



Clydeside Surveys Limited, Dunsyston, West Glen Gardens, Kilmacolm,
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Clydeside Surveys Limited specialise in all forms of hydrographic surveying including:

Bathymetric Surveys: to supply you with up to date bathymetry to enable planning, dredge control etc

Side Scan Sonar Surveys: for debris location and geophysical investigation

Shallow Seismic Surveys: seismic profiling to ascertain sub-bottom strata

Oceanography: if you require ADCP, current metering, dye tracing, drogue tracking

To request a call for further information click [here](#).

For a quality assured and totally professional service **contact** Clydeside Surveys.

Bathymetric Survey

Over the past 12 years we have been at the forefront of DGPS technology, providing our surveyors with all weather positioning to within +/- 0.02m - throughout the world.

Clydeside Surveys use the latest in automated software packages, which enables us to provide our clients with data far quicker and far more cost effectively than even a few years ago.

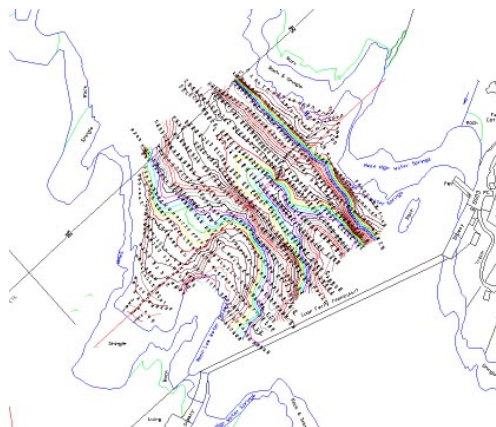
As we use the latest in mobile communications systems our surveys can be carried out, processed (including full QA) and transmitted to our client's own email server - **all within 24 hours!**

100% of our survey work is now produced under **AutoCad** and we can email a full drawing in DWG/DXF format in under 1 minute. This ensures our clients can carry out their own CAD design work, based on our survey results, in a far shorter period than has been possible in the past.

Our submissions are designed to be easy to interpret and include colour coded contouring at any required intervals, depth data, all available digital topographic data, the clients outline proposals and designs etc.

Much of our bathymetric survey work is in relation to navigational proving surveys and pre and post dredging surveys for which we can provide a professional and cost effective positioning and quantity evaluation service.

For 5 years we have been providing **multibeam surveys** for our clients. This system will provide accurate bathymetric data in a fraction of the time normally associated with post dredge surveys. The coverage is designed to be at least 100% and we have found the results to be at least as repeatable as single beam.



Side Scan Sonar

We use a **GeoAcoustics** high frequency side scan sonar system with a dual frequency tow-fish.

The system consists of a towed underwater fish which sends out short high frequency, high intensity sound bursts which are beamed from either side of the fish in a direction perpendicular to the direction of travel.

The acoustic beam is narrow in the horizontal plane yet sufficiently broad in the vertical plane to produce echoes from the seabed to points 150 metres or more abeam of the transducer.

These echoes, once detected by the transducers, are sent via the tow cable to the recorder which electronically processes the signals and prints them, line by line, to produce the sonar image on an **Ultra 200 series recorder**.

The Ultra 120 recorder has three channels, two of which will be utilised to record the side scan sonar data. For most survey work a high resolution 390kHz towfish will be used with the system set to either 25 or 50 metres per channel, providing a swath width of 50 or 100 metres centred on each survey line.

For operations in confined spaces such as in shallow water or close to known obstructions we use an Odom sonar. This allows us to work up very close to quay walls and other vessels without the snagging problems associated with towing a fish astern of the survey vessel.



Shallow Seismic

For a majority of this work we use a **EGG Uniboom sub-bottom profiling system**.

For high resolution surveys not requiring deep penetration we use an **ORE Pinger** and for projects requiring deep penetration where high resolution is not as essential, we use a **Sparker**.

The boomer system consists of an insulated metal plate and rubber diaphragm adjacent to a flat wound electrical coil mounted on a towed catamaran.

A short duration, high power electrical pulse, generated by the shipboard power supply and capacitor banks, discharges to the electrical coil. The resultant magnetic field explosively repels the metal plate generating a broad band acoustic pressure pulse in the water column.

The frequency of this pulse is in the range 400Hz to 14Hz with the majority of the energy being directed vertically downward at a maximum output of 300 joules per pulse.

A percentage of the acoustic energy is reflected from the sea floor. This percentage is dependent upon the **composition** of the seabed materials. The remaining energy penetrates the seabed and is reflected from layers of contrasting acoustic impedance. Acoustic impedance is a product of the density and seismic velocity of the material.

The reflections are detected by a **multi-element hydrophone** which is towed parallel to the source catamaran, astern of the vessel. This configuration is used in order to minimise the direct source-receiver signal.

The reflections detected by the hydrophone are converted to an electrical signal which is amplified, filtered and displayed in graphic form on the seismic recorder.

The character of the sub-bottom records are therefore dependant upon the way in which the acoustic signal is reflected. This is used to interpret the condition present. An **Ultra 120 series, 3 channel thermal recorder** will be used to display the data graphically on board with the incoming data being enhanced by the use of an in-line **TSS 360 Shallow Seismic Processor**.

Processed seismic data will be produced on an Isopach and for pipe route investigations we would also provide a longitudinal section.



Oceanographic - Data Processing & Presentation

The processing suite has been designed to be portable and can be loaded both onto laptop PCs for field use, as well as larger PC's for final data presentation in the office.

The software makes extensive use of commercially available programs for the data presentation aspects of a project. In particular all graphical plotting is undertaken in a **CAD environment** reducing the need to develop specific printer drivers.

The final plots can therefore be provided as files suitable for printing, or in a standard exchange format such as .DXF. The main processing and editing functions are handled by specially written code. This has a number of advantages, notably in that information on all major editing and processing tasks carried out is logged into a separate Quality Assurance file.

Inadvertent editing of data through the use of powerful spreadsheets or commercially available editors can result in significant amounts of restorative work or, in extreme cases, erroneous results.

The data handling packages used by Clydeside Surveys can be divided into two main areas:

Time Series Data Software

Oceanographic Survey Data

Oceanographic - Time Series Data Software

The presentation of time series data, typically the result of **long term** deployments of recording instruments, is mainly concerned with principal physical parameters such as **currents, waves, tides, weather and water quality information**.

The Clydeside Surveys data processing package typically stores these data as direct access files with each data point associated with a quality flag which stores information on the data point such as valid data; interpolated value; or erroneous data. In the latter case the data would be masked such that it would not be used in subsequent data processing tasks.

Data can be input to the data processing package as ASCII files or as raw data from oceanographic instruments (Aanderaa sensors, Interocean S4 current meters, RDI Acoustic Doppler Current Profilers, Braystoke current meters, Waveriders etc.). Standard processing packages include harmonic analysis, tidal or other digital filtering and spectral analysis.

Data can be presented as:

Summary Statistics

Time Series Plots

Scatter Plots

Rose Diagrams

Progressive Vector Plots

ASCII Listings

The data presentation packages are written to facilitate the merging and comparison of different data sets. For example tidal data, wave data and current meter data from three separate files can be presented on a single plot without the need to first merge the data into a single file. Each individual file contains time information, these data sets are used to ensure that the data is plotted to the correct position on the final plot eliminating the possibility of mismatched time series.

The program suite is under constant review and development of unusual or non standard types of data presentation can be incorporated to suit client requirements.

The collection and processing of survey data is one of the key areas of expertise within Clydeside Surveys and its associate companies. The experience gained in developing the software techniques to present oceanographic and environmental data has also been applied in the development of software based real time data collection and display systems.



Oceanographic - Oceanographic Survey Data

The collection and processing of oceanographic survey data is different to time series data in a number of ways. The data tends to be collected over **shorter time scales** but often covers greater geographical areas.

A greater degree of control over the data is also possible since Clydeside Surveys would generally be involved in both the data collection and processing aspects of a project.

A strong emphasis is placed on quality assurance during the data collection as well as on automating the routine aspects of data collection to as great an extent as possible. The use of automatic logging and relevant graphical displays allow the field staff more time to plan the survey and maximise useful data return.

Typical types of data that are routinely processed include:

ADCP Surveys

Dispersion Studies

Current and Water Quality Profiling

Drogue Tracking

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Pipe Route Surveys

Pipe route surveys play a large part of Clydeside Surveys' investigative work. We utilise most other aspects of our work in pipe route projects such as **bathymetric**, **side scan sonar**, **oceanographic** and **shallow seismic** surveys.

Other tools and techniques we utilise for pipe route surveys are:

Magnetometry

Jet Probing

The **magnetometer** is used to investigate sub-surface geology on the basis of anomalies in the Earth's magnetic field and locate man made objects on or below the seabed.

Objects high in ferrous or ferric compounds produce significant magnetic anomalies. We use our **Geometrics G-881** marine magnetometer for this part of the survey works. The instrument incorporates a towed fish, which is sealed and leakproof and contains a total field sensor. The fish is towed at a sufficient distance from the survey vessel in order to nullify any magnetic effects that it may have.

The fish contains a fluid rich in hydrogen atoms, such as kerosene, surrounded by a coil. The instrument provides absolute readings of total magnetic field with a high resolution of at least 0.1 nT (nanoTesla) which is more than sufficient for this type of survey work. In operation, the instrument is towed at a known distance from the survey vessel with the surface measuring unit synchronised to the survey computer's clock.

All collected data is passed to the computer via an RS232 link and combined with positional data for later retrieval and assembly of an anomaly chart.

We use **jet probing** as a 'low-tech' tool to ascertain the depth to overburden laying on top of rock and/or hard clays. This technique is only suitable in relatively **shallow** water, but provides very useful data at a very economical cost.



Inshore Site Investigation

Due to the varied nature of inshore site investigations a variety of survey techniques may be applied;

Benthic and PSD Surveys

CPT Operations

Acoustic Doppler Current Profiling

ADCP with 'Waves'

Inshore Site Investigation - Benthic & PSD Surveys

The scope of work is usually to define the **physical** and **biological** conditions of the seabed at representative stations along an existing or proposed outfall corridor.

The **grab survey** is undertaken along the outfall using a suitable seabed sampler. Inshore operations using small grabs, such as Van Veen and Shipek, are sometimes not successful. In these cases we use a hydraulic clamshell grab which is considered the most suitable for achieving representative samples although a Hamon grab is also utilised, in particular for benthic work, as this instrument is recommended by CEFAS for this type of operation.



Sampling of surface sediments (the top 5cm) is normally required on and off the pipe-route at regular intervals.

Samples collected are retained and sub-sampled into double-lined plastic bags prior to chilling within a cool chest. Samples are transported back to the laboratory for sieve analysis in this fashion.

Additional samples are collected for **benthic fauna** analysis using the Hamon grab which has been specifically designed to minimise washout of surface sediment as the grab is raised from the seabed. This means that the sample is completely enclosed within the grab. Samples are representative of around 0.1m² of the seabed. The recovered material is initially described and subsequently sieved through a 1mm mesh.

Organisms retained on the sieve are fixed immediately in 10% buffered saline formalin solution (4% formaldehyde), the volume of fixative used exceeding the volume of the sediment sample by a factor of at least two.



Large stones are returned to the sea following in situ inspection by the scientist onboard, recording the retention of attached fauna.

Inshore Site Investigation - CPT Operations

Cone Penetration Testing (CPT) is generally carried out in accordance with BS 1377 Part 9 section 3 with the exception that a 5cm² cone is used.

The Cone Penetration Test is based on pushing an instrumented cone into the ground at a constant speed, with continuous measurement of the cone end resistance, the friction along the sleeve of the cone and the pore water pressure.

These measurements make it possible to evaluate accurately the **ground conditions** and **stratigraphy** over the penetrated depth. The system is designed to use 2, 5, and 10cm² piezocones.

The probe is pushed into the seabed using a well proven 25kN nominal, 40kN maximum thrust, electric powered ROSON friction wheel drive unit.

Maximum penetration is in the order of 5.0 metres although in specific conditions greater penetration may be feasible. Our preferred method of operation is to utilise 5 cm² cones pushed into the soil with a maximum thrust setting of 20-30kN. Use of 5cm² cones is included in NEN (Dutch) standards.

High strength rigid steel rods reduce the risk of deviation and breakage compared with coiled tubing.

When using a 10cm² cone the base dimension and weight can be increased to 4.0 m² and 5 tonnes respectively.

Read about the real-time **data acquisition**, the **CPT rig** and the **advantages** of using our advanced CPT service.

Inshore Site Investigation - Acoustic Doppler Current Profiling

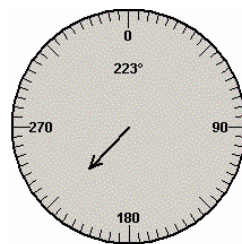
Recent advances in current flow measurement technology have provided Clydeside Surveys with the tools to gather current profiling data in a variation of marine environments.

For pipe and outfall route applications we use an **RDI Workhorse**. This tool can either be mounted aboard the survey vessel or for long duration surveys mounted in a seabed frame.

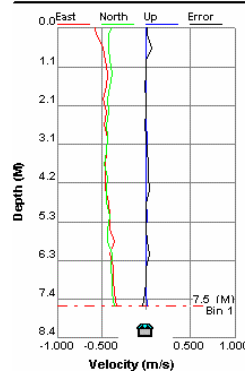
For measuring non-stop across the flow field, RDI's Horizontal ADCPs give horizontal profiles with as many as 128 individual points of measurement.



Installed in estuaries to define **complex circulation patterns**, in ports and harbours monitoring **surface currents** for navigation and safety, in rivers to measure **discharge rates**, and on oil platforms and seismic vessels during **oil exploration** and production.



| Mag(m/s) | Direction | Up(m/s) |
|------------------------|------------|------------|
| 0.498 | 223° | 0.013 |
| Bin Depth (M) | 7.53 | Bin 1 |
| Earth (m/s) | East North | Up Error |
| -0.34 | -0.36 | 0.01 -0.04 |
| ADCP Depth (M) | | 8.40 |
| Ocean Depth (M) | | 8.40 |

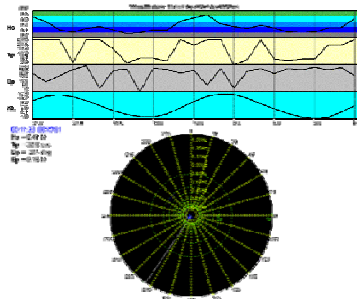


Inshore Site Investigation - ADCP with 'Waves'

An innovative and powerful way to measure **waves and currents** at once. More than a wave gauge -- ADCPs measure a complete frequency-direction wave spectrum and can operate in shallow and deep waters.

Better than a directional wave buoy -- ADCPs distinguish waves from multiple directions and operate with less risk of loss or damage. More powerful than a single instrument -- the ADCP measures velocity profiles, water level and wave frequency-direction spectra at once.

We can measure waves like never before -- for more capability and better performance than the traditional choices for measuring waves.



Thank you for downloading this brochure.