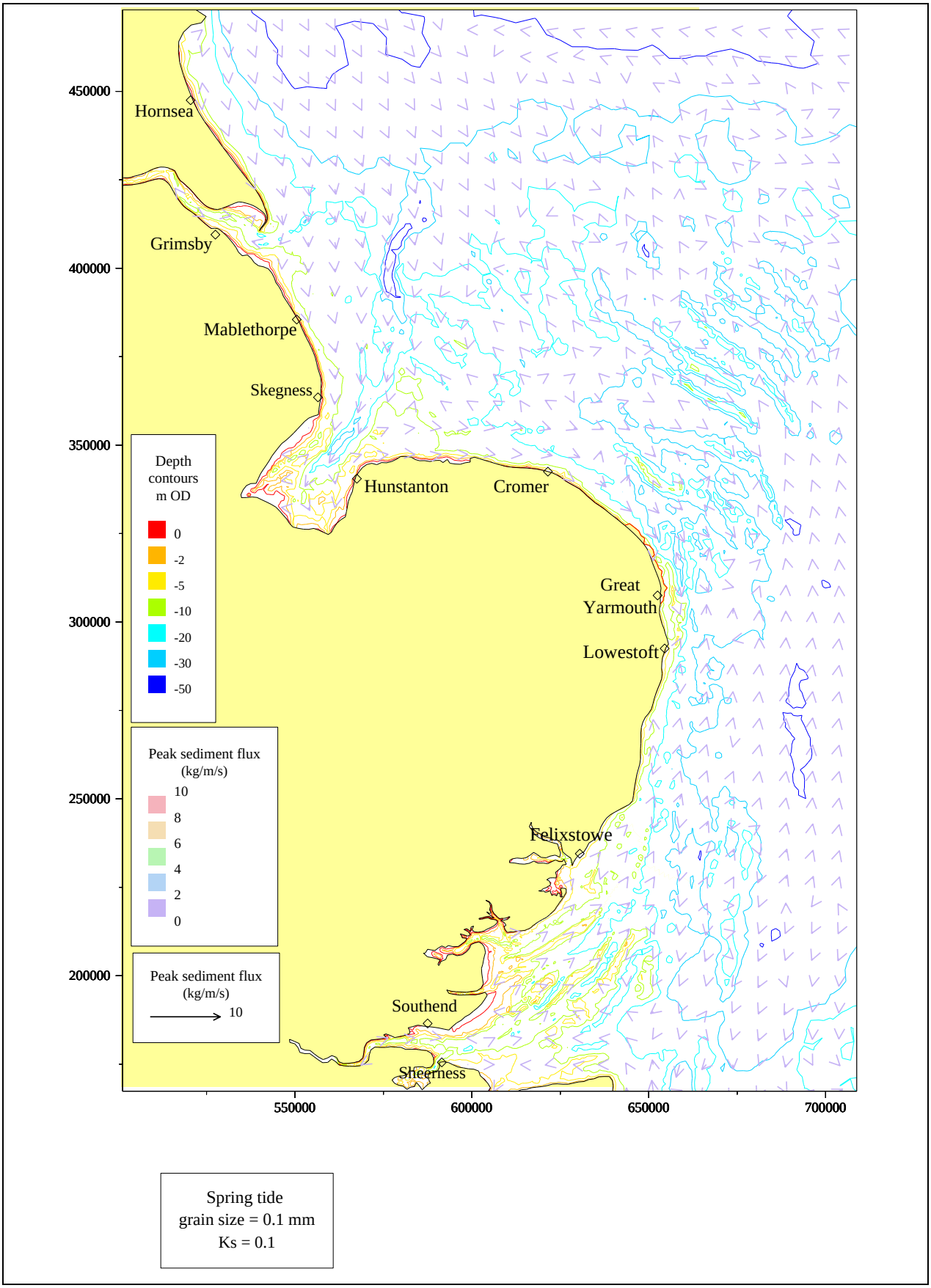


Figure 40 Peak sediment flux during spring tide (0.1mm sand)

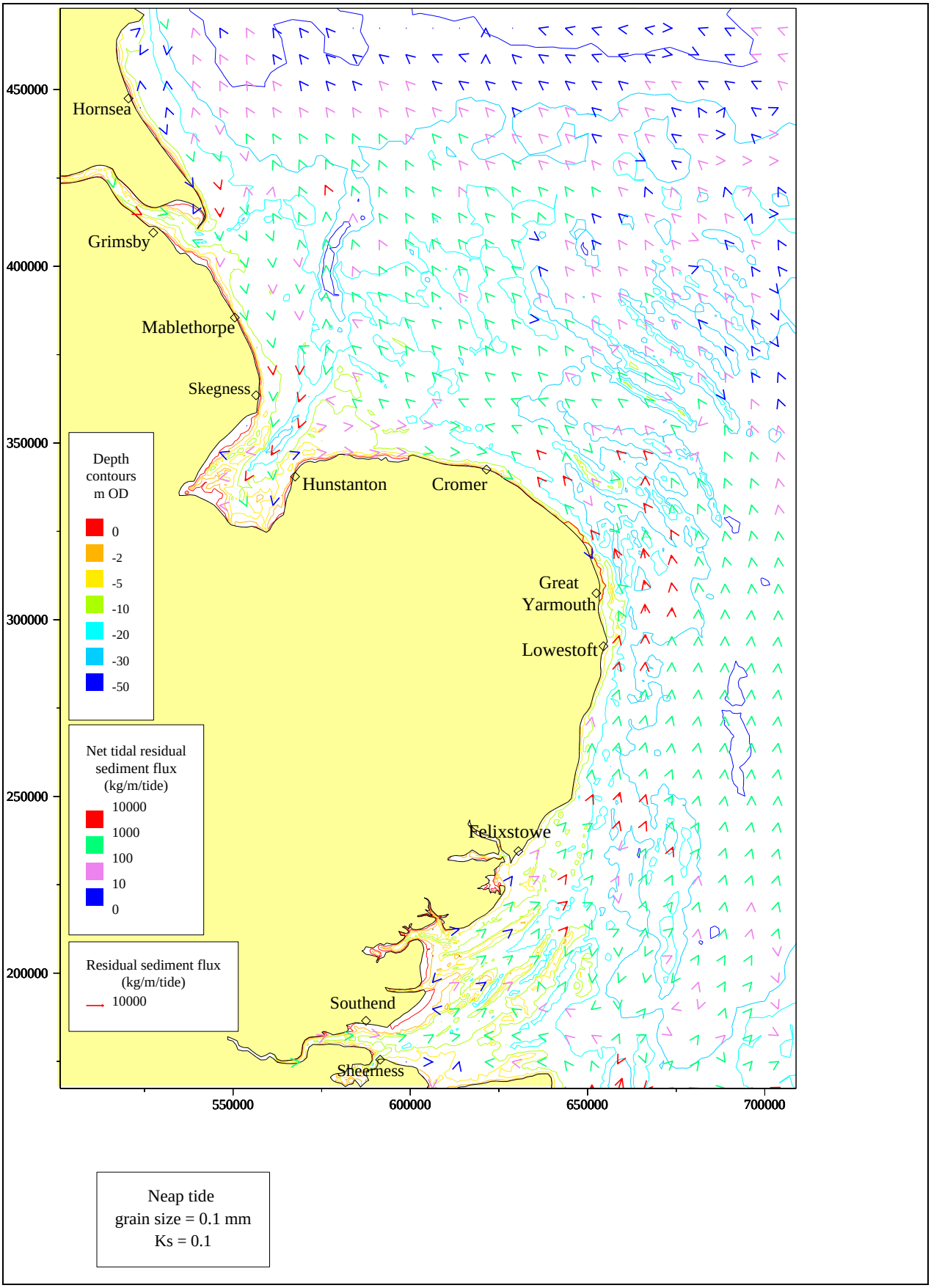


Figure 41 Neap tide net sediment flux patterns (0.1mm sand)

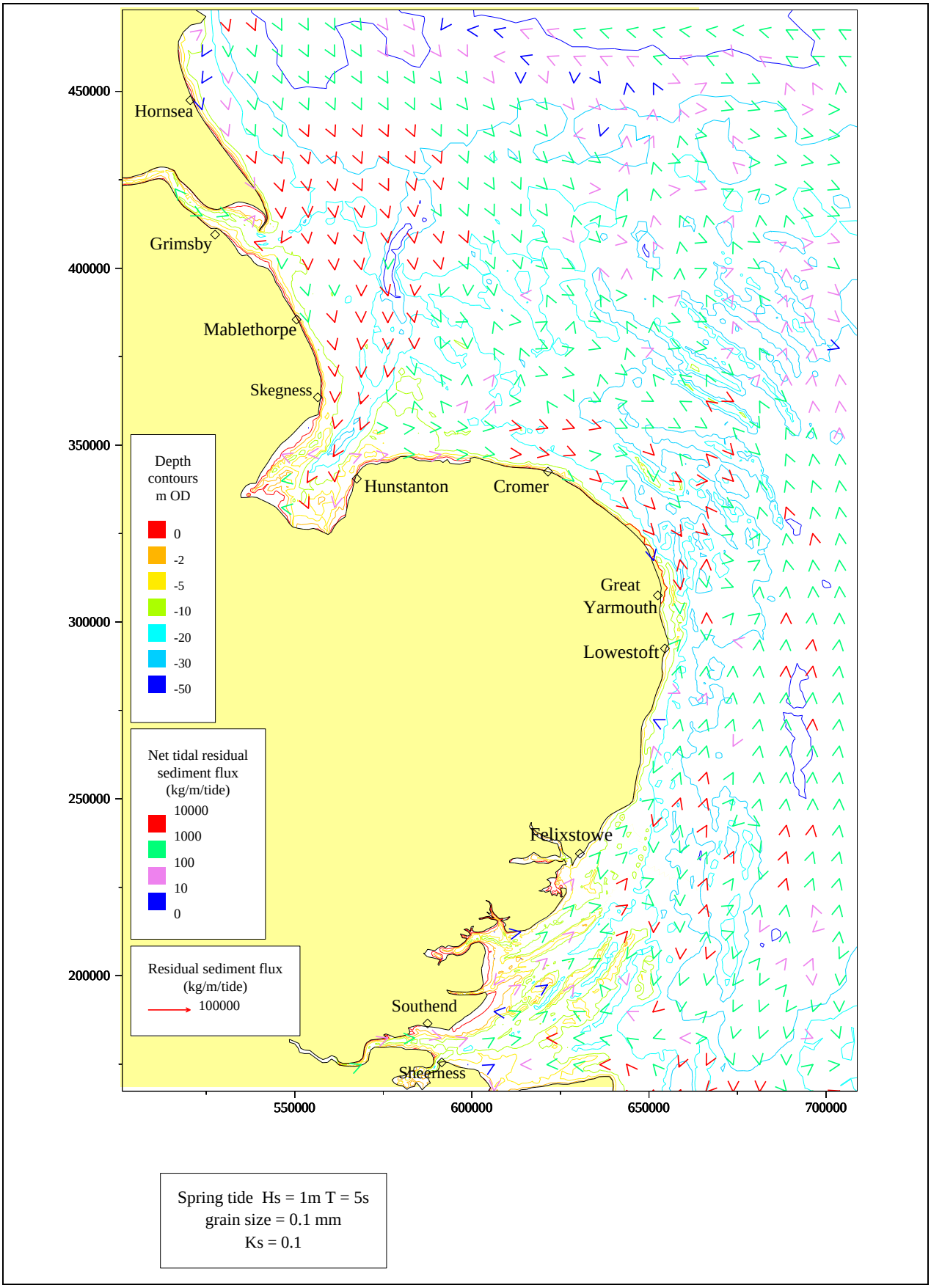


Figure 42 Spring tide with 1m 5s waves net sediment flux patterns (0.1mm sand)

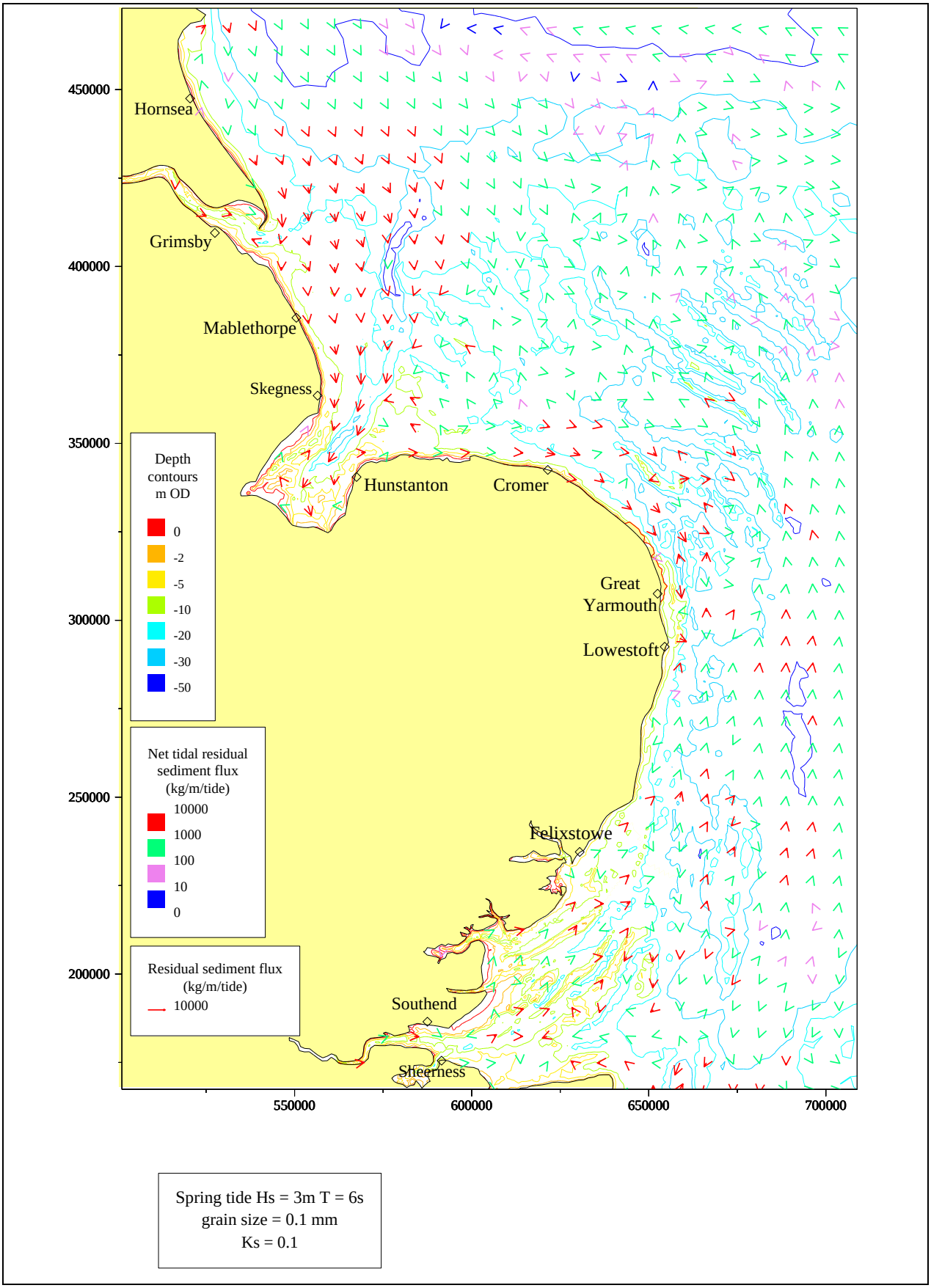


Figure 43 Spring tide with 3m 6s storm waves net sediment flux patterns (0.1mm sand)

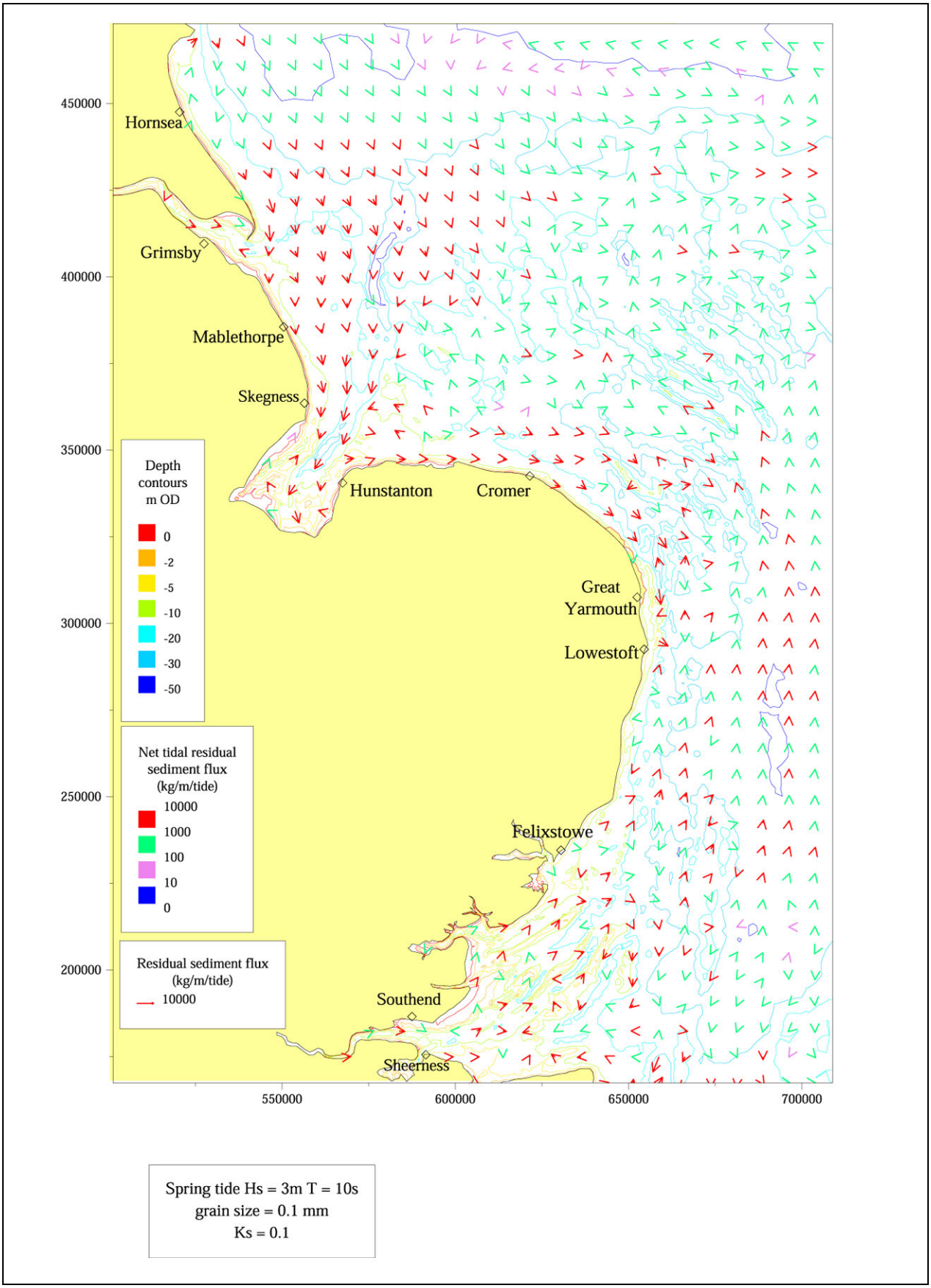


Figure 44 Spring tide with 3m 10s storm waves net sediment flux patterns (0.1mm sand)

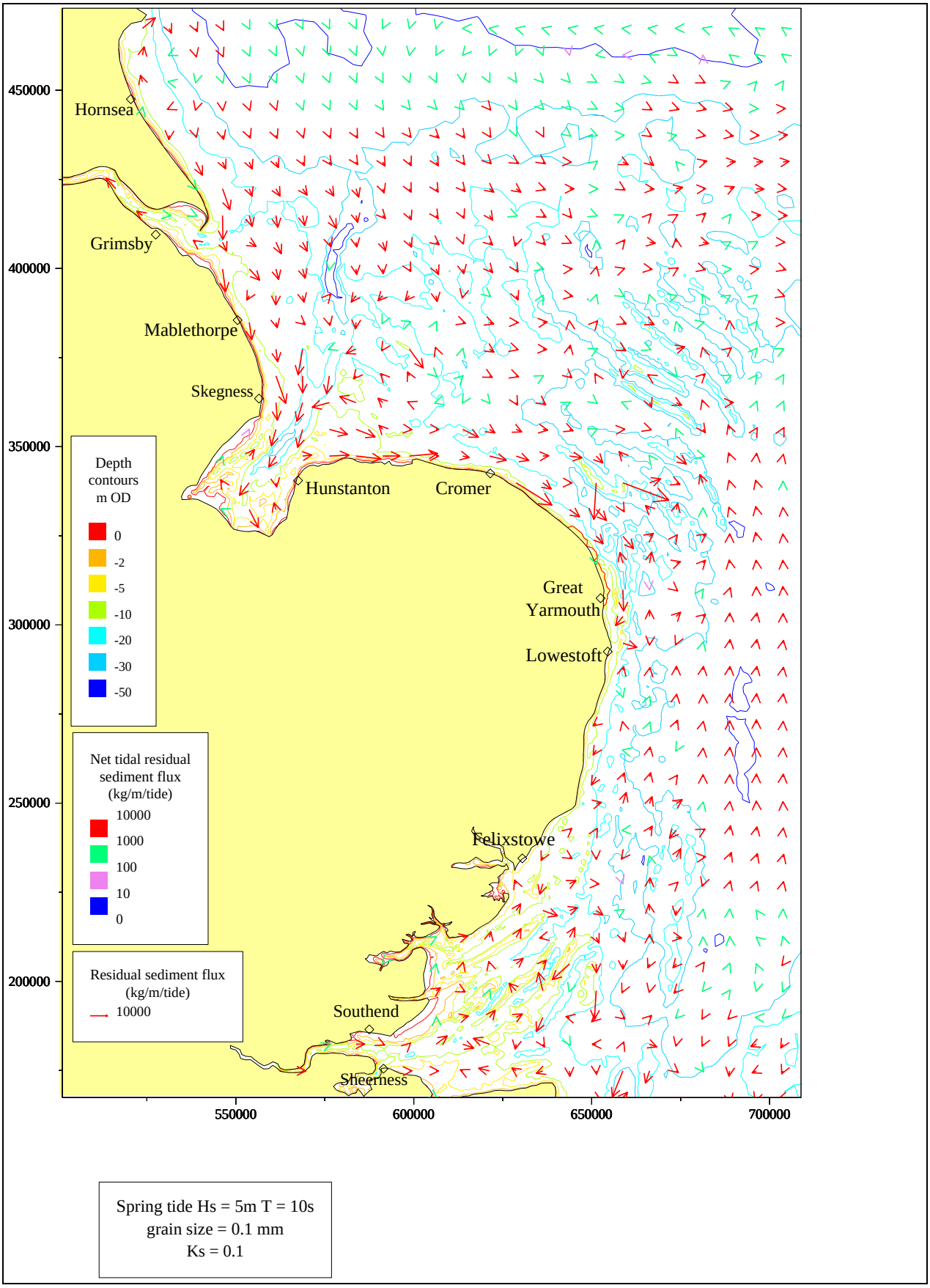


Figure 45 Spring tide with 5m 10s storm waves net sediment flux patterns (0.1mm sand)

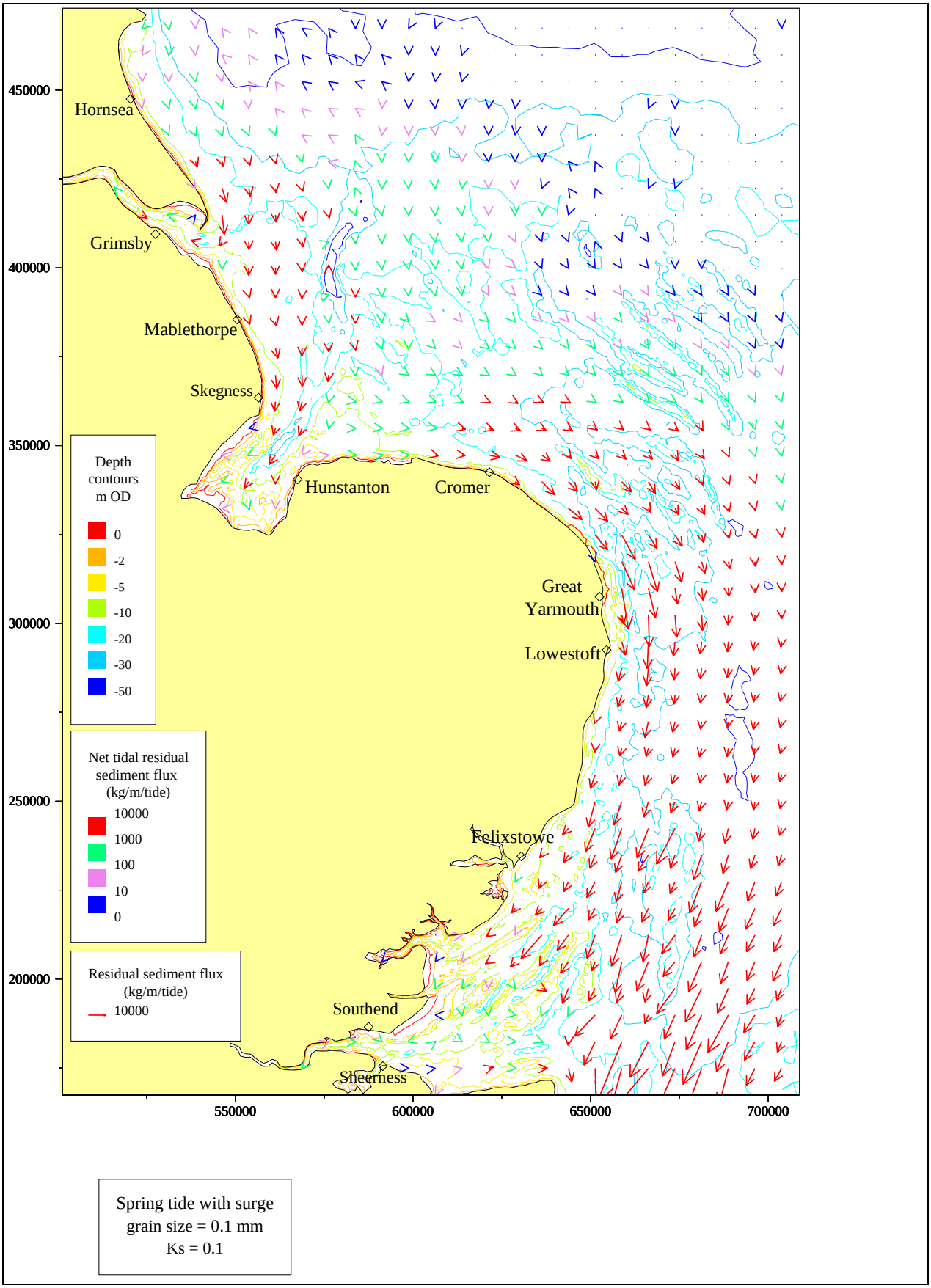


Figure 46 Spring tide with surge net sediment flux patterns (0.1mm sand)

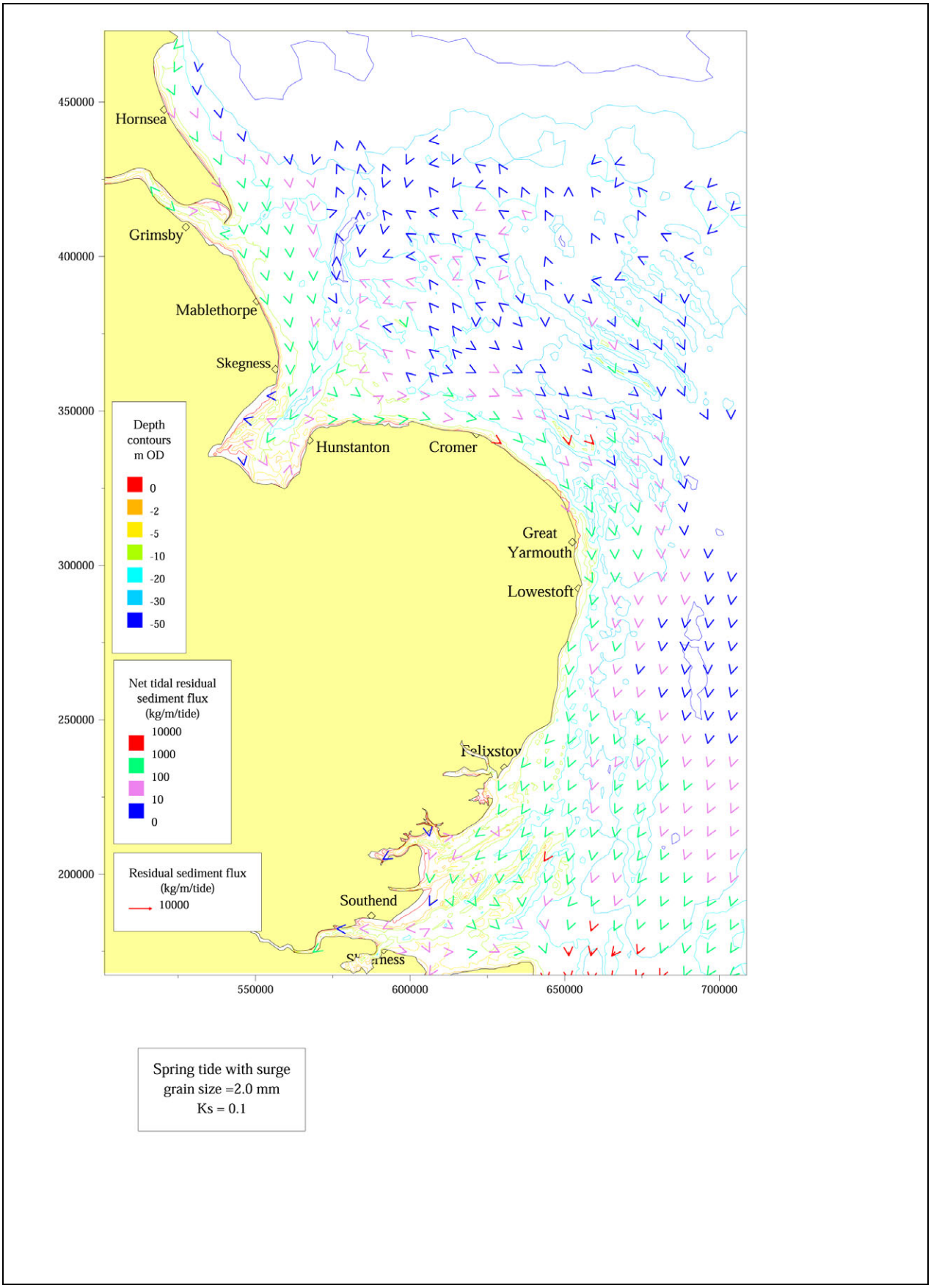


Figure 47 Spring tide with surge net sediment flux patterns (2mm gravel)

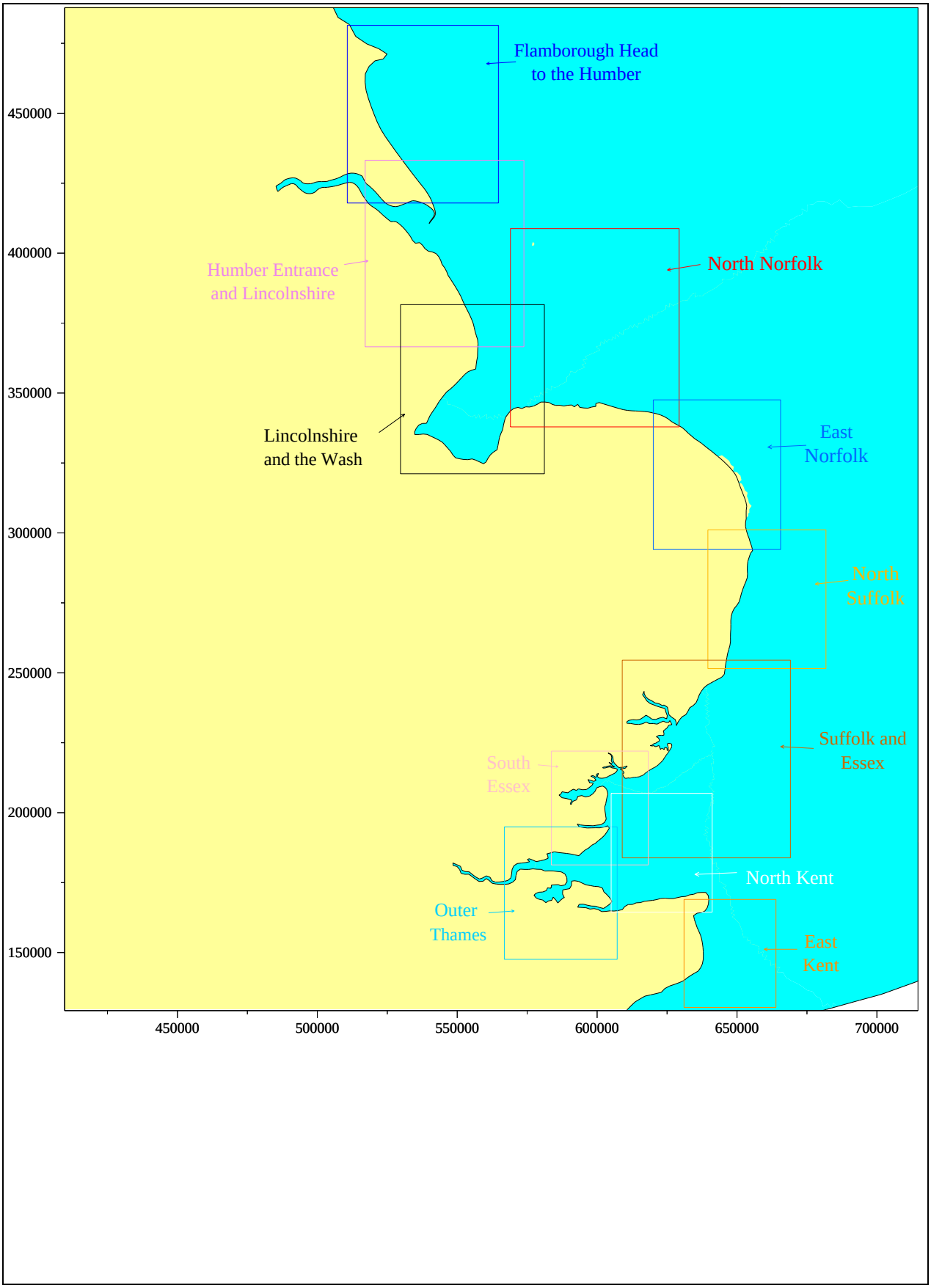


Figure 48 Plan showing local areas for which detailed model results have been plotted in Appendix 12 and of which a subset are included in this report

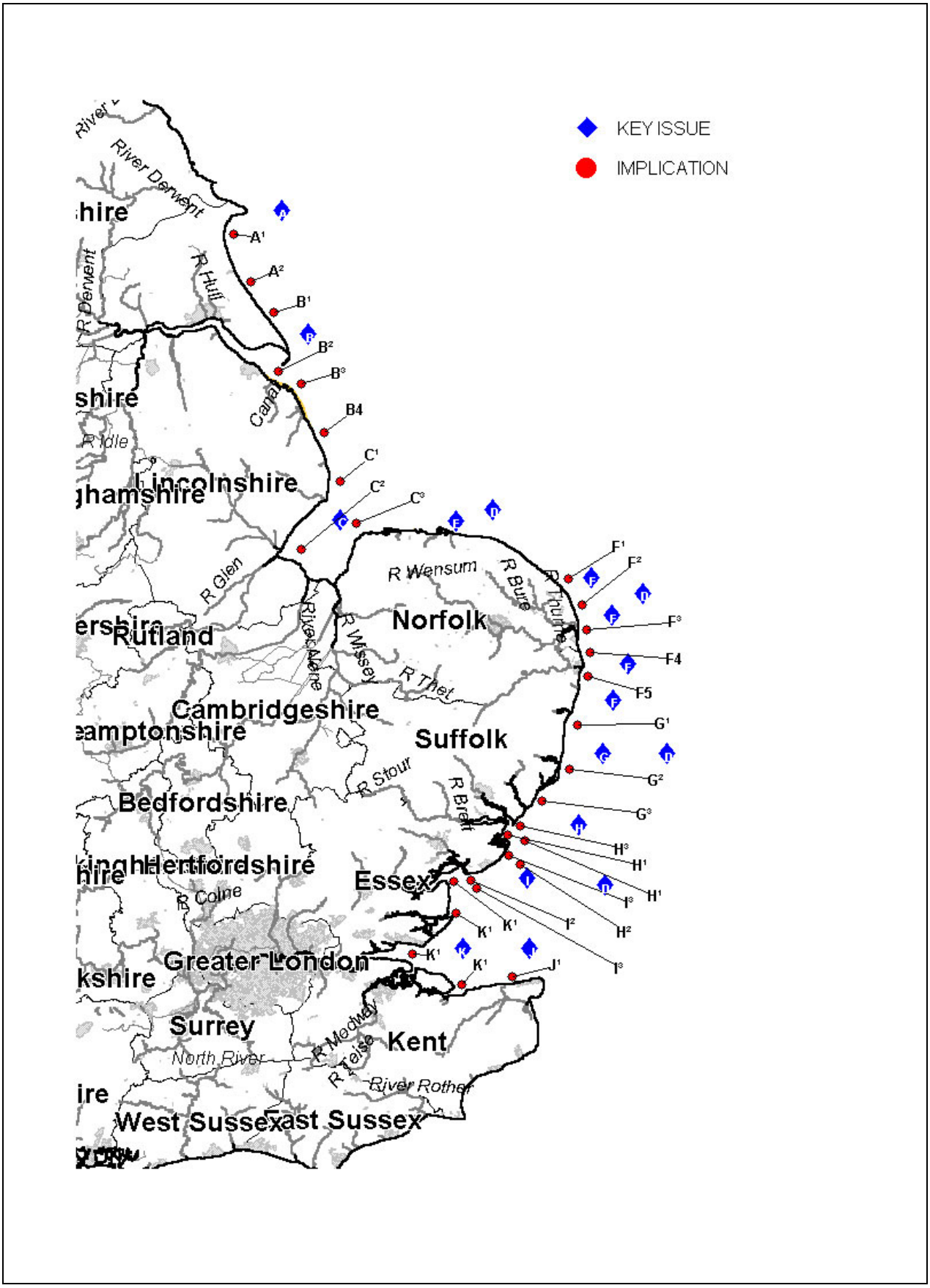


Figure 49 Locations of key issues relating to sediment transport identified in the consultation process and SMP review

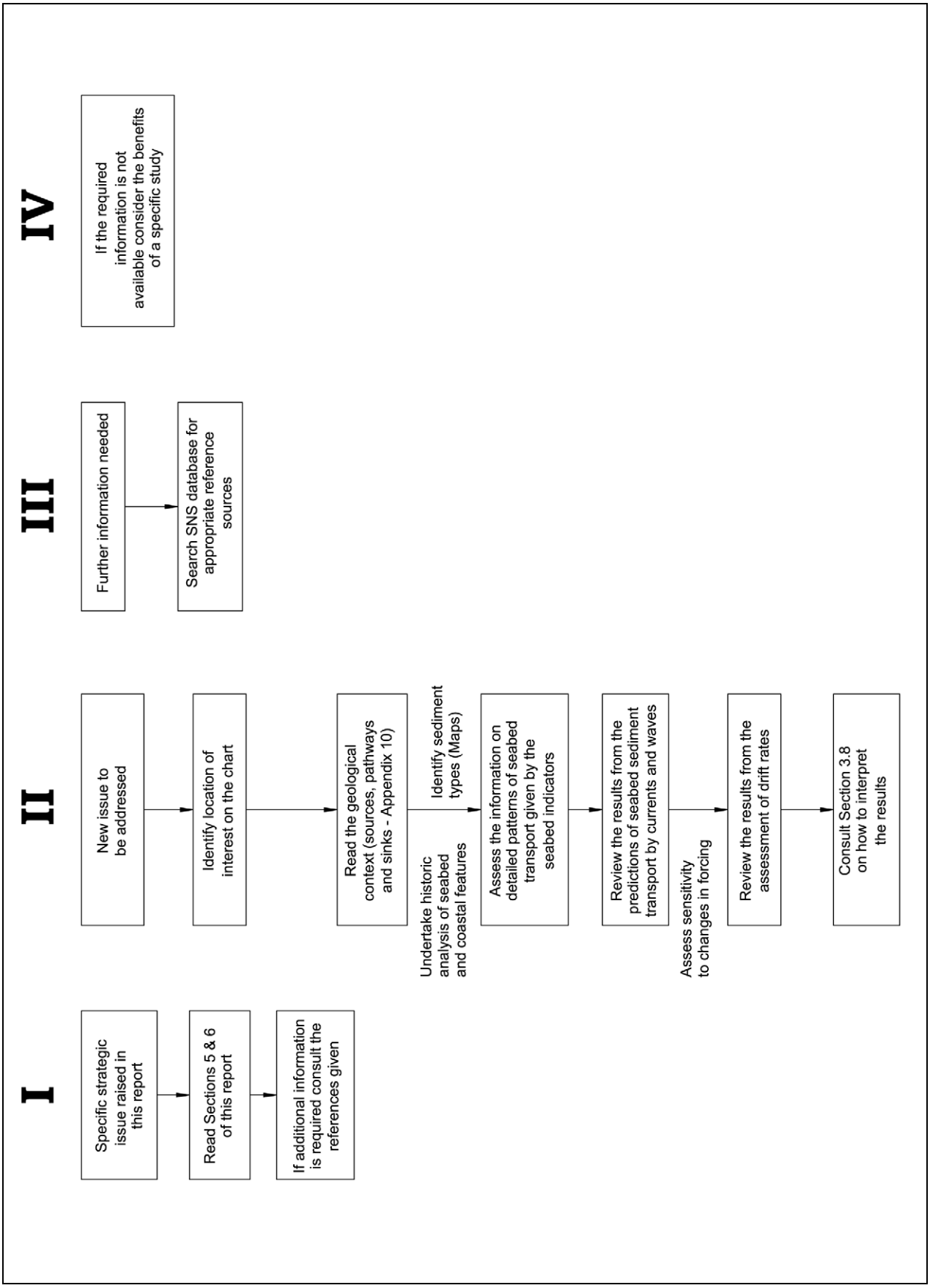


Figure 50 How to utilise the results of the SNS2 study

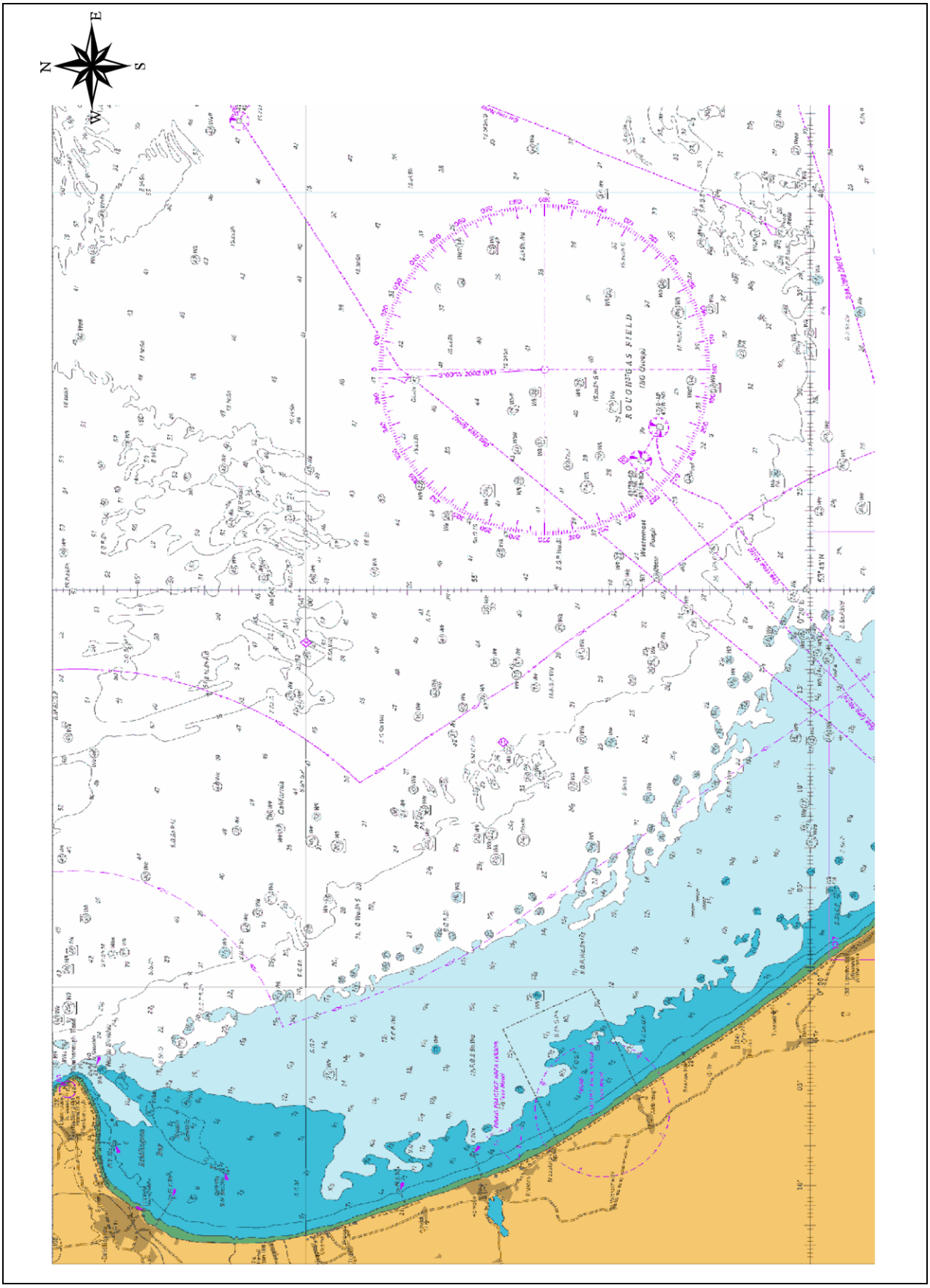


Figure 51 Admiralty chart of Region 1: Flamborough Head and mid-Holderness (from Admiralty Chart 1190)

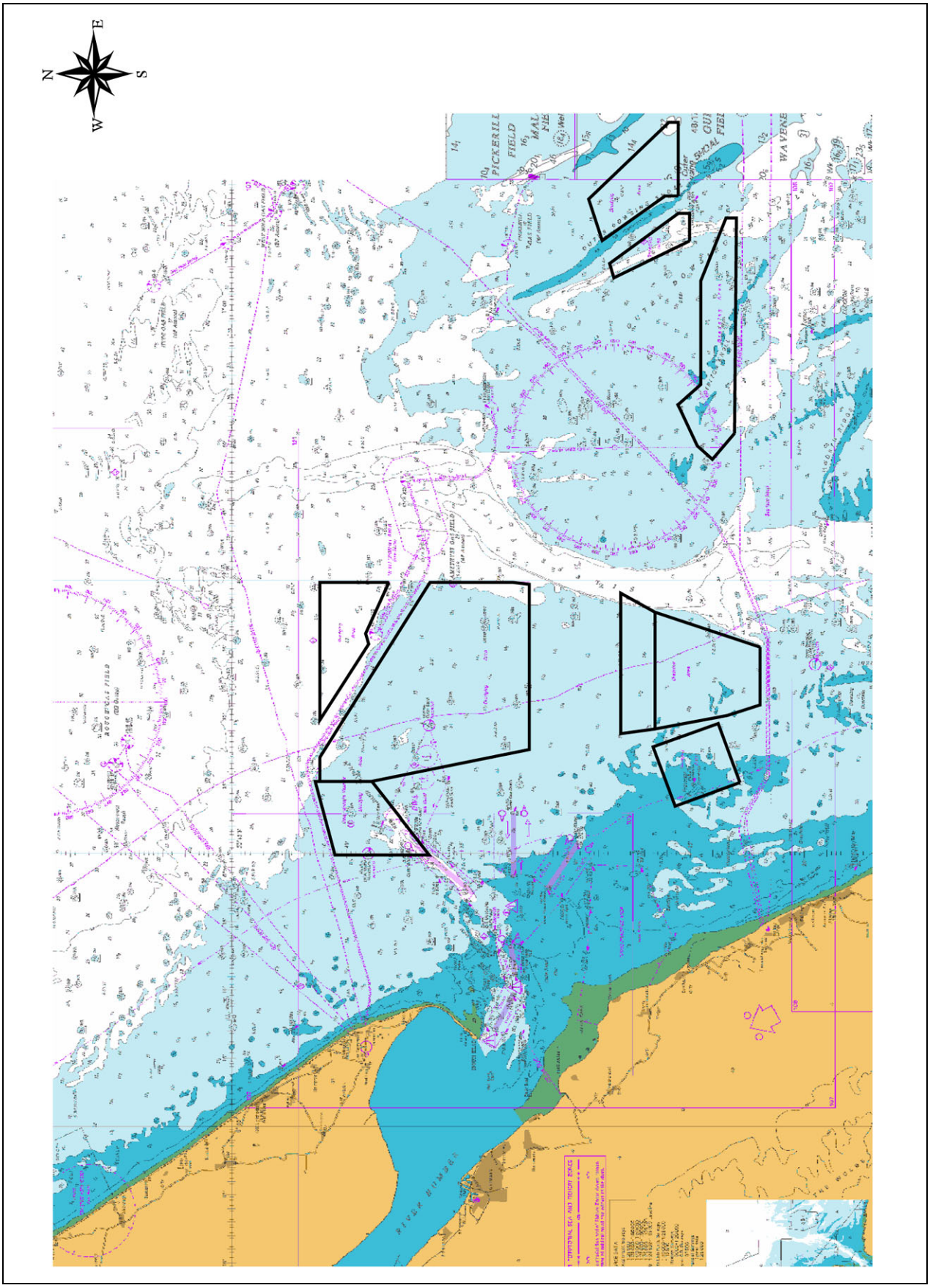


Figure 52 Admiralty chart showing extent of licensed aggregate dredging areas (black lines) overlain on Region 2: South Holderness, the entrance to the Humber and North Lincolnshire (from Admiralty Chart 1190 and Crown Estate)

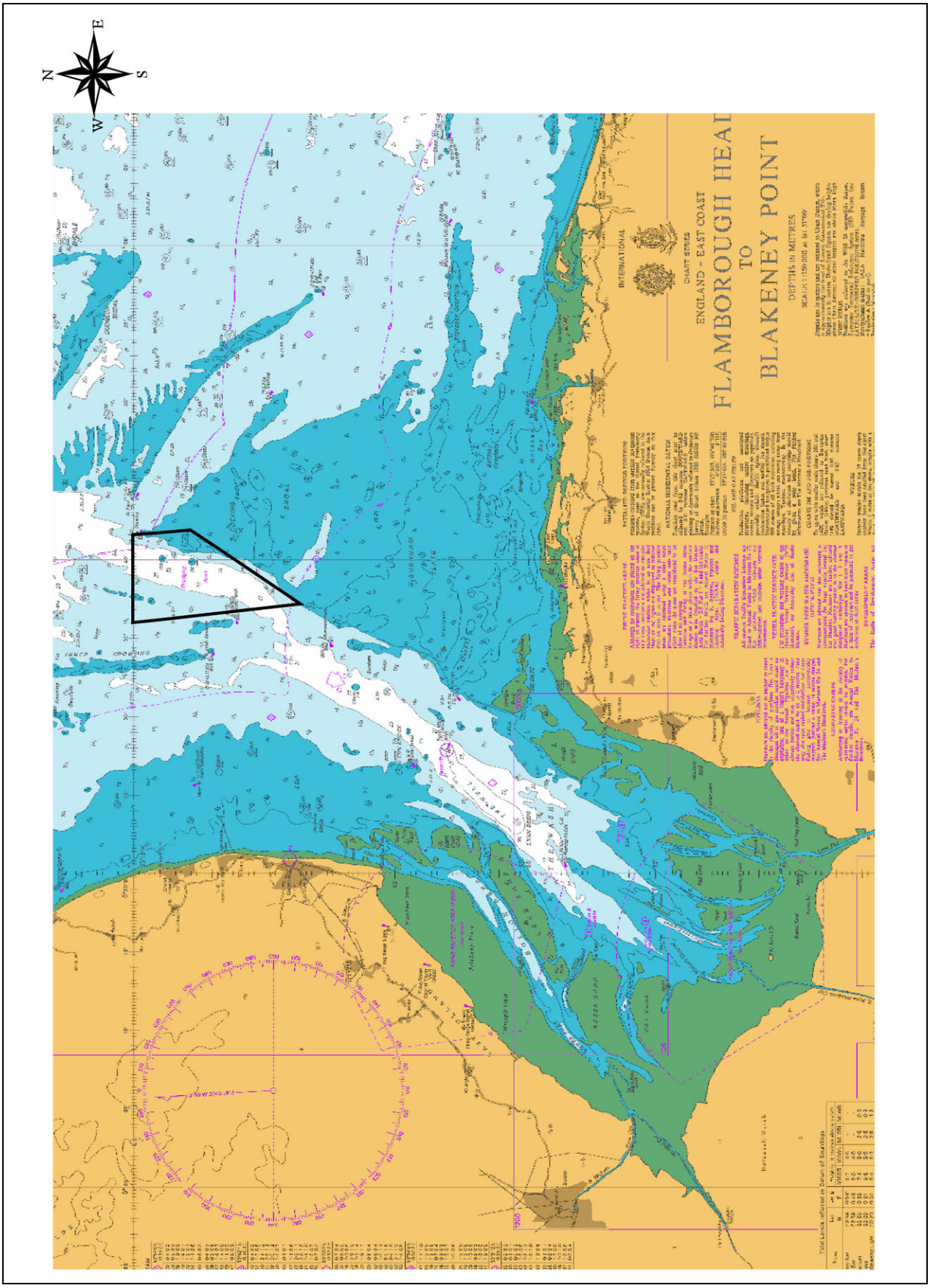


Figure 53 Admiralty chart showing extent of licensed aggregate dredging areas (black lines) overlain on Region 3: South Lincolnshire, the Wash and North Norfolk (from Admiralty Chart 1190 and Crown Estate)

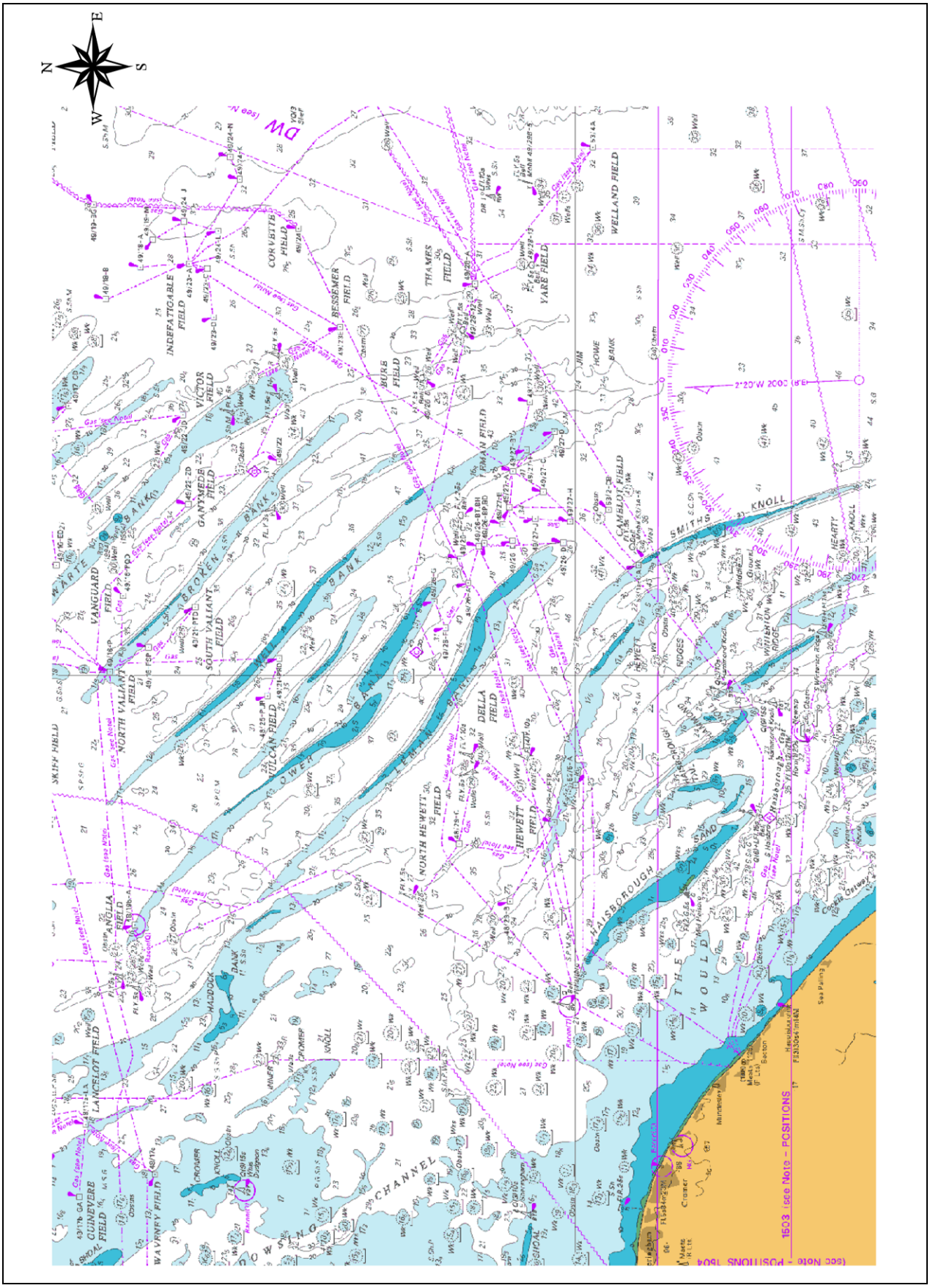


Figure 54 Admiralty chart of Region 4: East Norfolk (from Admiralty Chart 1408)

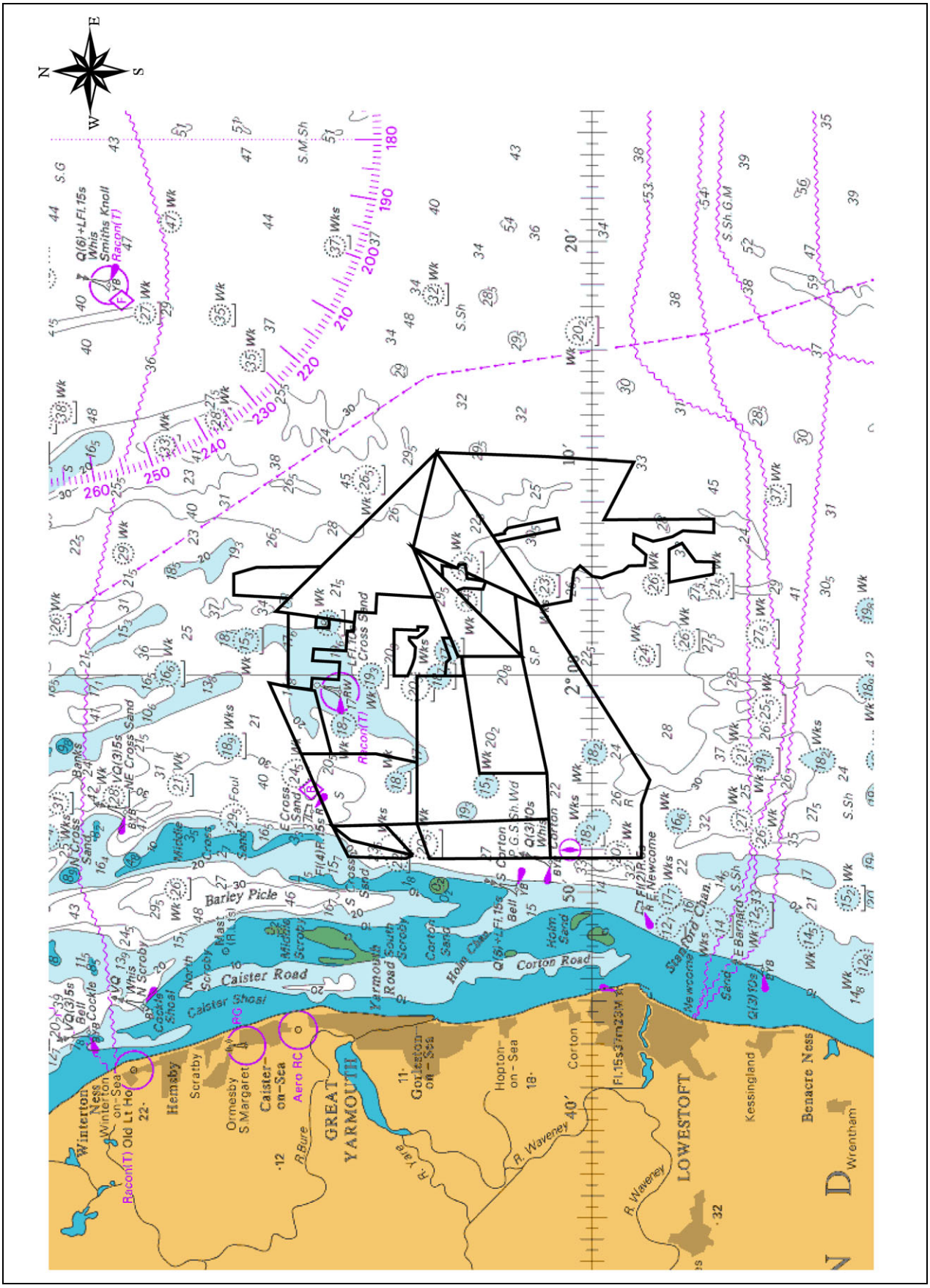


Figure 55 Admiralty chart showing the extent of licensed aggregate dredging areas (black lines) overlain on Region 5: East Norfolk and North Suffolk (from Admiralty Chart 1408 and Crown Estate)

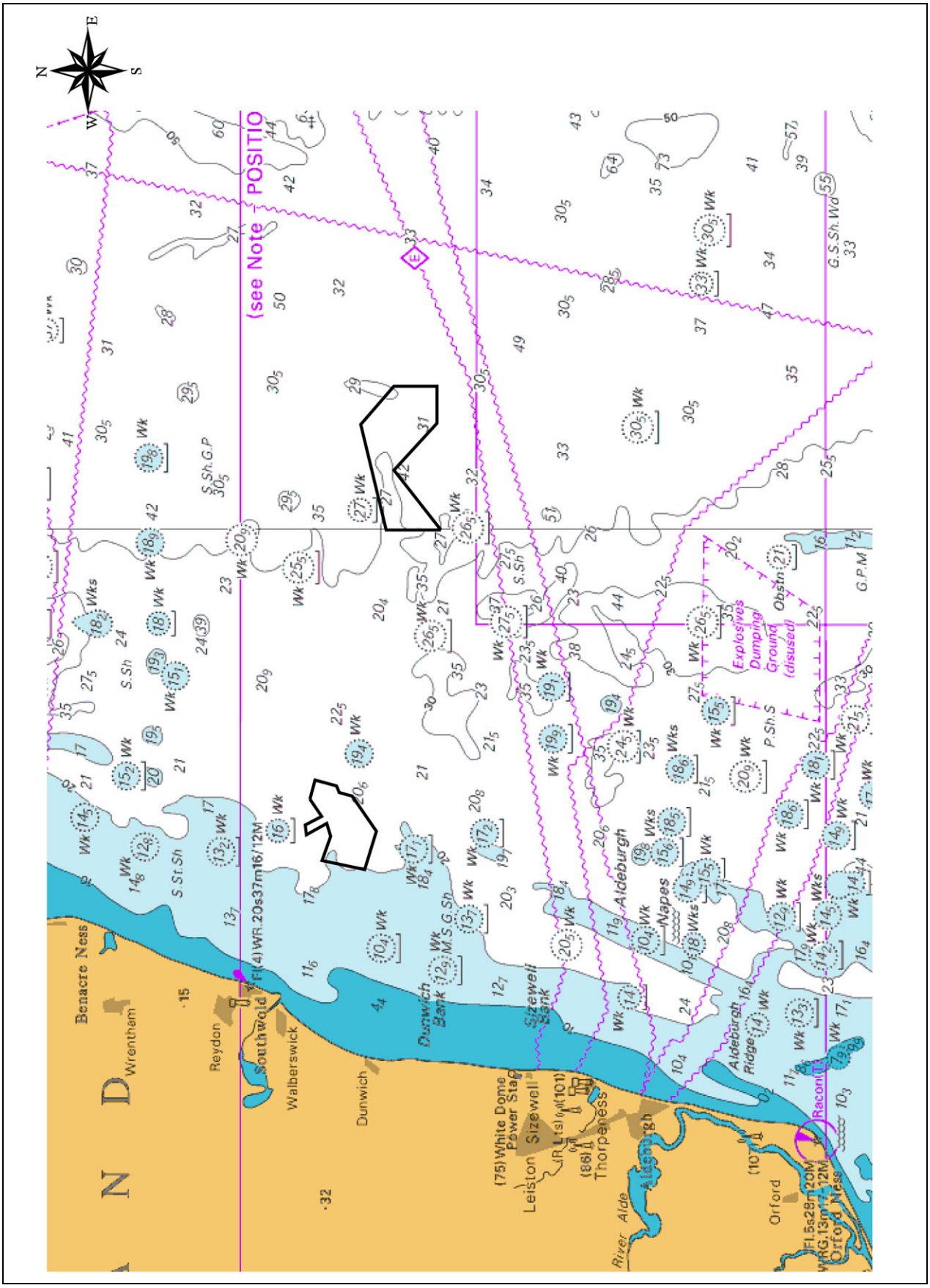


Figure 56 Admiralty chart showing extent of licensed aggregate dredging areas (black lines) overlain on Region 6: North Suffolk (from Admiralty Chart 1408 and Crown Estate)

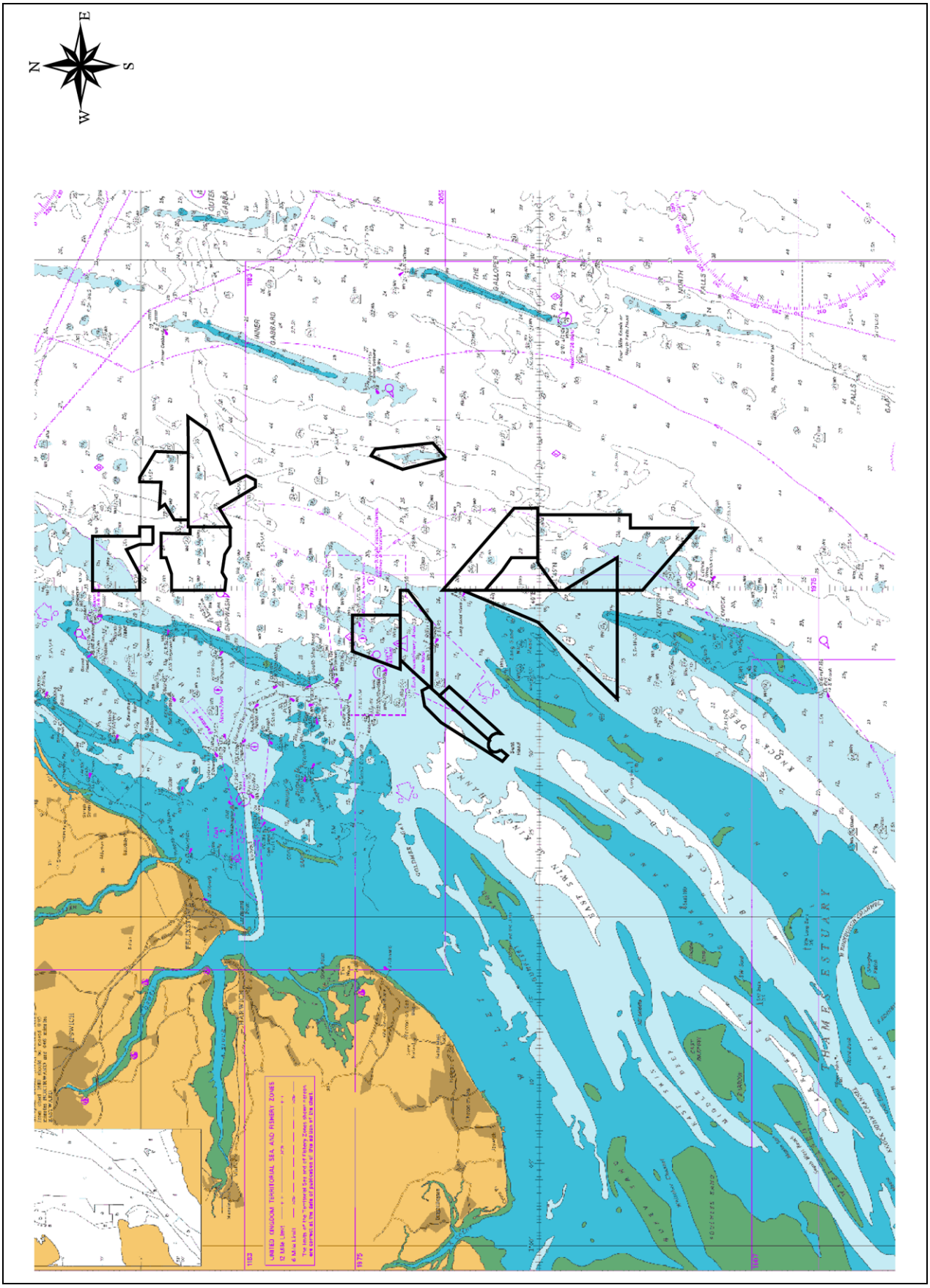


Figure 57 Admiralty chart showing extent of licensed aggregate dredging areas (black lines) overlain on Region 7: Suffolk and Essex (Admiralty Chart 1610 and Crown Estate)

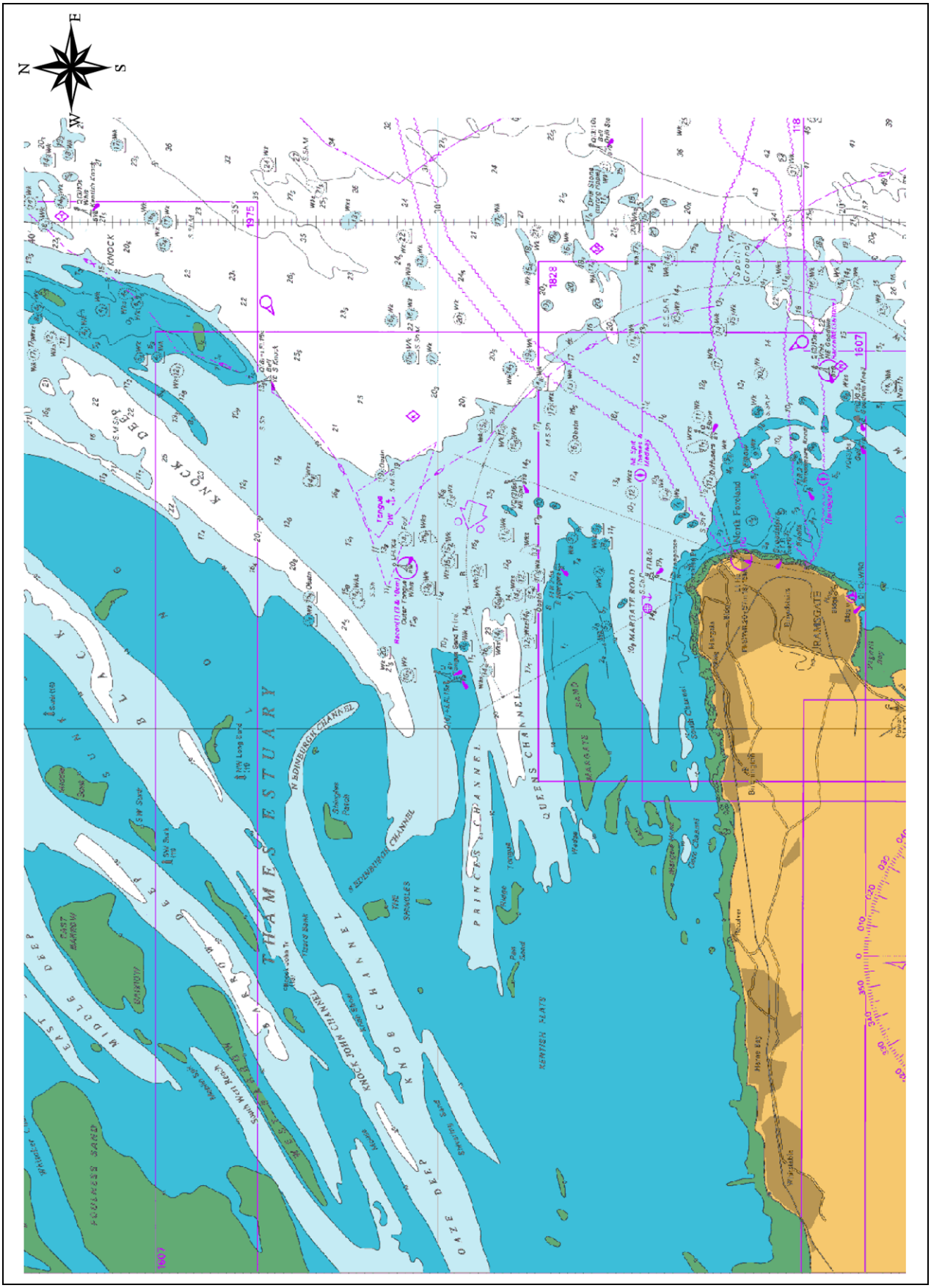


Figure 58 Admiralty chart of Region 10: North Kent (from Admiralty Chart 1610)

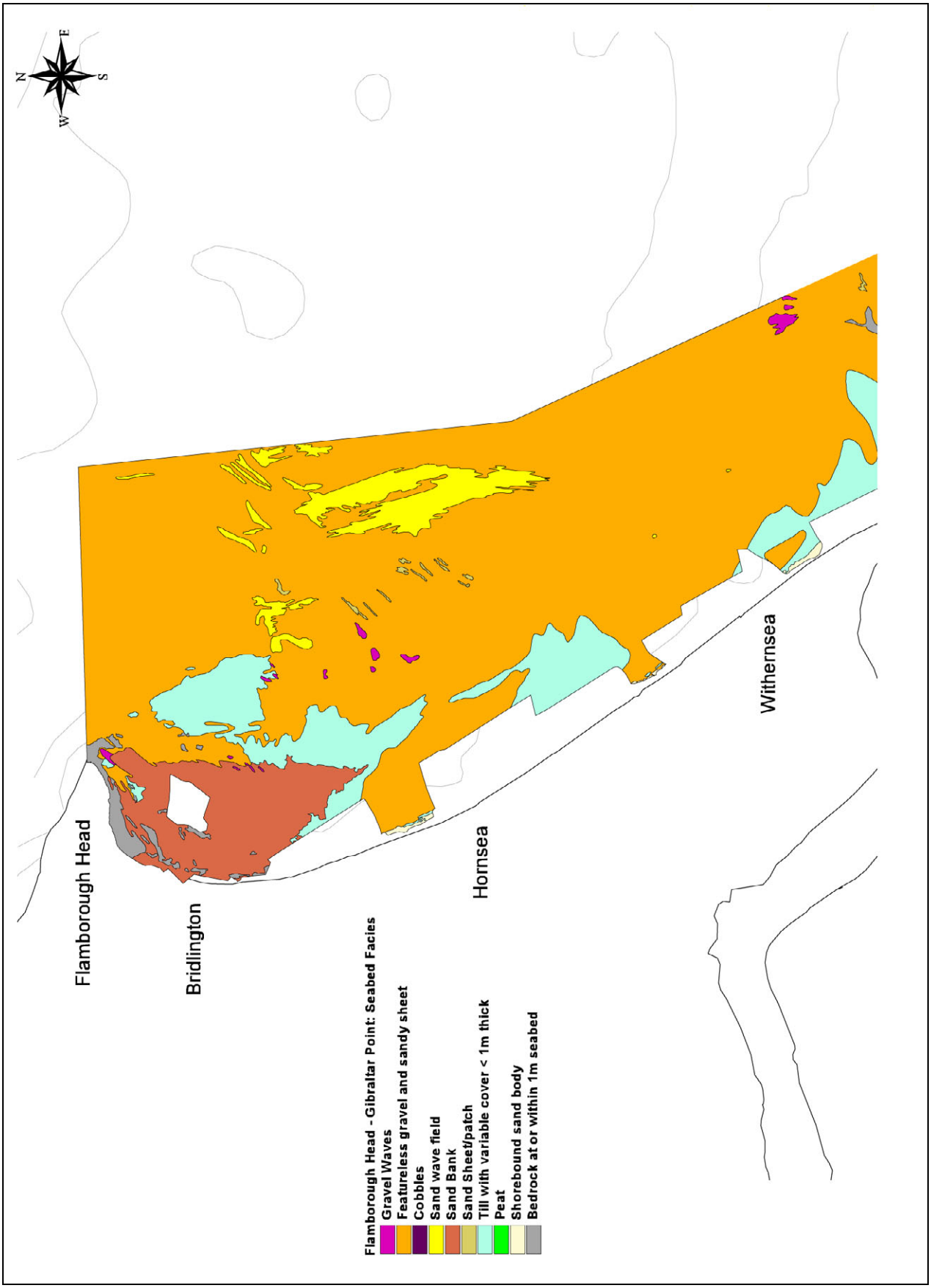


Figure 59 Seabed facies in Region 1: Flamborough Head and mid-Holderness (reproduced by permission of British Geological Survey)

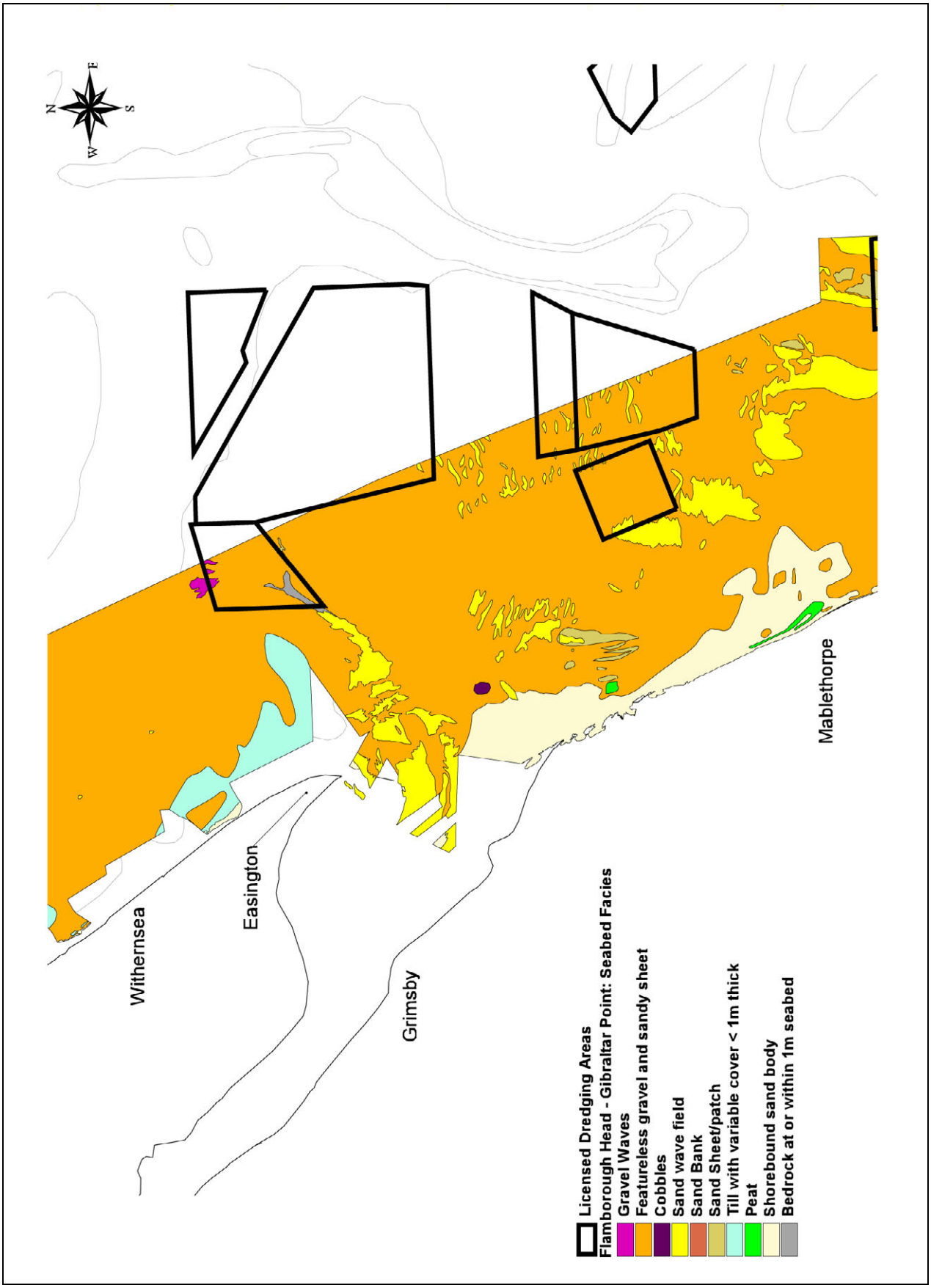


Figure 60 Seabed facies and extent of licensed dredging areas in Region 2: South Holderness, the entrance to the Humber and North Lincolnshire (source: BGS and Crown Estate)

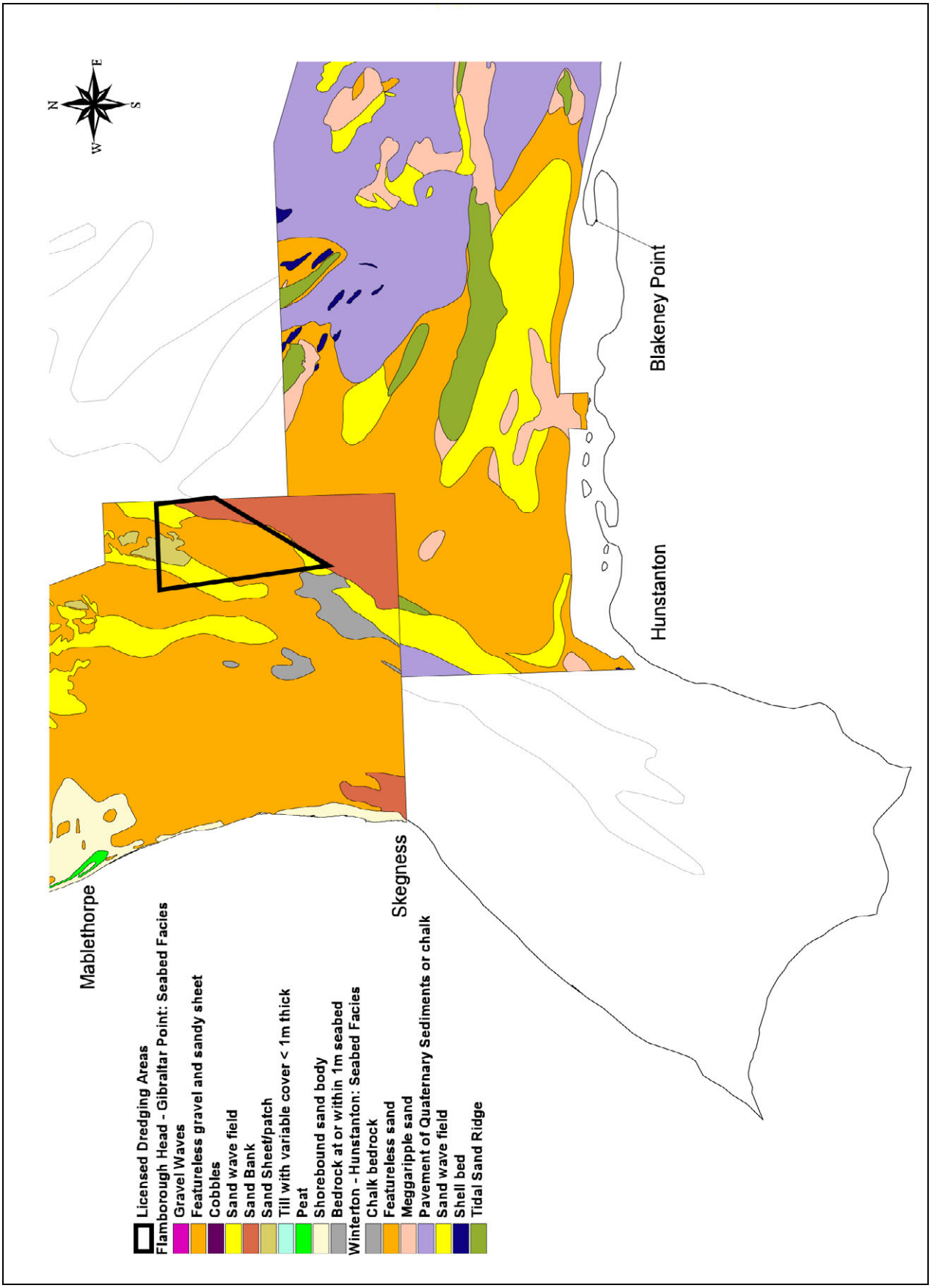


Figure 61 Seabed facies and extent of licensed dredging areas in Region 4: South Lincolnshire, the Wash and North Norfolk (source: BGS and Crown Estate)

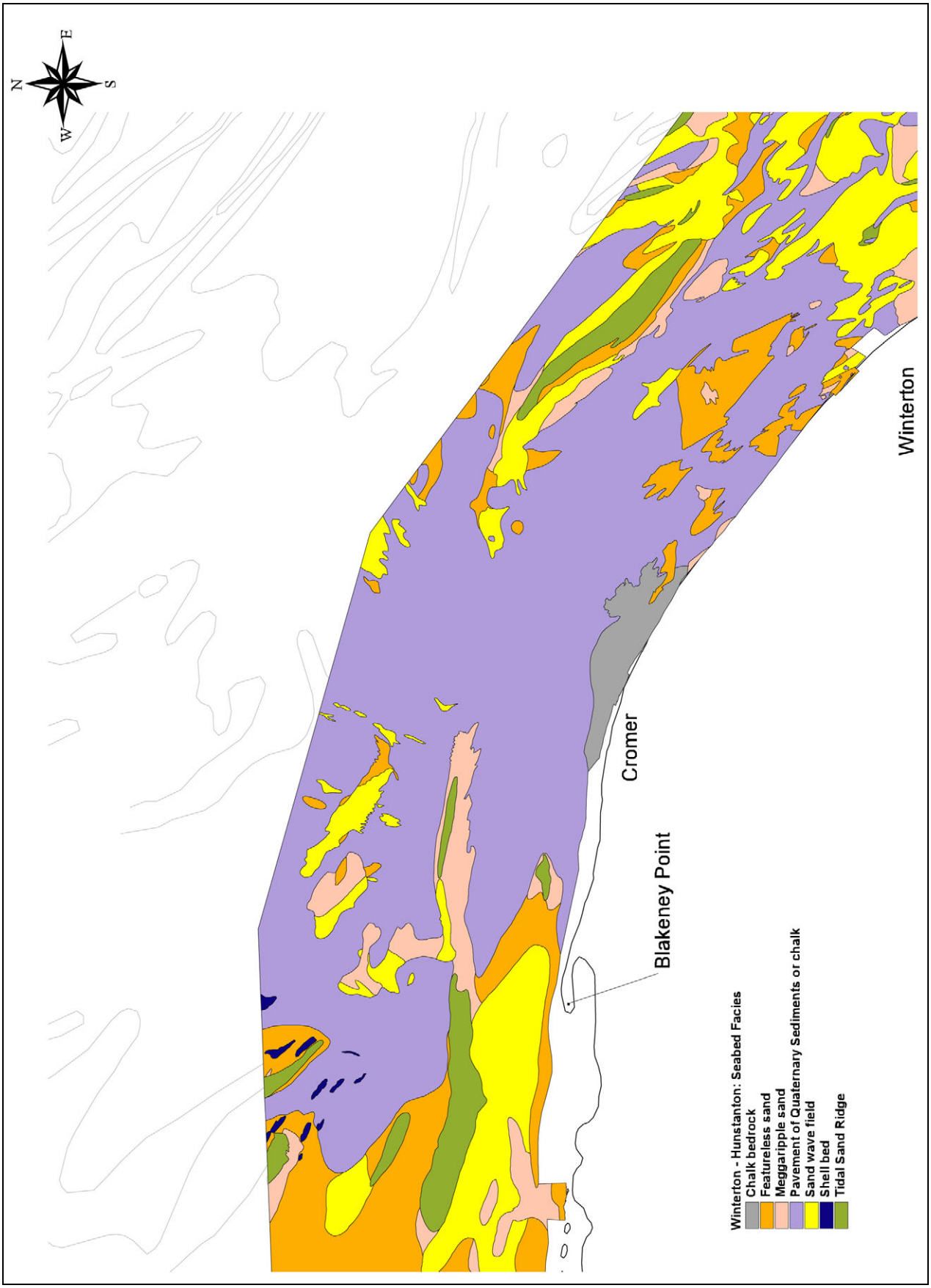


Figure 62 Seabed facies in Region 4: East Norfolk (reproduced by permission of British Geological Survey)

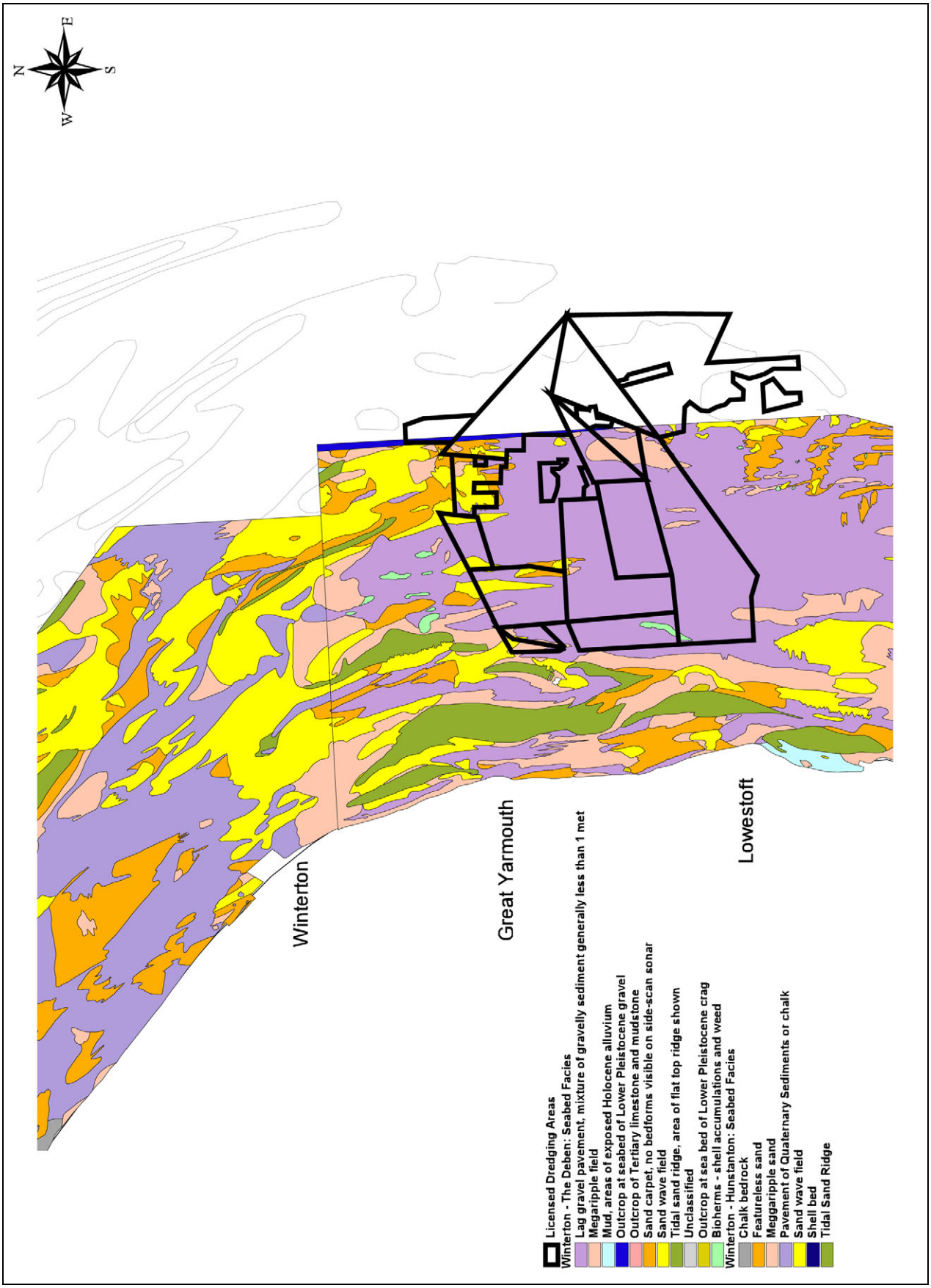


Figure 63 Seabed facies and extent of licensed dredging areas in Region 5: East Norfolk and North Suffolk (source: BGS and Crown Estate)

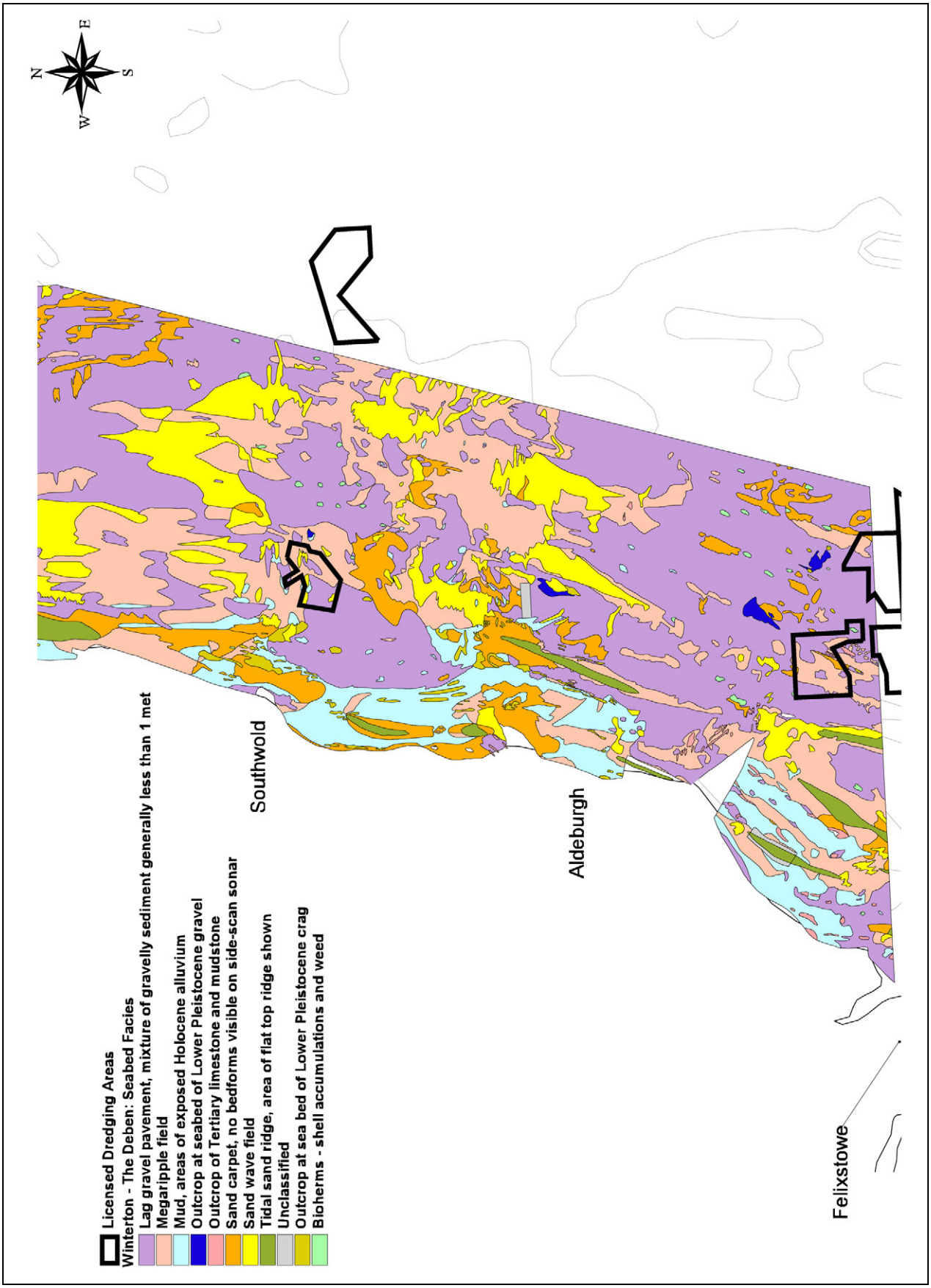


Figure 64 Seabed facies and extent of licensed dredging areas in Region 6: North Suffolk (source: BGS and Crown Estate)

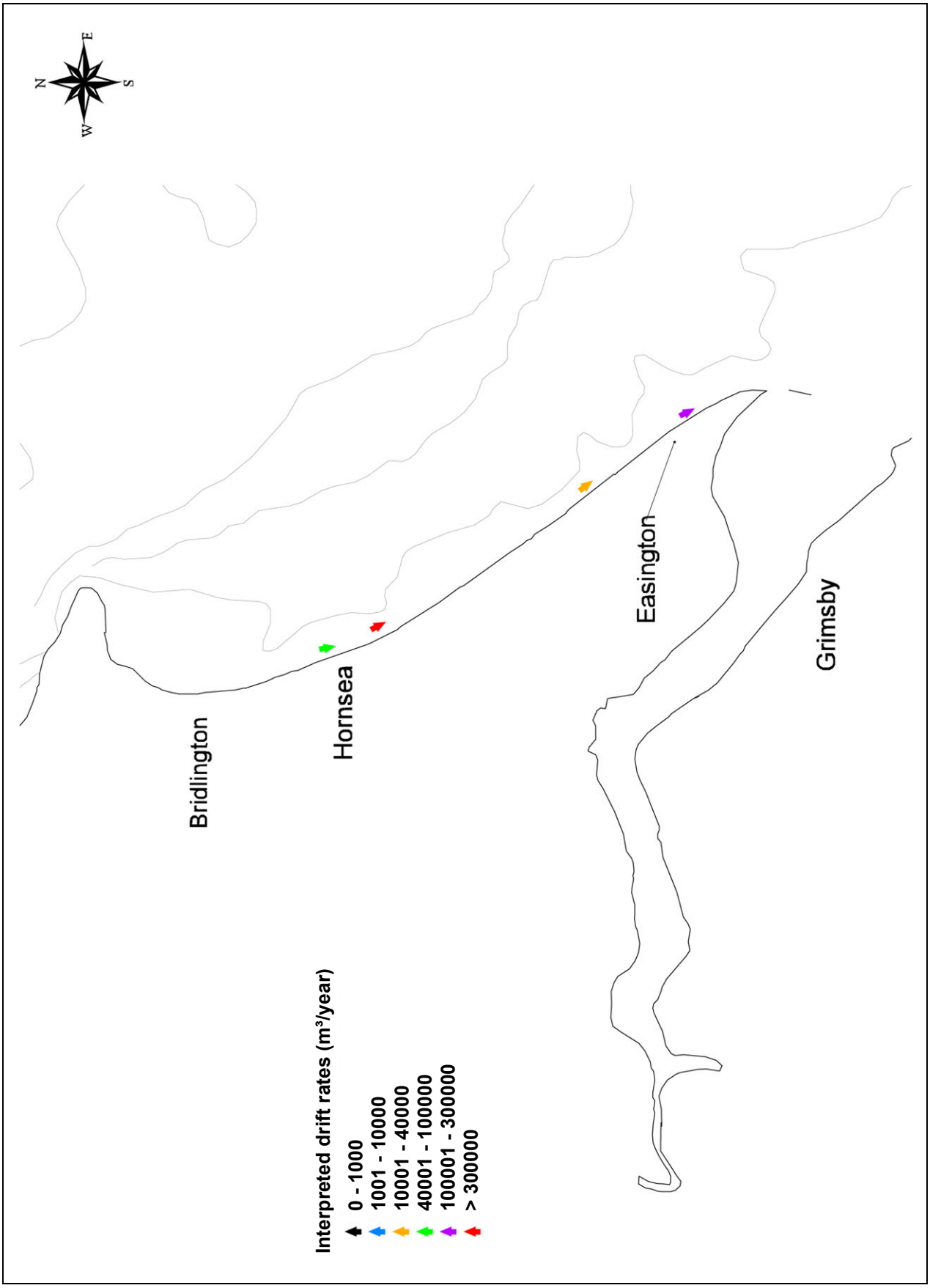


Figure 65 Longshore transport predictions in Region 1: Flamborough and Holderness

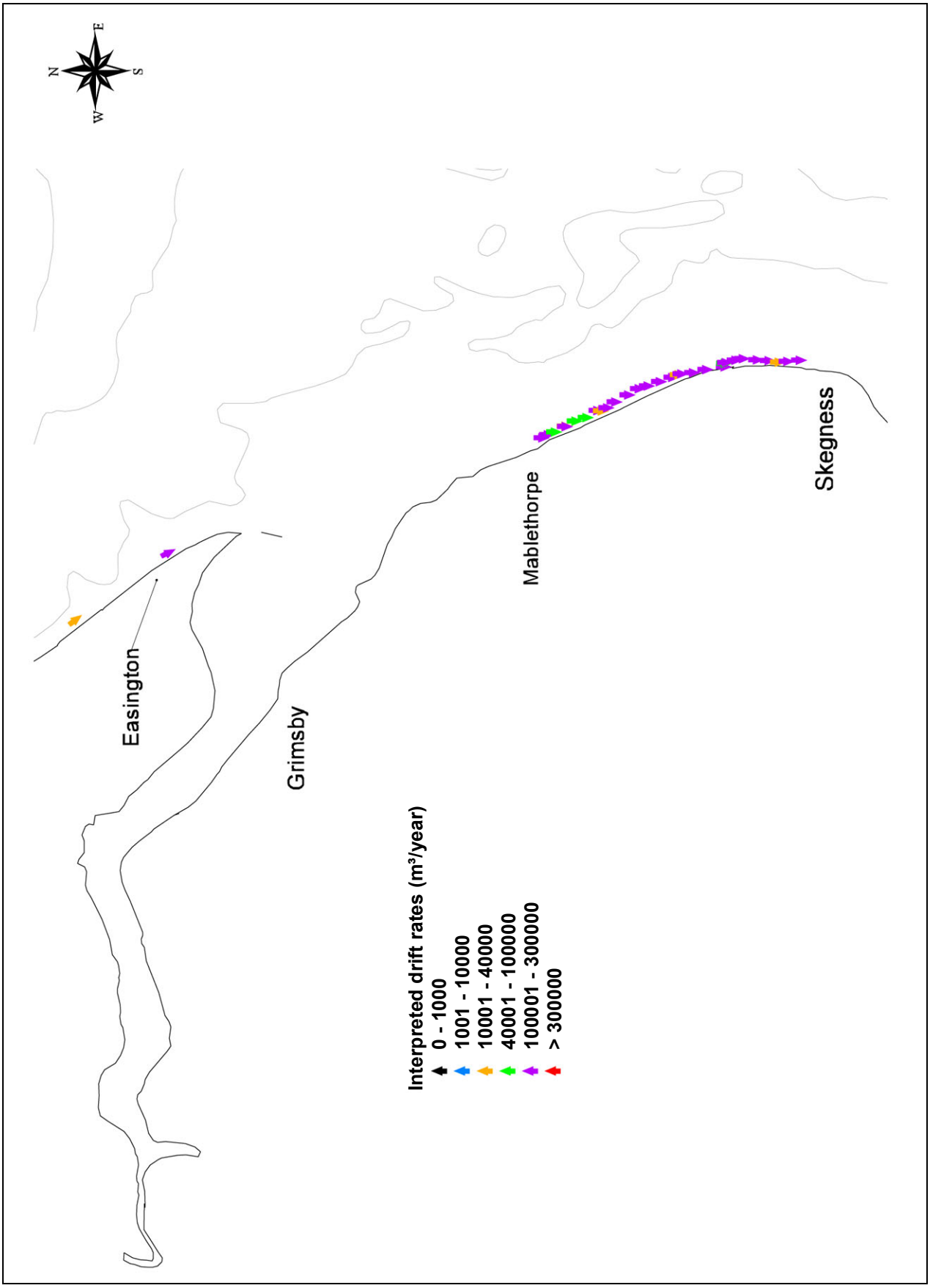


Figure 66 Longshore transport predictions in Region 2: South Holderness, the entrance to the Humber and Lincolnshire

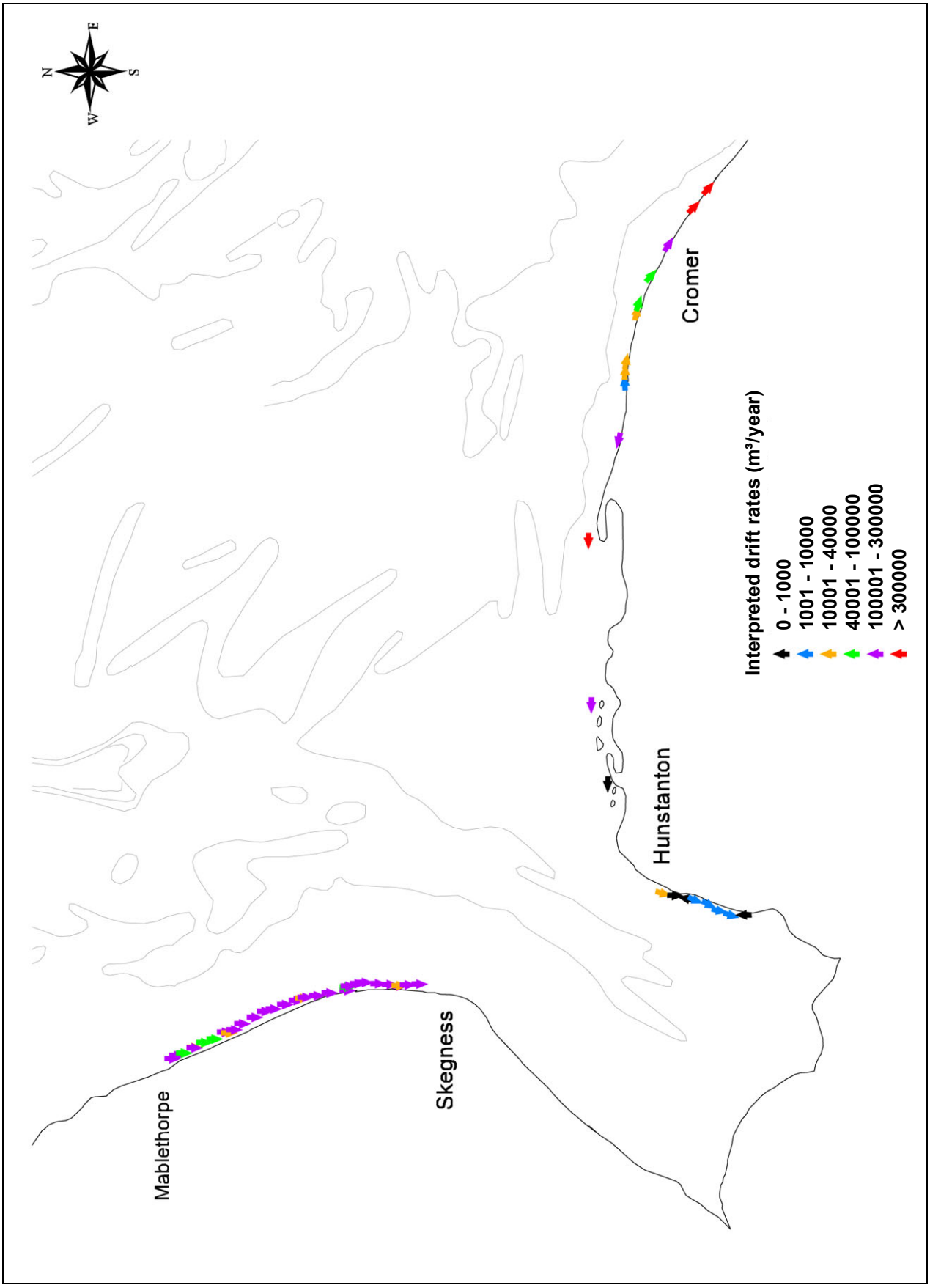


Figure 67 Longshore transport predictions in Region 3: South Lincolnshire, the Wash and North Norfolk

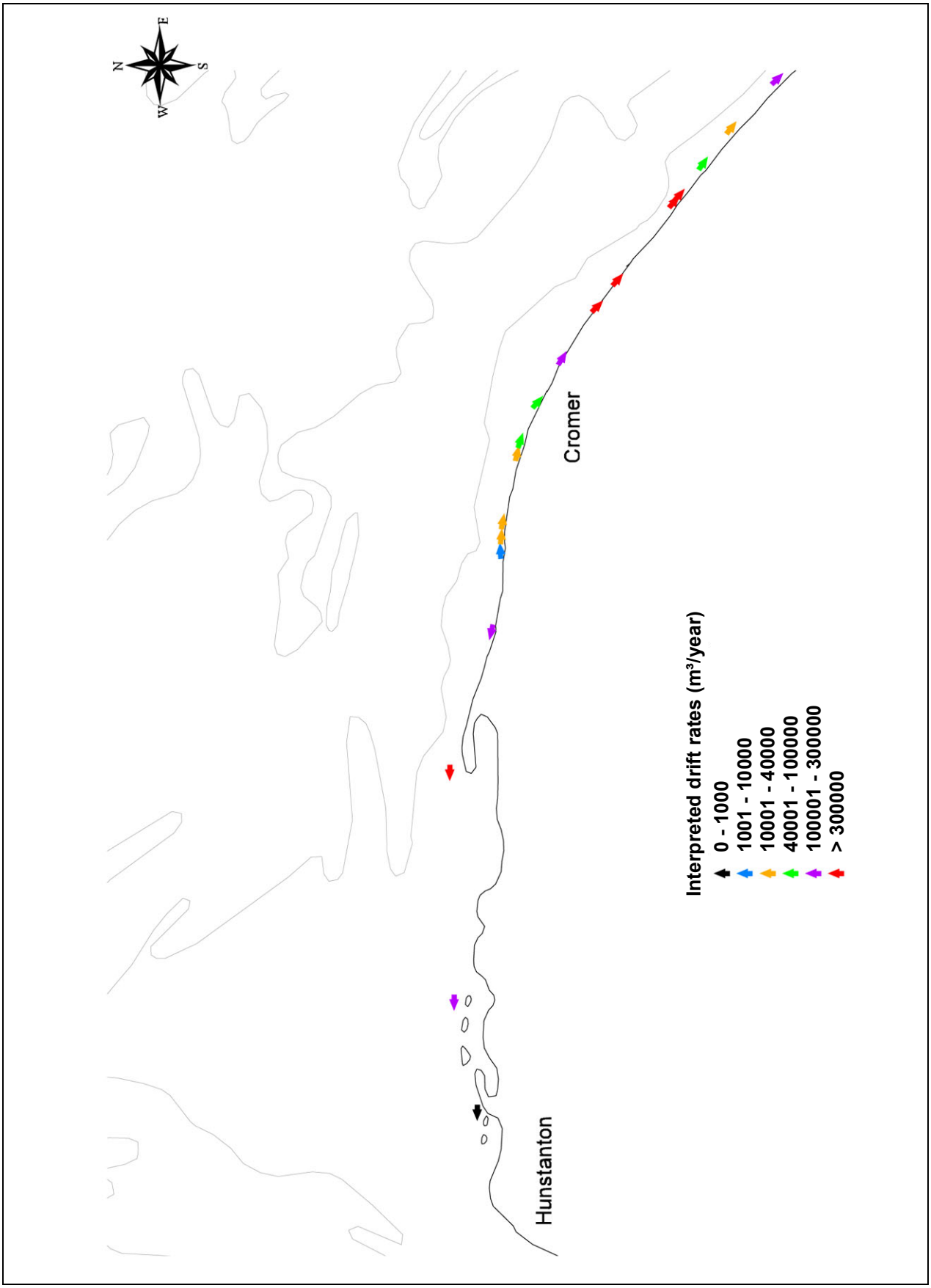


Figure 68 Longshore transport predictions in Regions 3 and 4: North Norfolk and East Norfolk

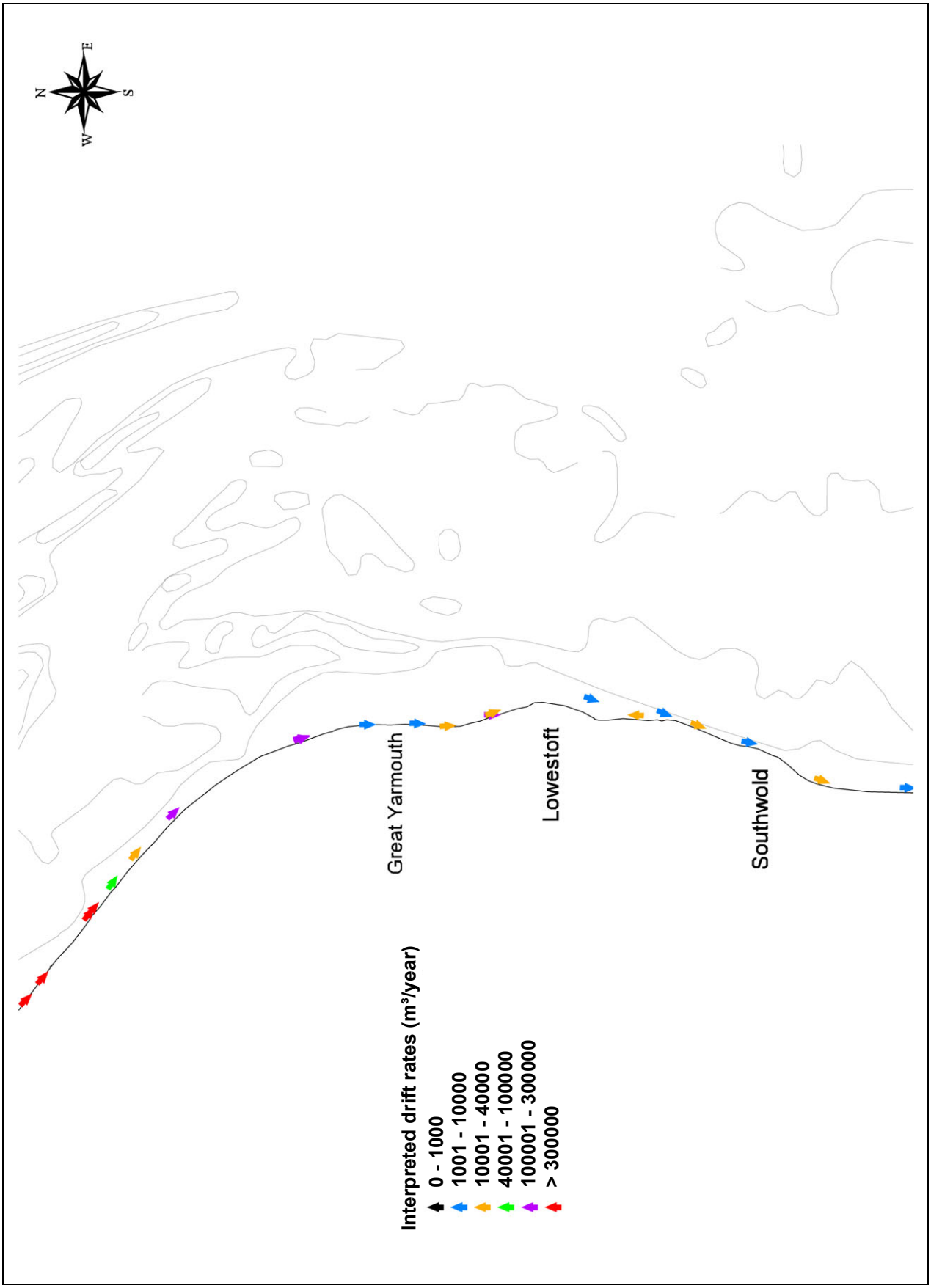


Figure 69 Longshore transport predictions in Regions 4 and 5: East Norfolk and North Suffolk

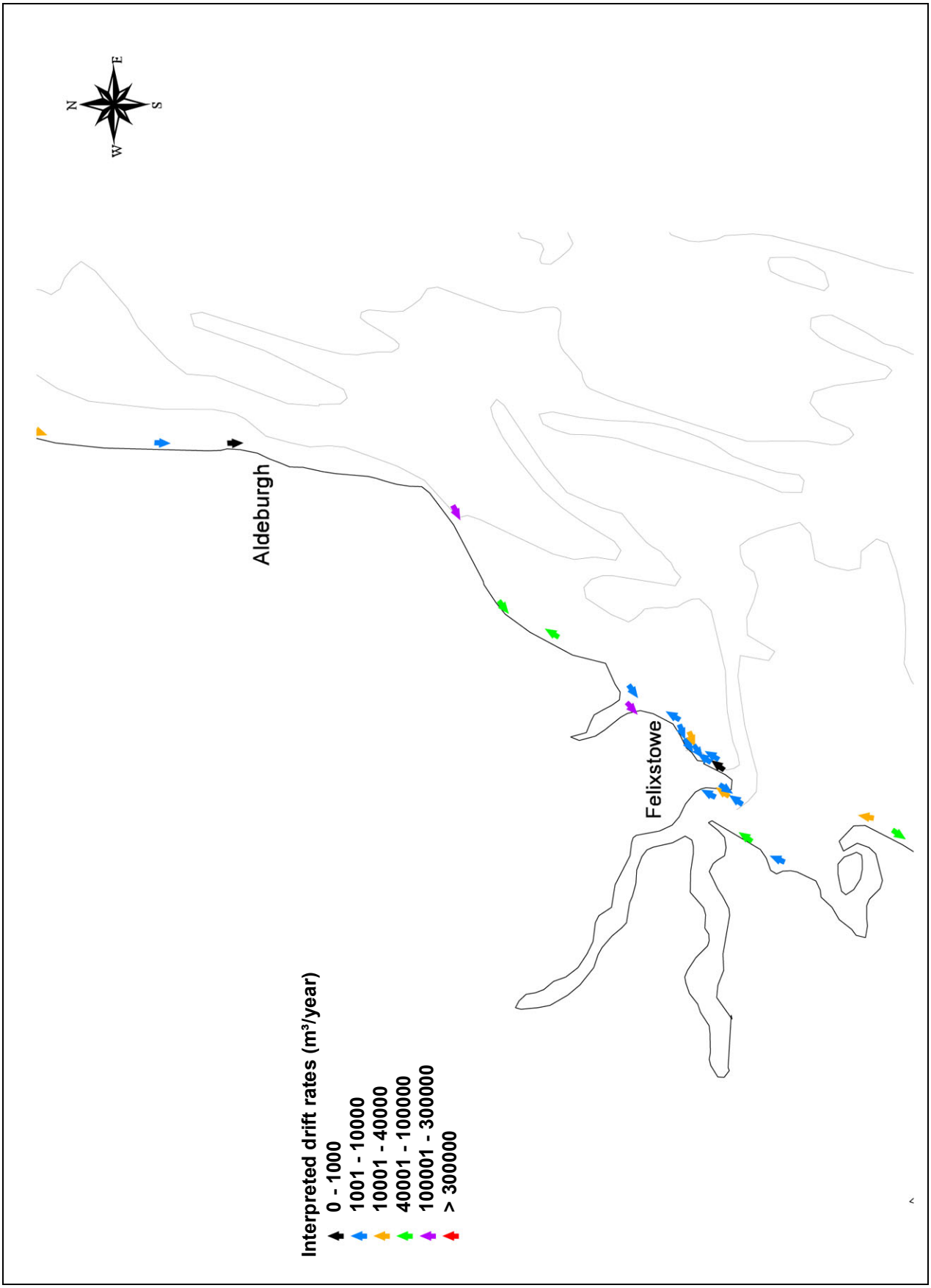


Figure 70 Longshore transport predictions in Region 6: North Suffolk

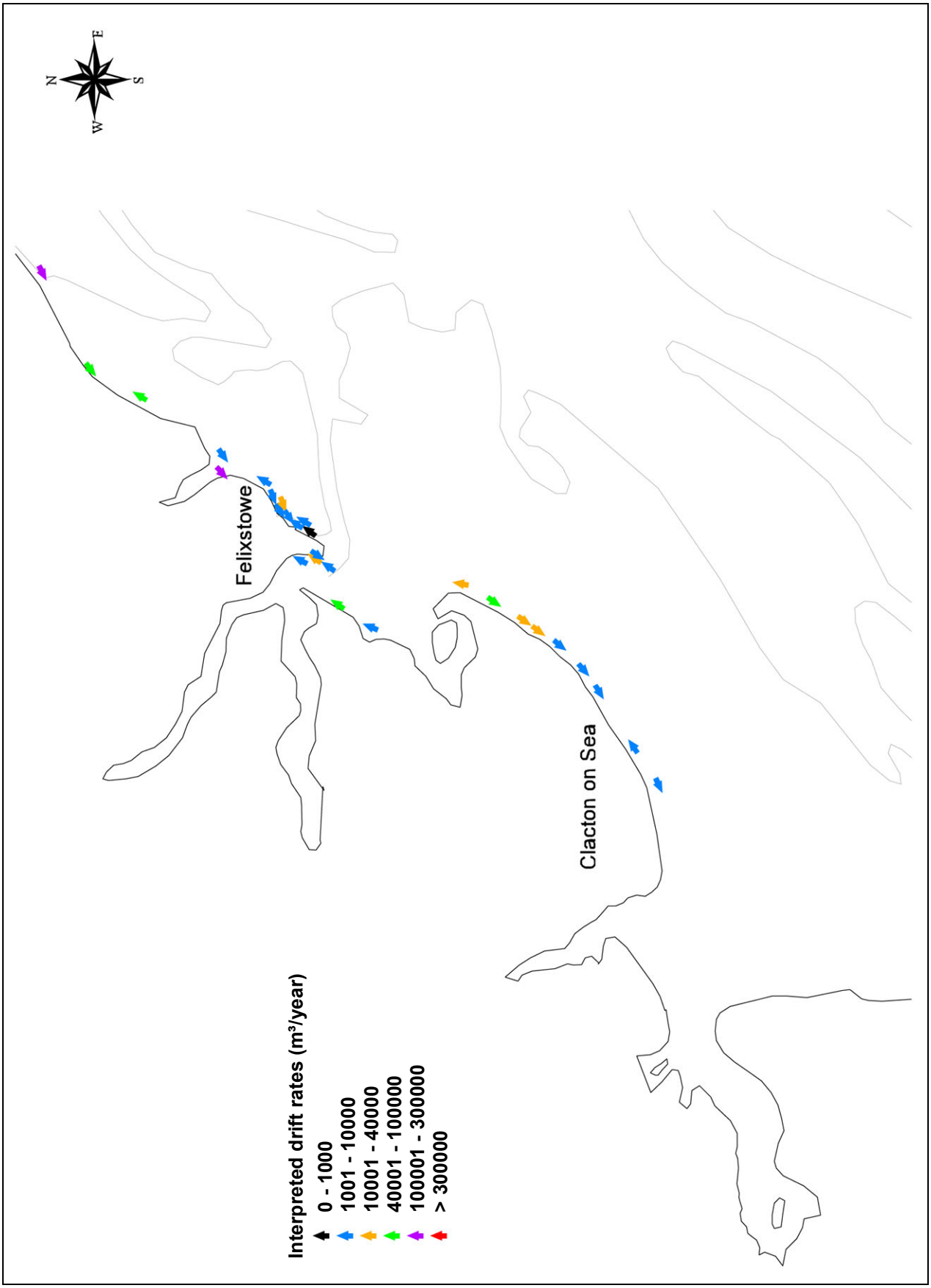


Figure 71 Longshore transport predictions in Region 7: Suffolk and Essex

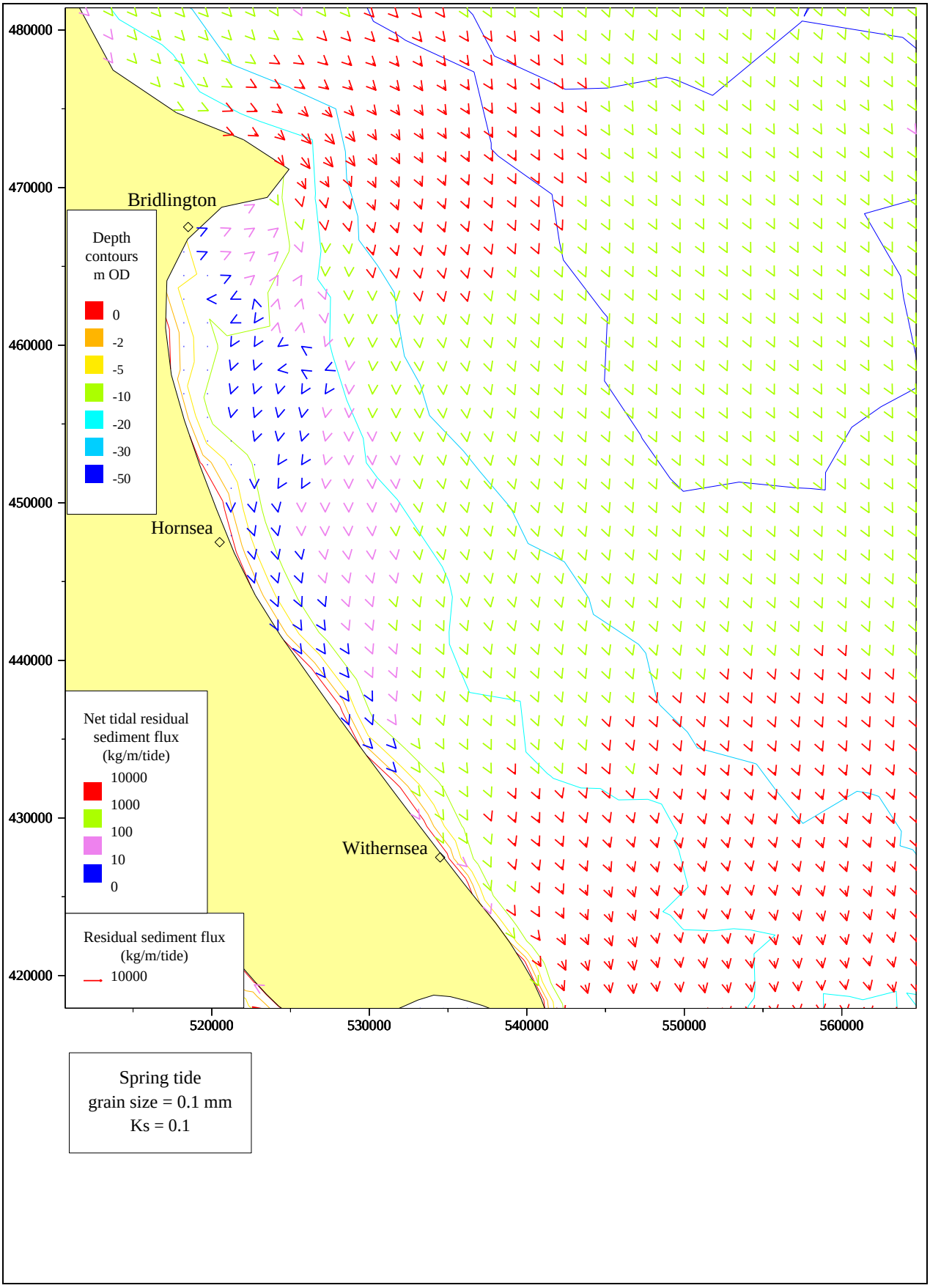


Figure 72 Spring tide net sediment flux patterns (0.1mm sand) detail: Flamborough Head to the Humber

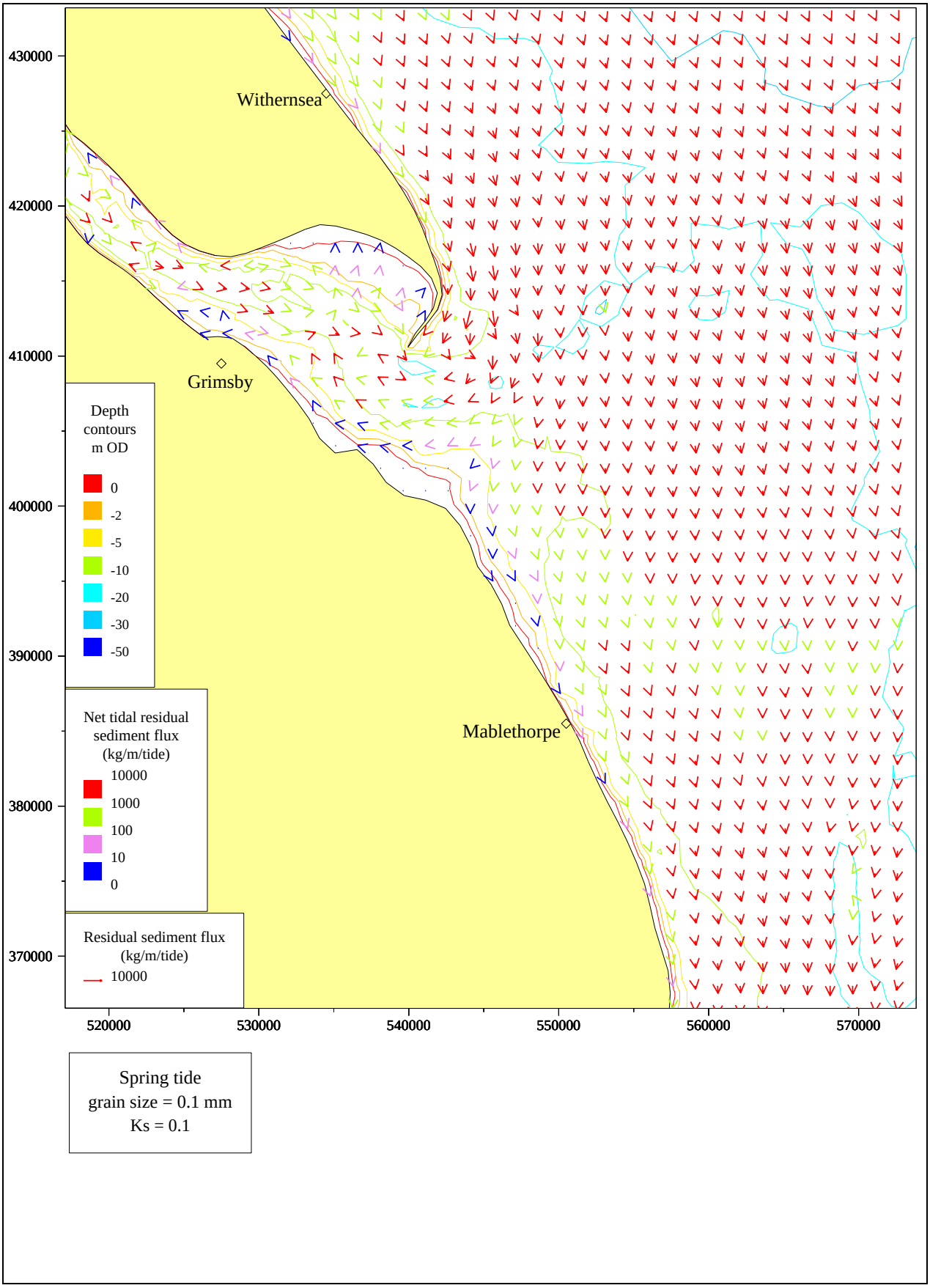


Figure 73 Spring tide net sediment flux patterns (0.1mm sand) detail: Humber Entrance and Lincolnshire

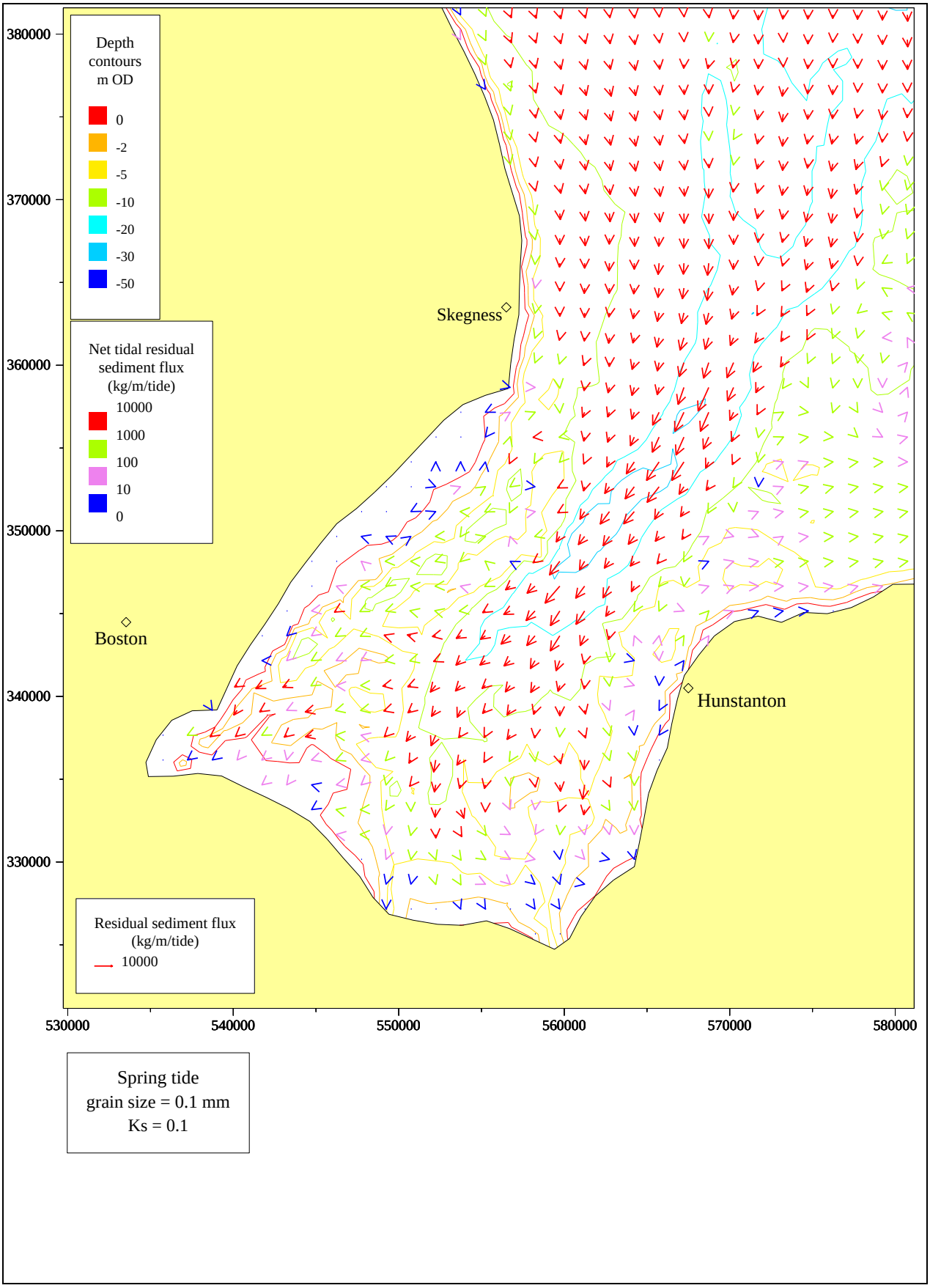


Figure 74 Spring tide net sediment flux patterns (0.1mm sand) detail: Lincolnshire and the Wash

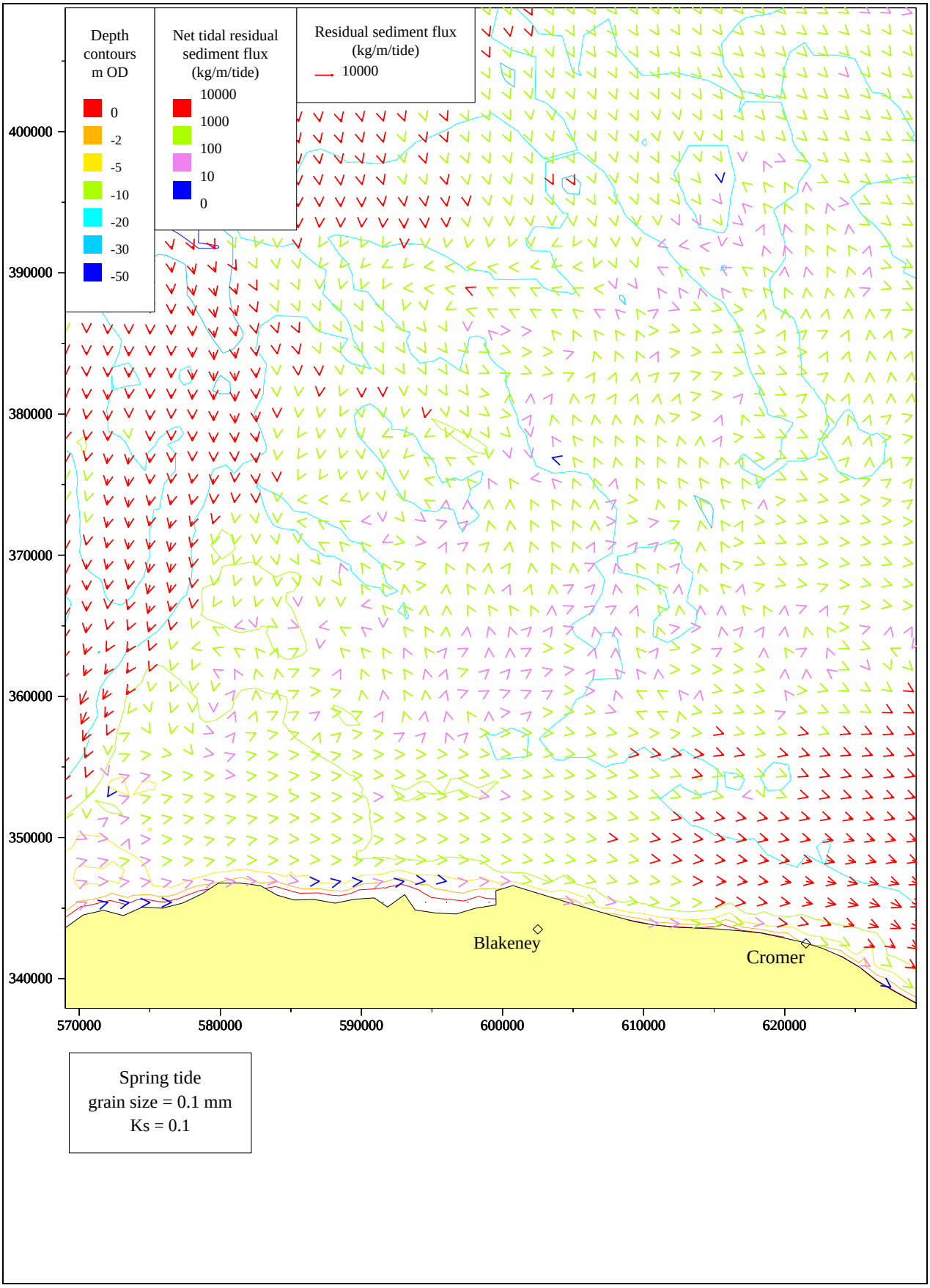


Figure 75 Spring tide net sediment flux patterns (0.1mm sand) detail: North Norfolk

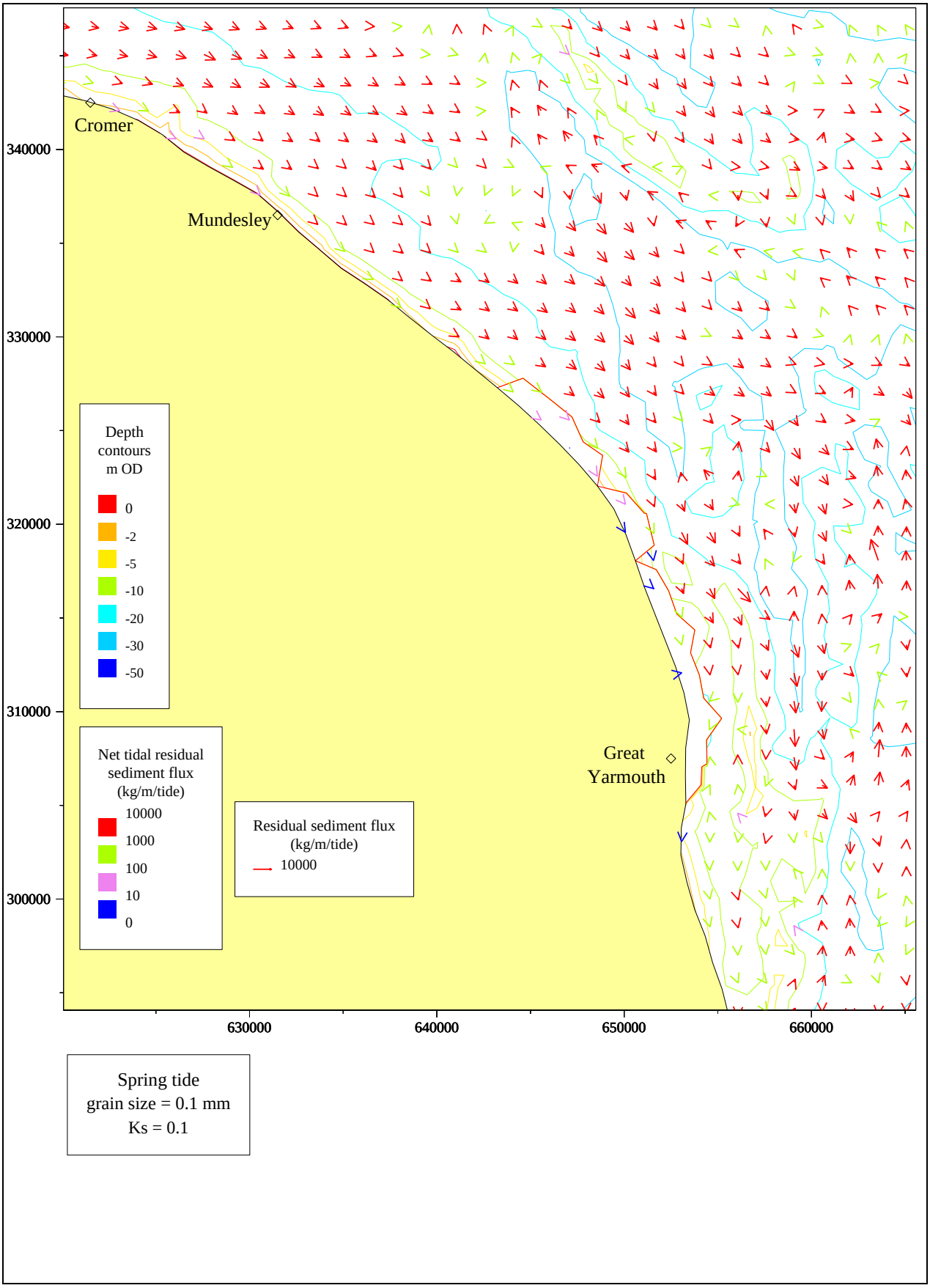


Figure 76 Spring tide net sediment flux patterns (0.1mm sand) detail: East Norfolk

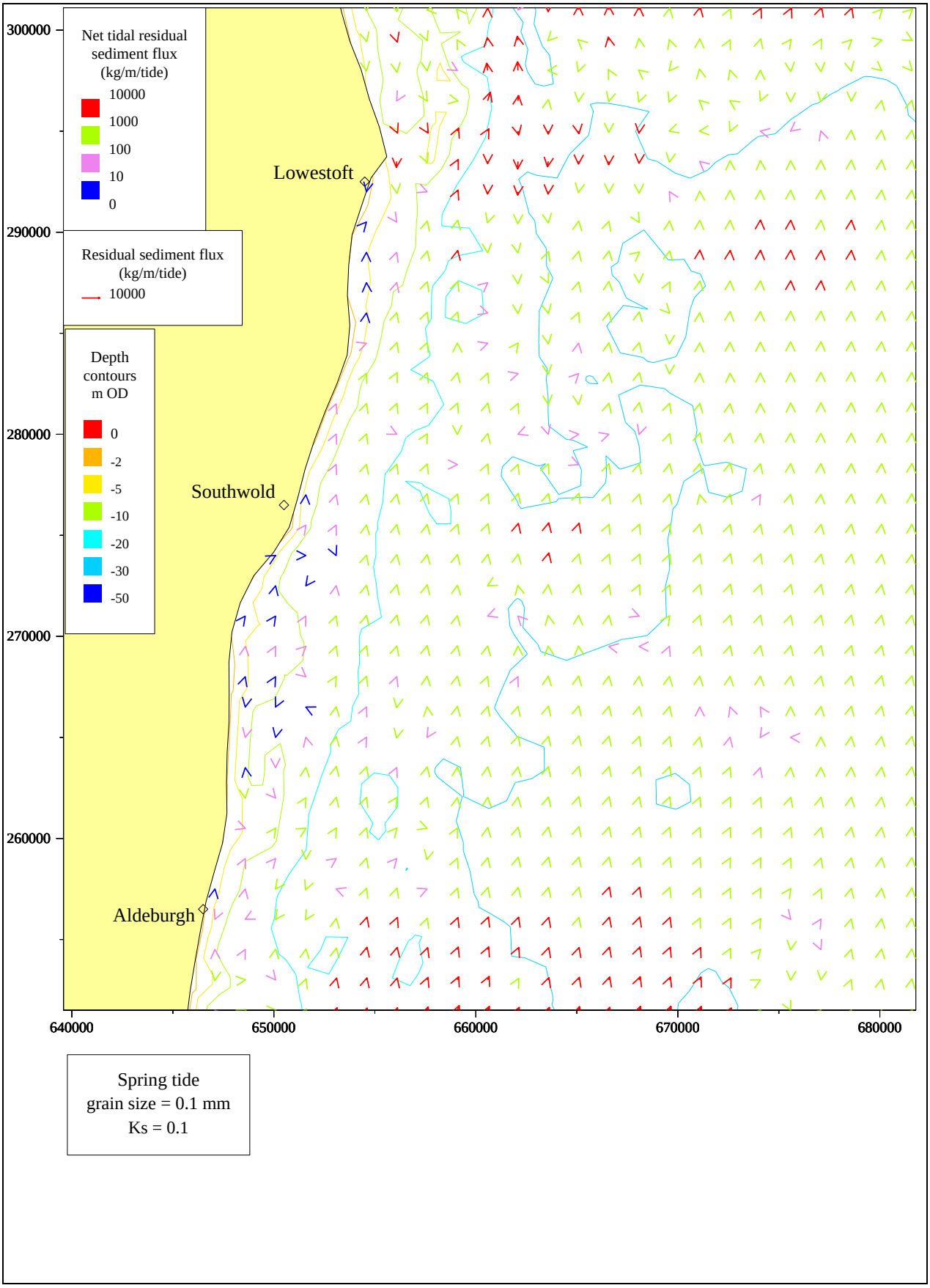


Figure 77 Spring tide net sediment flux patterns (0.1mm sand) detail: North Suffolk

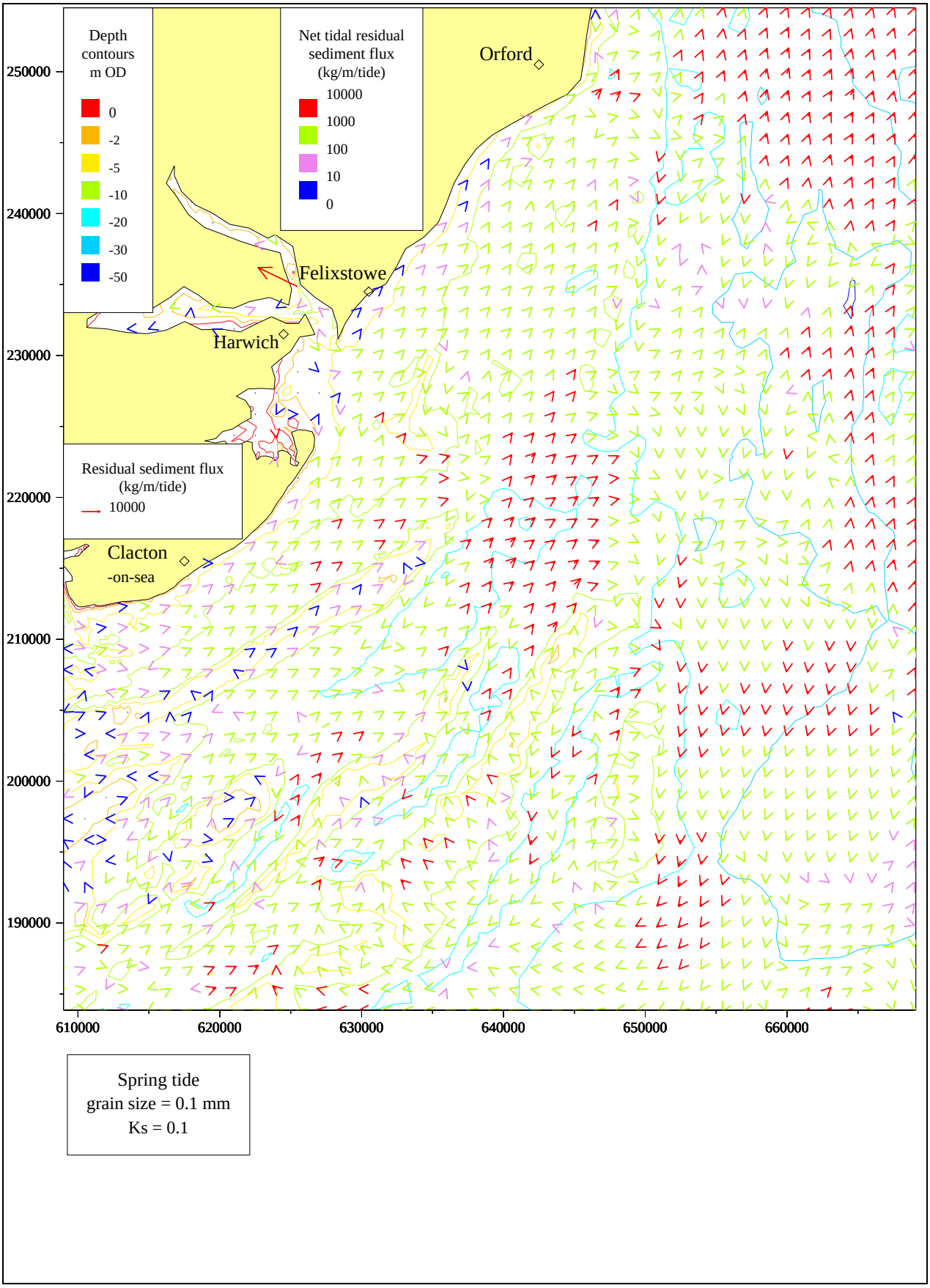


Figure 78 Spring tide net sediment flux patterns (0.1mm sand) detail: Suffolk and Essex

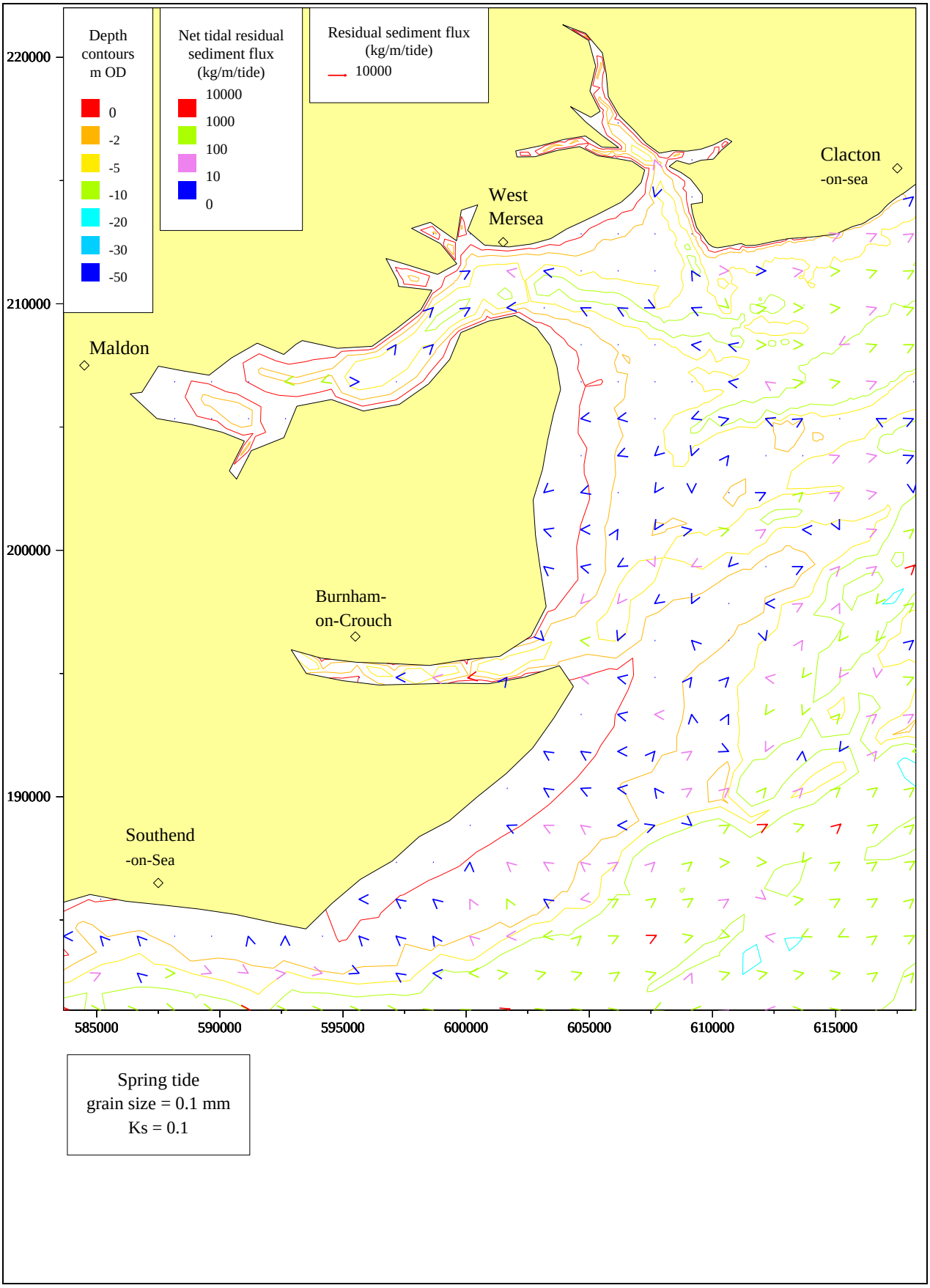


Figure 79 Spring tide net sediment flux patterns (0.1mm sand) detail: South Essex

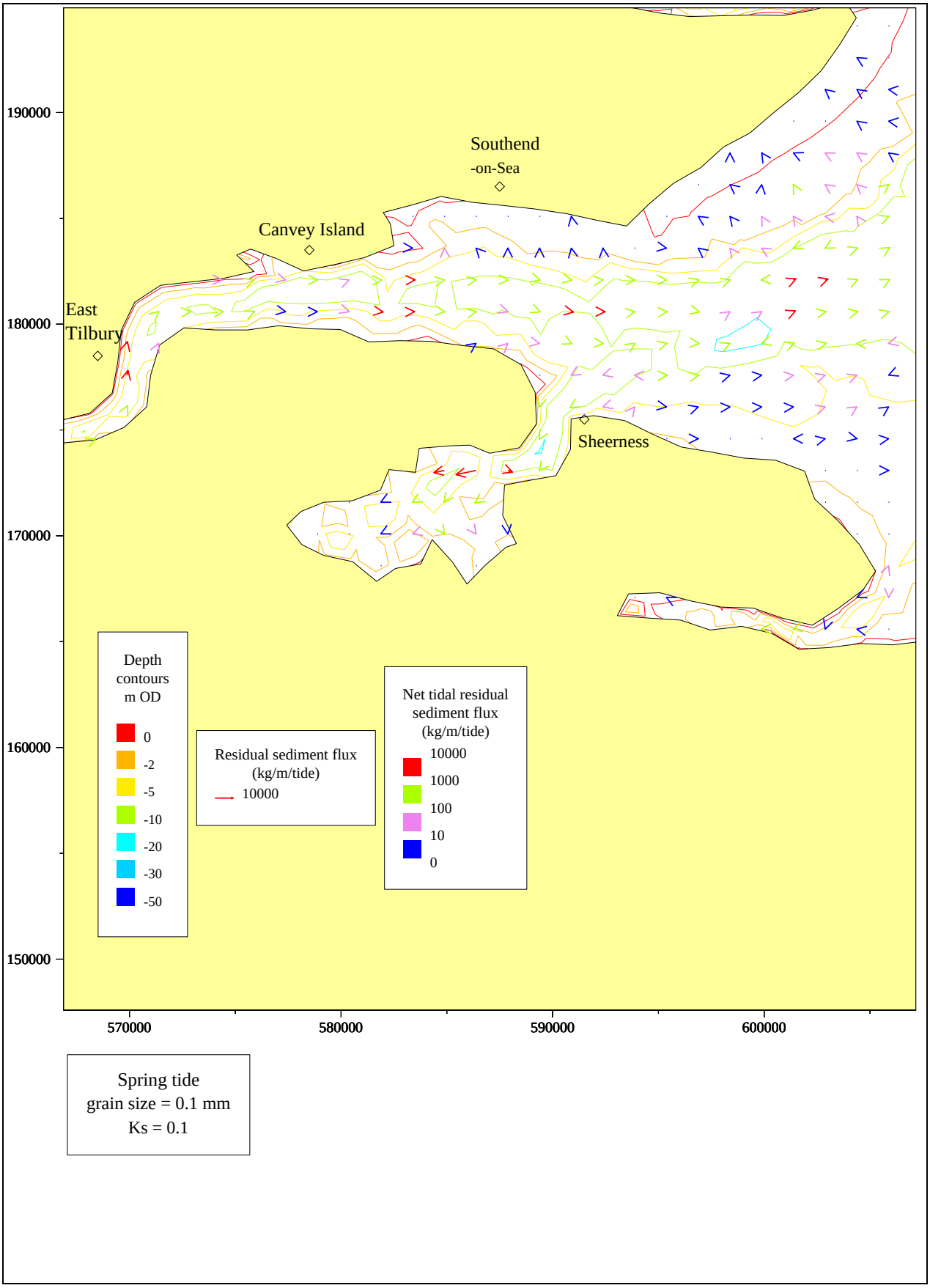


Figure 80 Spring tide net sediment flux patterns (0.1mm sand) detail: Outer Thames

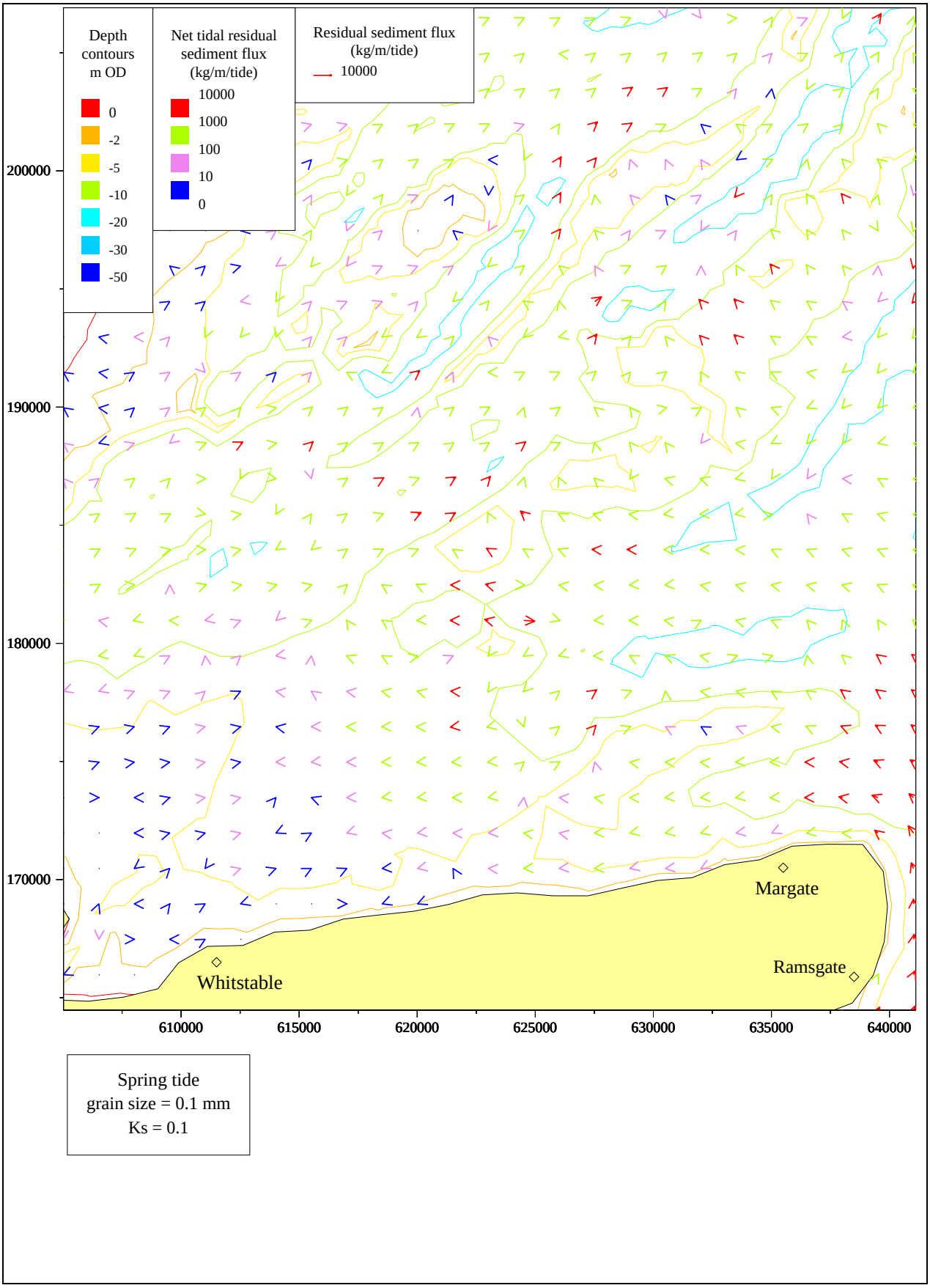


Figure 81 Spring tide net sediment flux patterns (0.1mm sand) detail: North Kent

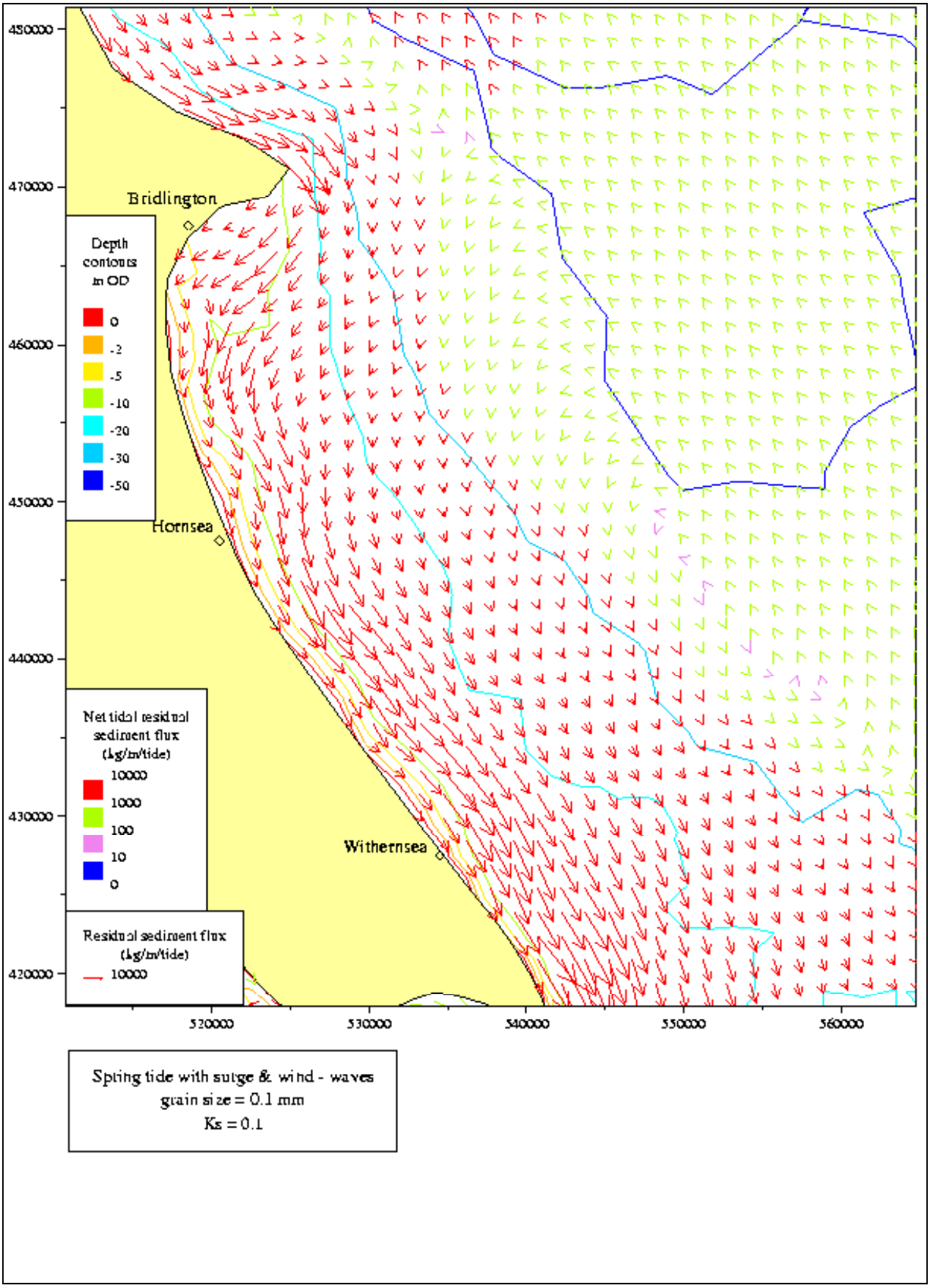


Figure 82 Spring tide with surge net sediment flux patterns (0.1mm sand) detail: Flamborough Head to the Humber

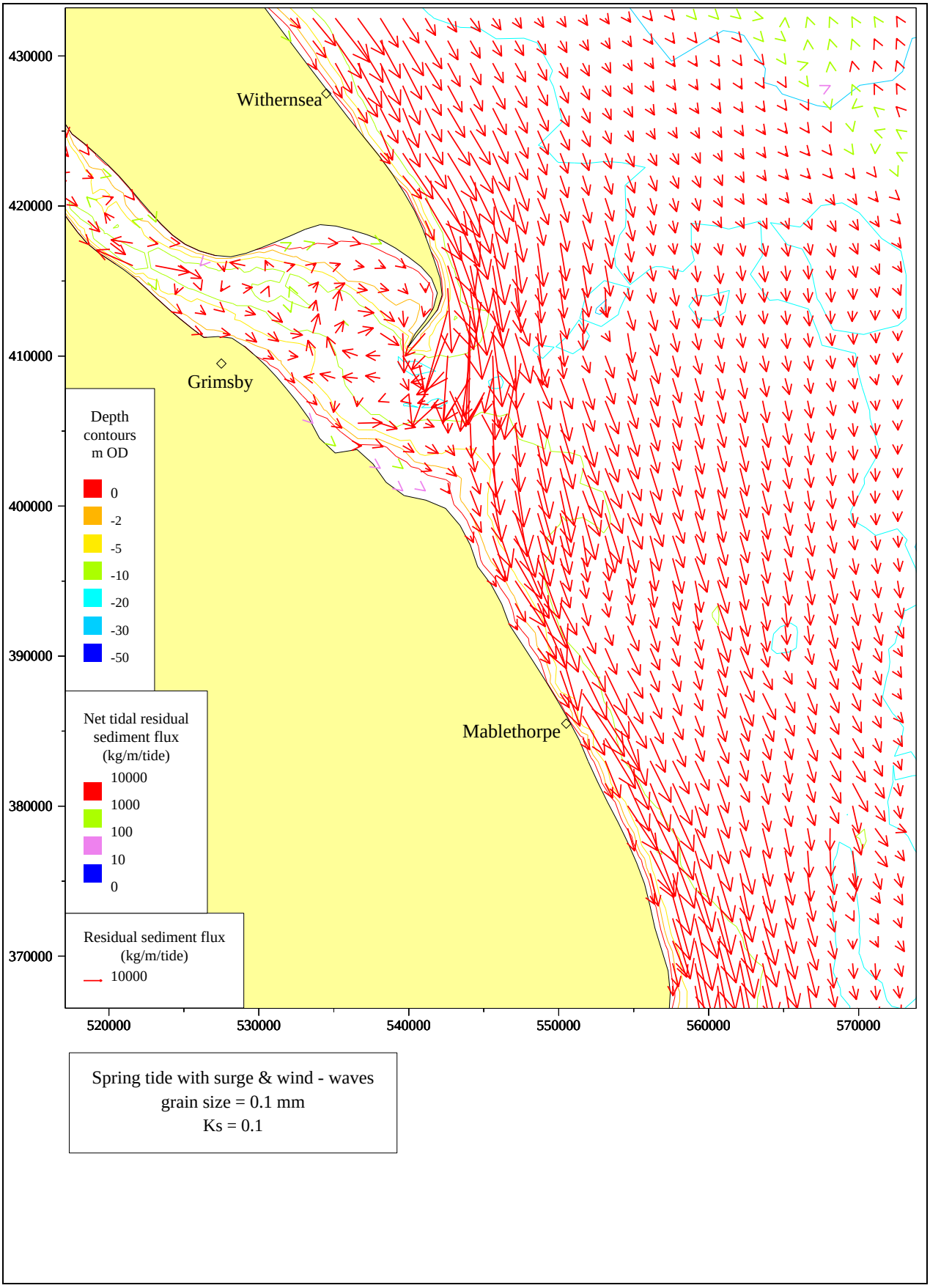


Figure 83 Spring tide with surge net sediment flux patterns (0.1mm sand) detail: Humber Entrance and Lincolnshire

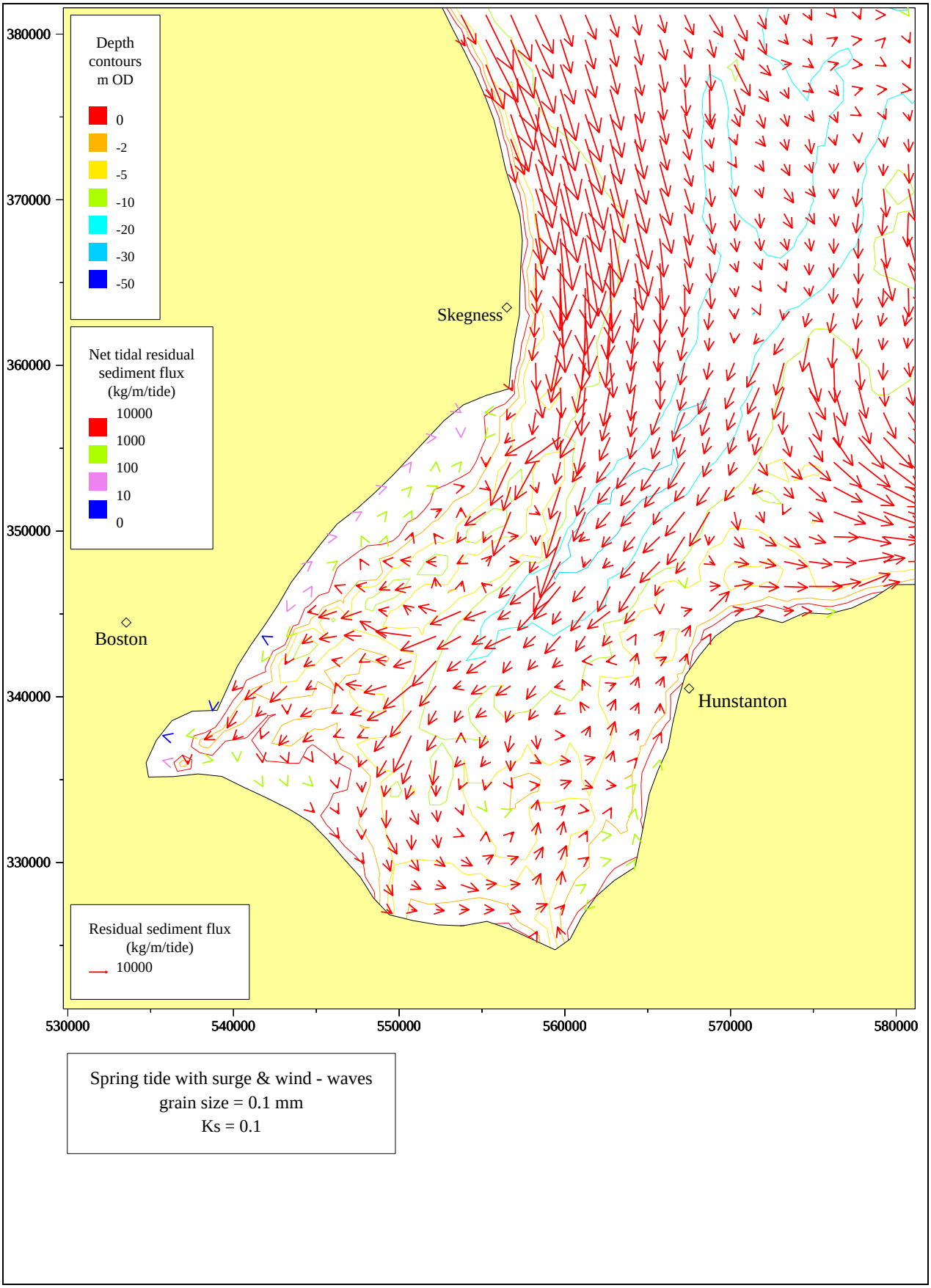


Figure 84 Spring tide with surge net sediment flux patterns (0.1mm sand) detail: Lincolnshire and the Wash

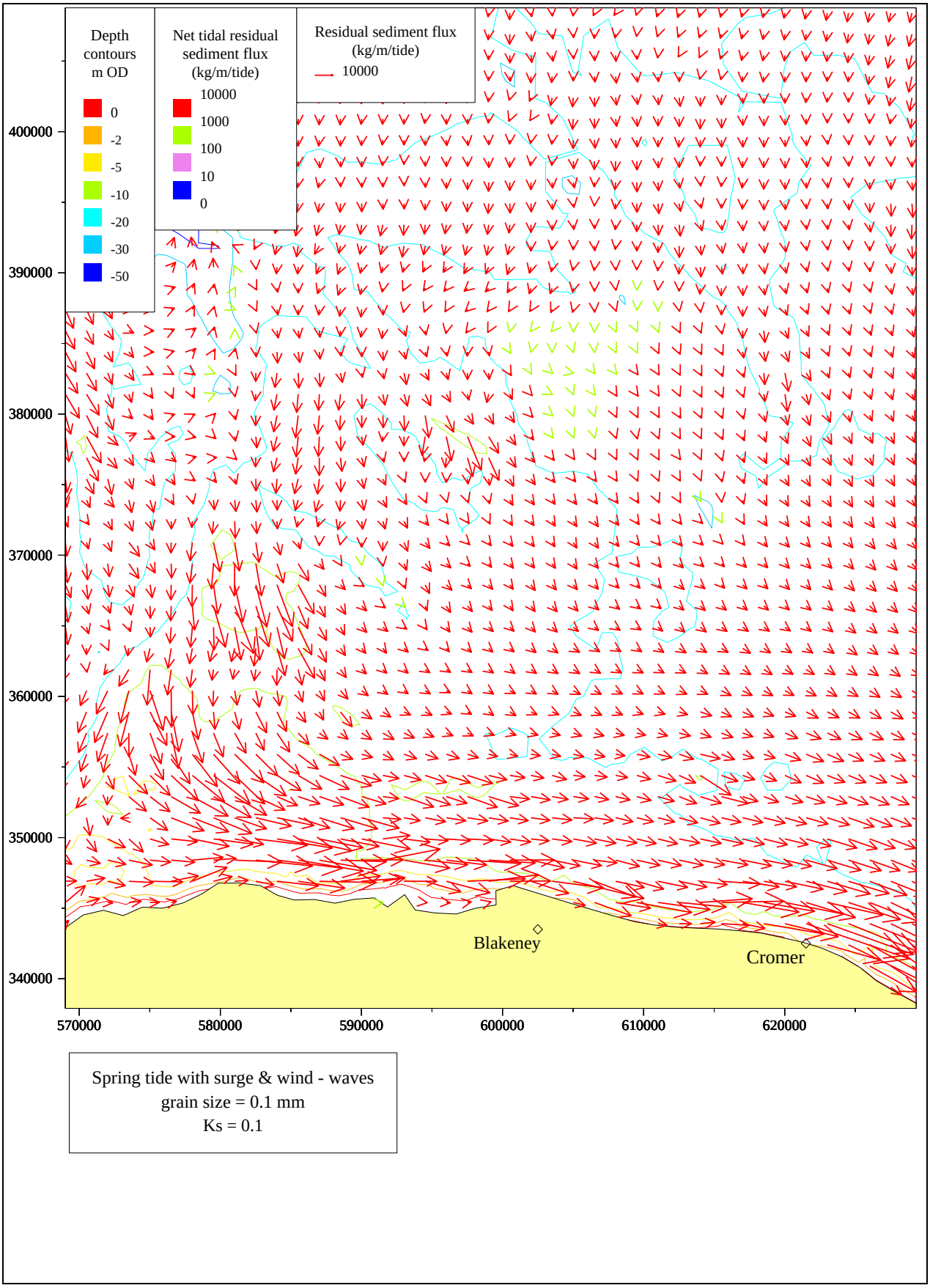


Figure 85 Spring tide with surge net sediment flux patterns (0.1mm sand) detail: North Norfolk

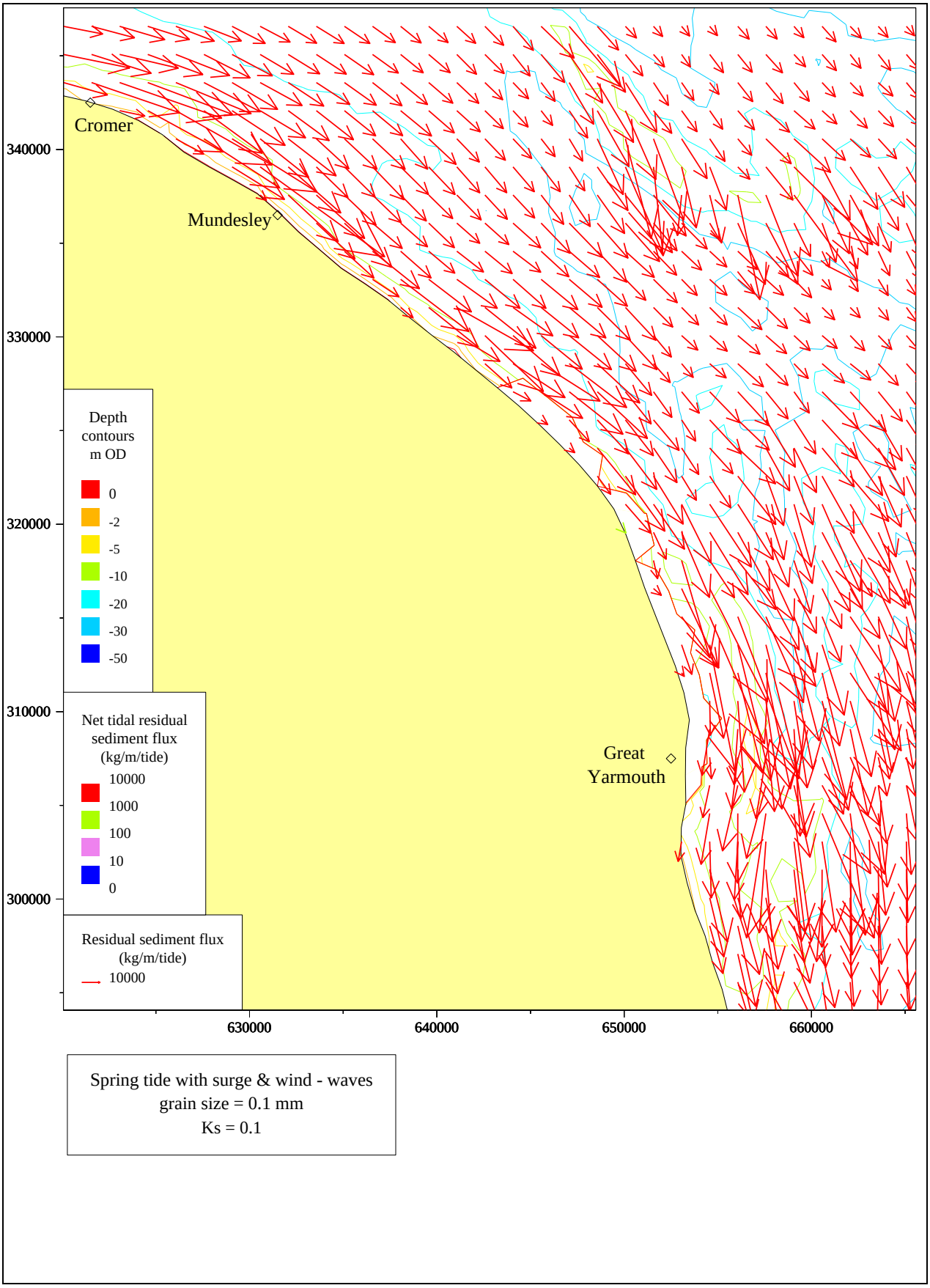


Figure 86 Spring tide with surge net sediment flux patterns (0.1mm sand) detail: East Norfolk

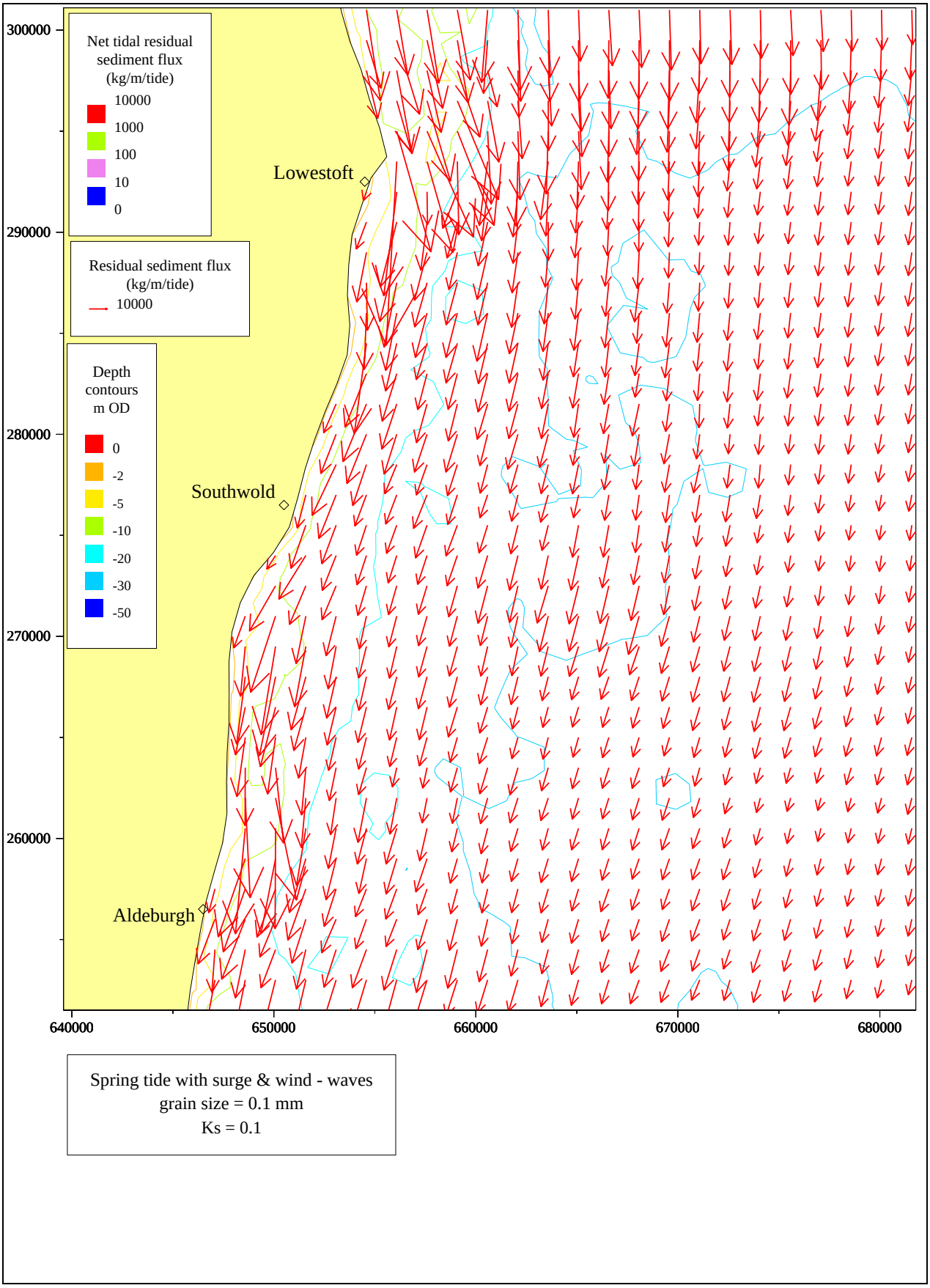


Figure 87 Spring tide with surge net sediment flux patterns (0.1mm sand) detail: North Suffolk

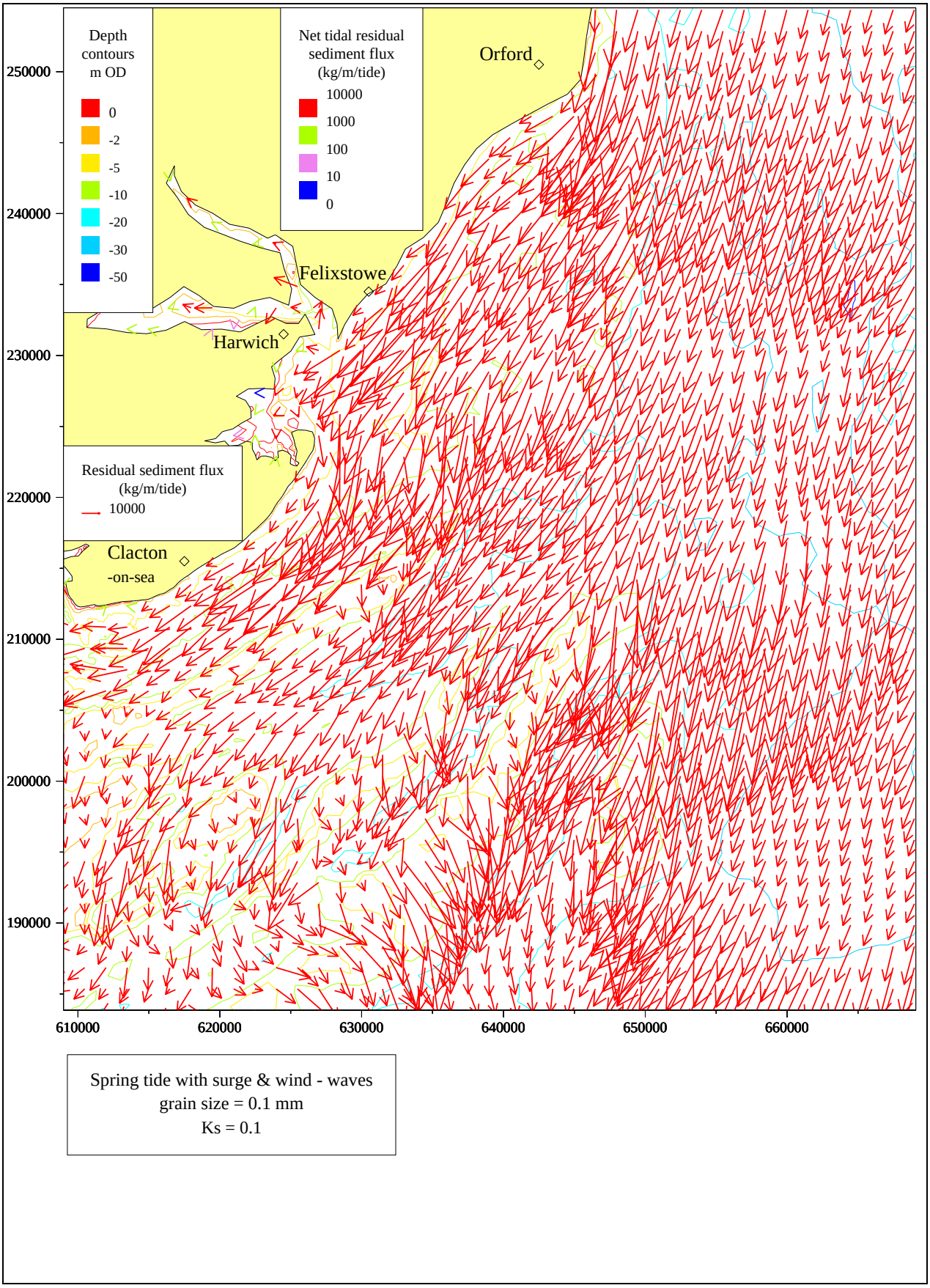


Figure 88 Spring tide with surge net sediment flux patterns (0.1mm sand) detail: Suffolk and Essex

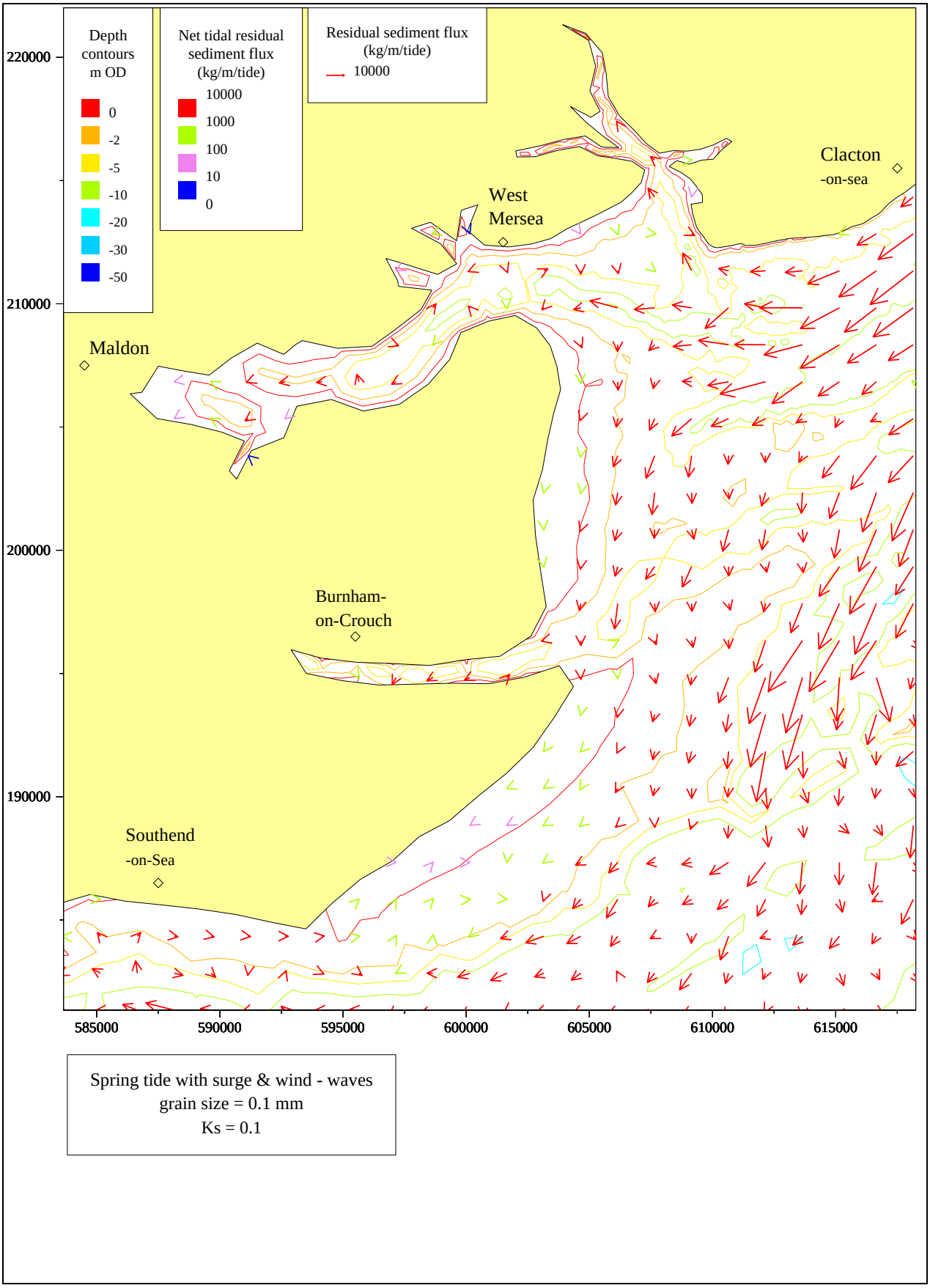


Figure 89 Spring tide with surge net sediment flux patterns (0.1mm sand) detail: South Essex

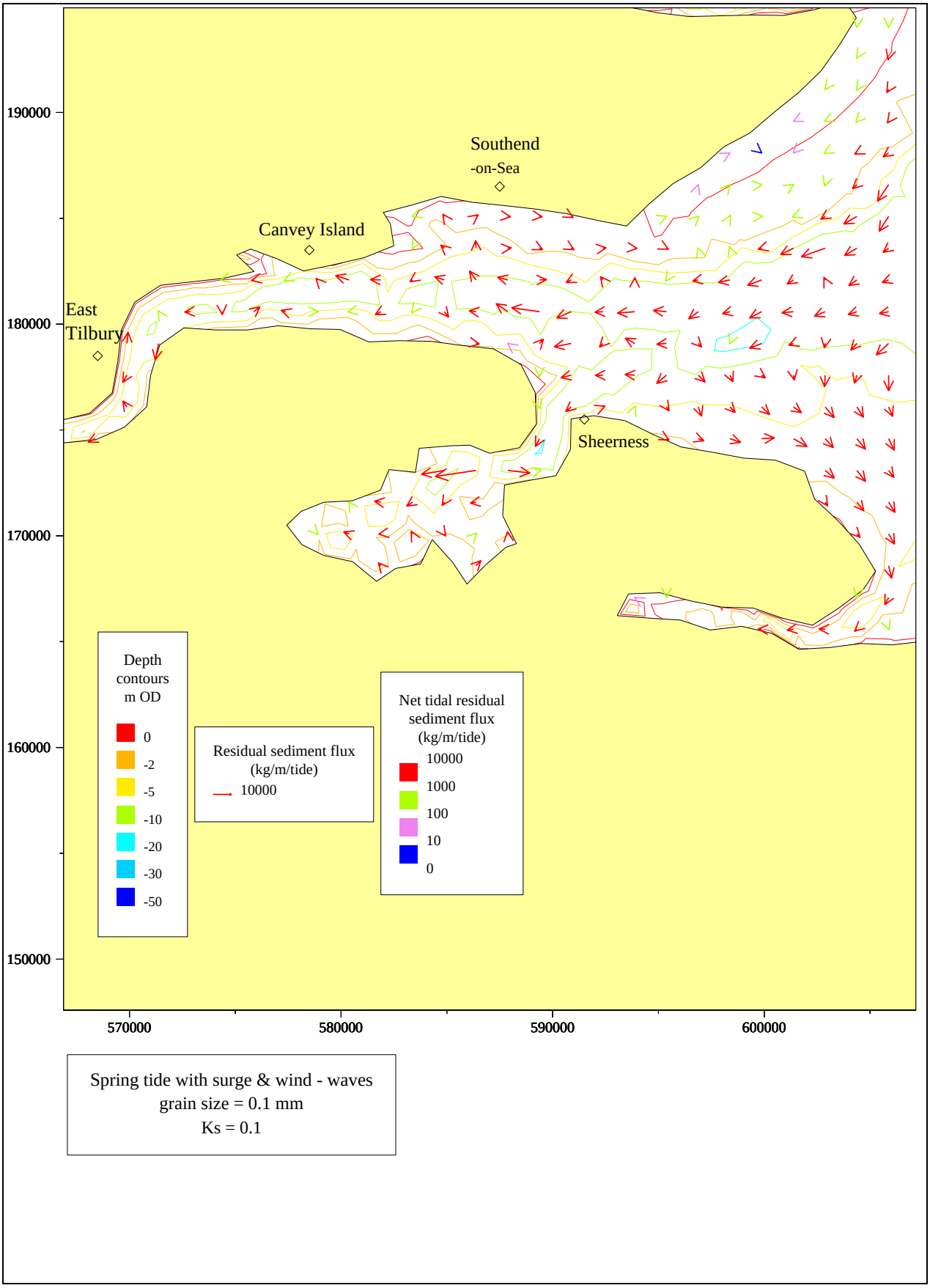


Figure 90 Spring tide with surge net sediment flux patterns (0.1mm sand) detail: Outer Thames

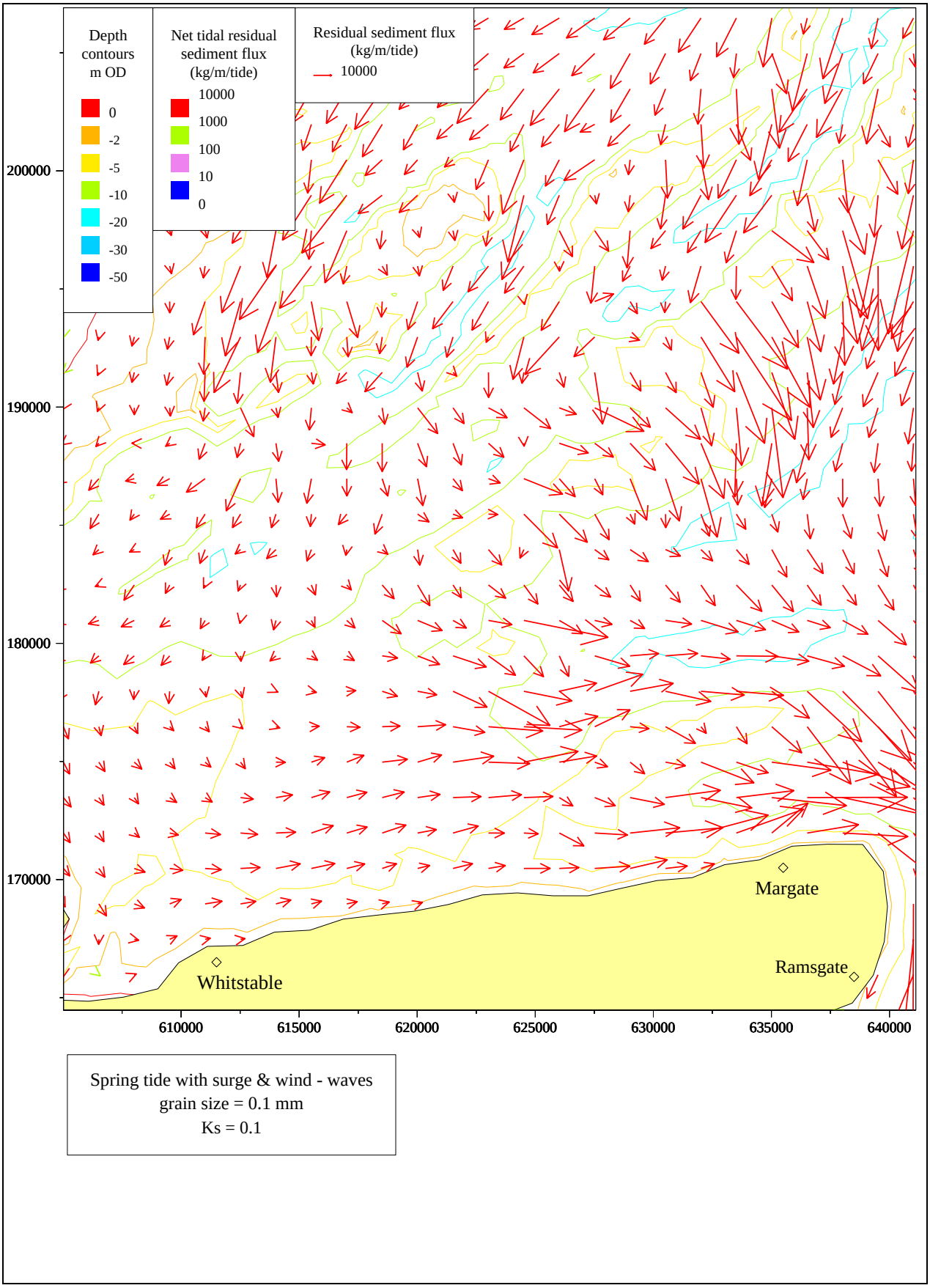


Figure 91 Spring tide with surge net sediment flux patterns (0.1mm sand) detail: North Kent

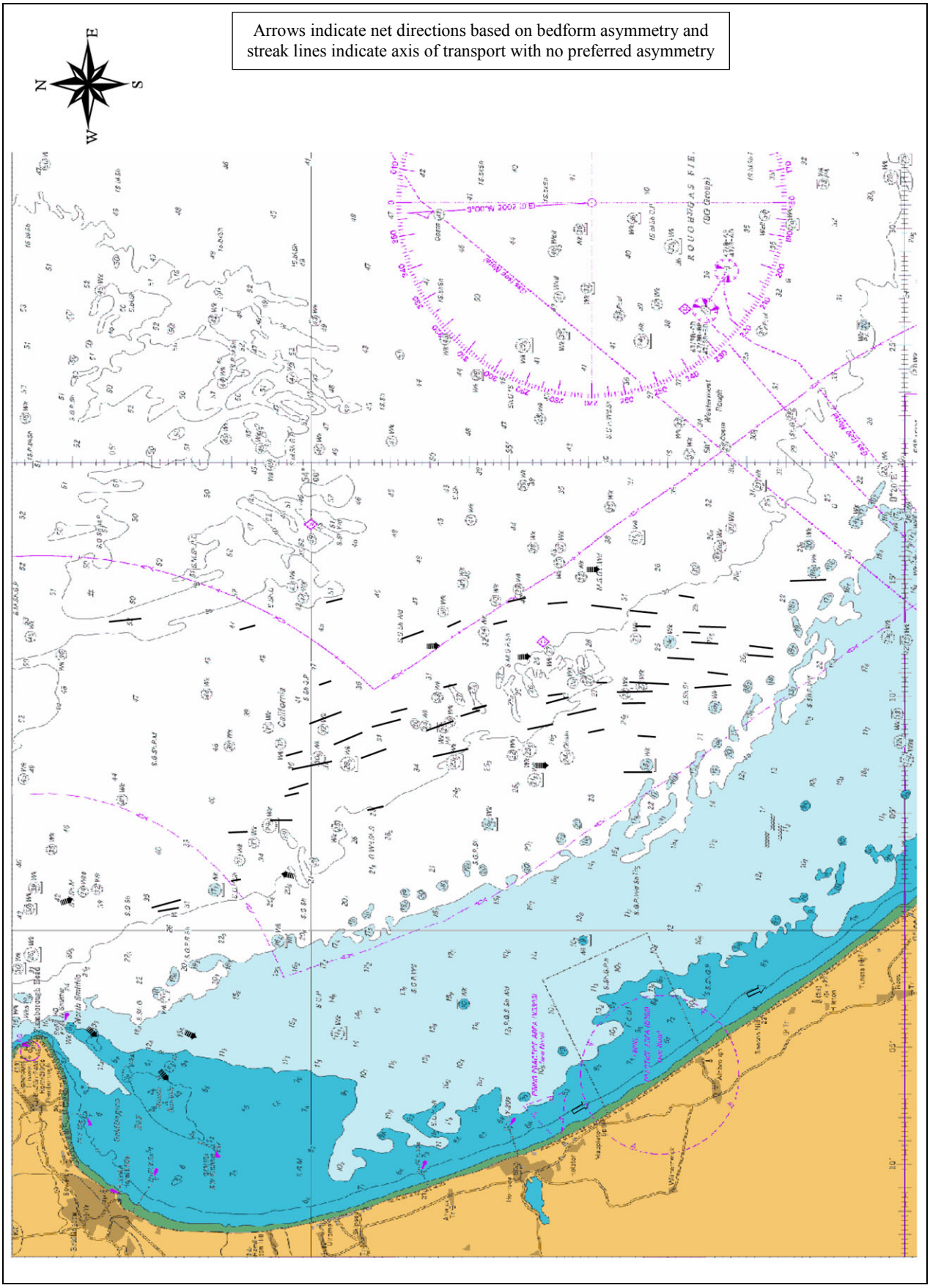


Figure 92 Combined seabed sediment transport indicators Region 1: Flamborough and mid-Holderness (mapped on detail from Admiralty Chart 1190)

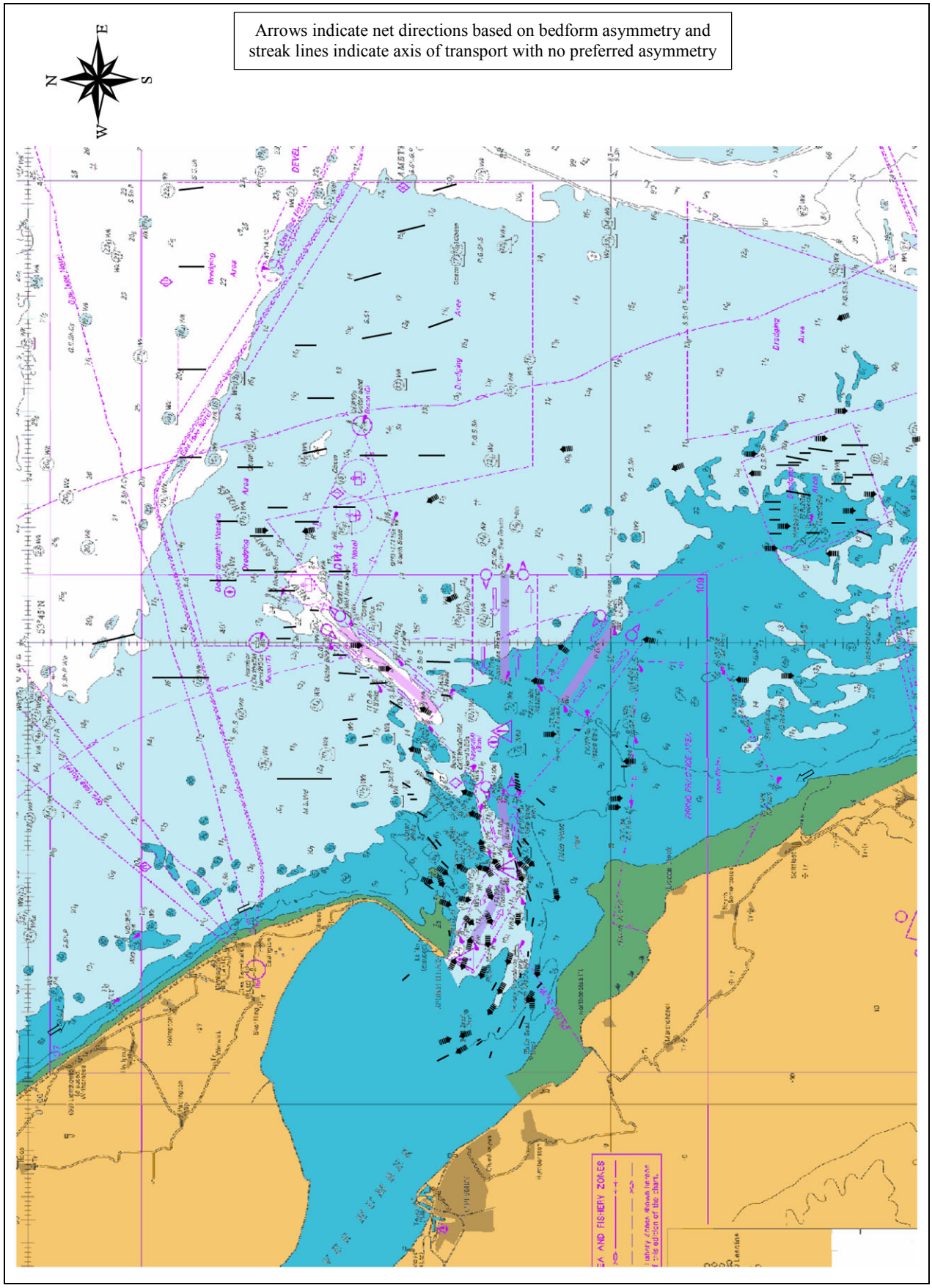


Figure 93 Combined seabed sediment transport indicators Region 2: South Holderness, the entrance to the Humber and North Lincolnshire (mapped on detail from Admiralty Chart 1190)

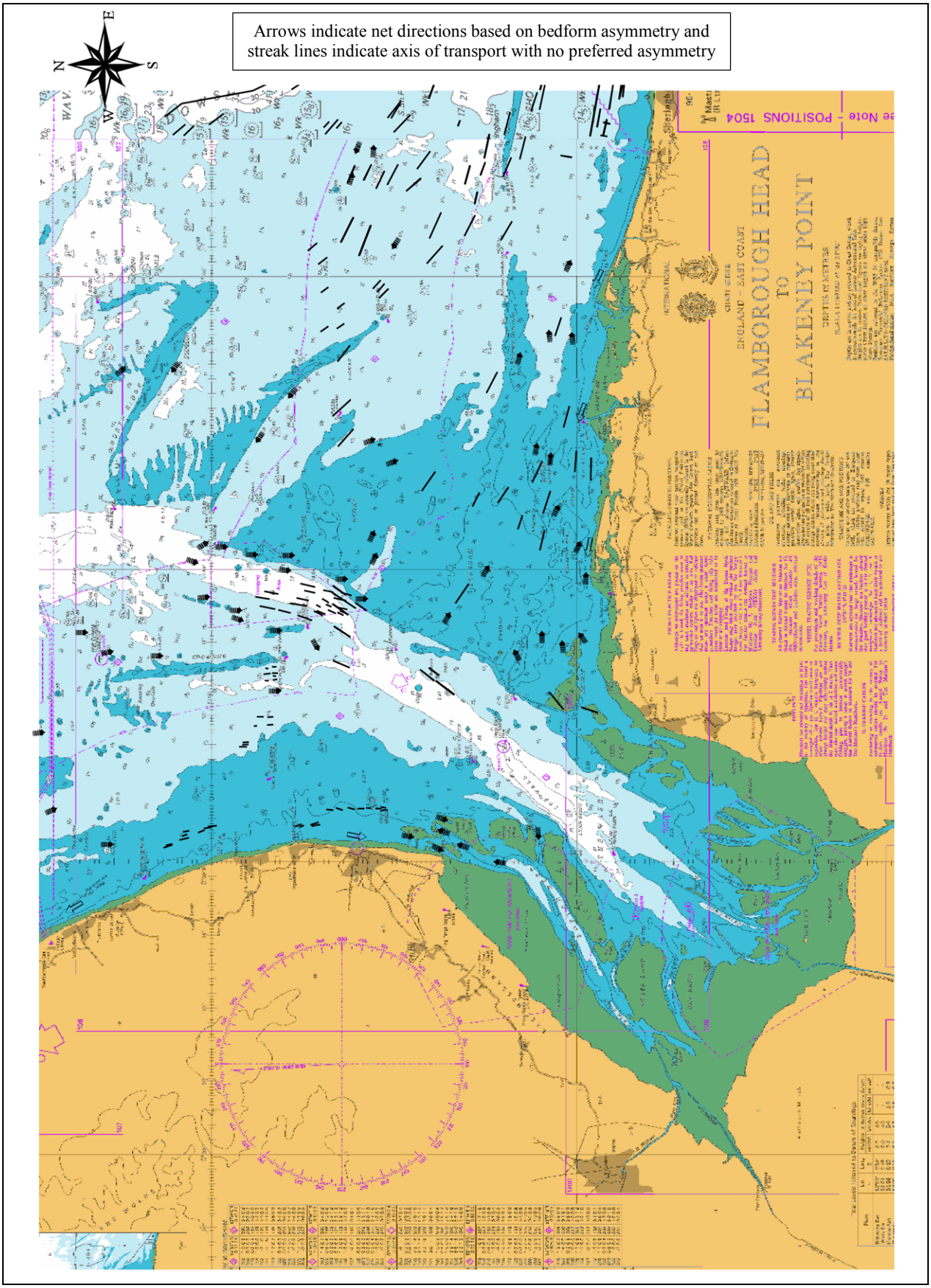


Figure 94 Combined seabed sediment transport indicators Region 3: South Lincolnshire, the Wash and North Norfolk (mapped on detail from Admiralty Chart 1190)

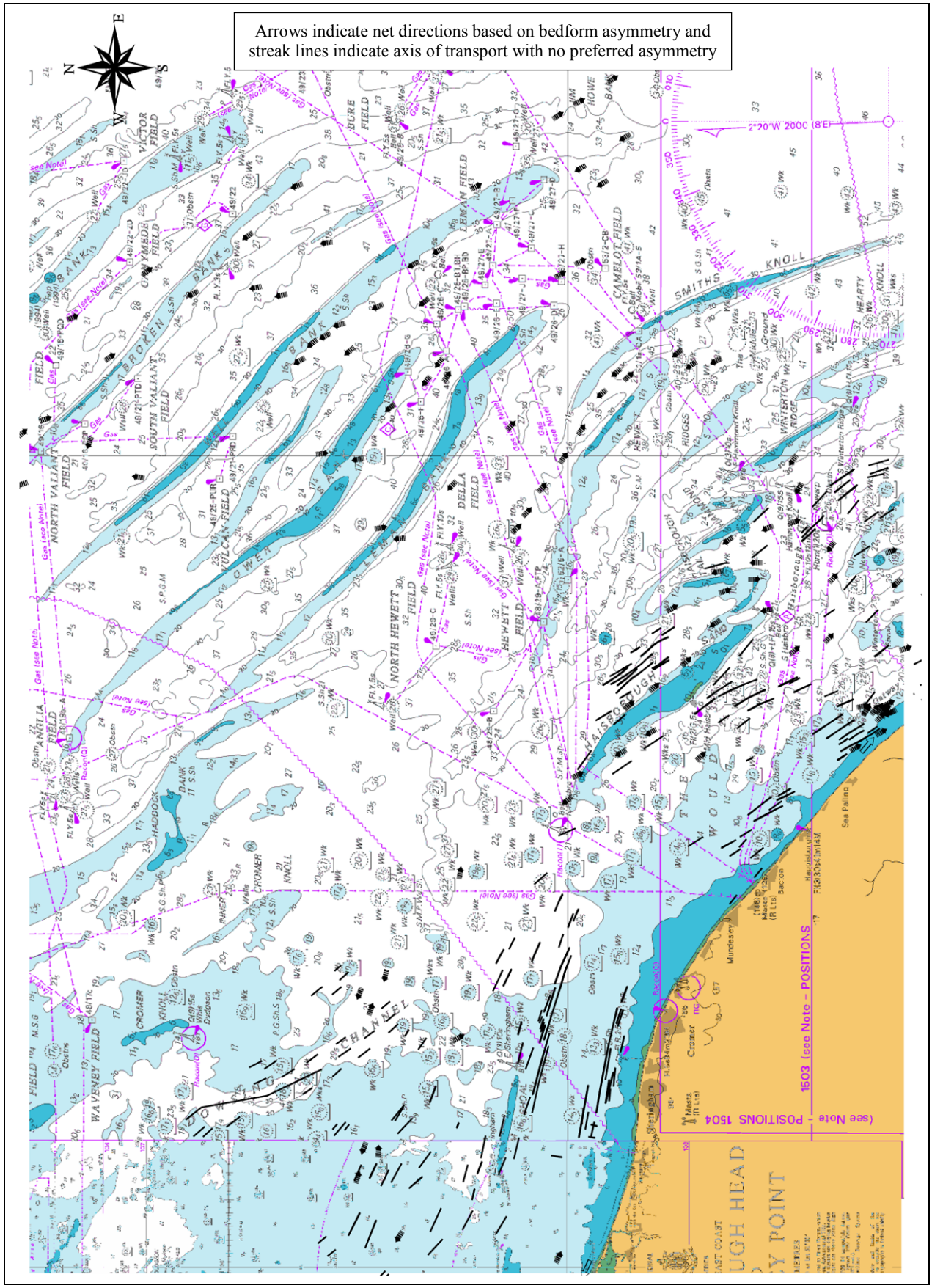


Figure 95 Combined seabed sediment transport indicators Region 4: East Norfolk (mapped on detail from Admiralty Chart 1408)

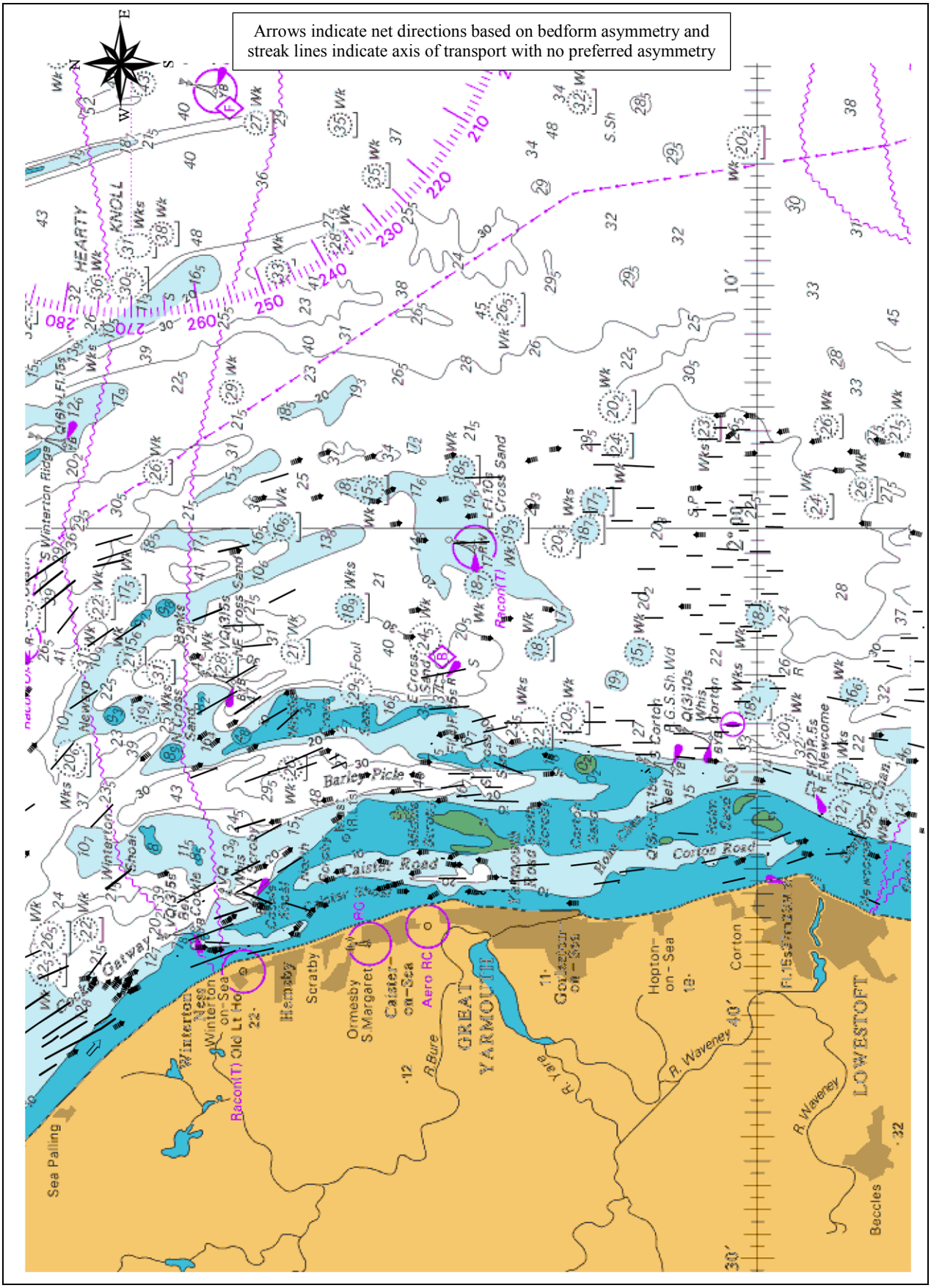


Figure 96 Combined seabed sediment transport indicators Region 5: East Norfolk and North Suffolk (mapped on detail from Admiralty Chart 1408)

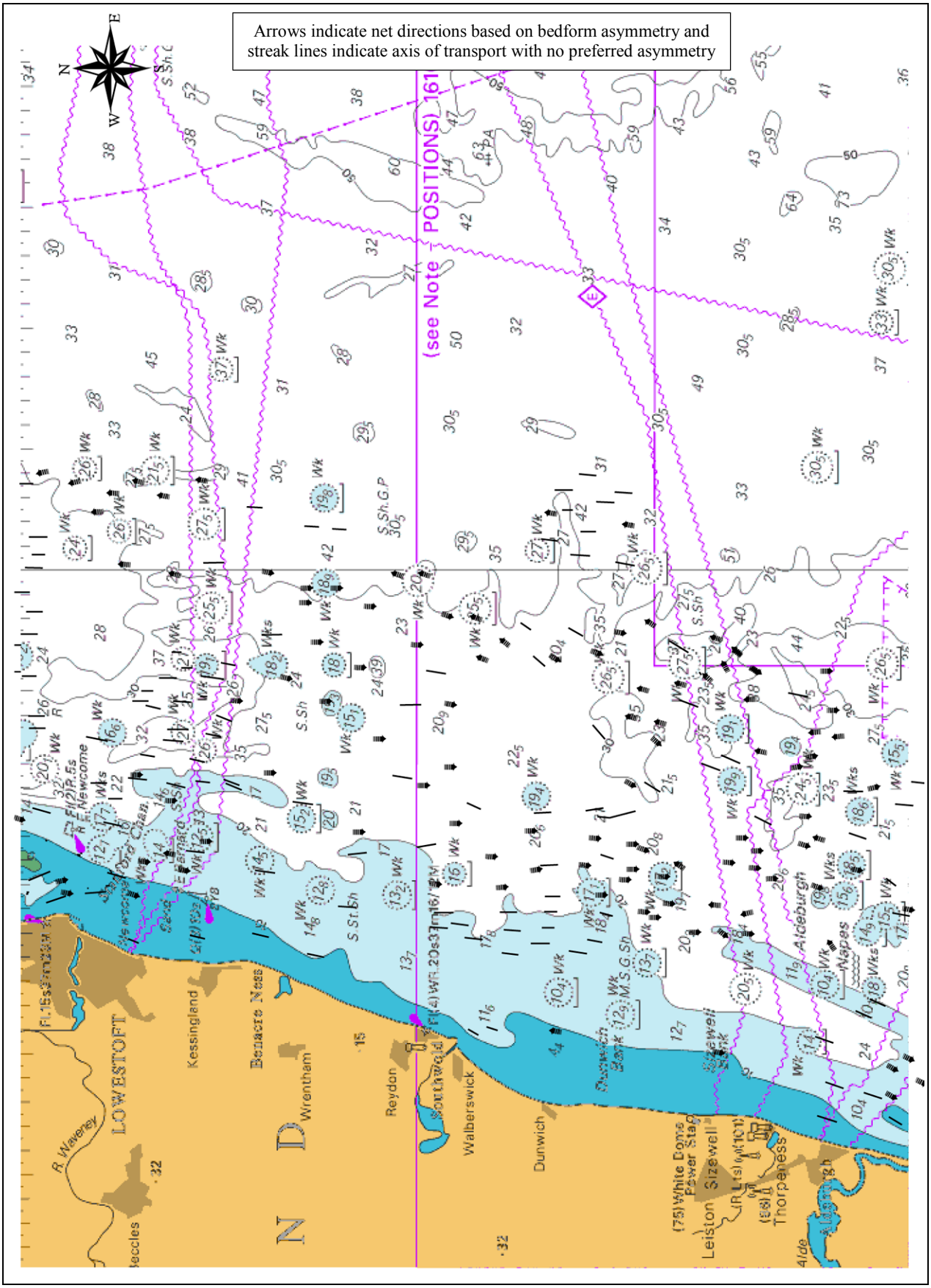


Figure 97 Combined seabed sediment transport indicators Region 6: North Suffolk (mapped on detail from Admiralty Chart 1408)

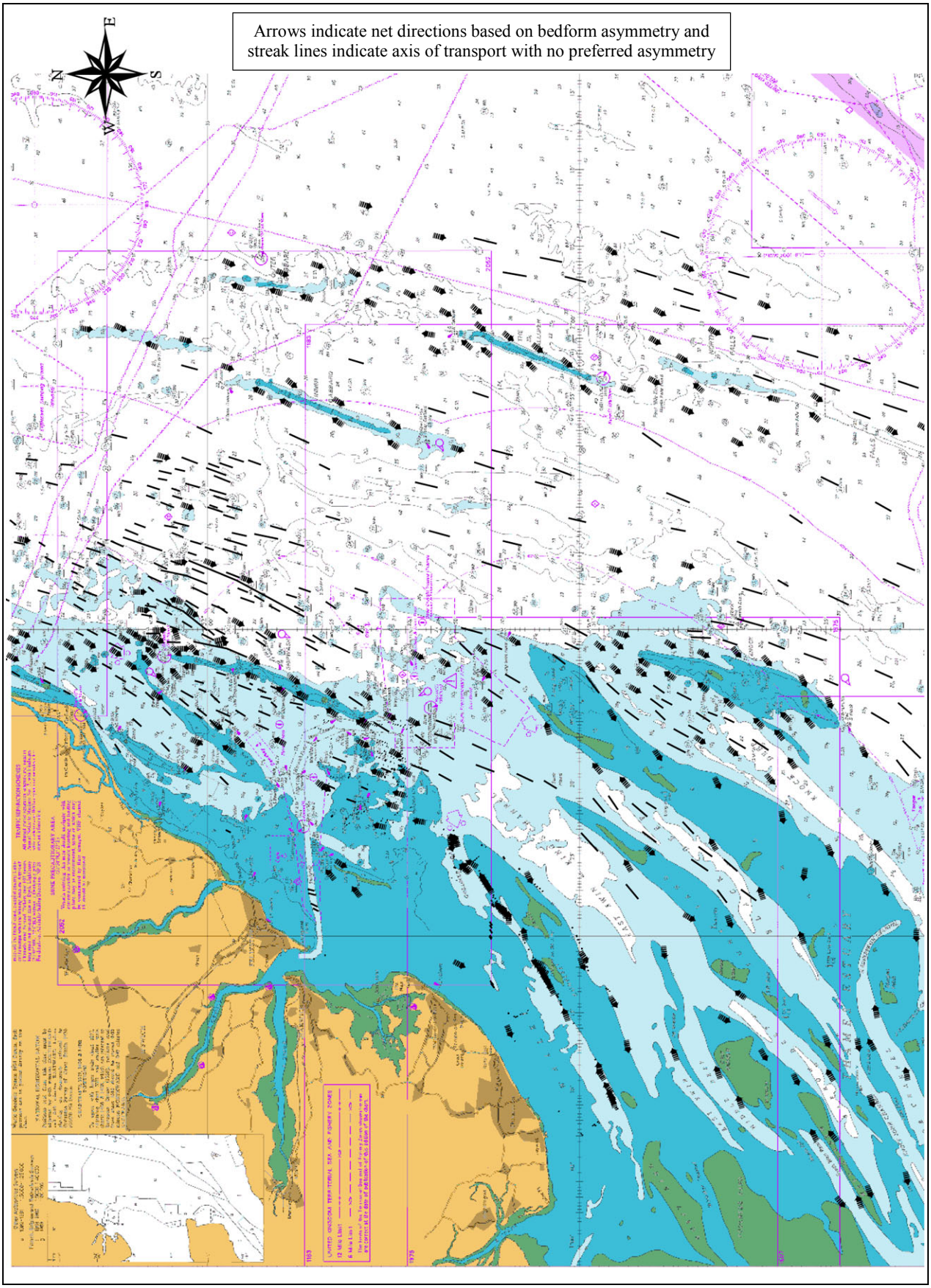


Figure 98 Combined seabed sediment transport indicators Region 7: Suffolk and Essex (mapped on detail from Admiralty Chart 1610)

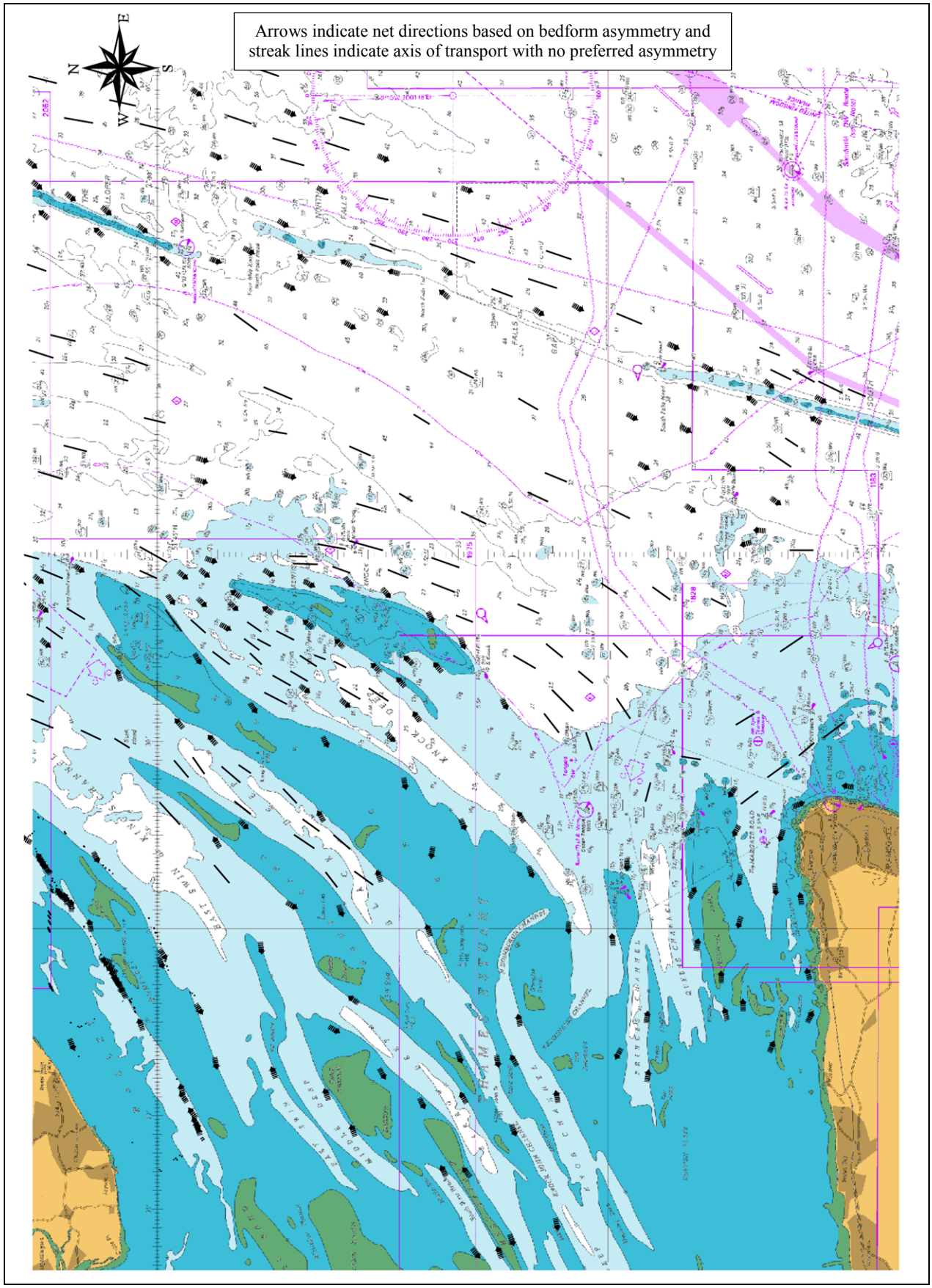


Figure 99 Combined seabed sediment transport indicators Region 10: North Kent including Outer Thames Estuary (mapped on detail from Admiralty Chart 1610)

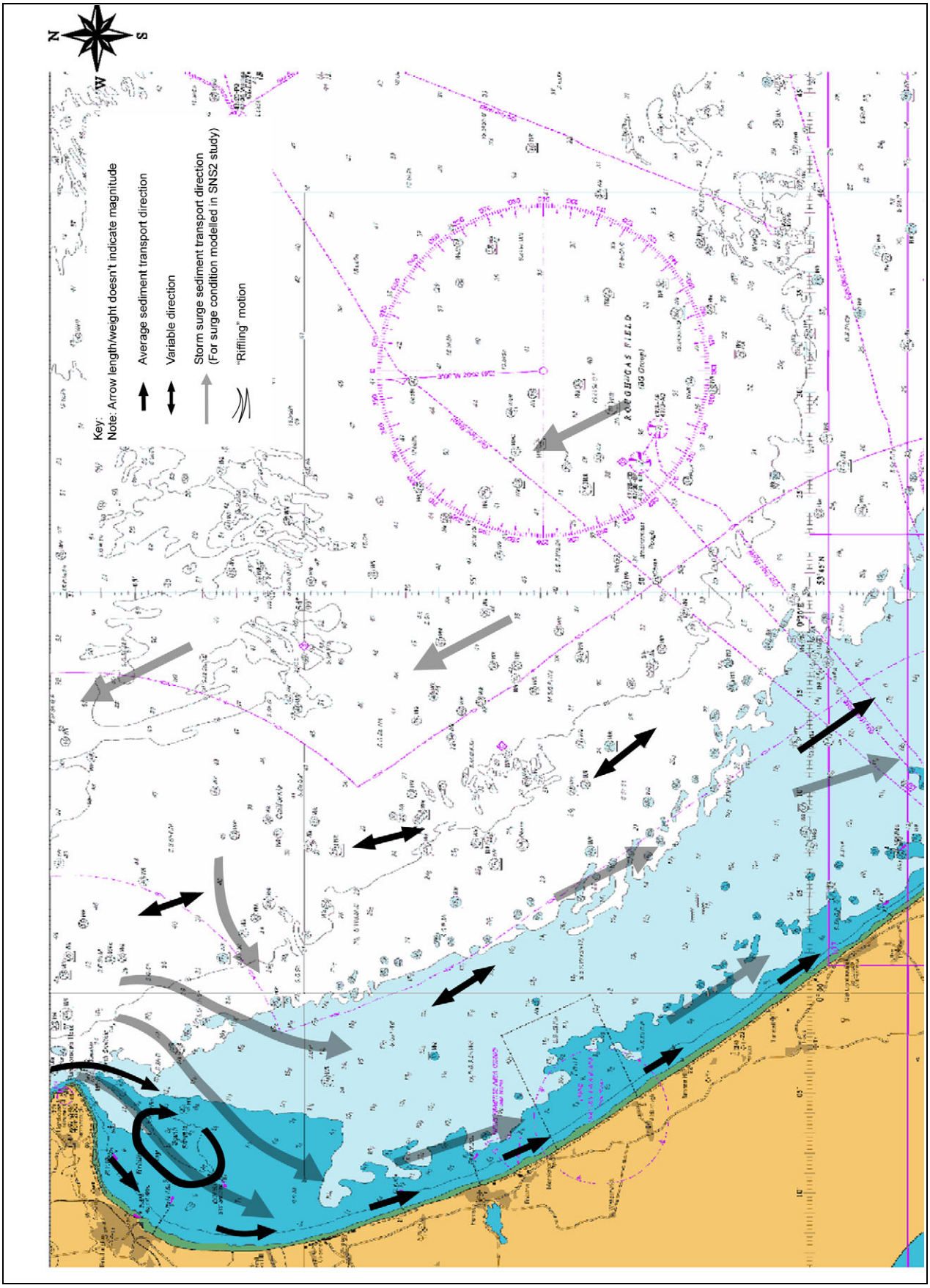


Figure 100 Region 1: Flamborough Head and Holderness (Admiralty Chart 1190). Schematic sediment transport pathways

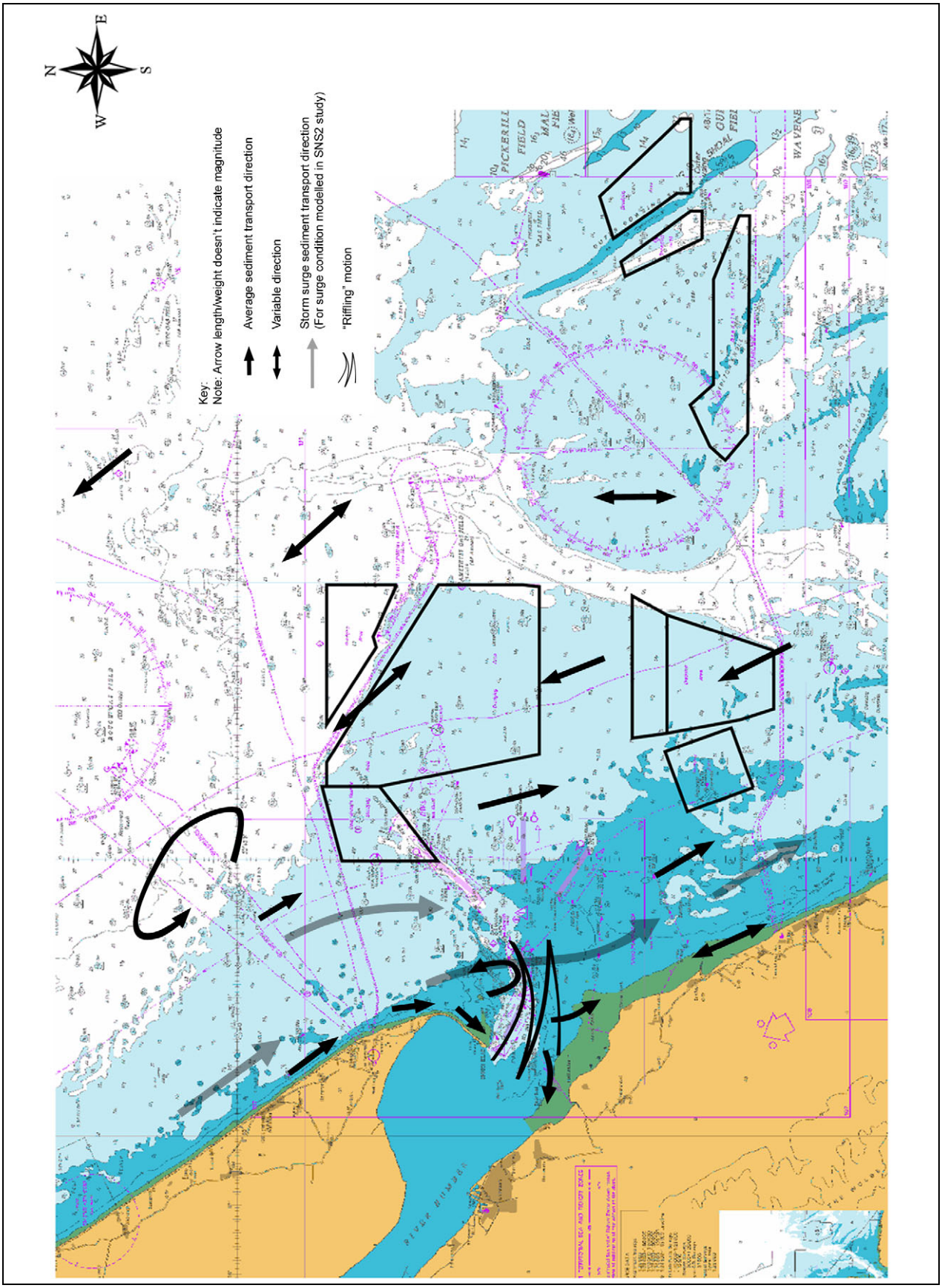


Figure 101 Region 2: South Holderness, the entrance to the Humber and North Lincolnshire showing licensed aggregate dredging areas (Admiralty Chart 1190). Schematic sediment transport pathways

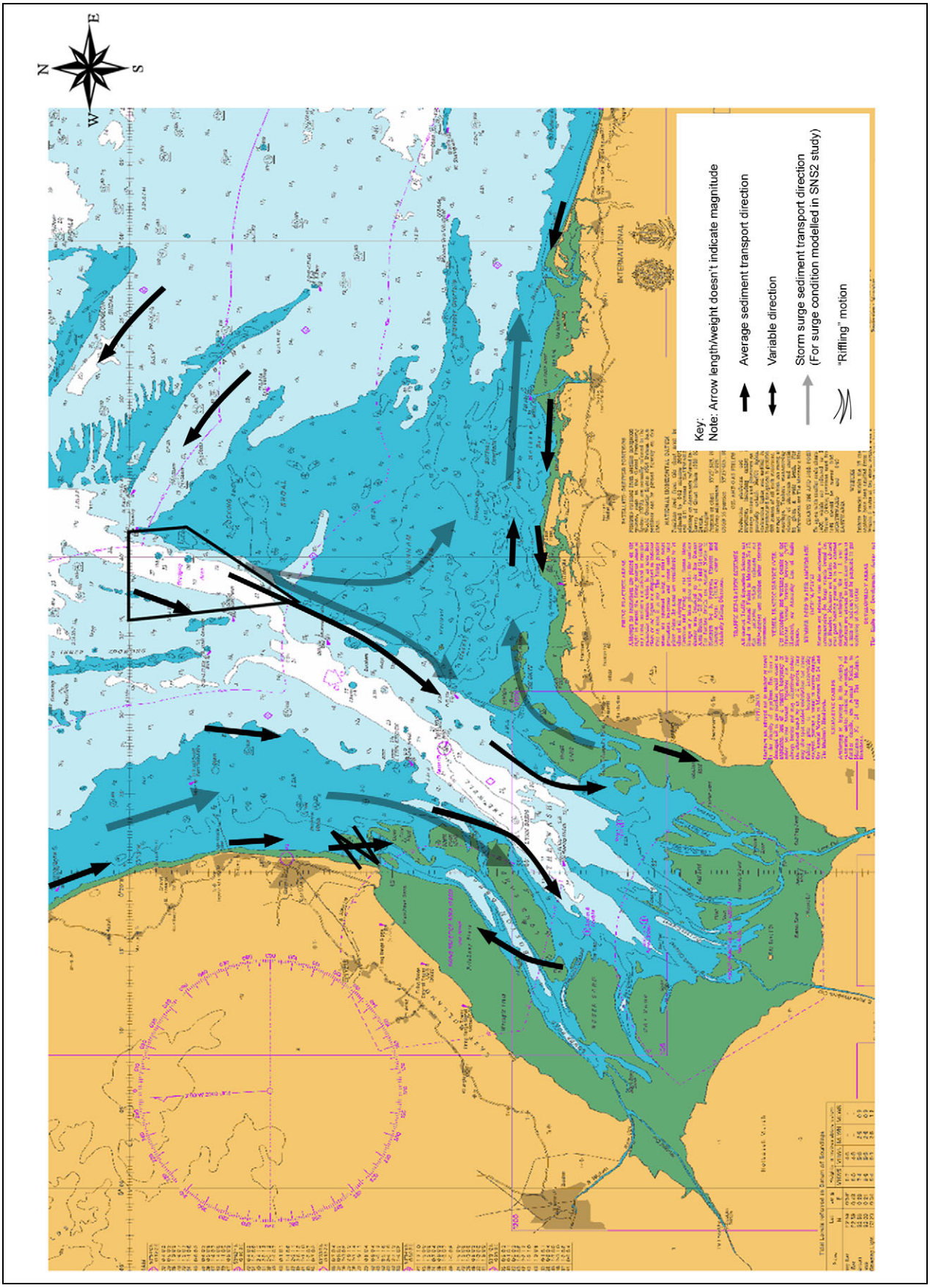


Figure 102 Region 3: South Lincolnshire, the Wash and North Norfolk showing licensed aggregate dredging areas (Admiralty Chart 1190). Schematic sediment transport pathways

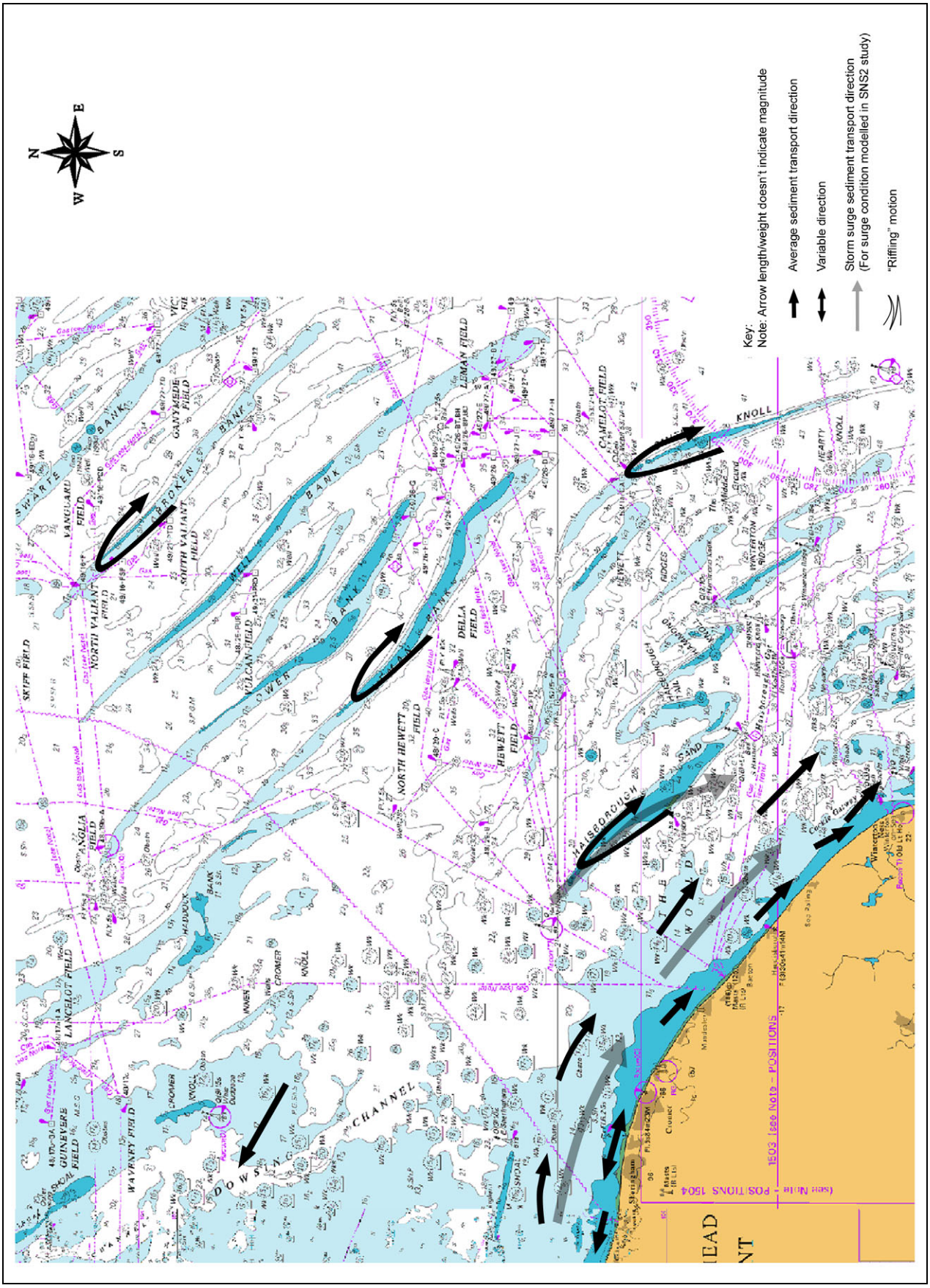


Figure 103 Region 4: East Norfolk (Admiralty Chart 1408). Schematic sediment transport pathways

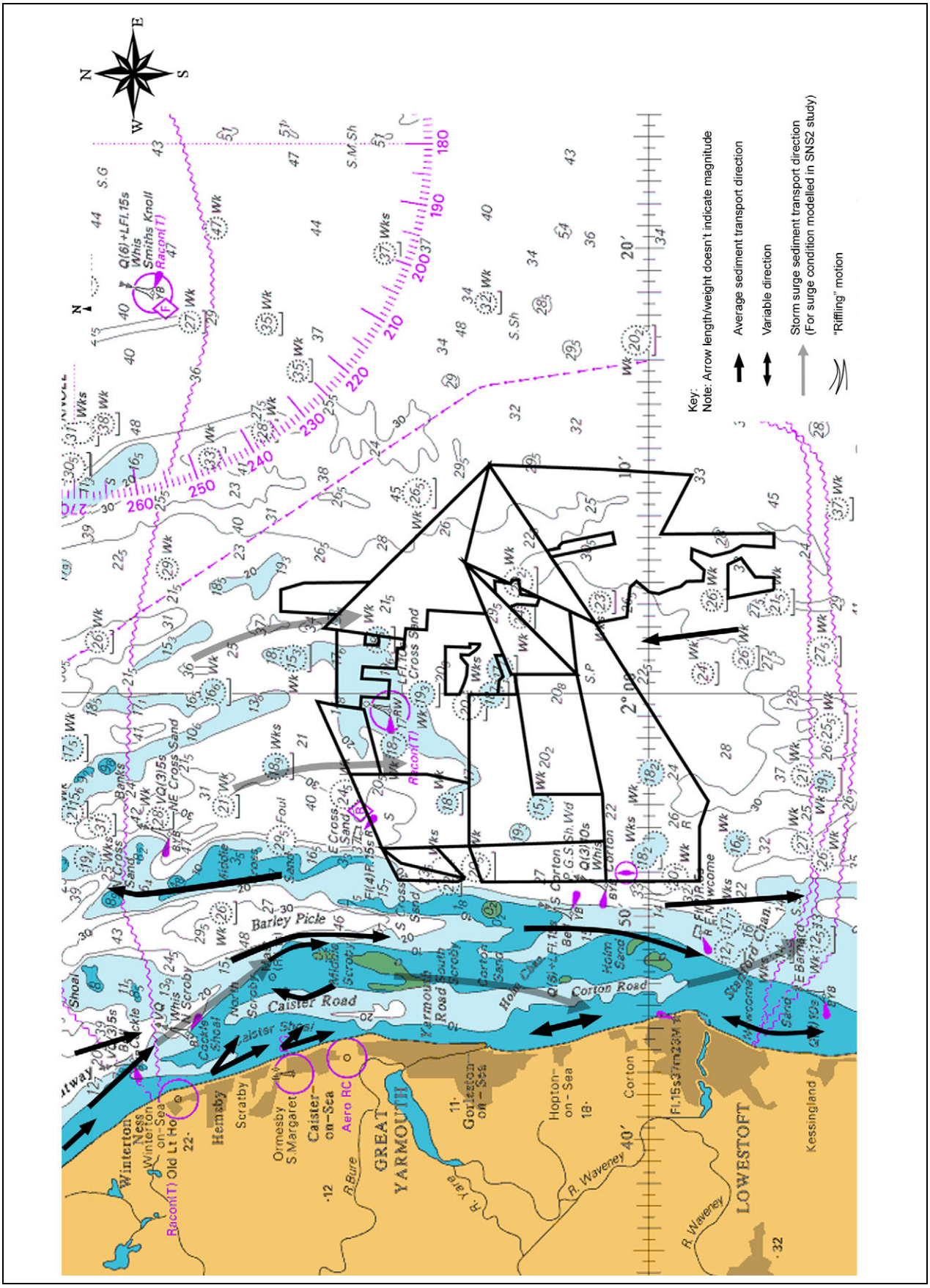


Figure 104 Region 5: East Norfolk and North Suffolk showing licensed aggregate dredging areas (Admiralty Chart 1408). Schematic sediment transport pathways

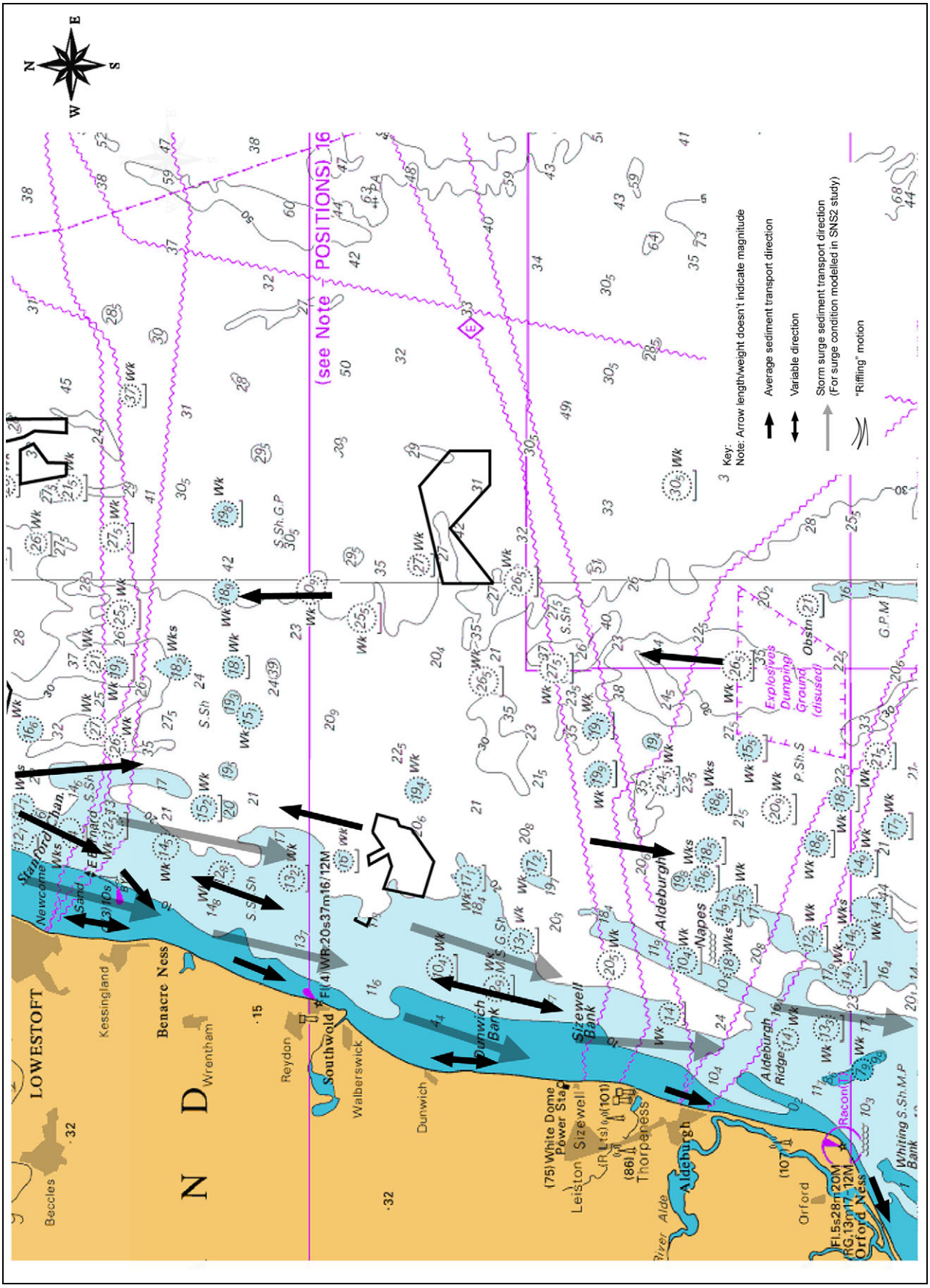


Figure 105 Region 5: North Suffolk showing licensed aggregate dredging areas (Admiralty Chart 1408). Schematic sediment transport pathways

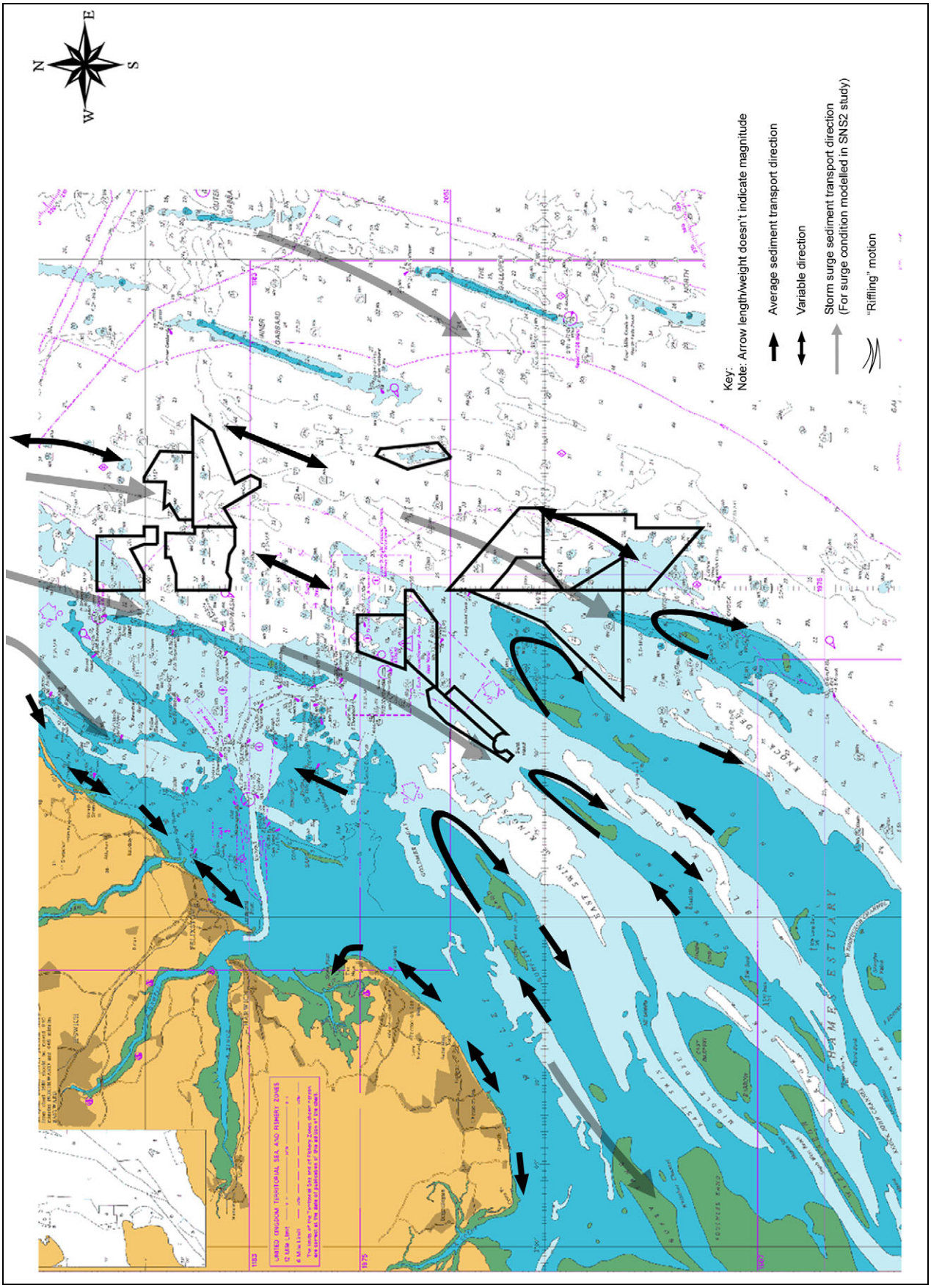


Figure 106 Region 7: Suffolk and Essex showing licensed aggregate dredging areas (Admiralty Chart 1610). Schematic sediment transport pathways

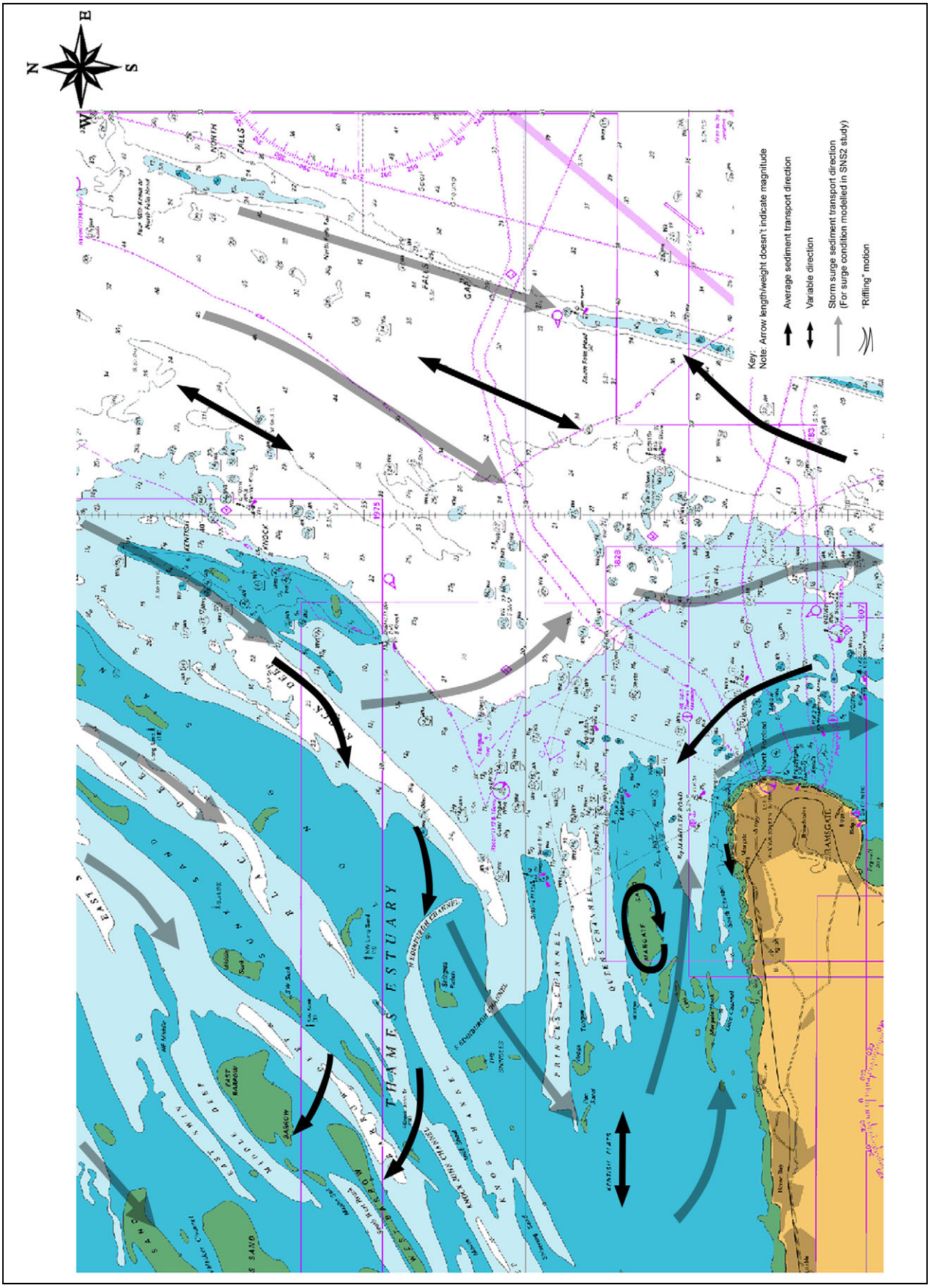


Figure 107 Region 10 North Kent (Admiralty Chart 1610). Schematic sediment transport pathways

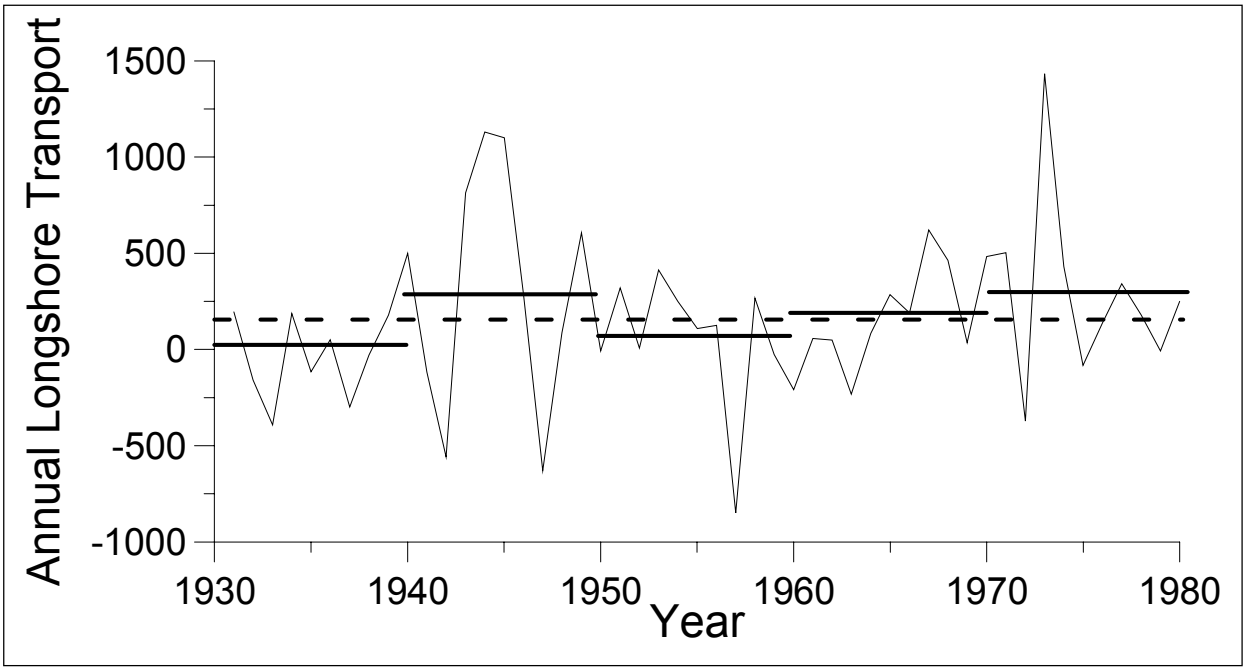


Figure 108 Annual average sand transport rates past Sea Palling in 000's m^3/y (from Onyett, 1982)

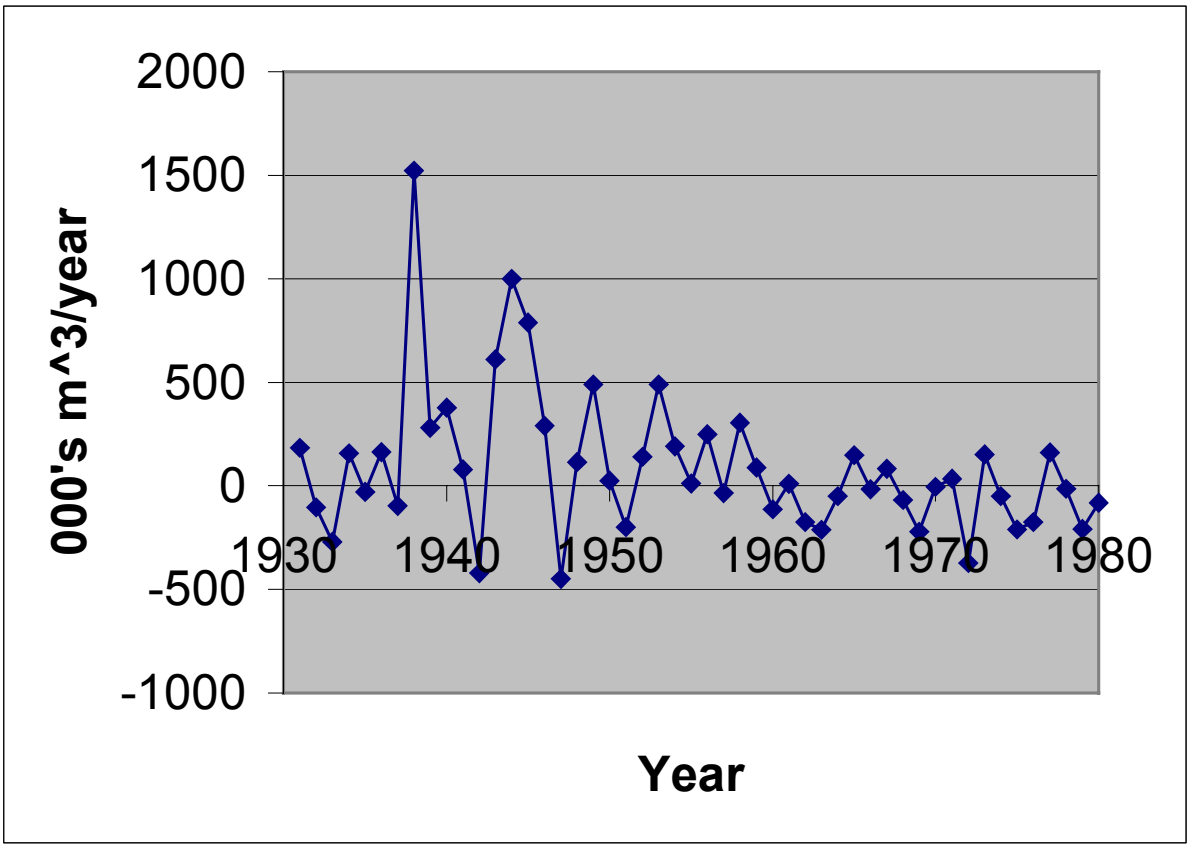


Figure 109 Annual Transport along the coastal section from Mundesley to Sheringham, including Cromer (from Onyett, 1982)