



Autumn Symposium organised and hosted by the
**Southern Region of
The Hydrographic Society UK**

HYDROGRAPHY and MARINE SPATIAL DATA INFRASTRUCTURE

Bradfield College, Near Reading

27 October 2009



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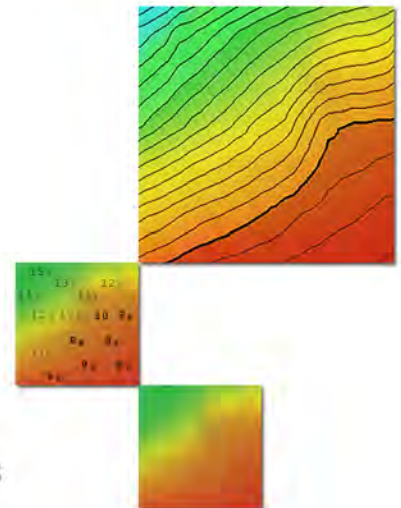
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Autumn Symposium organised and hosted by the Southern Region of The Hydrographic Society UK

HYDROGRAPHY and MARINE SPATIAL DATA INFRASTRUCTURE
Bradfield College - 27 October 2009

SYMPOSIUM PROGRAMME

REGISTRATION – 0900

Opening Session – 0930 - 1000

Welcome & opening remarks – **William Heaps** – *Chairman The Hydrographic Society UK*

KEYNOTE Address – ‘Hydrography and Marine Spatial Data Infrastructure’ – **Rear Admiral Ian Moncrieff** – *UK National Hydrographer*

Session 1 – What is Spatial Data Infrastructure? – 1000 –1100 *Chairman – David Cotton (MEDIN)*

The UK Location Programme – **Keith Murray** – *programme Technical Director at DEFRA*

Towards Marine Spatial Data Infrastructure – Engaging the Hydrographic Community – **John Pepper** – *Independent Consultant & Chairman IHO Marine SDI Working Group*

Questions and Discussion

COFFEE BREAK (1100 to 1130)

Session 2 – Enablers – 1130 – 1300 *Chairman Vic Abbott (University of Plymouth)*

VORF, Concept & Current Status – **Marek Ziebart** – *University College London*

Vertical Offshore Reference Frame – Validation – **Dave Mann** – *Gardline Geosurvey*

MSDI: Hydrographic Workflows, Software and Related Data Standards – **Andrew Hoggarth** – *CARIS*

The UK Civil Hydrography Programme (CHP): Now and into the Future – **Rob Spillard** – *MCA*

Questions and Discussion

LUNCH (1300 to 1400)

Session 3 – Hydrographic Content – 1400 – 1515 *Chairman John Pinder (Port of London Authority)*

Specification & Content for a Reference Base supporting Marine SDI – **Dr Mike Osborne and James Rapaport** – *SeaZone Solutions Ltd*

Integrated Mapping Survey for Sustainable Development of Ireland’s Marine Resources (INFOMAR)

Multi platform survey for terrestrial and marine integrated mapping – **Sean Cullen** – *Geological Survey of Ireland*

Collaborative Near Shore Surveys between Coastal Monitoring Programme and the CHP – **Dr Travis Mason** – *Channel Coastal Observatory (CCO)*

TEA BREAK (1515 to 1545)

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Session 4 – Applications – 1545 – 1630 *Chairman William Heaps (Associated British Ports / THSUK)*

Marine and Coastal Access Bill: Coastal Integration – **Dr Diane Dumashie** – *Dumashie Ltd.*

The Crown Estate Marine Resource System (MaRS) – **Jamie Moore** – *The Crown Estate*

Final Session – 1630 - 1700

Concluding Remarks - **William Heaps**

Introduction

Welcome to this symposium, which has been organised on behalf of The Hydrographic Society UK by members of the Society's Southern Region.

The event was conceived following a presentation at the UK Geoforum (www.ukgeoforum.org.uk) annual lecture, given by Rear Admiral Ian Moncrieff, and we are delighted that he has agreed to open this seminar, which now looks at this very important subject in more detail.

The programme is formed around the key MSDI topics below

- Enablers
- Hydrographic Content
- Applications

We hope that this booklet will help you make the most of the day, and provide a useful reference for the future. If you have any questions, or need assistance during the day, please do not hesitate to ask one of the organising committee or a member of the college staff. Enjoy your visit to Bradfield College!

Symposium Organising Committee

William Heaps (ABP Southampton),
Ian Russell (Retired),
Neil Pittam (PMSS)
Sarah Belcher (ABPmer).

Thanks also to Mike Osborne of Seazone and the staff of Bradfield College.

Symposium Sponsors

Special thanks are due to our two main sponsors: Caris, and NetSurvey / IVS 3D.



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The Hydrographic Society UK – Southern Region

The Southern Region holds regular meetings on the second Wednesday of most months (except July and August), at which a variety of presentations of interest to members are given by guest speakers; we also hold occasional social events. Our meetings are normally held in Southampton on board the historic preserved steam ship *SS Shieldhall* (www.ss-shieldhall.co.uk), but sometimes events are arranged elsewhere in the Region, according to demand. We would be really pleased to welcome members old and new to our meetings, which always feature excellent presentations, and provide valuable opportunities to enhance your professional development, as well as the chance to socialise, exchange ideas and make business contacts with like minded colleagues.



The *SS Shieldhall* - our meeting venue (though we don't put to sea!)

11th November 2009: 'Developments in the Management of Large Marine Datasets (GB)'. John Taylor on behalf of Seazone Solutions Ltd.
Onboard SS Sheildhall 19:30 for 20:00.

9th December 2009: AGM followed by social event - mulled wine, mince pies and a quiz.
Onboard SS Sheildhall 19:30 for 20:00.

Further meetings are planned for 2010, details of which will be available from www.ths.org.uk

Marine Spatial Data Infrastructure – A Quick Guide

The following text (compiled by Ian Russell) may be found useful in understanding the importance of Marine SDI, and the rationale for holding the symposium:

HYDROGRAPHY and MARINE SPATIAL DATA INFRASTRUCTURE

Latest IHO definition of Hydrography per EIHC-4 June 2009

"Hydrography is the branch of applied sciences which deals with the measurement and description of the physical features of oceans, seas, coastal areas, lakes and rivers, as well as with the prediction of their change over time, for the primary purpose of safety of navigation and in support of all other marine activities, including economic development, security and defence, scientific research, and environmental protection". (*pers.com. Shipman/Russell 23 June 2009*)

The term "Spatial Data Infrastructure" (SDI) is often used to denote; "the relevant base collection of technologies, policies and institutional arrangements that facilitate the availability of and access to spatial data." The SDI provides a basis for spatial data discovery, evaluation, and application for users and providers within all levels of government, the commercial sector, the non-profit sector, academia and by citizens in general

Spatial Data Infrastructure Cookbook v2.0 (PDF) January 2004

Rationale

INSPIRE (INfrastructure for SPatial InfoRmation in Europe) is an EU Directive that lays down a general framework for a Spatial Data Infrastructure (SDI) for the purposes of community environmental policies and policies or activities which may have an impact on the environment. It aims to improve the interoperability of, and access to, spatial information across the European Union at a local, regional, national and international level, facilitate improvements in the sharing of spatial information between public authorities and provide improved public access to spatial information.

The objective of the Location Strategy for the United Kingdom is to maximise the value to the public, government, UK business and industry of geographic information. It will provide a consistent framework to assist national, regional and local initiatives and service delivery.

Marine Spatial Data Infrastructure (MSDI) is the component of a National SDI that encompasses marine and coastal geographic and business information in its widest sense. An MSDI would typically include information on seabed bathymetry (elevation), geology, infrastructure (e.g. wrecks, offshore installations, pipelines, cables); administrative and legal boundaries, areas of conservation and marine habitats and oceanography.

Features

- Metadata
- Interoperability of spatial datasets
- Network services
- Data and Service Sharing
- Monitoring, reporting and coordination

National Spatial Data Infrastructure

In the information age it is realised by governments that good quality and well managed spatial data are an essential ingredient to economic and commercial development, and to environmental protection. For this reason many nations are establishing national spatial data infrastructures, bringing together the services and data sets of major national spatial data providers, for example topography, geodesy, geophysics, meteorology, and bathymetry. The Hydrographic Service is an important part of the national spatial data infrastructure.

IHO PUBLICATION M-13 - Manual on Hydrography (2008)

KEYNOTE Address – ‘Hydrography and Marine Spatial Data Infrastructure’

Rear Admiral Ian Moncrieff – National Hydrographer

Ian Moncrieff graduated in Geography and Geology at Keele University in 1977. He joined the Royal Navy on a university cadetship in 1976 and comes to the UKHO with a long and distinguished Naval background.

Qualified as a Principal Warfare Officer (PWO) originally specialising in Communications, he has accumulated over 20 years operational seagoing experience in nine warships. From May 05 he was a Joint Operational Commander as Commander British Forces South Atlantic based in the Falkland Islands. A graduate of the 2005 Higher Command and Staff Course and the Defence Strategic Leadership Course, prior to this he was Director (Communications and Information Systems) Navy and Assistant Chief of Staff to the CINCFLEET.

He took up his appointment as National Hydrographer on 5th December 2006

The UKHO

The UK Hydrographic Office (UKHO) exists to help preserve life and safety at sea. It has a world-class reputation for providing safe and accurate navigational information. This is essential to support the operations of the Royal Navy and other mariners around the world. The UKHO also plays a central role in discharging the UK's treaty obligations to provide hydrographic services for waters of UK national responsibility, as required under international convention.



Session 1 – What is Spatial Data Infrastructure?

The UK Location Programme - Keith Murray

UK Location Programme, Technical Director, DEFRA

The Issue

According to the UK Location Strategy “everything happens somewhere”. Location information is starting to be used increasingly in many frontline operations. Thanks to Google Earth, Microsoft LiveLocal and others expectation have been raised and spatial information is no longer constrained to an obscure backroom and complex software that requires a PhD to drive it. All kinds, and all qualities, of information are now on the desktop and this is being supported by a new range of web services that are about to revolutionise the industry.

Over the last 20 years the growth in electronic information has grown and in the spatial world the tools have also advanced significantly in that time. This was supported in the early days by the emergence of mini and then desktop computers; this freedom enabled innovation and led to significant growth – the problem we face today is that much of this development has largely been undertaken in isolation – resulting in the proverbial “silos”.

Now we wish to combine information from different organisations we discover different formats, different resolutions of data, different positions for the same things, different ways of digitising and coding – the downside of the years of freedom. The Atlantis Initiative reported from market research that one third of users spend 25-50% of their project budget simply finding data and then cleaning it up so that it can be used in the task they set out to solve This is not a situation we can tolerate If we envisage “information served online and combined from multiple sources at anytime and anywhere” which is the expectation and upon which new legislation such as the Marine Bill will ultimately depend.

The Policy

In recognition of these issues the UK Location Strategy was commissioned by a Communities and Local Government Minister on the basis that something had to be done. The strategy was signed off by the Domestic Affairs Cabinet Committee (DA [PED]) in November 2008 and published on the GIPanel website. It has also support from the three devolved administrations and the Ministry of Defence. The strategy outlines five strategic objectives:

- “(1) we know what data we have, and avoid duplicating it
- (2) we use common reference data so we know we are talking about the same places
- (3) we can share location-related information easily through a common infrastructure of standards, technology and business relationships
- (4) we have the appropriate skills, both among geographic professionals and among other professional groups who use location information or support its use
- (5) we have strong leadership and governance to drive through change, including the implementation of this Strategy and the implementation of INSPIRE.”

The INSPIRE Directive became effective on 15 May 2007 and member states were given two years to transpose it into national legislation. Only four member states achieved this and the

UK intends to complete transposition in the early autumn of 2009, with Scotland managing its own legal arrangements. However the Directive is only a framework and the real impact will be felt through the regulations for:

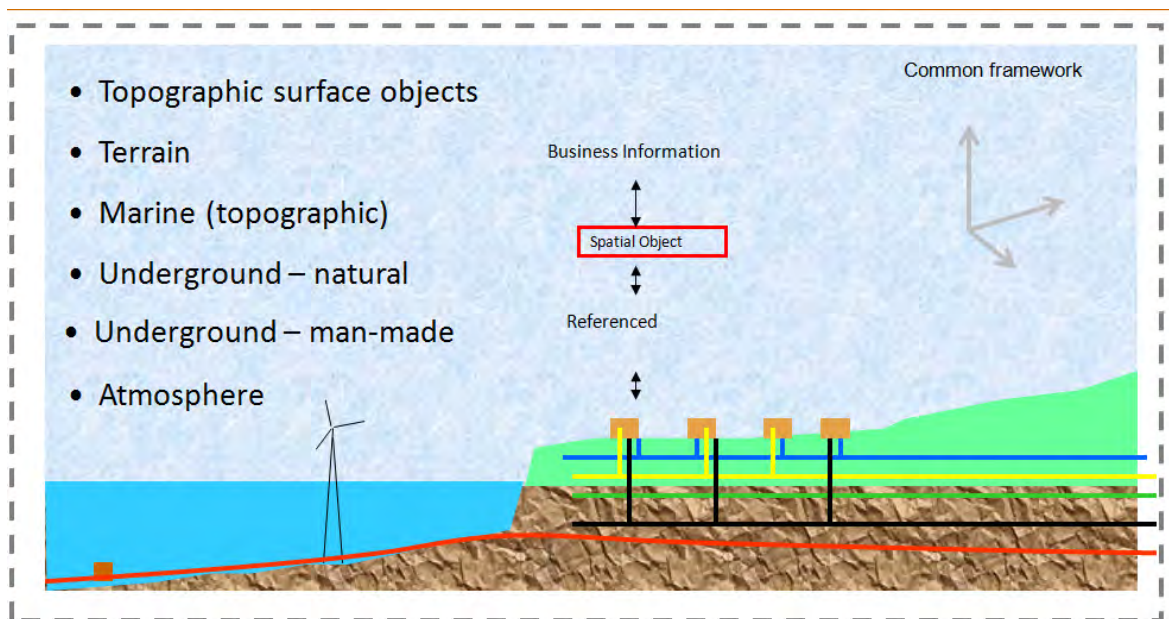
- Discovery Metadata
- Data Specifications [for 34 themes of data]
- Network Services
- Data and Service Sharing
- Monitoring and Reporting arrangements

The foundation material of these regulations has been developed by dedicated drafting teams and thematic working groups from across member states. When these are legal requirements public sector organisations will be obliged to adopt the regulations, which in most cases are specifications and standards and they will have to do this within given timescales.

The plan

The UK Location Council was formed and first met in late November 2008, three days after the publication of the UK Location Strategy. Their goal is to address the objectives of the Location Strategy as well as support delivery of INSPIRE. Indeed it is a unique opportunity to progress interoperability and improve access to public sector information so that it is more widely used and exploited in decision making and problem solving in all spheres of life.

Work started on the conceptual design for the UK Location Programme in January 2009 through a series of stakeholder workshops which also included specific topics such as portals and rights management. A blueprint has been produced and reviewed. This will be used act as a top level framework for the many different strands of work that will take place either as investments or “better aligned” business as usual spend.



Extent: UK territorial waters [as defined in the Marine Bill] tbc

The design is holistic in its approach combining all kinds of information from land, marine, air, underground natural and underground man-made. The INSPIRE standards and timescales will act as a unifying force but there will need to be a lot of work on guidance to bring about real benefits in support of this. The design identifies the need to proactively coordinate common activities and along organisational boundaries much more in future if we are to make progress towards interoperable data and where necessary address duplication issues and if possible transform this into complementary activity.

The issues

The challenges are quite significant since the programme is as much about business change as it is about technical development. Greater cross organisational collaboration requires new ways of thinking and new ways of working – stimulated by much greater use of web services and the ability to combine data from several sources ready to use. This will demand careful coordination and sound understanding by senior staff in the affected organisations to push through this change and to identify and seize the benefits. Simpler licensing, a greater level of professionalism and expertise in data architectures in the spatial information domain will all be required as well as greater integration with mainstream information. The power of the web in this role has yet to be fully realised but is recognised by the Cabinet Office.

The next steps

The current financial situation may make some wonder if this is the right time to be tackling this problem – when in practice it may be a golden opportunity to bring about the desired changes within a national programme of rationalisation and reuse. We certainly need to have priorities but there is a lot to be said for strategic alignment by individuals and organisations, facilitated by the provision of self help, tools and resources - so that the whole is greater than the sum of their individual contributions or as they say in Norway “give a little – get a lot”.

Towards Marine Spatial Data Infrastructure – Engaging the Hydrographic Community - John Pepper

Chairman IHO Marine SDI Working Group

Global Warming and Climate Change leading to increased risk of natural disasters and rising sea levels are important indicators of a changing worldwide marine and coastal environment. The role hydrographic and oceanographic spatial data plays in supporting global, regional and national environmental programmes by providing tools for decision making is absolutely critical. To understand the forces of change, one needs to be able to provide accurate and timely base reference information comprising, as a minimum, the topography and characterisation of the seabed upon which temporal information such as wave, tide and current can be referenced. Whilst the Hydrographic community is the prime holder of much of this important information, it has yet to identify and / or appreciate the role it might have in the disseminating this information.

In the broader sense hydrographers, geologists, biologists and oceanographers can be brought together to provide solutions through enabling frameworks such as Spatial Data Infrastructures (SDI's). It is important that organisations work together to ensure best practise is achieved and that spatial data can be made "interoperable" to ensure multi disciplinary use.

In order to prepare the World-wide hydrographic community to respond to the growing requirement for such information, the International Hydrographic Organisation (IHO) set up a Working Group in late 2007 whose task it was to develop thinking on how the hydrographic community might respond to this need, how data producers can work together and what processes are necessary to deliver data to support wider environmental decision making processes successfully. The aim of the Working Group was to feedback its findings to the IHO by summer 2009.

The presentation will outline the processes used by the Marine Spatial Data Infrastructure Working Group (MSDIWG) to engage the HO community, the research elements required to ascertain the current "state of play" across the World; the analysis of responses; identifying ways in which the IHO might assist Hydrographic Offices (HO's) in developing their understanding and knowledge of the marine element of SDI at the national or regional level and the development of capacity building material.

Session 2 – Enablers

VORF, Concept & Current Status - Prof. Marek Ziebart

(Jonathan Iliffe contributor)

Department of Civil, Environmental and Geomatic Engineering, University College London

VORF is the Vertical Offshore Reference Frame, a set of transformation models enabling a user to transform data safely and efficiently between marine and terrestrial reference surfaces, such as lowest astronomical tide and the Newlyn datum. Its development was commissioned by the UKHO in 2005 after a scoping study was carried out by UCL. Since then VORF has gone through the stages of technology demonstrator, operational version and maintenance contract. One of the principal step changes that VORF enables is the facility to merge land and sea datasets collected on differing datums, bringing them seamlessly to a common reference frame, and at the same time accounting for the uncertainties introduced into the spatial data under the particular transformations applied. In this talk the VORF concept is explained, the development process is described and the basis for the original concept is revisited in the light of the rapid developments in Global Navigation Satellite System (GNSS) technology. The current status of the project is outlined, as are additional developments in other parts of the world. This includes a currently funded EU project to assess extending VORF coverage to the whole of the North Sea.

Vertical Offshore Reference Frame – Validation – Dave Mann

Gardline Geosurvey

The Vertical Offshore Reference Frame (VORF) project was commissioned by the UK Hydrographic Office (UKHO) and its aim is to provide a continuous model within UK and Irish waters of various tidal datum in relation to terrestrial and satellite coordinate reference frames.

The VORF model is currently in the validation stage, and limited datasets from the VORF model have been released for use in hydrographic surveys that ultimately deliver bathymetric data to the UKHO.

This paper is presented in two sections.

The first section describes a trial that was conducted on behalf of the UKHO as part of the validation process. The purpose of the trial was to collect GPS data at the site of a deployed seabed tide gauge over the period of one tidal cycle. A survey vessel was equipped with a pair of dual-frequency C-Nav 2050 GPS receivers, operating with the C-Nav high-accuracy Globally Corrected GPS (GcGPS) service.

During the period of the trial the following data was acquired:

- Raw dual-frequency GPS data, logged continuously at 1 Hertz.
- Real-time C-Nav GPS solution, logged continuously at 1 Hertz.
- EM710 MBES data logged continuously.
- Seapath 200 motion and heading data logged with the MBES data.

GPS height has been derived using data acquired by the C-Nav 2050 dual-frequency GPS receiver. The data was processed using two methodologies:

- By processing the height derived in the real-time C-Nav solution.
- By processing the raw dual-frequency GPS data and deriving a post-processed Solution.

The GPS derived heights were reduced to tidal datum using the VORF model.

Tidal observations recovered from the tide gauge were subjected to harmonic analysis, which yielded 34 tidal harmonics. These harmonics were used to generate tidal predictions for 19 years encompassing a Metonic cycle. From these predictions the maximum and minimum tidal levels referred to the mean tide were extracted, and hence the value of Lowest Astronomical Tide (LAT) was deduced.

Comparison of the GPS and tide gauge data reveals information about both the accuracy of the VORF datum models, and the precision of the GPS observations.

In the second part of the presentation the use of VORF information in the hydrographic data flow is compared with traditional techniques. Examples are drawn from recent surveys which illustrate the benefits of a homogenous marine spatial reference frame.

MSDI: Hydrographic Workflows, Software and Related Data Standards

- Andrew Hoggarth

(Julien Barbeau contributor)

CARIS

This presentation will discuss workflows that can facilitate the availability of hydrographic data in a Marine Spatial Data Infrastructure (MSDI) through the use of standards-based, off-the-shelf, GIS tools.

Using an example of the French Hydrographic Office, the presentation will highlight how MSDI can provide direct efficiencies to those managing hydrographic data. It will also highlight how MSDI can facilitate the sharing of hydrographic data with other organisations and provide a mechanism to feed hydrographic data into national and regional SDI initiatives.

The presentation will describe how CARIS software is making use of established hydrographic data standards such as IHO S57 and the Bathymetric Attributed Grid (developed by the Open Navigation Surface Working Group). It is aiding discovery through the use of the ISO 19115 Metadata standard and providing interoperability by making hydrographic data available via the Internet through the use of the Open Geospatial Consortium, Inc.® (OGC) WMS, WFS and WCS standards for data viewing, query and download.

In addition to the benefits to agencies from MSDI, and discussions around what data standards can be utilised, there are other important considerations that need to be addressed in order to ensure that hydrographic data is usable by other parties. Considerations have to be given to scale of data, portrayal of cartographic information and perhaps most importantly coordinate reference system differences that exist between hydrographic and terrestrial datasets. Effective interoperability will require the ability to fuse datasets together, this is especially important in the Coastal Zone, which is an area where the adoption of MSDI principles is perhaps most urgently needed. The presentation will describe tools and workflows that can be used to reconcile these differences.

The UK Civil Hydrography Programme (CHP): Now and into the Future **- Rob Spillard**

(André Cocuccio contributor)

Maritime and Coastguard Agency (MCA)

The Civil Hydrography Programme (CHP) is a multi-million pound, fixed budget Government initiative to prioritise and survey the waters surrounding the UK to modern standards (IHO Order 1a) for the update of nautical charts and publications.

Responsible for an area broadly in line with the UK Exclusive Economic Zone (EEZ – an area in excess of 720,000km²), the CHP commands over 60% of the total annual UK Government spend on multibeam hydrographic survey. Based on current survey effort, however, it will take the CHP approximately 100 years to complete its mission.

Since taking over full management of the CHP in 2006, the Maritime and Coastguard Agency (MCA) have introduced a number of efficiency drives in order to address this issue and deliver more survey data for the pound (£). These have included switching from single beam echosounder technology to multibeam swath data acquisition, the introduction of a fully contestable, long-term [survey] contracts model, and retrofitting the MCA's tug "Anglian Sovereign" for use as a hydrographic survey vessel during periods of standby. These initiatives alone have delivered efficiency gains in the order of several million pounds (£) since their inception.

Looking to the future, the MCA are now actively seeking additional efficiency gains through the introduction of Marine SDI in the form of data sharing agreements and co-funding joint initiatives. Echoing the theme of this seminar, the overarching principle behind this strategy is 'gather once, use many' and to facilitate the availability of and access to Government commissioned hydrographic data.

Driving this forward is an increasing trend for hydrographic survey to be commissioned across UK Government, ranging in use from nautical charting to habitat mapping and even geological assessment. However, despite the clear overlap between sectors, the vast majority of this work has previously been acquired in isolation with little or no sharing of the results.

Having identified this deficiency, the MCA have lead the way by actively promoting a more co-operative approach to hydrography within Government, and through hosting annual Committee on Shipping Hydrography (COSH) seminars, have laid the groundwork for Government organisations to benefit from co-operative arrangements.

A significant step forward in this regard has been a memorandum of understanding (MoU) between the MCA, DEFRA, BGS and UKHO, covering hydrographic survey data and data gathering. Agreed and signed earlier this year (2009), the principle aims of the MoU are:

- to freely exchange existing and future multibeam echosounder data and backscatter data between participating organisations; and
- to establish a mechanism to ensure that participating organisations' future surveys are programmed in such a way so as to avoid duplication wherever possible.

Underpinning this collaborative approach has been the open availability of ISO (and therefore INSPIRE) compliant discovery metadata for each MoU partner. Available via the www.mcga.gov.uk/hydrography website as standard GIS layers (fully attributed ESRI

shapefiles in WGS84 UTM Zone 30N), this has offered a level of interoperability previously unseen in UK Government-commissioned hydrography, and has facilitated improved sharing, exchange and co-ordination of hydrographic data and data gathering programmes between partner organisations.

It is envisaged that the MoU will serve to maximize the value of UK Government commissioned hydrographic data through wider uses / applications and will form a blueprint for future co-operative agreements on Government hydrography, with additional organisations becoming signatories in the near future. Building on this will allow the MCA to deliver the CHP at hitherto unequalled value for money, whilst also continuing to support the national spatial data infrastructure.

Session 3 – Hydrographic Content

Specification & Content for a Reference Base supporting Marine SDI - Dr Mike Osborne

(James Rapaport contributor)

SeaZone Solutions Ltd

Marine Spatial Data Infrastructure (MSDI) is the component of a National SDI that encompasses marine and coastal geographic and business information in its widest sense. An MSDI would typically include information on seabed bathymetry (elevation), geology, infrastructure (e.g. wrecks, offshore installations, pipelines, cables); administrative and legal boundaries, areas of conservation and marine habitats and oceanography.

This paper expands on these general ideas and provides a more detailed specification for the feature types that would constitute a reference base for the marine and coastal environment comparable to that on land. The specification is based on feedback provided by end users utilising marine data for a variety of applications (environment protection, economic development, risk management). The feedback was collated through questionnaires, workshops and literature in Europe and wider afield.

The content of base reference information from a marine perspective and how this relates to and builds on land information within an NSDI is explored. Sources of content for the reference base and the standards available to support it are investigated. Finally, SeaZone's marine geographic information product, HydroSpatial, is presented as a candidate specification for a marine reference base and the problems that needed to be overcome during its development and compilation explained.

Integrated Mapping Survey for Sustainable Development of Ireland's Marine Resources (INFOMAR) Multi platform survey for terrestrial and marine integrated mapping - Sean Cullen²

Thomas Furey ¹, Fergal McGrath ¹, Fabio Sacchetti ¹, Koen Verbruggen ² contributors)

¹ Marine Institute

² Geological Survey of Ireland

Between 1998 and 2005, the Geological Survey of Ireland and the Marine Institute worked together on the €32M Irish National Seabed Survey (INSS) project with the purpose of mapping the Irish marine territory using a suite of remote sensing equipment, from multibeam to seismic, achieving 81% coverage of the marine zone. Ireland was the first country in the world to carry out an extensive mapping project of their extended EEZ. The INSS was succeeded by the multiyear INFOMAR Programme. INFOMAR is now concentrating on mapping twenty six selected priority bays, three sea areas and the fisheries-protection 'Biologically Sensitive Area'. It will then proceed to complete 100% mapping of the remainder of the EEZ. Designed to incorporate all elements of an integrated mapping programme, the key data acquisition includes hydrography, oceanographic, geological and heritage data. These datasets discharge Ireland's obligations under international treaties to which she is signatory and the uses of these data are vast and multipurpose: from management plans for inshore fishing, aquaculture, coastal protection and engineering works, to environmental impact assessments related and integrated coastal zone management.

INFOMAR is a programme that is data-rich. Survey operations are delivering vast amounts of high quality data of interest to industry and academia alike. The INFOMAR website www.infomar.ie provides open and free access to the data in a variety of formats to suit all levels of interest. Data can be accessed, viewed and downloaded in a variety of ways, for instance through the webmapping viewer, the Interactive Web Data Delivery System (IWDDS) and also via a Web Map Service (WMS). In line with the EU INSPIRE directive, INFOMAR is providing data in an interoperable manner which strives to meet the relevant OGC and INSPIRE standards.

During the last three years of activity, INFOMAR carried out integrated surveys from the national research vessels, the R.V. Celtic Explorer and Celtic Voyager. Hydrographic, geophysical and groundtruthing data were acquired from Bantry, Dunmanus, Galway, Donegal, Sligo, Tralee, Dingle and Waterford bays. Work has been carried out in the challenging environment of the River Shannon Estuary. Airborne LiDAR (Light Detection And Ranging) and inshore- vessel surveys have also been carried out, giving detailed bathymetric, topographic and habitat information for the shoaler waters and inshore areas. This paper will focus both on the general framework and scope of INFOMAR and the initial results and experiences of the last three years' surveys.

Collaborative near shore surveys between Coastal Monitoring Programme and the CHP - Dr Travis Mason¹

(Andy Bradbury¹, Martin Hutchings² & Rob Spillard³ contributors)

¹ Channel Coastal Observatory (CCO)

² Teignbridge District Council

³ Maritime & Coastguard Agency

Traditionally, very little data have been collected in the area termed by BGS as "The White Ribbon", due primarily to the operational difficulties of working at the margins of both land and sea-based surveying systems. The operational difficulties translate, of course, into cost and accordingly bathymetric surveys in the lower inter-tidal and sub-tidal region are significantly more expensive than surveying a similar area in water deeper than 20m. Yet for both operational and long-term beach management, it is crucial to assess the mobility of sediments in the nearshore region.

The Southeast and Southwest Strategic Regional Coastal Monitoring Programmes have a particularly demanding requirement for nearshore bathymetric data, since they need data to be of sufficient quality to produce difference models from repeated surveys up to 5 years apart. Recent, extensive surveys of the southeast coast of England have highlighted the difficulty in using single beam data (collected using 50m spaced, shore-normal profiles) for difference modelling in areas of irregular bathymetry and particularly in areas with a rocky foreshore.

A recent initiative has been to combine resources with the Maritime & Coastguard Agency's Civil Hydrography Programme to upgrade the Regional Coastal Monitoring Programme single beam surveys to swath bathymetry surveys to IHO Order 1a, to fulfill the requirements of both organisations. The survey data are required in two co-ordinate systems; the Regional Monitoring Programmes need positions to OSGB36 and elevations relative to Ordnance Datum, whilst the MCA require WGS84 and Chart Datum depths. Use of the new Vertical Offshore Reference Frame would make this task considerably simpler.

Recent advances in GPS survey techniques have been employed since, in many cases, tide control was achieved using RTK/PPK. An example in central-southern England will demonstrate the improvement in survey results using RTK for tidal elevations, particularly where the tidal regime is difficult.

Two areas in the Southwest were surveyed under this agreement: the majority of Lyme Bay and Mount's Bay. In both areas, the landward limit for the survey was MLWN and therefore, the data overlap with recent topographic lidar surveys done for the Coastal Monitoring Programme giving, probably for the first time, a seamless elevation model for the coastal region, from about 500m inland to 1000m offshore. Both data types can be combined (with the caveat of the accuracies and precision of each system), since both the topographic and bathymetric data were collected using the same survey ground control. This coastal DEM, combined from several types of data, is a considerable contribution to marine SDI.

One of the most important features of the data collection is an integrated data archive/metadata system, together, of course, with a facility to make the data easily available to other users. The metadata standard used by the Regional Monitoring Programmes is FGDC, and every data file is archived with full metadata, thus fulfilling Inspire requirements and enabling the metadata records to be available for other metadata catalogues. We have found that the key to achieving successful metadata lies in planning the data management route prior to contract tender, including defining carefully both file formats and names at this stage. Many

of the metadata fields can be pre-filled, providing consistent survey specifications are used and the data quality-controlled to ensure the standard is met.

All data collected by the Regional Coastal Monitoring Programmes and the collaborative surveys referred to above are made freely available via the www.channelcoast.org website, along with the full FGDC standard metadata.

A similar collaboration has been between the MCA, Dorset Wildlife Trust and New Forest District Council (on behalf of the Southeast Coastal Monitoring Programme) to survey a large area of the Dorset coast to IHO Order 1a, and share the data. Dorset Wildlife Trust's contribution is thanks to a grant from Viridor Credits and is the first time this sort of grant has been used for the purpose of a maritime habitats investigation. The Southeast coast is due for repeat bathymetric survey this summer and it is anticipated that further collaboration will allow similar upgrade to swath bathymetry.

Other data collected by the Regional Coastal Monitoring Programmes which may be of use to nearshore bathymetric surveyors includes ortho-photography and real-time data from an extensive network of coastal directional Waverider buoys and several wave radar tide gauges.

Marine and Coastal Access Bill: Coastal Integration - Dr Diane Dumashie

Dumashie Associates

The Marine and Coastal Access Bill provides for a new system of marine planning that will be a key tool in helping the UK Government deliver its vision for the Marine Environment.

This Bill is set to steer a broad range of choice for decisions about the future of marine administration but central to reform is the adoption of a system of Marine Spatial Planning (MSP).

Focussing on the coastal zone, this paper is concerned with how the Bill will improve planning and management upon the coastal zone, to deliver a range of benefits and resolve many of the current difficulties with marine decision-making informed by marine spatial data.

The need for and the importance of planning for the future of the marine environment is reflected in the triple bottom line applied to Marine environments:

achieving a sustainable marine economy
ensuring a strong, healthy and just society
living within environmental limits

But also,

using sound science responsibly
promoting good governance
facilitating political agreement on a nation and state wide basis

Spatial planning will be based on a framework that includes marine policy statements acting as a guide to decision making for the Marine Management Organisation (MMO) and the development of Marine Plans that will apply policy in spatial detail to particular parts of the marine area. Both will guide and direct decisions in the marine environment but importantly the geographic coverage will be mapped to indicate the area of sea covered. Consequently, marine plans will be a source of information, which developers and other marine industries can use when considering where and how they might carry out activities.

Without doubt geo-spatial information and data will be one key to the success of the Bill and its constituent parts such as licensing and the delineation of marine conservation areas. Planning bodies must have access to best quality information managed and disseminated by expert data centres to ensure a coherent approach to marine planning can be taken across UK waters.

This places the surveying profession in a pivotal position, not just technically to undertake data collection for planning, but also on a strategic policy level; contributing to decision making and asset management.

Coastal integration will need to rely upon best and appropriately available data. With increasing opportunities for coastal regulators and communities to have a say in the way the marine environment is managed, and conversely for marine management to give proper consideration to land planning, the knowledge and application of marine spatial data infrastructure extends much further than collection.

Perhaps is no coincidence that to implement the MMO, a Professional with a background in working at sea, Mr Christopher Parry, has been appointed Chair Designate of the Marine Management Organisation.

This presentation will

- Explore the role of MSP in the Marine and Coastal Access Bill as it completes its progress through the Parliamentary process
- Briefly examine the relationship between the respective land and marine objectives and the synergies (or not) over the coastal zone, and
- Discuss the potentially important opportunities for Hydrographic Surveyors to contribute, co-ordinate and effectively deliver marine management objectives along the coast.

The Crown Estate Marine Resource System (MaRS) – Collaboration for individual success, an opportunity to enhance marine spatial planning

- Jamie Moore

(Peter Lawrence contributor)

The Crown Estate

The Marine Resource System (MaRS) being developed by The Crown Estate helps support strategic and integrated management of the diverse marine environment.

The Crown Estate manages the a large proportion of the UK seabed and is responsible for licencing a range of activities including Renewable Energy, Aggregate Extraction, Aquaculture, Cables, Pipelines, Carbon Capture and Gas Storage. The Marine Estate is faced with complex interactions between competing development opportunities, environmental requirements, stakeholder requests and legislation. MaRS is a bespoke multi-criteria decision making tool that enables The Crown Estate to manage the marine environment in a transparent, equitable and sustainable manner.

MaRS uses Geographical Information System (GIS) technology that stores, analyses, and presents marine spatial data from a myriad of sources to conduct proactive marine spatial planning. The system functionality allows users to;

Identify suitable locations for potential developments;

Undertake risk analysis of identified development options;

Report possible development conflicts with other marine users or uses;

Calculate potential interactions with mobile activities or species that may surround an opportunity;

Undertake policy and sustainability assessments; and

Optimise proposed development opportunities.

By delivering robust and transparent tools for marine planning The Crown Estate also hopes to provide benefits to the wider marine community. It is recognised that the availability and integration of marine data layers is fundamental to support good planning decisions. The MaRS project has collated a comprehensive database of UK marine datasets and these are stored with full metadata records, compliment to relevant standards including ISO:19115, MEDIN and INSPIRE. MaRS has been designed to incorporate a wide range of spatial datasets and the system is fully flexible supporting a range of user defined parameters. The MaRS tools require UK Marine datasets therefore the system will benefit from the development and implementation for a UK Marine Spatial Data Infrastructure (SDI) which will promote continuity within input datasets.

MaRS will develop as a means to strategically plan marine resource through informed decision making and allows The Crown Estate to apply its core principles of integrity, commercialism and stewardship in the face of increasing demands on this valuable and fragile resource. It is also recognised that other users including developers, government departments and planners could also benefit from working with the system and its outputs.

For further information regarding MaRS, please see www.thecrownestate.co.uk/MaRS

The Hydrographic Society UK

We very much hope that you have enjoyed today's event, which is just one of many organised by THSUK

If you are not already a member, please consider joining to support our work and objectives:

"to promote the science of surveying at sea and related sciences and technologies; to provide a centre for meetings and a channel for correspondence and the exchange of information between technologists and others engaged or interested in hydrography and related sciences; to promote and co-ordinate the study and practice of such sciences and technologies in all or any of their aspects; and to accumulate, extend and disseminate amongst the members of the Society and others information, knowledge and expertise relating thereto in any part of the world;

to advance the education and training of persons engaged in or intending to engage in the study of hydrography and related sciences."

Membership details, and forms can be found on our website, or we will be delighted to give you more information today

For further information on The Hydrographic Society UK please use the following links and contacts:

The Hydrographic Society UK Website www.ths.org.uk

Please email helen@ths.org.uk or write to:

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