National Oceanography Centre, Southampton
UNIVERSITY OF SOUTHAMPTON AND NATURAL ENVIRONMENT RESEARCH COUNCIL

ENGLISH HERITAGE

Field monitoring of flow around a shipwreck on the Hastings Shingle Bank

In a collaborative project between the University of Southampton and Emu Limited, eight seabed frames were deployed on the Hastings bank for academic research purposes during June and July 2005. The study is funded by English Heritage through the Aggregate Levy Sustainability Fund (ALSF). Site choice was made in consultation with Hanson Aggregates Marine Ltd (Southampton). Details of the deployment were as follows:

Objectives of the study: To measure the modification of tidal flow around a shipwreck in the marine environment. The data collected during this and future deployments is being used, in combination with other physical and numerical studies in the laboratory, to better understand the processes affecting scour around wrecks; this study will also evaluate the effect (if any) on scour, of aggregate extraction near to such wrecks. The conclusions of the complete study will be used to design with more confidence, exclusion zones to protect wrecks of archaeological importance.

Equipment deployed: A total of eight instruments were deployed at chosen locations around the wreck (see Figures 1&2) for around 31 days. Instruments were mounted upon weighted seabed frames (Figures 3&4) with diver locater beacons. The instrument suite comprised: 3 Nortek AWACs (1MHz); 3 Nortek Aquadopp profilers (1 MHz - 2 of which in sideways configuration); 1 Nortek Continental (470kHz); and 1 RDI Sentinal Workhorse (1200kHz). Instruments recorded regular profiles of flow velocity and also collected information about waves and water depth. The main profile data collected by each instrument is summarised below.

Site number	Instrument*	Data extent (days)	Data extent (distance)	Number of profiles	Interval (min)	Cell size (m)
1	RDI	21.99	15-20m	7919	4	0.5
2	Aquapro up	21.33	To surface -10%	2905	10	0.5
3	Aquapro side	31.99	25m	4605	10	0.5
4	Aquapro side	33.12	15-25m	4780	10	0.5
5	Continental	31.07	4m	2983	15	2
6	AWAC	31.82	To surface -10%	4581	10	0.5
8	AWAC	30.97	To surface -10%	4458	10	0.5
9	AWAC	32.67	To surface -10%	4704	10	0.5

Table 1 – Data extent and setup of the instruments.
* ‘up’=upwards looking; ‘side’=sideways looking

Location and timeframe of deployment: The general study site is the dredging license area associated with the Hastings bank, approximately 20km east of Beachy Head and 13km south of Hastings (see Figure 2). The specific study site is centered upon an ‘Unknown wreck’, position 50°44.59’N, 000°36.18’E (NGR 583740E 96960N) approximately 200m outside the license area. The majority of frames were within 150m of the wreck. Instruments were deployed between the 18th-20th of June and recovered between the 21st-22nd of July, 2005

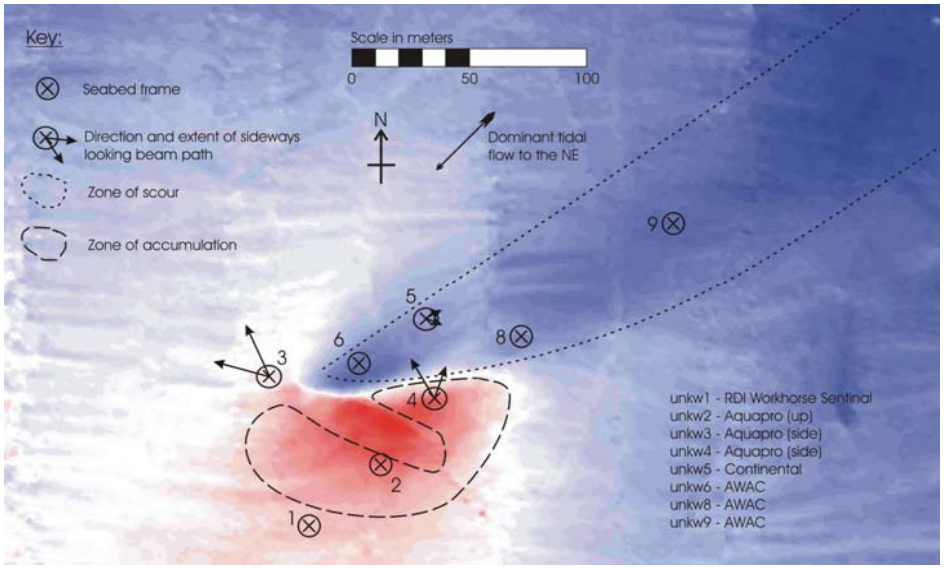


Figure 1 – Location of instruments around the wreck. Arrows indicate the extent of the measurements made by sideways looking units. Data provided by Hanson Marine Ltd.

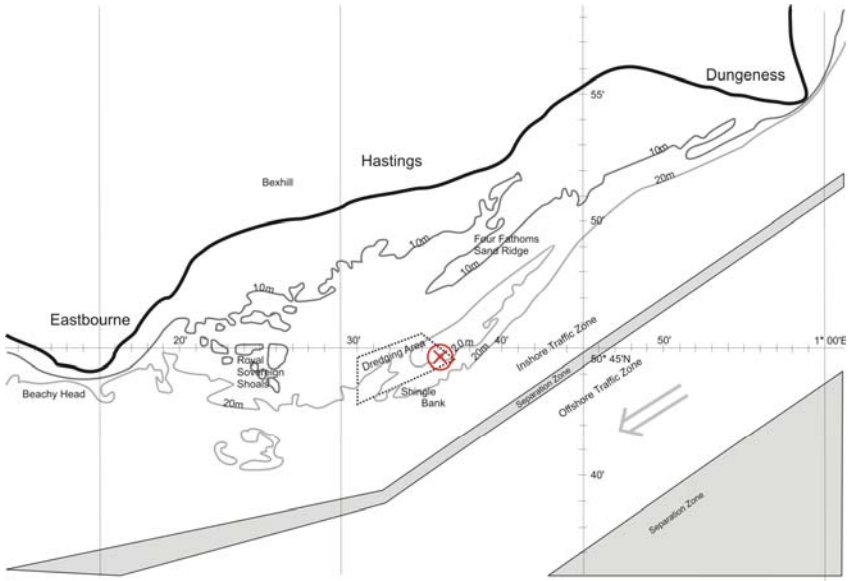
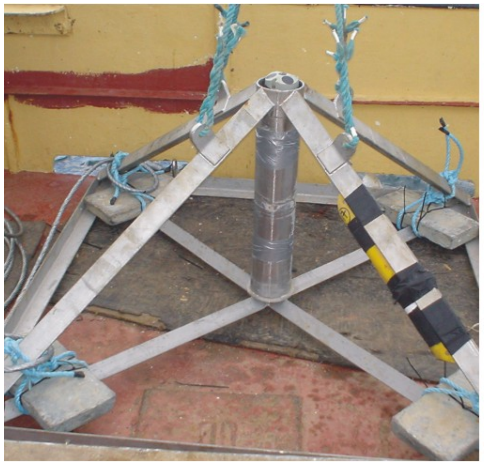


Figure 2 – Location of the site, relative to the coast and offshore traffic separation zones. Image after UKHO Admiralty Chart 536 – Beachy Head to Dungeness.



Figures 3&4 – the small (1.2x1.2x0.6m) and large (2.0x2.0x1.8m) seabed frames used in this study. Also shown are the frame weights, diver locator beacons on both frames and Nortek Aquadopp profilers in upwards and sideways looking modes, respectively.

Data and Observations: The flow meters measured primarily, profiles of velocity at the intervals and cell resolution listed in Table 1. Each profile represents one minute of time averaging and therefore represents most closely, the flow generated by the tide. Examples of the data collected in this way are shown in Figure 5.

The flow meters also recorded high frequency (2Hz) time series of flow at a single location near to the bed. These data provide some indication of the flow amplitude of large waves; however, detailed measurements of this kind are typically made using other types of instruments. Measurements of the actual water depth (showing waves at the water surface) were made at the same frequency using a pressure sensor and, in some cases, a modified depth sounder.

During equipment deployment and recovery, divers were used to attach, release and orientate many of the instruments. Whilst underwater, divers collected video footage and some sediment samples. In combination with the flow measurement data and images of the seabed collected by other organisations, it is possible to build a detailed picture of the distribution and possible interactions between seabed sediments and the typical flows found around the site.

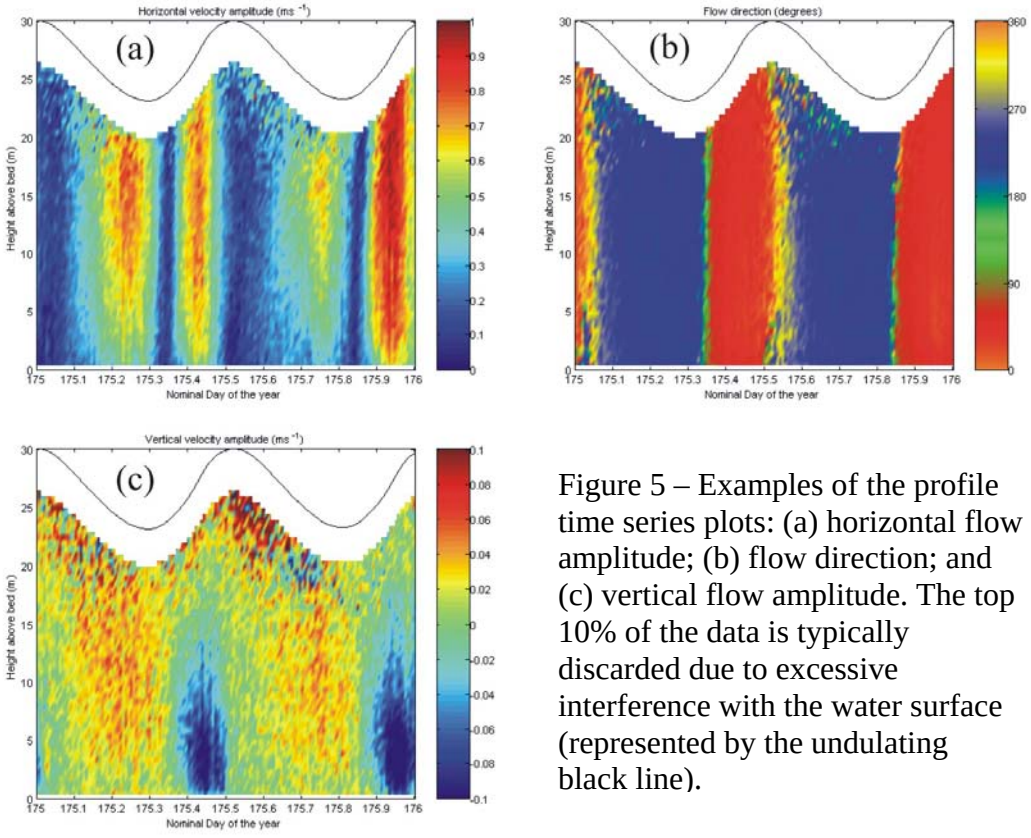


Figure 5 – Examples of the profile time series plots: (a) horizontal flow amplitude; (b) flow direction; and (c) vertical flow amplitude. The top 10% of the data is typically discarded due to excessive interference with the water surface (represented by the undulating black line).

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