



NRA

NORTHUMBRIA & YORKSHIRE REGION

WATER GUARDIAN
CAPABILITY
STATEMENT



CAPABILITY STATEMENT OF THE COASTAL SURVEY VESSEL *WATER GUARDIAN*

CONTENTS	Page
LIST OF FIGURES	2
1 INTRODUCTION	3
2 TECHNICAL DETAILS	3
3 CREW	3
4 SAMPLING CAPABILITIES	4
5 STORAGE FACILITIES	4
6 HEALTH AND SAFETY	4
7 DOMESTIC FACILITIES	4
8 WATER QUALITY ANALYSIS	9
8.1 AUTOSAMPLER AND AUTOANALYSER	9
8.2 ECOPROBE	10
8.3 TOW FISH	13
8.4 AQUATRACKER	14
9 BIOLOGICAL QUALITY SAMPLING	17
9.1 SEDIMENT SAMPLING	17
9.1.1 BOX CORER	17
9.1.2 DAY GRAB	17
9.1.3 VAN VEEN GRAB	17
9.1.4 GRAVITY CORER	17
9.1.5 PROCESSING SEDIMENT SAMPLES	18
9.2 FISHERIES SURVEY	25
9.2.1 BEAM TRAWL	25
9.3 OTHER BIOLOGICAL MONITORING	25
10 HYDROGRAPHIC SURVEYS	26
10.1 DROGUE TRACKING	26
10.2 SPORE/DYE TRACING	26
10.3 CURRENT PROFILING	26
11 BATHYMETRIC SURVEYS	26
11.1 SUBSTRATE PROFILING	26
12 NAVIGATION	29
12.1 QUBIT TRAC AND CHART SYSTEM	29
12.2 GYROCOMPASS	29
12.3 BRIDGEMASTER	29

LIST OF FIGURES

FIG	TITLE	PAGE
1	Technical drawing of vessel layout	5
2	Storage facilities in the aft hold	7
3	The Galley	7
4	Sleeping quarters	7
5	Example trace from the auto-analyser	11
6	Example trace from the Aquashuttle	15
7	Box corer	19
8	Day grab	19
9	Van Veen grab	21
10	Gravity corer	21
11	Processing sediment samples	23
12	Beam trawl	23
13	Tees estuary trawl data	27
14	Diagram representing QUBIT system	30

1 INTRODUCTION

The aim of this document is to describe the capabilities of the coastal survey vessel **WATER GUARDIAN** and the application of its uses.

WATER GUARDIAN is one of a fleet of four purpose built vessels which are owned and run by the National Rivers Authority. It is designed for collecting water, sediment and biological samples for statutory needs (National and International), national surveillance programme of the marine environment, and any regional operational needs. It was built and commissioned in 1992 by David Abels Boatbuilders of Bristol and is now permanently berthed at the Hartlepool marina. Additional berthing facilities exist at various locations along the North East coast with a permanent berth allocation at Tyne Dock.

WATER GUARDIAN routinely works for the National Rivers Authority in the estuaries and along the North East coast, but has worked up to 30 miles off shore, and as a contractor for other organisations. Clients include Wimpey Environmental, Hull University Institute of Coastal and Estuarine Sciences, Sheffield University, Plymouth Marine Laboratory, NERC, Port of Tyne, Tees Development Corporation, and University of Newcastle-upon-Tyne. A full set of admiralty charts on board the vessel mean that it has the navigational information to survey anywhere in the British Isles.

2 TECHNICAL DETAILS

Technical drawings of the layout of the vessel are shown in figure 1. The principal dimensions of **WATER GUARDIAN** are:

Overall length	16.45m	Overall breadth	5.50m
Depth mid	2.25m	Draught aft (max)	1.70m
Gross Tonnage	51.31t	Net Tonnage	27.65t
Top speed	10 knots	Engines	Twin 180bhp engines
Wheelhouse	Forward		
2 Generators	63 Amps, 20 Amps (Also capable of connecting to shore power.)		

The engines and main generator are keel cooled so that power can be supplied even when the vessel is aground.

There is an intercom system between the cabin and deck, and the accommodation.

3 CREW

WATER GUARDIAN is operated by a master with assistance from a survey officer, a standby skipper is also available. The crew hold all the relevant qualifications to enable the vessel to undertake various surveys, including trawling in British tidal waters.

The Master's Qualifications

- Class V deck officer with Command endorsement,
- Class 2 fishing ticket allowing trawling,
- Ships Captain medical certificate.

The Survey Officer's Qualifications:

- 1st class degree in Oceanography/Hydrography,
- RICS (Royal Institute of Chartered Surveyors) final qualifying exams,
- Class V deck officer
- First Aid at sea.
- Efficient Deckhand

4

SAMPLING CAPABILITIES

- Minimum draft 1.7m in fully loaded condition.
- Winches 4 ton twin drum trawl winch.
0.5 ton sampler winch and davit.
1.5 ton HIAB crane
- ✦ The survey cabin area covers 15m² and includes 3.5m² bench space, sink, power points (24v, 12v DC and 240 AC), running sea-water via a peristaltic pump through four taps, and fresh water.
 - ✦ The deck area covers approximately 31m² and can be fully illuminated if survey requirements are such that work has to be carried out at night.
 - ✦ The gantry at the stern of the vessel is mounted on hydraulic rams so that it is capable of moving fore and aft. This adds to the ease and safety of using sampling equipment.
 - ✦ Divers can be deployed from the stern of the vessel.
 - ✦ ***WATER GUARDIAN*** is equipped to sample a wide range of determinands and materials. Sections 8 - 12 describe some of that capability giving examples of work done and various outputs. If any survey requirements are not covered in this document we would be pleased to discuss them.

5

STORAGE FACILITIES

There are ample storage facilities on board ***WATER GUARDIAN*** for empty bottles and chemical and biological samples in the aft hold (see fig 2). If lower temperatures are required then refrigerator and freezer facilities are available in this area.

6

HEALTH AND SAFETY

WATER GUARDIAN complies with all Department of Transport and SOLAS (Safety of Life at Sea) Regulations, COSHH (Control of Substances Hazardous to Health) Regulations, and it operates to NRA Code of Practice - Marine Activities. All staff are trained in sea survival and as VHF radio operators. ***WATER GUARDIAN*** is equipped with 8 survival suits, 12 life jackets, 2 hand held EPIRBs and 1 automatic EPIRB, Search and Rescue Transponder, line throwing apparatus, flares, 2 life rafts (3 if necessary), full set of code flags. The maximum number of personnel allowed on board, including crew, is 12 in estuaries, and 8 off shore.

7

DOMESTIC FACILITIES

WATER GUARDIAN has accommodation for up to 7 people in 3 cabins and mess facilities for up to 8 (see figs 3 and 4). The facilities available include W.C., shower, basin, microwave, 2 ring hob, grill, kettle, colour television (with remote control), refrigerator, 2 freezers, vodaphone and fax.

Figure 1 TECHNICAL DRAWING OF VESSEL LAYOUT

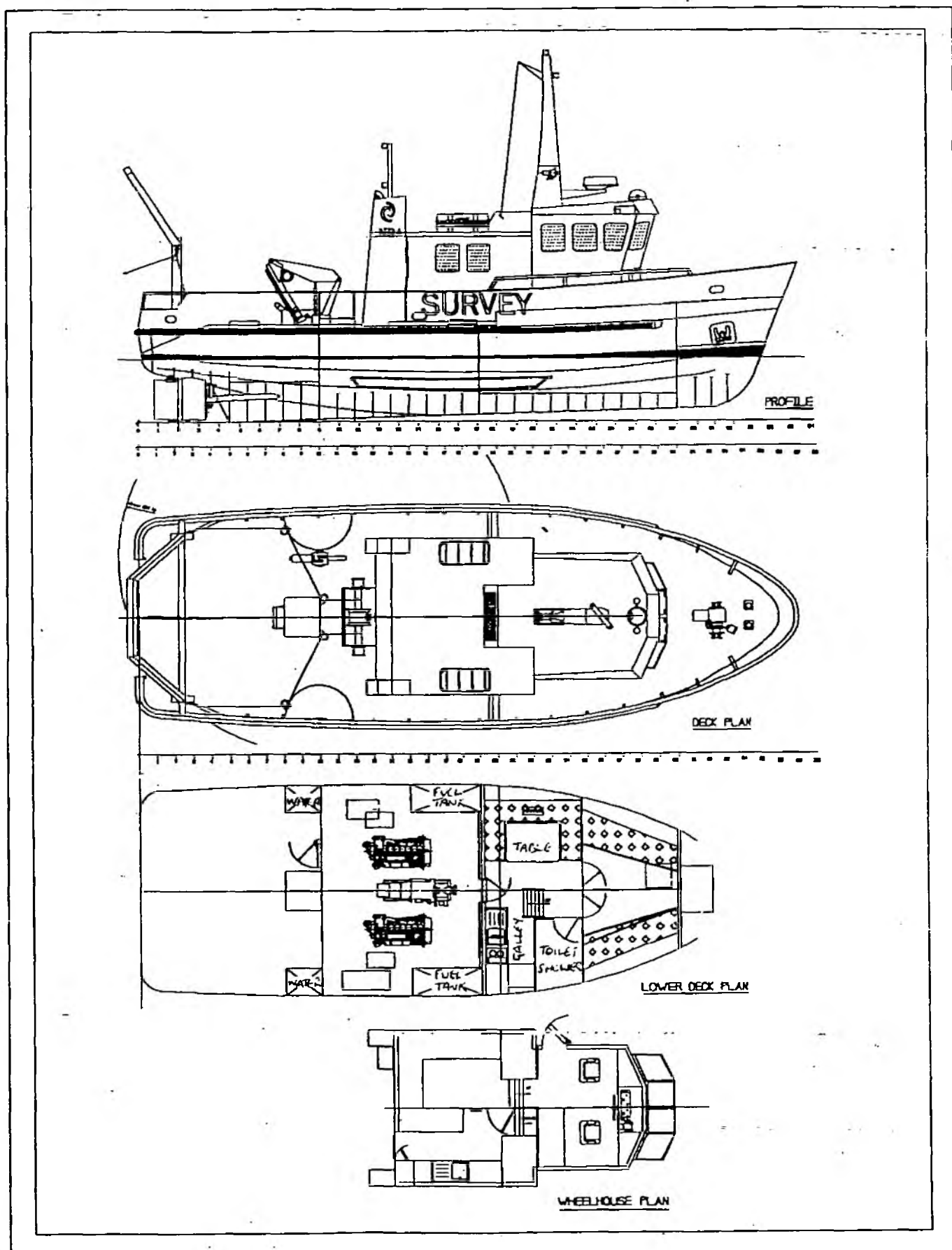


Figure 2

STORAGE FACILITIES IN THE AFT HOLD



DOMESTIC FACILITIES

Figure 3

THE GALLEY



Figure 4

SLEEPING QUARTERS



WATER QUALITY ANALYSIS

8.1 AUTOSAMPLER AND AUTOANALYSER

The autoanalyser is set up to analyse water samples at regular intervals (2 minutes) as the vessel is sailing giving almost immediate results. Water is sampled from 1m below the surface via a peristaltic sea water pump containing a 0.4µm exclusion filter. The filtrate is passed through a 100ml flow-through cell at 0.5 litres per minute, and the excess is sent to waste. The SKALAR AUTOSAMPLER removes a sample from the cell every two minutes, and also logs the exact location of the sample via the QUBIT system. (See section 12.1)

The sample is split four ways in the autoanalyser and at present is set up to read **total nitrogen, silicate, phosphate, and ammonia** using standard colourimetric methods. It can however be set up to measure other determinands including metals. Results from each of the four channels are calculated using a standard curve of known concentration in accordance with the Beer Lambert Law. Figure 5 shows an example of some data collected by the autoanalyser, and processed through the QUBIT system (section 12.1)

There are quality control procedures which operate on board the vessel to provide consistency and reliability in the results.

- ★ *DRIFT AND QUALITY CONTROL STANDARDS ARE RUN EVERY THIRTY SAMPLES TO COMPENSATE FOR ANY BASELINE DRIFT WHICH MAY OCCUR.*
- ★ *NEW INTERMEDIATE CHEMICAL STOCK IS PREPARED BEFORE EACH SURVEY FROM STANDARD STOCK AND REFRIGERATED AT 4°C FOR THE DURATION OF THE SURVEY.*
- ★ *DETECTION LIMITS ARE CALCULATED FROM STANDARD SOLUTIONS.*

The autoanalyser can be connected to a plotter which will give an instant demonstration of the trace.

Normally the autoanalyser is set up to the following standard:

DETERMINAND	RANGE	LIMIT OF DETECTION AND ACCURACY
Nitrate	1 to 500 p.p.b.	12 p.p.b.
Ammonia	1 to 200 p.p.b.	12 p.p.b.
Phosphate	1 to 150 p.p.b.	2.3 p.p.b.
Silicate	1 to 300 p.p.b.	1 p.p.b.

Application and uses to date.

Coastal and estuarine surveys around the North East coast of England.

South coast of Britain for Southern Region NRA.

8.2 ECO PROBE

The ECO probe is an instrument which can measure 6 parameters concurrently in the field. These are **dissolved oxygen, temperature, conductivity, pressure, pH, and transmission.** On board *WATER GUARDIAN* there are three ECO probes, one of which is in a flow through cell and is used for surface water sampling. The second can be used for a depth profile or spot sampling of those parameters. The third is permanently fixed in the Aquashuttle (See section 8.3).

The ECO probe is capable of interfacing with the on board QUBIT-TRAC system to record and display data (see section 12.1). Figure 6 gives an example of data collected from the ECO PROBE on board the Aquashuttle.

The range of measurements of the various parameters taken by the ECOPROBE are as follows:

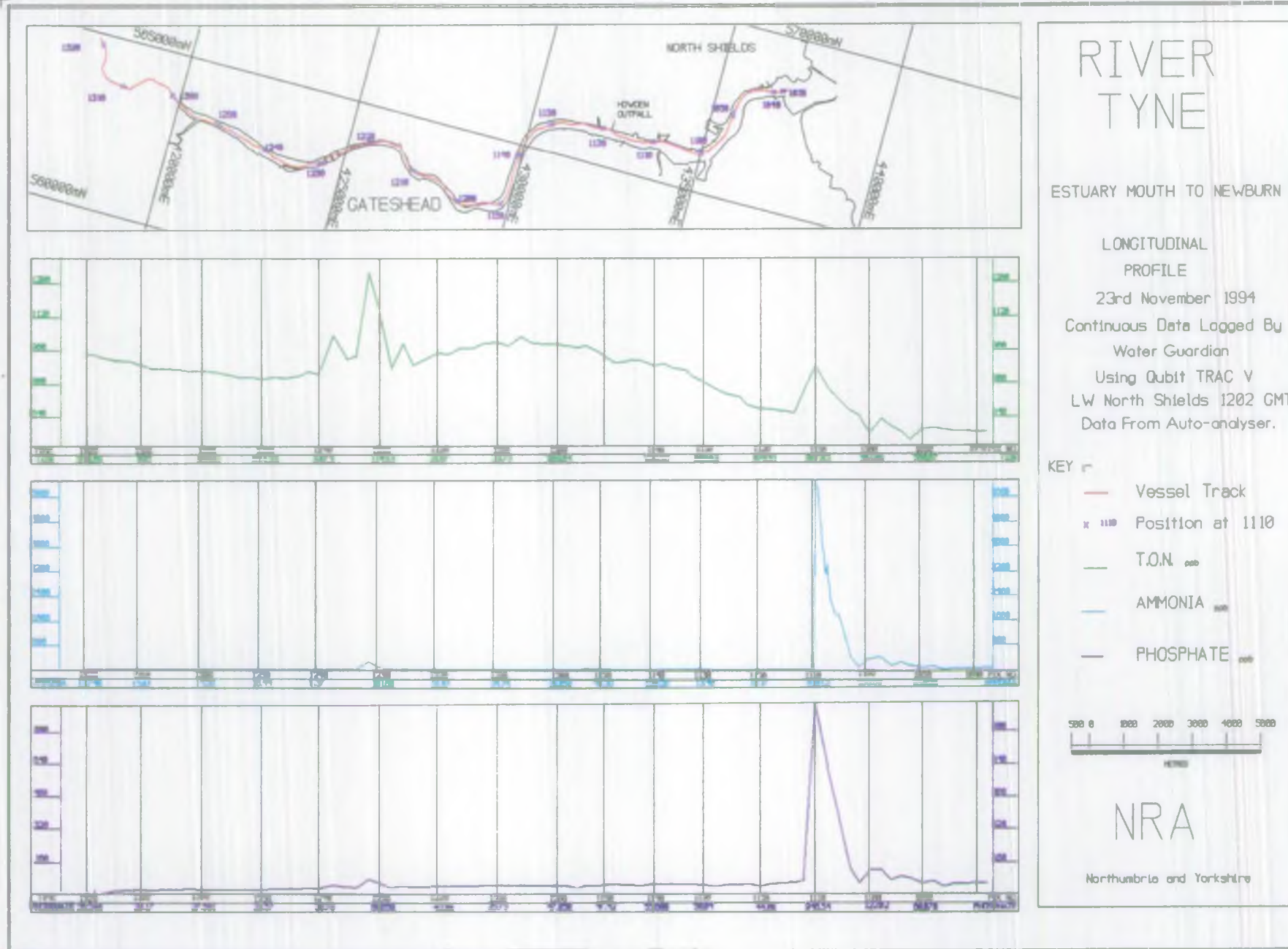
PARAMETER	RANGE	UNITS	ACCURACY
Temperature	-2 to 38	°C	+/- 0.01
Conductivity	0 to 65	mS/cm	+/- 1
Dissolved Oxygen	0 to 150	%	+/- 0.1 ppt
pH	4 to 11	pH units	+/- 0.05
Transmission	1 to 100	%	+/- 0.5
Pressure	0 to 100	dBar	+/- 0.5

Application and uses to date.

National Marine Monitoring Programme. NRA's Annual monitoring for a range of determinands at a network of UK sites for DoE. Materials sampled include water, sediments, fish, shellfish, bioassays.

Figure 5

NUTRIENT DATA FROM TYNE ESTUARY COLLECTED FROM AUTOANALYSER AND PRINTED THROUGH QUBIT



8.3 TOWFISH (AQUASHUTTLE)

The TOWFISH is a stable, undulating vehicle which can be towed along at controllable depths in the water column, between 0 and 100m with a wavelength of 800m to 40Km to collect profile data. It has a volume of 20 litres and is therefore able to contain a suite of instrumentation. On *WATER GUARDIAN* the Towfish routinely contains an ECO PROBE measuring conductivity, temperature, dissolved oxygen, pH, transmission, and a BACKSCATTER FLOUROMETER for measuring chlorophyll a. Additional instruments could be installed to measure an extensive range of underwater parameters including bioluminescence, underwater sample collection for plankton records, and fish egg monitoring. The instruments are connected by cables to the on board QUBIT system which can log all the data recorded alongside the navigational information. (See section 12.1).

The Towfish is relatively light weight and robust, capable of being towed at speeds of up to 20 knots and can be launched and recovered while the vessel is underway, by non-scientific crew with minimal training.

The range of measurements of the various parameters taken by the AQUASHUTTLE are as follows:

PARAMETER	RANGE	UNITS	ACCURACY
Temperature	-2 to 38	°C	+/- 0.01
Conductivity	0 to 65	mS/cm	+/- 1
Dissolved Oxygen	0 to 150	%	+/- 0.1 ppt
pH	4 to 11	pH units	+/- 0.05
Transmission	1 to 100	%	+/- 0.5
Chlorophyll a #1	0 to 10	mg/l	
Chlorophyll a #2	0 to 100	mg/l	

Applications and uses to date

Mixing zone studies

Howden STW mixing zone

NRA National Coastal Survey.

Aim to obtain coastal water quality data as part of coordinated national NRA approach.

Tyne estuary water quality

Collection of spatial and temporal water quality information for classification and regulation purposes.

8.4 AQUATRACKA

This is a compact, lightweight submersible instrument capable of measuring depth profiles up to 60m. It can be set up for measuring either **Rhodamine**, or **Chlorophyll a** or for **nephelometry** (measurement of particle concentration by light attenuation) and is calibrated by the manufacturer as necessary. It is routinely used for Chlorophyll a monitoring, but can easily be converted to measure one of the other parameters (with some notice). It has a high degree of sensitivity, and accuracy and can operate accurately in shallow water.

The following details describe the ranges measured and accuracy of the readings:

DETERMINAND	RANGE	UNITS	ACCURACY
Chlorophyll a	0.01 to 100	$\mu\text{g/l}$	± 0.01
Rhodamine	0.01 to 100	$\mu\text{g/l}$	± 0.01
Nephelometer	0.2 to 750	$\mu\text{g/l}$	± 0.2
	0.4 to 1500	$\mu\text{g/l}$	± 0.4

Applications and uses to date

NRA National Coastal Survey.

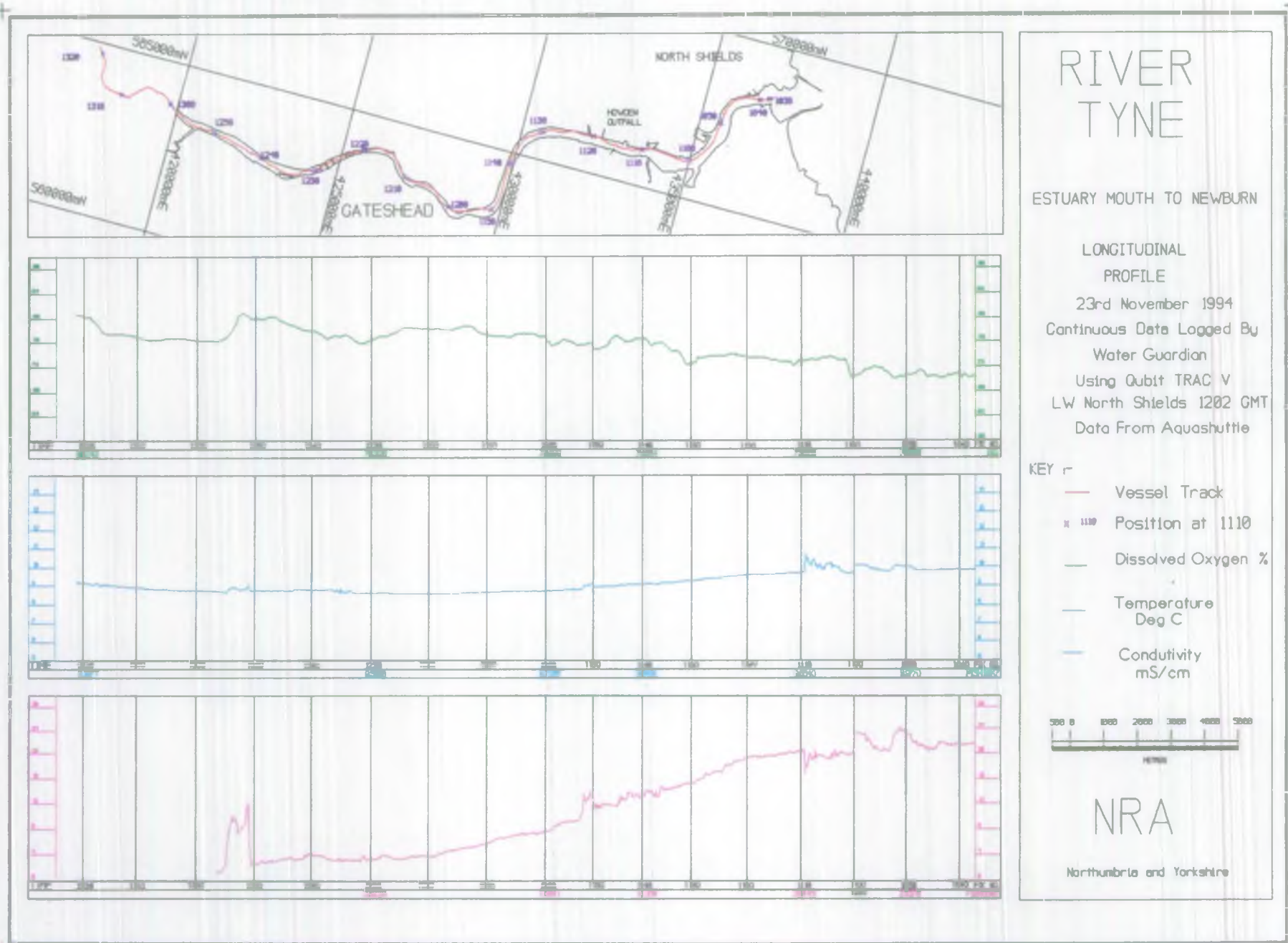
Aim to obtain coastal water quality data as part of coordinated national NRA approach.

Scarborough outfall, Yorkshire

Investigation of the extent of local effects and impact of the outfall by a dye tracing study.

Figure 6

DISSOLVED OXYGEN, TEMPERATURE AND CONDUCTIVITY IN THE TYNE ESTUARY COLLECTED FROM THE AQUASHUTTLE AND PRINTED THROUGH QUBIT



BIOLOGICAL SAMPLING

9.1 Sediment sampling

A number of techniques from a range of sampling devices are presently available onboard *WATER GUARDIAN* for sampling sediments either for their biological component, or for their physical structure, or for chemical composition. The following grabs and corers are routinely in use but other devices may be applied if necessary.

9.1.1 BOX CORER

This instrument constructed from a galvanised steel frame containing a weighted coring tube is used for sampling sediments (see figure 7). It is lowered over the stern of the vessel on to the bed where it is automatically triggered by the transfer of the weight of the device, to take a sediment core sample with a surface area of 0.025m^2 . It is very effective in a wide range of estuarine sediment types consistently reaching a depth of 20cms. Undisturbed cores can be used for Redox profiling.

The core taken can be used for macroinvertebrate population studies including sediment particle size analysis, and accumulation of metals and organics.

9.1.2 DAY GRAB

This is a large galvanised steel grab which is deployed over the stern of the vessel for taking quantitative benthic samples (see figure 8). As it hits the substrate a catch is released which automatically triggers the sample collection. It takes samples with a surface area of 0.1m^2 to a maximum depth of 15cm.

The sediment sample taken can be used for macroinvertebrate population studies, as well as sediment analysis.

9.1.3 VAN VEEN GRAB

This is a sampling instrument which works along the same principle as the day grab, but is smaller and can be used by hand over the side of a small vessel (see figure 9). It takes samples with a surface area of 0.05m^2 .

9.1.4 GRAVITY CORER

This is a large corer designed for penetrating into marine sediments to a depth of up to 1.5m. The heavy duty stainless steel core is suspended from a 500Kg weight and deployed from the stern of the vessel (see figure 10). The shear weight of the corer pushes the tube deep into the sediment. The samples taken are suitable for depth profiling of chemical contaminants.

9.1.5 PROCESSING SEDIMENT SAMPLES

WATER GUARDIAN has on board all the equipment necessary to wash and sieve all the macroinvertebrate sediment samples collected. Generally the procedure used involves the sediment sample (collected by any method) being transferred to a hopper. This fits into a tilting cradle on the sieve table. A low pressure sea water pump is used to wash the sample from the hopper down the chute to the sieve (see figure 11). A smaller sea water hose is available for back washing the sieve to concentrate and transfer the sample into a suitable container for preservation as necessary.

Sieves available on board **WATER GUARDIAN** are Endecot stainless steel sieves with a mesh size of 1mm or 0.5mm. These conform with the BS 410 specification.

Application and uses to date

SAMPLER	LOCATION	CLIENT	SURVEY
BOX CORER	Tees & Tyne	NRA	Estuarine outfall impact investigations.
	Tees	DoE	Operational Investigation: Methods comparison Tioxide directive monitoring
DAY GRAB	Tyne, Wear & Tees estuaries,	NRA	National Marine Monitoring Programme
	Offshore Tyne & Tees.		
	Tees estuary	NRA	Sediment PCB investigation
	Tyne, Wear, Tees	DoE	Dangerous Substances Directive Monitoring
VAN VEEN GRAB	Scarborough		Sewage outfall impact investigation
	Offshore	Hull University	Sand extraction impact investigation
	Tyne, Wear, Tees, Blyth, Tweed	DoE	Dangerous Substances Directive Monitoring
	Albert Edward Dock, Tyne	NRA	Pollution investigation
GRAVITY CORER	Tees	NRA	National Marine Monitoring Programme
	Blyth	NRA	PCB sediment contamination investigation

Figure 7

BOX CORER

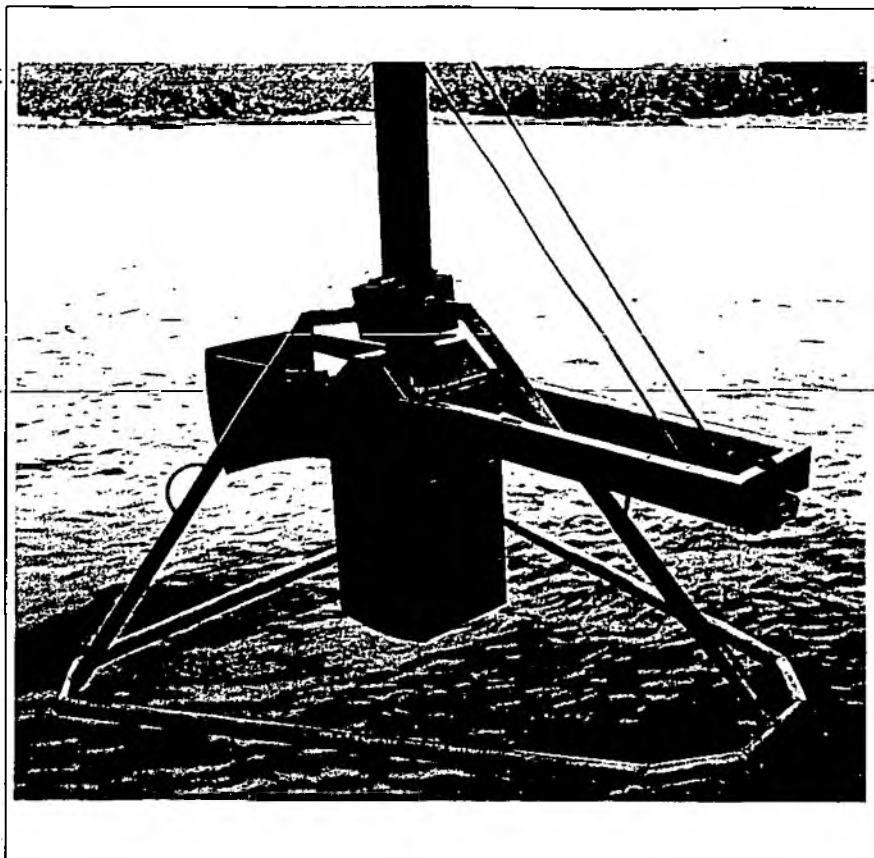


Figure 8

DAY GRAB

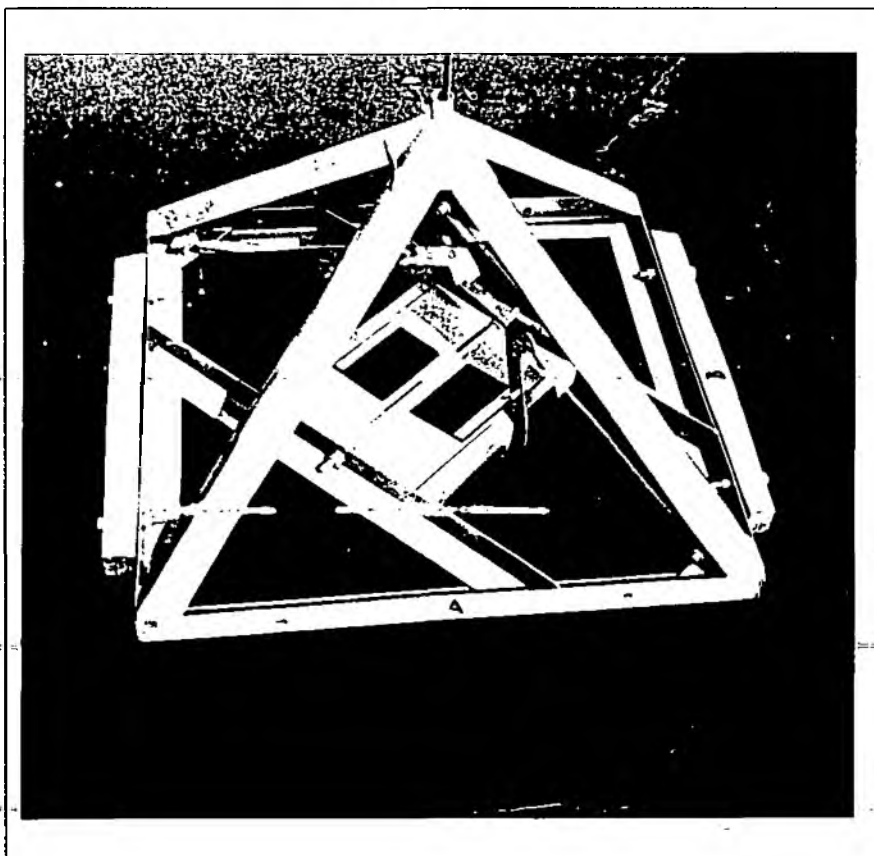


Figure 9

VAN VEEN GRAB



Figure 10

DIAGRAM OF GRAVITY CORER

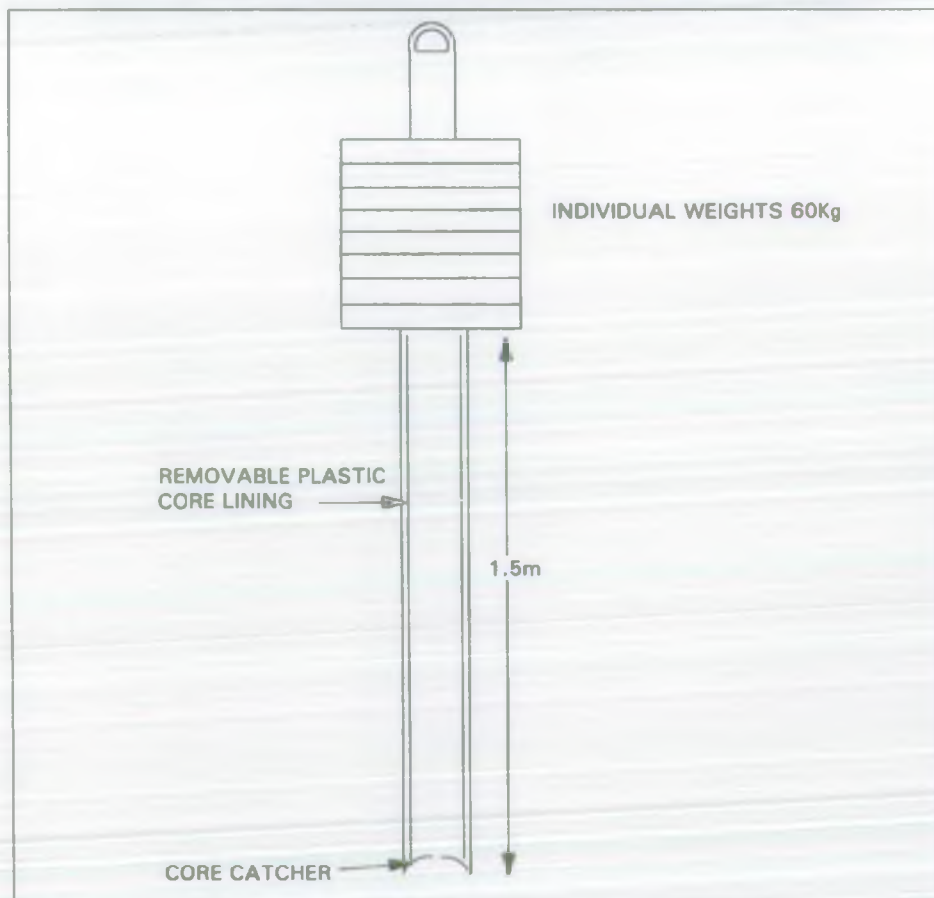


Figure 11 PROCESSING SEDIMENT SAMPLES



Figure 12 BEAM TRAWL



9.2 Fisheries surveys

9.2.1 BEAM TRAWL

The beam trawl on board the vessel is 2.4m wide. The net has a 40mm mesh with a 10mm mesh cod end (see figure 12), and is towed at speeds of up to 3 knots through the water. *WATER GUARDIAN* has a lowered towing point that is directed through the transom which avoids unsafe use of the gantry, and lowers the centre of effort making trawling easier.

The beam trawl can be used for surveying throughout an estuary, including operating successfully in shallow waters, it is simple to deploy and haul from the vessel, it is aimed at demersal species such as flounder and dab which have many of the characteristics necessary of sentinel organisms in pollution-studies, and it is robust and easy to maintain.

Trawl surveys can operate with a minimum of three experienced crew.

Applications and uses to date

The objectives of surveys using the beam trawl are to monitor the indigenous fish populations and the more mobile megabenthos in relation to the expected community, populations and health given the hydrophysical nature of the area.

LOCATION	CLIENT	SURVEY
Tyne, Wear, Tees & Blyth estuaries.	Tees Development Corporation, & DoE (Tioxide Directive)	Annual quantitative study of status in demersal fish populations in relation to change with time. (See figure 13 for example of survey results)
Tyne, Wear, Tees & Blyth estuaries.	Tees Development Corporation, & DoE (Tioxide Directive)	Annual study of health of flounder populations through the examination of external morbid lesions.
Tyne, Wear & Tees estuaries and offshore.	National Marine Monitoring Programme	Collection of flounder and dab tissue samples for chemical analysis in bioaccumulation studies.
Blyth estuary	NRA	Collection of invertebrates and flounder for PCB analysis in bioaccumulation study.
Humber estuary	Anglian NRA	Humber fish surveys

9.3 Other biological monitoring

The towing technique can easily be adapted to operate other apparatus off the stern of the vessel. For example plankton nets (as operated for the University of Newcastle-upon-Tyne) and any other nets of different mesh sizes, mid-water trawls, as well as the towfish (see section 8.3).

HYDROGRAPHIC SURVEYS

10.1 DROGUE TRACKING

Use of the RADAR system on board *WATER GUARDIAN* allows for up to 30 targets to be simultaneously tracked at intervals of between 15 seconds and 30 minutes (see section 12.3). This has useful applications in a number of ways, for example to study the impact of a sewage outfall plume from a treatment works on the bathing beach water quality at nearby beaches.

10.2 SPORE/DYE TRACING

Use of the AQUATRACKA can allow for rhodamine dye to be traced. This has useful applications in investigating impact of existing or potential outfalls, and also on the effect of tidal movements on flows.

10.3 CURRENT PROFILING

An ACOUSTIC DOPPLER CURRENT PROFILER (ADCP) is an instrument which can quickly and accurately evaluate water velocities throughout the whole water column. It does this by transmitting acoustic pulses of a known frequency into the water, and measuring the reflections whose frequency is slightly changed in proportion to the velocity of the particles. This change is known as the 'doppler' shift. By breaking the signal into uniform segments, a profile through the water column can be recorded, and the ADCP can use this to calculate river or estuary discharge values. Data collected can be instantaneously viewed in a variety of formats, allowing the operator to assess the quality of the data being acquired and examine particular areas of interest further.

This equipment has been successfully used by North West NRA in measuring the Mersey estuary flux over a spring-neap cycle, as a part of a fish migration study, and for accurately measuring the slow flow in the Manchester ship canal. It has very many applications, and can be deployed from *WATER GUARDIAN* for similar work.

BATHYMETRIC SURVEYS

11.1 SUBSTRATE PROFILING

The use of echosounders, pingers, and side scan sonar in conjunction with the QIBIT TRAC system (section 12.1) will enable profiles of the sea, estuary or river bed to be accurately mapped, along with an indication of the 'softness' of the substrate type, which gives an indication of bedrock, shingle, sand or mud etc.

This can be useful in monitoring movement of substrates (for example, movement of the colliery spoil along the North East coast), investigating new pipeline or trench locations, as well as the condition of existing features, and surveys prior to and after dredging operations.

Figure 12

TEES ESTUARY TRAWL SURVEYS 1993

Summary of Species recorded

GREATHAM CONTROL - 10 tows

<i>Crangon crangon</i>	<i>Myoxocephalus scorpius</i>
<i>Carcinus maenas</i>	<i>Agonus cataphractus</i>
<i>Liocarcinus depurator</i>	<i>Limanda limanda</i>
<i>Pandalus montagui</i>	<i>Pleuronectes platessa</i>
<i>Asterius rubens</i>	<i>Platichthys flesus</i>
<i>Pollachius virens</i>	<i>Gadus morhua</i>
<i>Merlangius merlangus</i>	

WILTON - 10 tows

<i>Crangon crangon</i>	<i>Limanda limanda</i>
<i>Carcinus maenas</i>	<i>Pleuronectes platessa</i>
<i>Liocarcinus depurator</i>	<i>Platichthys flesus</i>
<i>Agonus cataphractus</i>	<i>Gadus morhua</i>
<i>Zoarces viviparus</i>	<i>Asterius rubens</i>
<i>Pollachius virens</i>	<i>Octopus vulgaris</i>
<i>Merlangius merlangus</i>	

PORTRACK - 12 tows

<i>Crangon crangon</i>
<i>Merlangius merlangus</i>

2 species

MIDDLESBROUGH DOCK - 12 tows, 14 species

<i>Crangon crangon</i>	<i>Pollachius virens</i>
<i>Carcinus maenas</i>	<i>Sprattus sprattus</i>
<i>Liocarcinus depurator</i>	<i>Platichthys flesus</i>
<i>Pandalus montagui</i>	<i>Limanda limanda</i>
<i>Myoxocephalus scorpius</i>	<i>Pleuronectes platessa</i>
<i>Merlangius merlangus</i>	<i>Gadus morhua</i>
<i>Cancer pagurus</i>	<i>Clupea harengus</i>

QUEEN ELIZABETH

<i>Crangon crangon</i>
<i>Carcinus maenas</i>
<i>Liocarcinus depurator</i>
<i>Pandalus montagui</i>
<i>Cancer pagurus</i>
<i>Merlangius merlangus</i>
<i>Gadus morhua</i>
<i>Myoxocephalus scorpius</i>
<i>Agonus cataphractus</i>
<i>Sprattus sprattus</i>
<i>Pollachius virens</i>
<i>Limanda limanda</i>
<i>Pleuronectes platessa</i>
<i>Platichthys flesus</i>

- 11 tows, 14 species

SMITHS DOCK - 10 tows, 16 species

<i>Crangon crangon</i>
<i>Carcinus maenas</i>
<i>Liocarcinus depurator</i>
<i>Pandalus montagui</i>
<i>Pomatoschistus minutus</i>
<i>Merlangius merlangus</i>
<i>Myoxocephalus scorpius</i>
<i>Sprattus sprattus</i>
<i>Pollachius virens</i>
<i>Limanda limanda</i>
<i>Pleuronectes platessa</i>
<i>Gadus morhua</i>
<i>Platichthys flesus</i>
<i>Agonus cataphractus</i>
<i>Aspitrigla cuculus</i>
<i>Cancer pagurus</i>

BAMLETTS BIGHT - 12 tows, 12 species

<i>Crangon crangon</i>	<i>Sprattus sprattus</i>
<i>Carcinus maenas</i>	<i>Platichthys flesus</i>
<i>Liocarcinus depurator</i>	<i>Limanda limanda</i>
<i>Merlangius merlangus</i>	<i>Pandalus montagui</i>
<i>Anguilla anguilla</i>	<i>Clupea harengus</i>
<i>Pleuronectes platessa</i>	<i>Gadus morhua</i>

Yarm

N

Scale

0 1 km

NORTH

SEA

13 species

13 species

Billingham

Stockton

NAVIGATION

12.1 QUBIT TRAC AND CHART SYSTEM

The QUBIT TRAC (Transportable Realtime Autonavigation Computer) part of the system is on board the vessel, and this is the part which provides an interface between the navigational equipment and the scientific samplers (probes, fluorimeter and autoanalyser). This enables all the scientific information gathered to be accurately recorded over time, distance and depth during a survey. (Figures 5 and 6 show examples of survey data which has been processed through QUBIT). It also allows a specific location to be targeted to within 3m, in order that temporal change can be adequately monitored by taking repeat samples at time intervals and comparing data sets. Up to 20 parameters can be recorded at any one time, and up to 10 can be viewed on screen. QUBIT is compatible with any instrumentation with RS232, 322 or NMEA 183 digital output, or low voltage analogue output.

Positioning is provided by RACAL/DECCA 53G Navigator with Differential GPS, Raw GPS and DECCA capabilities to a best accuracy of $\pm 5m$ 2drms.

QUBIT TRAC can also be configured to utilise a wide range of short/medium range positioning systems to provide accuracies of $\pm 3m$ (eg Trisponder, Microfix etc).

On completion of surveys fairsheets can be produced using QUBIT CHART V system on media up to A0 in size. (NB QUBIT CHART V is located in the NRA office). Figure 14 shows a representation of how the sampling equipment and navigational systems link together through the QUBIT.

12.2 GYROCOMPASS

The navigational equipment on board the vessel includes both a magnetic compass on which bearings can be taken, and a gyrocompass as well as echo sounder and lead lines to measure water depths and a JMC Doppler log to record speed through water.

The ROBERTSON RGC50 Gyrocompass works directly with the autopilot enabling a more reliable course to be steered in heavy seas. It also interfaces with the QUBIT trac system providing large benefits in accurate sample collection and recording.

12.3 RADAR

The BRIDGEMASTER 180/4 is the radar system installed on the vessel. It includes the Autotrack and Geographics option which allows the operator to build up maps showing navigational and safety information, and stores this on memory cards. It can also automatically plot up to 30 targets with safety parameters to enable warning alarms to be given for collision avoidance. The accuracy and sensitivity of this function mean that it can also be used for drogue tracking by recording up to 30 drogue positions simultaneously at intervals from 15 seconds up to 30 minutes.

Figure 14

DIAGRAM REPRESENTING QUBIT SYSTEM

INPUTS

