



UK Hydrographic  
Office

# Hydrographic Survey Specification (Acoustic)

Version 3.0 | July 2018



**ADMIRALTY**  
Maritime Data Solutions



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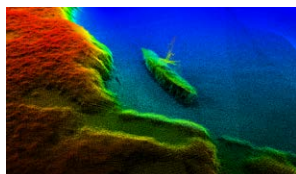
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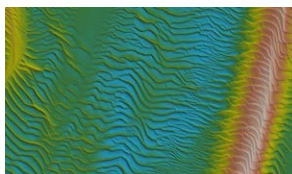
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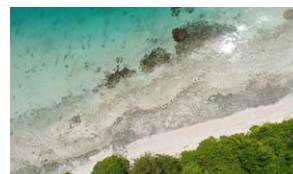
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## How to use this interactive document

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### Contents panel

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### Buttons

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 back to this home page (contents) or

  back or forward a page.

### Underlined copy

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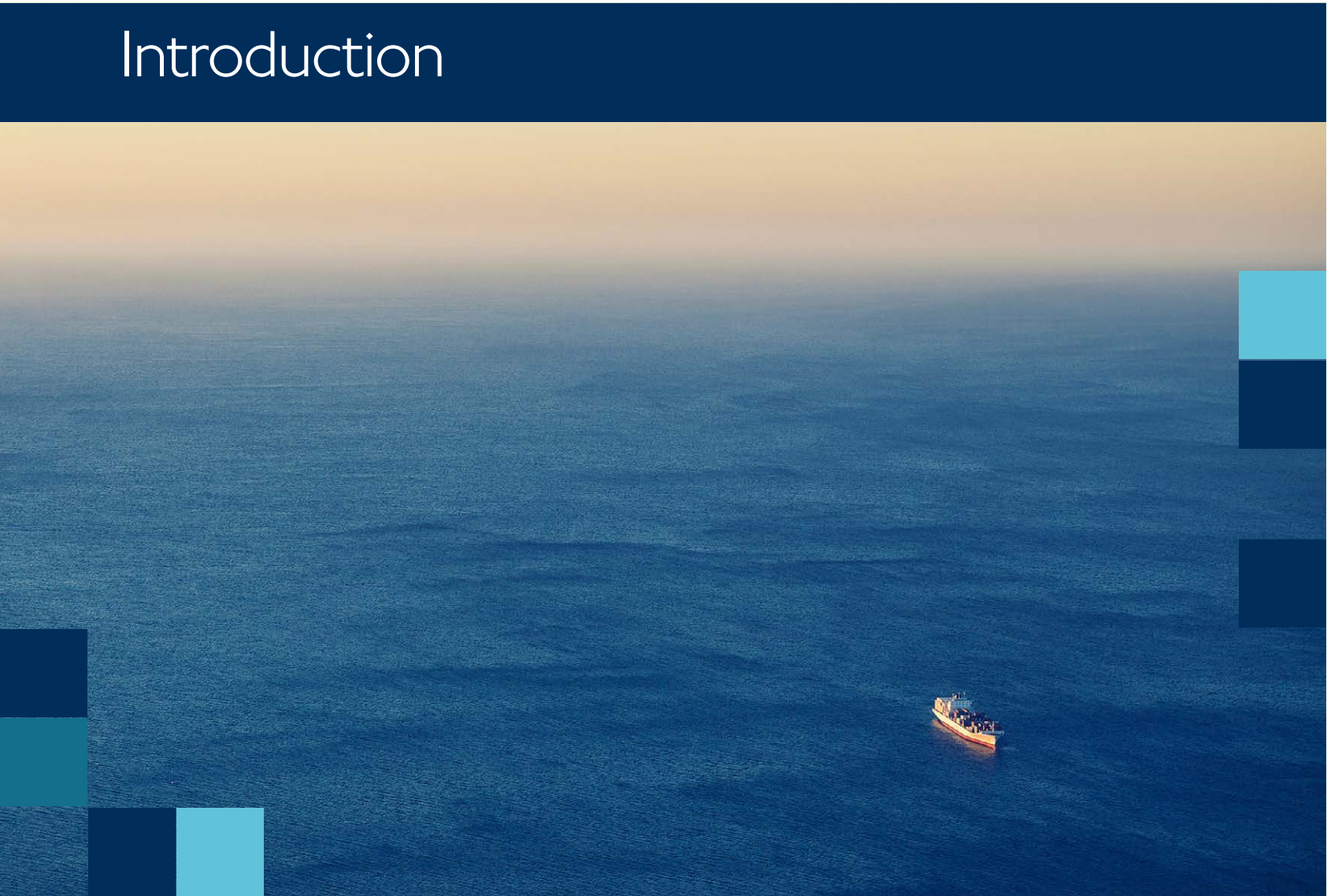


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Part A

Introduction

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A1 The UK Hydrographic Office

The UK Hydrographic Office (“the Authority”) is part of the Ministry of Defence and operates as a Trading Fund. It is responsible for satisfying the UK’s Safety of Life at Sea (SOLAS) obligations with regards to the publishing and updating of nautical charts and publications. The Authority also provides other services for Mariners and the Royal Navy.

In accordance with the Equality Act 2010, in our capacity as a public body we have a statutory duty to eliminate unlawful discrimination, promote equality of opportunity and promote good relations between people from different groups.

Participating Survey Companies (and their sub-contractors) (“the Contractor”) will be expected to ensure that the service they provide promotes Equality between the Authority and its customers and does not directly or indirectly discriminate on the grounds of Equality in accordance with both the Act and the Duty.

A2 Symbols & Abbreviated Terms

Abbreviation	Term
AAR	After Action Review
ADCP	Acoustic Doppler Current Profiler
AED	Automated External Defibrillator
ASV	Autonomous Surface Vehicle
AUV	Autonomous Underwater Vehicle
BM	Benchmark
CD	Chart Datum
DPR	Daily Progress Report
EMT	Emergency Medical Technician
GNSS	Global Navigation Satellite System
HAZID	Hazard Identification
HI	Hydrographic Instruction
HIRA	Hazard Identification and Risk Assessment
HOC	Hazard Observation Card (otherwise known as Safety or Stop Cards)
iaw	In accordance with
ITQ	Invitation To Quote
IHO	International Hydrographic Organization
MBES	Multi-Beam Echo Sounder
OOW	Officer Of The Watch

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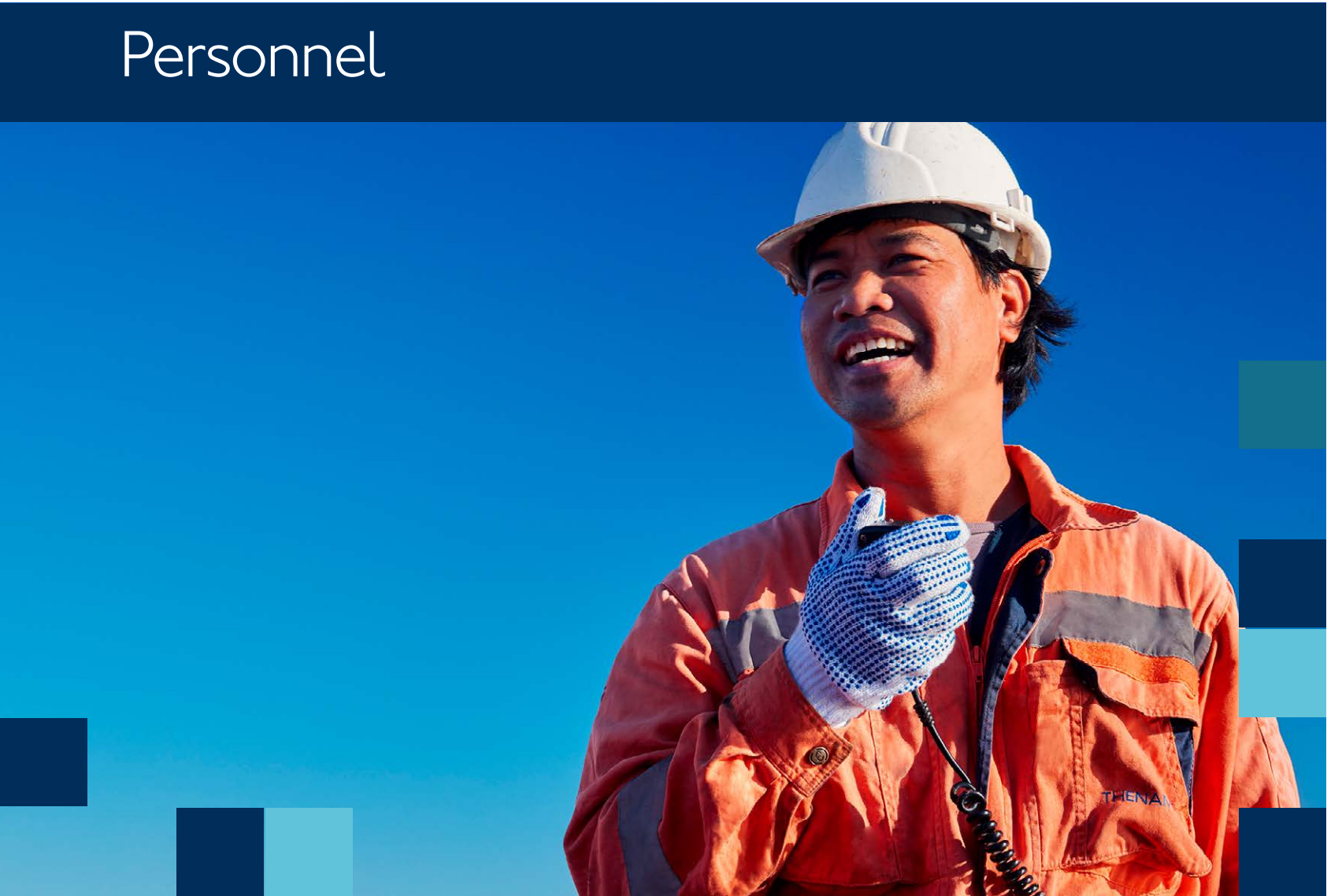
A2 Symbols & Abbreviated Terms  
Continued

Abbreviation	Term
PEP	Project Execution Plan
PC	Party Chief / Charge Surveyor
QHSE	Quality, Health, Safety & Environment
RIDDOR	Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (2013)
ROV	Remotely Operated Vehicle
S44	Special Publication No44 – standards for Hydrographic Surveys, edition 5 February 2008
SBES	Single-Beam Echo Sonder
SIDS	Small Island Developing States
SVP	Sound Velocity Probe
SWA	Stop Work Authority
SIMOPS	Simultaneous Operations
UAV	Unmanned Aerial Vehicle
UKHO	UK Hydrographic Office
WCD	Water Column Data

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## B1 Offshore Manager

The Offshore Manager performs the role of the Project Manager, but locally from the field offices, (afloat or ashore) as opposed to remotely from the Contractor's main offices.

The requirement for an Offshore Manager is not normally envisaged but may be proposed in the Tender where Contractor considers that the reality of the local situation is such that the presence of an Offshore Manager on the ground in-country would help ensure the smooth conduct of operations in the face of potentially poor communications, challenging local logistics and culture and potentially considerable time zone differences between the Contractor main offices and the Survey Team.

Exceptionally the requirement for an Offshore Manager may be stated in the HI although this will be limited to situations in which it is known that significant logistics issues will be encountered.

## B2 Party Chief

The Party Chief is in overall charge of the conduct of survey operations. They are responsible for:

- › Liaison with the Authority Client Representative or Project Manager.
- › The welfare of all project personnel including sub-contractors.
- › QHSE.
- › Logistics.
- › Running the daily routine.
- › Direction and completion of the work scope in accordance with the HI and Survey Specification.
- › Adherence to Contractor policy and procedures.
- › The creation of field deliverables including the Mobilisation and Calibration Report and DPRs.
- › Completion of all QHSE related documentation and returns.

The Party Chief may be from a hydrographic survey background and may also meet the requirements and fulfil the role of Charge Surveyor described below.

Appropriately experienced individuals from other offshore backgrounds may however be appropriate, including but not limited to Survey Engineers and Geophysicists. If this is to be the case there must also be a designated Charge Surveyor present who does meet the specific requirements stated below. The Party Chief shall be on site during all survey operations.

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### B3 Charge Surveyor

The Charge Surveyor shall have completed an IHO/FIG Category A accredited hydrographic survey course (or have equivalent training and/or experience as agreed by the Authority) and have a minimum of 5 years' hydrographic surveying experience including surveying for nautical charting purposes.

The Charge Surveyor shall have the authority and experience to make and implement operational decisions and will be available for the Authority to contact regularly to assess progress and modify the survey plan if necessary.

The Charge Surveyor's other duties and responsibilities shall be arranged such that they do not interfere with the management of the contract and his/her primary Quality Control (QC), Leadership and Management responsibilities as Charge Surveyor [\(i\)](#).

It would not normally be considered appropriate or possible in practice for the Charge Surveyor to additionally perform the role of Online Surveyor. If the Contractor's intention is for the Charge Surveyor to also fulfil the role of Online Surveyor, this is to be made clear in the tender documentation, together with an explanation of how he/she will in practice conduct a full working day as Online Surveyor and then fulfil their other duties, and not be in breach of working time regulations or Contractor Fitness for Work or Fatigue Management policies.

### B4 Online Surveyor

The online surveyor is responsible for data acquisition and real-time data QC. They coordinate survey operations during live operations and ensure, by maintaining the Online Survey Logbook, that an accurate narrative exists of how operations were conducted in practice.

As a minimum, the Online Surveyor shall have completed an IHO/FIG Category B accredited hydrographic survey course (or have equivalent training and/or experience as agreed by the Authority).

### B5 Survey Engineer

The Survey Engineer is responsible for Electronics and IT installation maintenance. He should have sufficient training and experience to be able to diagnose and repair any emergent faults in the survey spread.

In small boat operations the Survey Engineer may additionally be delegated responsibility by the Party Chief for logistics.

Whilst the Survey Engineer may support the Online Surveyor during the conduct of data collection, it would not normally be expected that the Survey Engineer would also be able to conduct the role of Online Surveyor unsupervised. If it is the intention for the Survey Engineer to also fulfil the role of Online Surveyor, particularly in small boat operations where he may be the only 'surveyor' onboard, this is to be made clear in the tender documentation, together with an explanation of how his/her skills, knowledge and experience will allow him/her to meet the minimum requirements specified for the Online Surveyor.



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## B6 Data Processor

The Data Processor is responsible to the Charge Surveyor for the post-processing of acquired survey data and the generation of project deliverables.

As a minimum, the Data Processor shall have completed an IHO/FIG Category B accredited hydrographic survey course (or equivalent as agreed by the Authority).

If the proposed plan for project manning is to have a Party Chief who is not a Surveyor (and therefore cannot additionally perform the role of Charge Surveyor), it is an acceptable alternative for the Lead Data Processor to perform the role of Charge Surveyor. If this is to be the case then the Lead Data Processor in their capacity as Charge Surveyor shall be on site during all survey operations. He/she shall have completed an IHO/FIG Category A accredited hydrographic survey course (or have equivalent training and/or experience as agreed by the Authority) and have a minimum of 5 years' hydrographic surveying experience including surveying for nautical Charting purposes.

## B7 Other Survey Specialists

Other survey specialists may be proposed by the Contractor during the Tender process. It is envisaged that these might include but not be limited to:

- › Land surveyors for the conduct of geodetic work and levelling.
- › Metocean specialists for the installation of tide gauges and offshore oceanographic equipment.
- › Specialist operators or maintainers of unmanned autonomous vehicles, vessels and drones.
- › ROV pilots and technicians.

Where these additional personnel are proposed, CVs and relevant documentation shall be provided to demonstrate their competency in the proposed role.

## B8 Offshore Paramedic / EMT

Exceptionally there may be a requirement for a qualified Offshore Paramedic / EMT to be embarked in project vessels.

It is anticipated that this requirement will be limited to larger vessels/liveboards operating some physical distance or transit time from a port or other place of safety with urban-standard ambulance and medical facilities. In these circumstances a normal first aider would be unlikely to have the training or equipment required to stabilise a seriously injured casualty to the extent necessary to prevent his/her deterioration or death during the transit. These circumstances suggest a higher level of training and equipment is appropriate, requiring that an appropriately equipped Offshore Paramedic / EMT is embarked.

The decision to embark an Offshore Paramedic/EMT will typically lie with the Contractor subject to an identification of the QHSE requirement during the HIRA/HAZID. If, however the provision of an Offshore Paramedic/EMT is specifically required by the Authority, this will be specified in the HI.

Where an Offshore Paramedic / EMT is embarked, (s)he will normally be delegated responsibility by the Party Chief for running the QHSE routine onboard, including maintenance of documentation and returns.

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## B9 Survey Team

The Contractor shall provide the Authority with the position, names, qualifications and experience of all the survey team sufficiently in advance of the personnel mobilising that substitutions can be proposed by the Contractor if required by the Authority.

Survey teams will include a balanced mix of the personnel identified above, with adequate experience both in charge of and in assisting with all aspects of surveys of complex coastal/offshore areas for nautical charting purposes, including office data compilation as well as fieldwork.

The requirement for a workable manning plan which allows the Charge Surveyor to perform his primary role, without working excessive hours, is emphasised.

## B10 Boat Crew

The Contractor shall provide details of the Boat Crew.

## B11 Online Surveyors in Small Boats

Some small boat survey operations are conducted on the basis of two personnel in the survey boat, namely the Coxswain and the Online Surveyor. Where this is the case the proposed Online Surveyor shall be used to working in this environment. Additionally, they shall have sufficient boat handling experience that, in the event of the Coxswain falling overboard, (or becoming incapacitated), they can safely handle the vessel to recover a conscious or unconscious person overboard and then safely return the vessel to a place of safety as designated in the Emergency Response Plan.

Formal boat handling qualifications are preferred but not specifically required for the Online Surveyor on small boats. The Online Surveyor should however be able to practically demonstrate, in the field, the safe and effective unaided recovery of an unconscious man overboard.

## B12 Working Hours & Conditions

Marine Crew ('seafarers') and Survey Personnel ('[a] worker on ships or boats') are to comply with (UK) Working Time Regulations, the [Maritime Labour Convention \(UK\)](#) and, where applicable, the spirit of the ILO [Maritime Labour Convention](#), notably Standard A2.3 and Regulation 2.7.

At ITQ, the Contractor shall demonstrate how the plan for project manning, travel and accommodation will meet these legal requirements.

## B13 Remote Working

Any changes to the above where the Contractor wishes required field staff to be located elsewhere, are to be fully justified in the tender.

In such instances tenders are to include a full communications plan, with evidence, to support the transfer of data, audio and video to ensure that productivity and output is not negatively impacted.

The Authority retains final say on the working location of all staff.

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## C1 The Authorities Intent

A well-run Quality, Health, Safety, Environment (QHSE) management system provides an effective means of protecting employees' health and safety, as well as the environment, and doing it in a cost-effective and well-planned manner. This in turn inevitably leads to sound operational outcomes and the rendering of high quality data to the Authority whilst also ensuring zero harm.

An effective QHSE system is based on the understanding that all accidents are the result of human error and are preventable. Establishing effective QHSE management also results in overall better training and administration methods.

It is the Authorities intent to demonstrate an ongoing and determined commitment to improving QHSE at work throughout our organisation and by our Contractors and Sub-Contractors.

We will lead the global offshore survey industry by promoting and improving upon existing offshore industry QHSE best practice and meeting or exceeding the guidance of the UK Health and Safety Executive and other regulatory bodies.

All policies and example documentation referred to in Section C shall be supplied as part of the tender.

## C2 Principles of QHSE

A number of principles have been recognized as foundational to QHSE. These include:

- › Management must fully support QHSE execution by all employees.
- › All employees must participate, and comply with all QHSE policies, procedures, and rules.
- › Individual employees are responsible for working safely and protecting the environment.
- › Safety comes first; the goal is to eliminate all injuries and environmental incidents.
- › Good practices don't "just happen" – they must be planned and properly executed.
- › The potential for safety, health, or environment incidents should be eliminated during the planning stage.
- › Contractors must demonstrate that an effective QHSE system is in place and functional in practice.
- › QHSE includes all aspects of a Contractor's operation, including areas such as purchasing, logistics, the mobilisation of personnel and equipment and administrative services.
- › All QHSE related events (as detailed in this section) must be reported to the Authority, documented, and investigated. This allows performance tracking and continual improvement.
- › Monitoring and assessment should be conducted regularly.

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C3 Contractor Responsibility

Equipment and survey personnel provided by the Contractor for work in connection with the contract shall be the Contractor’s responsibility at all times. Any loss, injury or damage suffered or caused by them shall be at the Contractor’s risk throughout.

Any loss, injury or damage to personnel, equipment or the environment must be reported to the Authority in accordance with the guidance contained in this section and to any other relevant authority required by local regulations and the national legislation of the country in which the Contractor is headquartered. If doubt exists the Authority is to be informed and UK standards and requirements followed as the default position.

The Authority reserves the right to request, and receive in a timely manner, documentary evidence to demonstrate Contractor compliance with or the ability to meet the minimum standards laid down in this Framework, at any time throughout the life of the contract; a refusal or inability to provide relevant documentary evidence automatically signals a departure from the Framework.

C4 Stop Work Authority

Any person participating in the Project has both the right and the legal obligation under his/her Duty of Care to exercise SWA if they perceive a condition or behaviour that poses imminent danger to persons, equipment or the environment.

SWA shall be formally stated as a Contractor company policy which is supported by the head of the organisation. The policy should make it clear that it is an expectation that an employee *will exercise* SWA if they are in doubt as to the safety of an activity and that they will never be subsequently held to be wrong when exercising SWA in good faith.

SWA should be managed in accordance with the Contractor’s internal policies and procedures. It will typically follow the general procedure of Stop, Notify, Investigate, Correct, Resume and Follow-Up.

Where SWA is exercised, it shall be recorded using a HOC card and specific reference made to the event in the DPR. If there was potential for an *Incident* or *Non-Conformance* it shall also be reported and reviewed in accordance with the Contractor’s *Near Miss* procedure or *Non-Conformance Procedure* as appropriate.

The circumstances leading to the situation will be reviewed in the Weekly Safety Meeting which will formally brief any Follow-Up actions implemented to prevent a recurrence of the unsafe act or condition.



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## C5 Drugs and Alcohol Policy

Being under the influence of alcohol or drugs can seriously impair an individual's judgement and reactions leading to an increased risk of accidents and injuries occurring. Workers who present themselves for work under the influence of drugs or alcohol are unlikely to have the physical, mental and emotional condition to be able to carry out their duties without risk to themselves or others. They are therefore not Fit for Work.

The Contractor shall have in place a drugs and alcohol policy which:

- › Forbids the presence or possession of drugs illegal under UK or local law and of psychoactive substances or alcohol in vessels or offices used under this contract.
- › Forbids the consumption, possession or supply by project personnel of drugs which are illegal under local or UK law and of psychoactive substances.
- › Requires that personnel do not report or try to report for work when unfit due to alcohol or drugs (whether illegal or not) or to substance abuse. Whether an employee is fit for work is a matter for the reasonable opinion of the Contractor management or the Client Representative.
- › Includes random and for-cause drug and alcohol testing whilst personnel are on the project.

The Contractor's Drugs and Alcohol policy may allow for social consumption of alcohol in moderation whilst not working provided that all employees present are Fit For Work at the commencement of their next shift and their blood alcohol level complies with the Contractor's Drugs and Alcohol Policy.

The Authority or its nominated representatives reserve the right to request evidence of and approve the regime in place at any time throughout the life of the contract.

The Authority reserves the right to require that all project personnel are to be subject to an OGUK compliant Drug Test (or recognised national equivalent) conducted not more than 2 weeks prior to mobilising to the Project. Personnel testing positive for a controlled substance are not to mobilise to the project and the Authority is to be informed of the situation and a replacement nominated. If the Authority exercises the right to require a pre-mobilisation drugs test, clearance certificates are to be provided to the Authority upon request. The contractor shall have in place a policy and rehabilitation system to assist any personnel who test positive for the presence of controlled substances or alcohol in the pre-mobilisation testing.

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## C6 Prescription & Non-Prescription Drugs and Medications

The Contractor shall have in place a policy which requires all project personnel to:

- › Ensure they are aware of the side effects of any prescription and non-prescription (legal) drugs and medications including those that may impact on their capacity for work.
- › Advise the Party Chief immediately of any side effects of prescription drugs, which may affect work performance or the health and safety of themselves or others. For example, drowsiness.
- › Declare any Prescription & Non-Prescription medications to the relevant authority as appropriate to the Project. This may be the Party Chief, Project EMT/Paramedic or vessel master as appropriate. This should be completed prior to travel so the Contractor can confirm there are no local laws prohibiting the possession or use of said medications.
- › Take steps to ensure they are aware of any common drugs which are contraindicated by any prescription and non-prescription (legal) drugs and medications that they are taking. Where this is the case the relevant authority should be informed, as appropriate to the Project. This may be the Party Chief, Project EMT/Paramedic or vessel master as appropriate.

This Policy may be included in a wider Drugs and Alcohol policy.

## C7 Fitness for Work

The Contractor shall have in place a Fitness for Work policy and procedure.

Fitness for work encompasses a general state of an employee's wellness (physical, mental and emotional) which enables a worker to perform assigned tasks competently and in a manner which does not compromise the safety or health of themselves or others for the duration of their shift.

Fitness for work considerations should include but not be limited to:

- › Safe work practices and procedures and duty of care.
- › Health promotion.
- › Fatigue Management including long haul travel and sensible acclimatisation to the prevailing environment.
- › Impairment.
- › Drug and alcohol management.
- › Mental health.
- › Functional physical fitness.
- › Appropriate project manning levels.
- › Management of shift lengths and Rosters.
- › Regular employment health assessments conducted by a medical professional.
- › Employee Assistance Programme.

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## C8 Fatigue Management

The Contractor shall have in place an effective Fatigue Management policy and procedure detailing the method by which the negative impact of fatigue shall be managed and Fitness for Work maintained.

The Fatigue Management Procedure may be a stand-alone document or may be incorporated as a specific aspect of the Fitness for Work Policy.

## C9 Long Haul Travel

The Contractor shall have in place an effective Long-Haul Travel policy and procedure detailing the method by which the negative impact of Long Haul Travel shall be managed, effective acclimatisation achieved and Fitness for Work maintained.

The Long-Haul Travel Procedure may be a stand-alone document or may be incorporated as a specific aspect of the Fatigue Management Policy.

## C10 Motor Vehicles

The Contractor shall have in place a Motor Vehicle policy and procedure detailing the method by which Motor Vehicles will be safely employed during the project. This should include a weekly checklist to be completed by a designated responsible person (typically the Survey Engineer) to ensure that the vehicle remains free from basic defects which affect safety.

## CII Management of Change

If a requirement emerges to depart from the survey plan as embodied in the HI, from the provisions of the Survey Specification, or from the detail described in any Contractor supplied project documentation, then the change is to be agreed with the Authority's Survey Manager or Client Representative.

The Contractor is to capture the change using the Contractor's Management of Change (MoC) Form and Procedure. A completed copy of this document is to be forwarded to the Authority's Programme Manager and Client Representative.

## C|2 Autonomous Vehicles

Where Autonomous Vehicles (ASV, AUV, UAVs) and ROVs are to be used during a project a concept of operations is to be provided for that system detailing how it will be operated, including any relevant system-specific safety considerations.

## C13 HIRA/HAZID

The Contractor is to conduct a formal Hazard Identification Risk Assessment/Hazard Identification (HIRA/HAZID) early in the planning stage of the Project. This should be attended by as many of the nominated offshore team as possible, but as a minimum should include the Charge Surveyor for the project.

The Authority is to receive early invitation to attend the HIRA/HAZID such that the Client Representative can make arrangement to attend in person or by video teleconference.

The HIRA is a 'live document' which should be subject to regular review and update as planning for the project progresses.

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## C14 Survey Project Briefing

The Contractor is to conduct a formal Project Briefing with all survey personnel mobilising to the project. Ideally this should be conducted in the Contractor Offices. Where this is not possible, the Charge Surveyor should conduct the Survey Project Briefing on arrival in the field and before commencing mobilisation activities.

The Project Briefing should ensure that all personnel are aware of the contents of the HI, Survey Specification and Project Execution Plan.

Additionally, any relevant *Lessons Identified* from previous projects should be raised, together with measures to be taken to prevent a recurrence.

The Authority is to receive early invitation to attend the Project Briefing such that the Client Representative can make arrangement to attend if deemed appropriate.

## C15 Project Execution Plan

Prior to mobilisation, the Contractor is to provide a Project Execution Plan (PEP). This document is to contain the technical detail of how the Contractor intends to execute the HI, together with a representative line plan.

Where different sizes and classes of vessels and vehicles are proposed (including ASVs, AUVs, ROVs and UAVs), the PEP is to detail how these assets will be employed, together with considerations regarding simultaneous operations.

The PEP is to contain a Gantt style chart detailing the timeline of key project activities from award of contract to rendering of data to the Authority.

Additionally, (where a Mobilisation/Demobilisation Plan is not provided as a separate document) the PEP should contain a section considering the specifics of vessel mobilisation and demobilisation.

## C16 Inspection and Test Plan (ITP)

Prior to mobilisation, the Contractor is to provide a comprehensive ITP for the project, covering the key activities from the start of personnel and equipment mobilisation to the end of personnel and equipment demobilisation.

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## C17 Mobilisation & Calibration Report

The Contractor's Charge Surveyor is to render a Mobilisation and Calibration Report to the Authority on completion of the Mobilisation and within 48 hrs of commencement of data collection. The contents of the Mobilisation and Calibration report are to include but not be limited to:

- › A description of all survey equipment and systems installed in all vessels including ASVs, AUVs, ROVs and UAVs.
- › Vessel and vehicle sensor offsets.
- › Geodetic Parameters Check (if required).
- › Description of all geodetic marks and benchmarks used during mobilisation and calibration.
- › Details of Tide Gauge installation, levelling and pole to gauge calibration.
- › Details of offshore Tide Gauge / Current Meter installation.
- › Heading Calibration.
- › Static position check results.
- › Node Comparison.
- › Dynamic position check results.
- › MBES gross error check.
- › Patch Test results.
- › MBES repeatability check results.
- › SVP comparison.

Additionally, if specified in the HI (not normally expected):

- › SBES Bar Check.
- › Ultra-short base line Calibration.
- › Magnetometer function check.



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## C18 Health, Safety & Environment Management Plan

A HSEMP shall be supplied to The Authority prior to survey operations being undertaken for each HI.

The HSEMP shall be tailored to the HI and reflect the actual survey area, vessels, offices and accommodation to be used.

## C19 Project Emergency Response Plan

A Project ERP shall be provided for the project and supplied to the Authority prior to personnel mobilising on each HI.

The Project ERP shall be tailored to the HI and the specific vessel and area of operations. The Project ERP should include but not be limited to:

- › Contractor Incident management procedures.
- › Identification of a Contractor duty officer / 24/7 response number.
- › Communications Plan, e.g. GSM Voice/GSM Data/SATCOM/EPIRB/PLB/Satellite Messenger.
- › Response to First Aid Incidents.
- › Response to (commercial or recreational) diving emergencies if these activities are to be conducted.
- › Response to serious Medical Emergencies.
- › Transfer of seriously injured personnel to appropriate medical facilities.
- › Repatriation of seriously injured personnel (or transfer to appropriate medical facilities).
- › Specific actions in the event of a disaster warnings (eg Hurricane and Volcano).
- › Specific actions in the event of unpredicted disaster as appropriate to the region and time of year, for example Earthquake, Fire, Tsunami, Flood, Civil Unrest.
- › Easy-access summary of key contacts and telephone numbers.

Additionally, where ASVs, AUVs, ROVs and UAVs are to be used during the project, responses to incidents involving these vehicles are to be specifically considered in the Project ERP.

The Project ERP shall be locally tested within 24hrs of personnel mobilising to the HI. The successful completion of this test shall be documented in the DPR.

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## C20 Vessel Emergency Response Plan

A Vessel ERP shall be provided for each vessel involved in the Project and supplied to the Authority prior to the vessel sailing on completion of mobilisation. Issues to be considered in the Vessel ERP should include but not be limited to:

- › Fires (including machinery spaces, galley, laundry and other identified high-risk compartments).
- › Flood.
- › Man Overboard.
- › Fouled rudder or propeller.
- › Engine Failure.
- › Collision and Grounding.
- › Loss of containment (Oil and Fuel).
- › Response to First Aid incidents.
- › Response to serious Medical Emergencies.
- › MEDEVAC.

## C21 Hazard Hunt

On completion of mobilisation activities and before sailing a whole vessel Hazard Hunt will be conducted. This should be attended by the Vessel Master/Cox'n, the Charge Surveyor and the lead Survey Engineer and, if present, the Client Representative<sup>(ii)</sup>.

Items picked up during the Hazard Hunt are to be formally recorded, together with what actions were recorded to resolve the hazard.

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## C22 Daily Toolbox Talk

The Charge Surveyor is to hold a Daily Toolbox Talk with all survey personnel, members of the navigational watch, and any other marine crew directly involved in survey operations prior to the start of work (or at each shift change when conducting 24 hr operations).

The conduct of Toolbox Talks is to be reported in the DPR

Meetings shall be minuted (briefly), posted in the mess and shall include the following headings as a minimum:

- › Date, Time, List of attendees.
- › Activities – Last 24 Hours.
- › Planned Activities – Next 24 Hours.
- › Safety / Hazards.

The minutes of the Daily Toolbox Talk are to be retained for inspection by the Authority as required.

On smaller vessels with crews of 5 or less the requirement to minute meetings may be waived with the agreement of the Authority. Details are still, however, to be reported in the DPR.

## C23 Job Hazard Analysis/ Job Safety Analysis

A formal JHA/JSA shall be in place for each survey activity. These shall be tailored to the vessel and equipment in use and to the prevailing environmental conditions. Examples of activities to be subject to a JHA/JSA include but are not limited to:

- › Personnel Mobilisation & Long-Haul Travel.
- › Motor Vehicle Operations.
- › Mobilisation & Demobilisation activities.
- › Dimcon.
- › Fieldwork Ashore.
- › Tide Gauge Installation.
- › Small Vessel Operations.
- › Shallow Water Operations.

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## C23 Job Hazard Analysis/ Job Safety Analysis Continued

- › SVP Deployment & Recovery.
- › Secchi Disk Operations.
- › Grab Sampler Operations.
- › MBES Pole Mobilisation.
- › Raising/Lowering MBES pole.
- › Offshore MBES Operations.
- › Offshore Tidegauge Deployment and Recovery.
- › MBES Pole Demobilisation.

The Contractor's standard 'Generic JSAs' are an acceptable starting point in this process but there shall be hard-copy documentary evidence that these templates have been reviewed and updated by all participating personnel prior to commencement of work. Only personnel who are signed onto the JSA are to participate in the activity.

JHA/JSAs shall be subject to regular after action reviews to ensure that they remain fit for purpose. A new JHA/JSA is to be conducted whenever the procedure covered is subject to change.

The conduct of JSA/JHA and AARs are to be reported in the DPR.

JHA/JSA records and AARs are to be retained for inspection by the Authority as required.

## C24 Safety Observation Cards

Safety Observation Cards (sometimes known as Hazard Observation Cards ('HOC Cards') or STOP cards) are to be available in all project vessels and in the shore office.

All embarked personnel are to be encouraged to submit Safety Observation Cards (to the Party Chief) as part of the positive health and safety and continuous improvement culture. The Party Chief is to forward the cards to the designated Contractor HSE manager ashore in accordance with internal Contractor policy.

Where the Vessel's safety management system already uses HOC cards, the survey team may participate in this system. The Survey Party Chief is however to ensure that all HOC cards submitted through this system are recorded and forwarded to the designated Contractor HSE manager ashore.

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## C24 Safety Observation Cards

Where the subject raised is particularly noteworthy or worthy of commendation it should be remarked upon in the Party Chief's comments section of the DPR. It is recommended that the Contractor operates a reward or recognition regime for 'good spots' to encourage participation and active identification and rectification of hazards around the vessel, worksite and offices.

HOC cards submitted are to be statistically recorded in the HSEQ section of the DPR. They are to be retained for inspection by the Authority as required.

## C25 Toolbox Talk

Prior to commencing any survey or boat activity, the person leading the operation is to hold a Toolbox Talk to brief the participating team members on the activity, their role in it and any health and safety considerations. Toolbox Talks are to be minuted (briefly) with the minutes retained for inspection by the Authority as required.

## C26 Weekly Safety Meeting

The Charge Surveyor shall hold Weekly Safety Meetings with all embarked personnel. Meetings shall be minuted (briefly), posted in the mess, and shall include the following headings as a minimum:

- › Date, Time, List of attendees.
- › Safety Moment.
- › Review of minutes of previous meeting.
- › Review of all Safety/Hazard Cards submitted in the previous week together with outstanding actions to rectify.
- › Review of all SWA exercised together with required Follow-Up actions to prevent a recurrence.
- › Review of all Incidents occurring in the last week onboard the vessel or onboard any other Contractor survey vessel.
- › Update of Lessons Identified.
- › Review of any MCA or equivalent national Safety Bulletins relevant to the vessel or operations.
- › Review of any IMCA, Alerts, Safety Flashes or Safety Bulletins relevant to the vessel or operations.
- › Any Other Business .

The conduct of Weekly Safety Meetings is to be reported in the DPR.



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## C27 Incident Reporting

All Incidents resulting in loss or damage to equipment are to be reported to the Authority within 12 hrs, other than where the conduct of operations is directly affected, where there has been damage sustained by a third party, or where environmental damage has occurred beyond the boundaries of the survey vessel. In these events the Incident is to be verbally reported as soon as practicable, with follow up documentary reporting submitted within 12 hrs.

All Serious Incidents are to be verbally reported to the Authority as soon as practicable, with follow up documentary reporting submitted within 12 hrs.

All Medical Treatment Incidents (MTI), Light Duty Incidents (LDI) and Lost Time Injuries (LTI) are to be reported to the Authority as soon as reasonably practicable.

All Near Misses are to be reported to the Authority as soon as reasonably practicable and within 48 hrs of the Near Miss.

All the above Health and Safety related events are to be reported using the appropriate Contractor form and statistically recorded in the DPR.

## C28 Near Miss Reporting

A Near Miss is an event not causing harm, but which has the potential to cause injury or ill health or damage to the environment. This includes an event which had the potential for causing an adverse effect as defined in the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013 (RIDDOR).

The outcome of any subsequent investigation is to be reported to the Authority, in accordance with the Contractor company procedures, as soon as the outcome is known.

## C29 Non-Conformance Reporting

A Non-Conformance Report documents the details of a non-conformance identified in a quality audit or other process review. The objective of the report is to make an unambiguous, defensible, clear and concise definition of the problem so that corrective action can and will be initiated by management.

All Non-Conformances, together with the proposed Corrective Actions, are to be reported to the Authority in accordance with Contractor procedures.

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### C30 First Aid Injury

First Aid Injuries are injuries which require local treatment by a project First Aider which do not ordinarily require professional medical care. An injury which is treated by a medical professional (e.g. Offshore Paramedic / EMT), but which could have been dealt with by a normal first aider remains an FAI.

FAIs are to be managed locally and internally reported in accordance with Contractor policy. They need not be specifically reported to the Authority, but they are to be statistically recorded in the DPR.

In the event of a First Aid Case subsequently escalating and becoming a MTI, LDI or LTI, the situation is to be reported as an Incident as soon as practicable.

### C31 Medical Treatment Injury

A Medical Treatment Injury is a minor injury of a non-permanent nature requiring treatment by a doctor or other qualified medical professional. The employee can return to his/her normal work immediately on completion of treatment.

Or

Injuries to multiple individuals of a non-life threatening, non-permanent nature which require first aid only.

All MTIs are to be reported to the Authority as soon as reasonably practicable

### C32 Light Duty Injury

A Light Duty Injury may exceptionally result from a FAI, but is more commonly a MTI in which the injured employee additionally has work restrictions requiring assignment to other than his/her normal job or in which (s)he cannot perform all aspect of his/her normal role unaided.

All LDIs are to be reported to the Authority as soon as reasonably practicable.

### C33 Lost Time Injury

A Lost Time Injury requires treatment by a doctor or other medical professional in which the injured employee cannot return to work on his/her next scheduled work day because of the injuries received.

All LTIs are to be reported to the Authority as soon as reasonably practicable.

### C34 Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013

In addition to the above reporting requirements to the Authority, the Contractor is to report all incidents as required by RIDDOR 2013. Where it is the Contractor's intention to report an incident to the Health and Safety Executive or National equivalent under RIDDOR or national equivalent, this is to be made clear in the verbal and written reporting submitted to the Authority. A copy of the RIDDOR report is to be forwarded to the Authority as soon as it is submitted to the Health and Safety Executive.

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<b>C35 Accident Book</b>			<p>An Accident Book is to be available in every vessel participating in the Project and in the Shore Offices. The Accident Book is to be of an HSE approved format<sup>1</sup>.</p> <p>All accidents, no matter how minor, are to be recorded in the Accident Book. On completion of the project, the accident book is to be retained by the Contractor for at least 3 years.</p>								
<b>C36 Lessons Identified &amp; Continuous Improvement</b>			<p>The Charge Surveyor should maintain a running list of Lessons Identified. Ideally this should be held on a communally available PC which all participating personnel can access as required. The Lessons Identified should be reviewed at the Weekly Safety Meeting and entries developed as appropriate.</p> <p>On completion of the project the Lessons Identified should be captured in the Contractor's Lessons Identified repository to ensure Continuous Improvement. Typically, this will be through the mechanism of the Project Debrief. A copy of the Lessons Identified is to be forwarded to the Client Representative and the Authority.</p>								
<b>C37 Work in Poorly Surveyed and Shallow Waters</b>			<p>The vessel master is responsible for the overall navigational safety of the vessel and crew. If the master considers that there is a conflict of interest in terms of the safety of the vessel and crew with regard to the proposed survey areas, they have the overriding authority to refuse to survey those areas.</p> <p>The Contractor shall have a comprehensive 'Shallow Water Working' procedure set out as part of their quality/safety management system which shall be appropriate to the actual vessels in use.</p> <p>All areas within HI requirements deemed inaccessible to survey vessels are to be photographed and reported to the Client Representative and the Authority.</p> <p>Where autonomous vehicles are to be used, the Shallow Water Working Procedure is to specifically consider the safe operation of these vehicles and a full operational method statement is to be provided at ITQ.</p>								
<b>C38 Medical Certification</b>			<p>All offshore survey personnel must have an in-date medical certificate of at least UK MCA ENG-I standard or equivalent. Evidence of certification may be requested by the Authority or its nominated representatives at any time.</p>								
<b>C39 Safety Training Certification</b>			<p>All offshore personnel must have appropriate in-date certification in accordance with the current STCW regulations (or agreed equivalent) for the size and class of vessel used. Evidence of certification may be requested by the Authority or its nominated representatives at any time.</p>								

<sup>1</sup> E.g. <http://www.hse.gov.uk/pubns/books/accident-book.htm>

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## C40 First Aid & Medical Training

All members of the survey team shall hold an in-date recognised first aid certificate equivalent or superior to the UK HSE First Aid at Work (3 Day) course.

Additionally, all members of the survey team shall be trained in:

- › The use of the AED which is to be carried in all survey vessels.
- › The control of major bleeding and the effective use of the use of the major bleeds kit which is to be carried in all survey vessels.
- › The use of disposable resuscitators, suction devices and artificial airways which are to be carried in all survey vessels.
- › The administration of Adrenaline autoinjectors (EpiPen).
- › The correct treatment for envenomation by tropical marine creature's endemic to the area of operation.
- › The correct treatment for (marine and terrestrial) snakebites.

Additionally, all members of the survey team shall be trained in any techniques, appropriate to the area of operation, which are suggested by the Contractor's HIRA/HAZID.

Where oxygen resuscitation equipment is carried (typically in larger vessels), at least 50% of the personal onboard shall be qualified in its use.

In small vessels which are crewed by a small number of personnel, sufficient members of the 'marine crew' are to be trained as per the 'survey team' requirements above, such that a situation is unlikely to arise where a casualty is also the only first aider embarked. In practice (e.g. vessels operating with 2 x marine crew and 1 x surveyor), this may require that 100% of the marine crew are trained to the same level as the rest of the survey team.

## C41 Controlled Drugs

Where vessels (typically but not limited to live-aboards) are working in remote locations<sup>(iii)</sup>, a requirement for a 'Ship's Medicine Chest' may be suggested by the HIRA/HAZID.

In this event guidance as to the best content of the kit should be sought from an appropriate medical authority. Typically it would be anticipated that the contents of the kit would conform to the [WHO recommendations](#) for Category B vessels.

In larger vessels there will typically be a class requirement for the vessel master (at a minimum) to have training in administration of controlled drugs, typically subject to a remote consultation with a doctor. Where this is the case, evidence of appropriate training is to be provided to the Authority. Where this is not the case, the Contractor is to indicate in the Health and Safety Management Plan the intention for provision of suitable training to designated key individuals.

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## C42 Certification of Client Representatives

Client Representative(s) will hold medical, safety and first aid certifications meeting the minimum standards stated above.

Where local vessel requirements mandate a higher standard of certification, this is to be made clear in the Tender. This will have no negative impact on the scoring of the Tender, but will ensure that the Client Representative(s) have sufficient notice to attend training and meet the minimum standards before visiting the project.

Should the situation change during the course of the contract the Authority's Programme Manager is to be informed at the earliest opportunity.

## C43 Infectious Diseases

All Contractor personnel are to be offered travel vaccinations for infectious diseases endemic to the area of operation. These should be provided sufficiently in advance of operations as to confer maximum immunity.

When operating in malarial areas, all Contractor personnel are to be offered an appropriate antimalarial prophylaxis for the area of operations.

Statistical evidence of the number of personnel offered vaccinations and antimalarial prophylaxis, together with the uptake rate, are to be provided to the Authority upon request.

## C44 Employee Assistance Programme

The Contractor is to offer a confidential Employee Assistance Programme (EAP) to all employees.

## C45 Lone Workers

The requirement for Lone Working is not routinely envisaged. If a requirement for Lone Working is identified, it must be captured in the HIRA/HAZID and measures put in place to mitigate the additional risk involved.



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## C46 Vessel Safety Induction

All offshore survey personnel must undertake a Vessel Safety Induction prior to sailing which must ensure they are able to:

- › Communicate with other persons on board on elementary safety matters and understand safety information symbols, signs and alarms.
- › Know what to do if a person falls overboard; fire or smoke is detected; the fire or abandon ship alarm is sounded.
- › Identify assembly and embarkation stations and emergency escape routes.
- › Be familiar with the escape routes from their cabin and normal place of work. Personnel should be able to escape to clear air even if the environment is smoke-filled with no lighting.
- › Locate and don life-jackets (and immersion suits if carried).
- › Locate, launch and enter life-rafts.
- › In the event of fire, know how to raise the alarm and have basic knowledge of the use and types of portable fire extinguishers on board.
- › Where the vessel has fixed firefighting arrangements in the galley and/or machinery spaces, embarked survey personnel are to have a working knowledge of how these are remotely operated in an emergency such that they could go to the required location and actuate the system if directed to do so in an emergency by a member of the ship's crew.
- › Be familiar with the location of first aid kits and AED devices.
- › Be familiar with the location and operation of all safety equipment in the Vessel Safety Equipment section below.
- › Take immediate action upon encountering an accident or other medical emergency, before seeking further medical assistance on board; close or open the fire, weather and watertight doors fitted in the particular ship, other than those for hull openings.

Evidence of training may be requested by the Authority or its nominated representatives at any time.

## C47 Drills and Exercises

Regular emergency drills and exercises are to be held. The periodicity of these this will typically be in accordance with the vessel's own requirements. At a minimum however, a Muster Drill / Abandon Ship Drill and a Man Overboard Drill should take place immediately after first sailing on with all embarked personnel participating. Thereafter the drills should be repeated at each crew change.

Where the vessel has fixed firefighting arrangements in the galley and/or machinery spaces and remote fuel isolations for main machinery, embarked survey personnel are to have a working knowledge of how these are remotely operated in an emergency such that they could go to the required location and actuate the system if directed to do so in an emergency by a member of the ship's crew.

The conduct of Drills and Exercises are to be reported in the DPR and statistically recorded.

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C48 Vessel Inspections

All vessels employed in the survey are to be compliant with relevant SOLAS regulations and in addition inspected and approved in accordance with local legislation of the coastal state in which the survey is being undertaken. The cost of any inspection and any subsequent actions required by the coastal state and any re-inspection shall be borne by the Contractor.

Evidence of inspections and approvals may be requested by the Authority or its nominated representatives at any time.

C49 Client Representative Visits

The Authority reserves the right to send a Client Representative to visit during survey operations.

Visits are intended to primarily focus on the conduct and quality of hydrographic processes and deliverables. It will also include an informal assessment of safety aspects on board and compliance with the detail of the Survey Specification. If significant safety concerns are raised the Client Representative has Stop Work Authority. Issues identified are to be resolved before work recommences. If significant issues with the vessel are identified, the Contractor is to contact the coastal state authority responsible for vessel safety standards to resolve any issues prior to commencement of work.

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## C50 Vessel Safety Equipment and Suitability as a Workboat

As a minimum standard any manned vessel employed on the survey shall have:

- I. One adult life jacket (Compliant with ISO 12402-3, ISO 12402-2 or equivalent) for each individual working on the vessel. The Contractor will supply an additional adult life jacket for each of the Client Representatives embarked. In larger vessels it may be appropriate to have lifejackets specifically designated for emergency use to be stored in an accessible location at the designated Muster Stations.
- II. A 406 MHz Emergency Position Indicating Radio Beacon (EPIRB). In larger vessels this should be stowed in an upper deck housing with an in-date hydrostatic release.
- III. In larger vessels where mandated by Class requirements, a Search and Rescue Transponder (SART).
- IV. A SOLAS compliant life raft appropriate to the vessel and crew. The life raft should be stowed in such a position that it can be easily and quickly launched on either side of the vessel. In launches it should typically be stowed in a cradle on the coach-house roof and secured with a hydrostatic release which is in-date for test. In smaller boats a valise-type device may be appropriate, stowed where best accessible in an emergency. In larger vessels two such life rafts may be appropriate such they can be easily deployed on either or both sides of the vessel.
- V. Flares compliant with the Marine Equipment Directive (Marine Directive 96/98/EC) or local equivalent.
- VI. Fire Fighting Equipment appropriate to the vessel in use. Where the vessel is fitted with an enclosed machinery space it is to be fitted with a remotely operated fire extinguishing system and remote smoke detectors.
- VII. A portable water proof VHF Radio and spare batteries.
- VIII. Waterproof torch and spare batteries.
- IX. First Aid Kit. The contents of the kit should be appropriate to the size of the vessel, number of crew and distance of the survey area from the source of professional medical assistance identified in the ERP. The contents of the kit should include but not be limited to:
  - a. Items as detailed in MCA MSN 1768 (M+F).
  - b. Eye wash.
  - c. Equipment suitable for controlling a major bleed, e.g. field dressings, tourniquet and haemostatic dressings.
  - d. Vinegar; heat-packs (Tropical (jellyfish envenomation) and cold-packs.

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## C50 Vessel Safety Equipment and Suitability as a Workboat

### Continued

X. Automated External Defibrillator (AED). Each vessel to carry an AED. All project personnel are to be trained in its use.

XI. Bilge pump in each compartment below the waterline.

Additionally, if applicable to the size or design of the vessel in use:

XII. Where 'Working At Heights' is required, appropriate safety harnesses, fall arrest equipment and tool lanyards are to be available.

XIII. If appropriate, safety harnesses to ensure that exposed personnel cannot fall overboard.

Additionally, in vessels where remote working is envisaged, in larger vessels (typically live-aboards), or where identified in the HAZID/HIRA:

I. High water level alarm in each compartment below the waterline.

II. Medical oxygen providing equipment (e.g. 'oxyviva' equipment and Oropharyngeal and nasopharyngeal airways.

III. Spinal immobilisation board.

IV. Cervical collar.

V. 'SAM Splints' or similar.

VI. Basket stretcher suitable for transfer of a casualty and helicopter operations.

VII. Ship's medical stores appropriate to the category of vessel, the location of the worksite, number of PoB and the availability and proximity of external assistance including helicopter rescue services. Refer MCA MSN 1768 (M+F) for further guidance<sup>2</sup>. At a minimum it is envisaged that a 'Doctor's Bag' should be provided (Refer MCA MSN 1768 (M+F) Annex 2).

VIII. Crew Locator System (e.g. 'Sea Marshal' type PLB and direction finder).

Any deviation from this list must be discussed and approved with The Authority.

The Client Representative may verify that all items in this section have been provided to the project and are in date for inspection/test/ expiry as appropriate<sup>(iv)</sup>. The Authority maintains the strongest commitment to ensuring the health and safety of its personnel and those of the Contractor. If shortcomings are noted in respect of this minimum requirement, Stop Work Authority may be exercised, at Contractor liability, until such time as defects or deficiencies are rectified.

<sup>2</sup> [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/282054/msn1768.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/282054/msn1768.pdf)

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## C51 Noise

Personnel shall not be exposed to hazardous levels of noise<sup>(v)</sup>.

The level of noise inside the accommodation / at the survey desk (and processing office if applicable) shall not, during normal running, be so high that hearing protection is required as standard practice during normal survey operations.

A calibrated electronic Sound Level Meter is to be available to confirm acceptable levels of noise.

## C52 Lighting

Office lighting intensity (Online Surveyor and Processing Office) is to meet the UK requirements for office and workshop lighting<sup>(vi)</sup>.

## C53 Project Office (Ashore) Ergonomics

Workstation ergonomics in the Project office(ashore) are to meet or exceed UK office standards. A formal ergonomic assessment of workstation configuration is to be conducted prior to start of work and any identified defects rectified.

## C54 Project Office (afloat), Online Surveyor and Helmsman Ergonomics

The default standard for the ergonomics of the Project Office (afloat), online surveyor's workstation and the helmsman's position is that it shall meet or exceed UK office standards. A formal ergonomic assessment of workstation configuration is to be conducted prior to start of work. Where this assessment determines that, through the design of the vessel, it is not possible for the workstation ergonomics to meet UK standards, action is to be taken to reduce all hazards presented to As Low As Reasonably Practicable (ALARP).

Where it is identified that the ergonomics of any positions do not meet or exceed UK office standards, this is to be reported to the Authority as a non-conformance. The report is to include:

- › A copy of the ergonomic assessment.
- › A list of the personnel exposed to the hazard.
- › A description of material modifications undertaken to reduce the hazards identified to ALARP.
- › A description of what systems or work patterns have been implemented to mitigate any adverse impact on exposed personnel.

## C55 Man Overboard

All vessels are to have a workable plan<sup>(vii)</sup> for timely safe and successful recovery of a conscious or unconscious man overboard to deck.

The Client Representative will verify that a workable MOB plan is in place. If in doubt, the efficacy of this plan is to be practically demonstrated. If the plan proves to be unworkable, Stop Work Authority may be exercised, at Contractor liability, until such time as a workable plan is demonstrated.

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## C56 Work in the water

In general, project personnel (including vessel crew and survey personnel) should not enter the water for the purposes of conducting project related operations.

In some situations, this may however be appropriate or become necessary as a *planned event* <sup>(viii)</sup>. Should this be the case the activity should be fully risk-assessed through the mechanism of the JHA/JSA, with appropriate measures put in place to mitigate all identified hazards and reduce the level of risk to an acceptable level.

Where work occurs in the water in proximity to larger commercial vessels and port facilities there will almost certainly be a formal Permit To Work (PTW) regime in force. All relevant authorities shall be approached to ensure that relevant PTWs are in force before any personnel enter the water.

## C57 Commercial Diving

For the purposes of this Survey Specification, any use of compressed air for breathing underwater constitutes a Commercial Diving Operation when conducted in direct support of the Project. The default standard is that only qualified Commercial Divers meeting or exceeding applicable UK HSE standards are to be used to conduct diving operations <sup>(ix)</sup>.

Notwithstanding the above, if a requirement to conduct diving operations emerges, the situation is to be discussed with the Authority before the operation takes place – In some circumstances overseas a lesser standard of diving certification may be appropriate to the local situation. This will however be at the discretion of the Authority and always subject to a fully developed JHA and Safety Plan.

## C58 Cetacean Sightings

Cetacean sightings are to be recorded in a marine mammal observation log to be held by the OOW. They are to be recorded in the DPR.

## C59 Environmental Impact Statement

The Contractor is responsible for providing an Environmental Impact Statement before any survey operations commence.

The statement must be supplied to the Authority at least 4 weeks before commencing field work and cover a minimum of the following:

- › Travel and Transport.
- › Reduction of noise, vibration and emissions.
- › Energy and Climate Change.
- › Minimisation of total energy/fuel consumption.
- › Air Quality.
- › Minimisation of greenhouse gas emissions and pollution of air with gases and particulates.
- › Noise.

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C59 Environmental Impact Statement Continued

- › Avoid harm and minimise disturbance or annoyance to people and wildlife caused by noise generated during survey activities.
- › Waste.
- › Reduce waste production and promote reuse, recycling and recovery.
- › Water.
- › Reduce total water consumption, maximise efficiency of use and encourage reuse whilst minimising the risks of water pollution.
- › Seabed and Sediment.
- › To protect sea bed stability and features of geological importance.
- › Biodiversity and Nature Conservation.
- › Conserve and prevent loss of biodiversity.
- › Mitigation of potential hazards to marine life.
- › Historical Environment.
- › Protect from damage or disturbance maritime heritage assets.
- › Communities and Social values.
- › Minimise disruption and nuisance to communities and local environments.
- › Health, Safety and Well Being.
- › Promote a safe, healthy and productive work environment.



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C60 Accommodation

Survey operations conducted under this specification often use small boats ‘day-running’, with the survey team accommodated overnight in a local hotel. Where this is to be the case, the Contractor is to pass the details of the hotel accommodation to the Authority as soon as they are known. (To maximise physical security and minimise logistical complications the Client Representative will seek to base himself in the same hotel accommodation as the Contractor survey team). Where the intention is to use rental accommodation, the address of the accommodation should be passed to the Authority as soon as it is known, so that the Client Representative can seek hotel accommodation nearby.

Where the survey team and Client Representative are accommodated onboard the survey vessel, the Client Representative is to be supplied with a cabin of at least the same grade as the Contractor’s Party Chief. If fitted, the cabin is to have a desk and chair, with adequate provision for mains power. On larger vessels, appropriately configured desk space is additionally to be provided for the Client Representative near to the online survey desk.

Where the vessel is fitted with satellite data and/or voice communications for use by the Contractor’s staff, the Client Representative is to have access to the communications on request.

C61 Vessel Coding and Approval

Each vessel tasked with surveying shall be subject to approval by the Authority prior to survey work commencing under the relevant HI.

All vessels (and crew) must comply with the relevant MCA codes of practice or relevant Merchant Shipping Legislation as applicable. The Authority will have the final say as to which legislation is appropriate.

The Contractor must provide proof that the required codes and inspections for all vessels used for the purposes of this contract are in place.

Autonomous vehicles are to be fully compliant with any international and local legislation that may be in place at time of operation. Certification demonstrating compliance may be requested at any time by the Authority or its representative.

C62 Vessel Flag

It is not a requirement that a flagged vessel is used for survey operations. However, if a flagged vessel is used, vessels registered with a Flag State on the International Chamber of shipping Black or Grey Lists\* will not be accepted for any work in relation to this contract.

\* Paris MoU, Tokyo MoU & USCG target list (Safety)

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## C63 Vessel Suitability

All vessels/vehicles used for surveying must:

- › Meet all relevant requirements detailed in Section C.
- › Be of appropriate size and draught for surveying to the bathymetric contour specified in the HI.
- › Be of appropriate size and manoeuvrability for surveying around obstructions and navigational aids in the prevailing depth of water.
- › Be sufficiently directionally stable in a straight line at low speed so as to permit effective line-keeping without excessive holidays in the data/requirement for infill lines.
- › Be sufficiently dynamically stable to allow swath bathymetry survey operations to be successfully conducted in the conditions typically prevailing on site during the proposed working hours and equipment operational parameters.
- › Have appropriate enclosed superstructure to provide shelter to equipment from exposure to the elements.
- › Have appropriate and reliable power to supply survey equipment.

Additionally, any manned vessels are to:

- › Be sufficiently stable in respect of both crew welfare/fatigue.
- › Have appropriate enclosed superstructure to provide shelter to personnel from exposure to the elements.
- › Meet or exceed minimum ergonomic and lighting standards for all exposed personnel, notably the seating and workstation arrangement for the helmsman, online surveyor (and data processor if embarked).

Where the proposed vessel does not have inbuilt heads, galley facilities and seating arrangements, the Contractor must detail:

- › Intentions for provision of toilet facilities.
- › Intentions for provision of hot and cold food and drink.
- › Intentions for maintenance of personal hygiene, notably hand hygiene.
- › Intentions for allowing embarked personnel to take regular rest breaks.

For safety reasons, multiple-engine vessels are preferred.

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## C64 Vessel Audit

It is strongly recommended that (manned) vessels proposed for use in the project are subject to a full Vessel Audit to confirm their suitability and identify any potential shortcomings. In the case of charter vessels not previously known by the Contractor, this should be sufficiently in advance of mobilisation that emergent defects and shortcomings can be rectified without impacting on Project timelines or an alternative vessel selected.

The Contractor may use their own Vessel Audit form for this purpose with the checks carried out by the Contractor's staff or suitably qualified local nominee.

Whilst not intended to be prescriptive, all manned vessels proposed for use in the HI would, in addition to the specific requirements outlined in this Framework, be expected to meet the minimum standards suggested in IMCA's "Marine Inspection for Small Workboats (Common Marine Inspection Document for Small Workboats)" and, where appropriate to larger vessels, the IMCA "Common Marine Inspection Document".

Appropriate documentary evidence may be requested by the Authority that these minimum standards have been met.

## C65 Vessel Commitment

Once a Vessel Audit has been conducted and the Vessel approved for survey, the Contractor should seek the Authorities prior agreement to remove or replace the vessel with another. The Authority will only approve a vessel replacement if the oncoming vessel is an appropriate like-for-like exchange and continues to abide by the requirements of the HI, Survey Specification and tender bid.

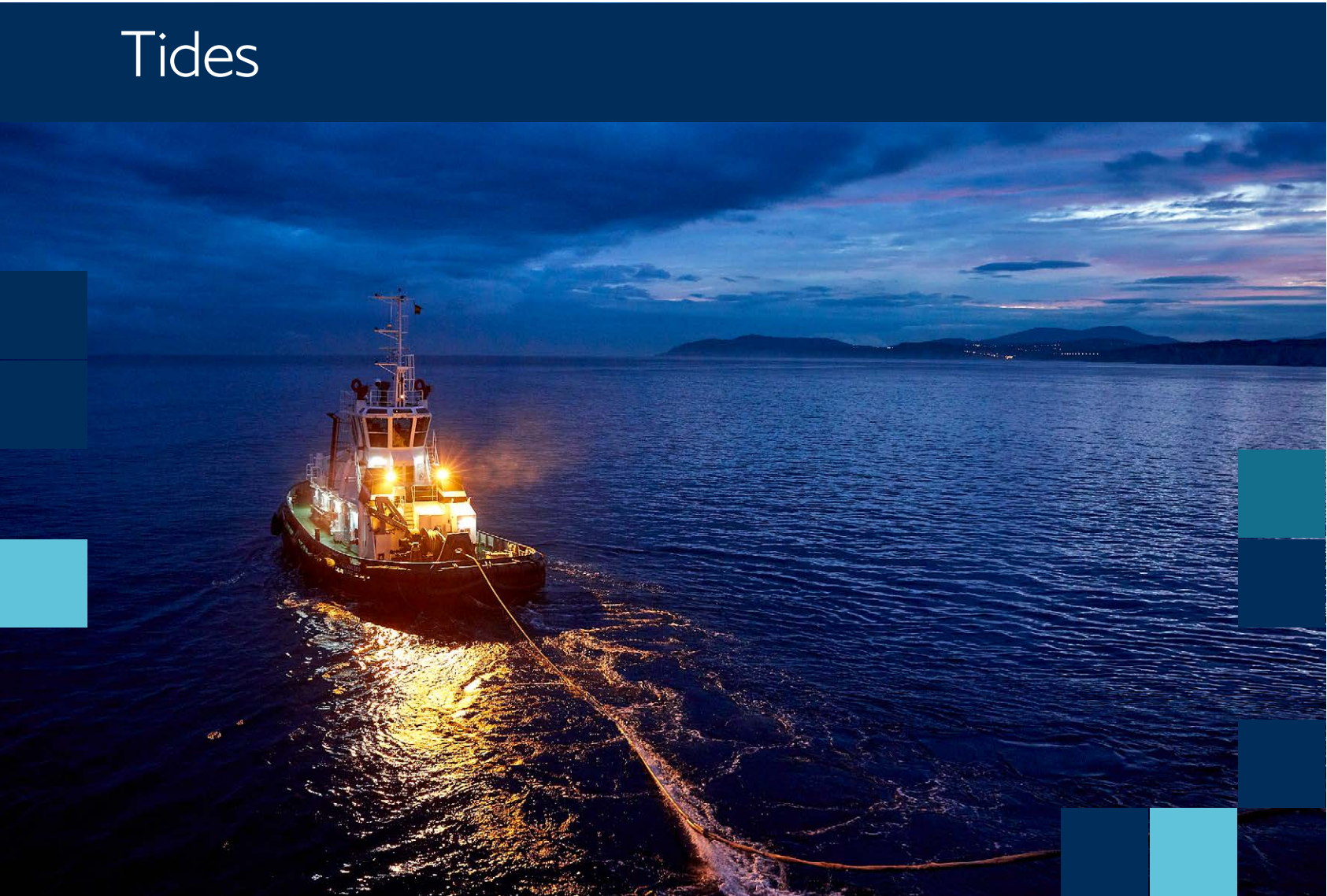
## C66 Working Language

The working language onboard the vessel, and for all reporting, is to be English.

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Part D

Tides



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<b>D1 Reduction of Soundings</b>			<p>All soundings are to be reduced to Chart Datum as specified by the specific HI. This will usually be by one of two methods:</p> <ul style="list-style-type: none"> <li>› Direct reduction from local tide observations collected for the duration of survey operations.</li> <li>› GNSS heighting using a spheroidal separation model.</li> </ul> <p>Soundings are to be presented as depths below Chart Datum, as supplied by the Authority.</p> <p>The Contractor shall demonstrate that the method chosen for sounding reduction results in the overall depth uncertainty requirements being met.</p> <p>Alternate methods of sounding reduction may be approved by the authority in certain cases, but must be fully outlined in individual survey tenders.</p>								
<b>D2 Establishing Chart Datum</b>			<p>Where the Authority deems that Chart Datum within the extents of an HI area is not adequately defined by the current infrastructure or historical knowledge. The Contractor will establish a tide gauge(s) in accordance with DI.3 and DI.4. The location of the tide gauge(s) being agreed between the Authority and the Contractor.</p> <p>The HI for a particular area will detail if the Contractor must undertake a Transfer of Tidal Datum iaw <b>NPI22</b><sup>3</sup> using form <b>H533</b>, or define a Sounding Datum for the survey in accordance with <b>NPI22</b>.</p> <p>In either case this data is to be forwarded to the Authority at the earliest opportunity to establish CD. The final value for CD will be passed back to the Contractor who is to use it for the final reduction of soundings.</p>								
<b>D3 Establishment of Shore-Based and Offshore (Seabed Mounted) Tide Gauges</b>			<p>Onshore/offshore tidal stations may be required within the extents of an HI area. The HI for a will confirm local requirements.</p> <p>Some HIs will require supplementary tidal stations, and some will require the use of locally available permanently installed gauges, e.g. local Port Authority or National tide gauge.</p> <p>When requested in the HI, tidal heights will be measured throughout the survey period and for a minimum of 30 days using a temporary or permanent tide gauge capable of meeting all the requirements stated below.</p> <ul style="list-style-type: none"> <li>› Automatic tide gauges (both onshore and offshore) are to have a measurement accuracy of <math>\pm 0.01</math> m or better.</li> <li>› Gauge time is to be synchronised with UTC on set up and is to drift by no more than <math>\pm 0.5</math> min in time over the course of the survey operation. Gauges should be configured to take readings on the hour and 10-minute intervals thereafter.</li> </ul>								

<sup>3</sup> Extract will be provided by the Authority if required.

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### D3 Establishment of Shore-Based and Offshore (Seabed Mounted) Tide Gauges Continued

- › Longer term deployments of gauges are to include a mechanism (e.g. GPS clocks or network time) to ensure the gauge remains aligned with UTC to with the required specification stated in the HI.
  - › On demobilisation of all gauges and during data downloads or tide gauge checks, gauge time is to be checked against UTC and recorded.
  - › Heights must be recorded to at least 2 decimal places of precision and at sample intervals no longer than 10 minutes.
- Offshore (and non-vented) tide gauges shall be corrected for atmospheric pressure. Temporary or permanent air pressure sensor for this purpose are to meet all of the following requirements:
- › Pressure is to be recorded at a location representative of the survey area in terms of air pressure.
  - › Pressure sensors are to measure an accuracy of  $\pm 0.5 \text{ hPa}$  or better.
  - › Time is to be synchronised with UTC on set up and is to drift by no more than  $\pm 0.5 \text{ min}$  in time over the course of the survey operation.
  - › Pressure sensors are to be configured to take readings at the same time and interval as the corresponding tide gauge(s).

## D4 Pole-to-Gauge Calibration

Offshore seabed mounted gauges do not require pole to gauge but must be referenced to Chart Datum using methods described in D2.

All shore based tide gauges must be calibrated by reference to independent readings using a tide pole/stilling well or other manual method (e.g. top down air gap measurements using a weighted tape measure from a known survey mark, see sections **E5, E6 & E7**) which can be subsequently tied into the vertical control. The **H143** spreadsheet must be used for this purpose. Readings are to be synchronised with the tide gauge and are to be taken half-hourly as a minimum, with 10-minute interval readings taken for the duration of one hour before to one hour after high and low water. If observing at a location with a tide range in excess of 5m (or where the range is perceived to be changing rapidly) the observations are to be taken every 10 minutes, and every 5 minutes for the duration of one hour before to one hour after high and low water. All tide gauges installed by the Contractor require a minimum 25-hour period of manual observations.

The pole/stilling well is to be read to an accuracy of  $\pm 0.025\text{m}$ , with the time of each reading recorded to within  $\pm 5$  seconds of UTC; the same applies for a 'top down air gap' measurement technique.



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D4

Pole-to-Gauge Calibration

Continued

Reports on the Pole to Gauge comparison are also to be made on Form **H516** (Summary of Checks on Automatic Tide gauge).

The pole used shall be levelled to at least two permanently mounted and documented control points which meet the requirements stated in **Establishment of Survey Control (E5) and Station Marking and Documentation (E7)**.

The pole and subsequently the tide gauge should also be referenced to spheroidal height to allow the Spheroid separation to be established.

When a permanent / previously established tide gauge is used, a pole to gauge calibration is required to ensure the gauge is correctly calibrated (unless documented evidence can be provided in the Report of Survey that this check has been undertaken within the last 6 months by an appropriate authority). The HI will confirm local requirements.

D5

Tidal Stream Observations

When required in the HI, tidal stream observations will be conducted in the locations listed using a seabed mounted ADCP. These observations shall obtain the Tidal Stream in the “surface” layer of the water column, which is to be representative of a depth of 5m below MSL.

The ADCP should also record the stream movement throughout the water column at appropriate bin sizes in order to achieve, at the very minimum, a ‘mid-column’ and ‘near seabed’ stream rates and directions.

Bin size is to be set to 0.5m in water depths of  $\leq 20\text{m}$ , and 1m in depths  $>20\text{m}$ .

If the ADCP is also capable of recording water level, this should also be enabled and supplied.

Tidal stream data (and height data if available) is to be synchronised with UTC on set up and is to drift by no more than  $\pm 0.5$  min in time over the course of the survey operation. Gauges should be configured to take readings on the hour and 10-minute intervals thereafter.

ADCPs will be deployed for tidal stream observations to enable a minimum of 30 days continuous data to be collected, unless stated differently in the HI.

D6

Deliverables – Tidal Data

Tide gauge records, including raw tide heights and metadata, are to be submitted preferably in .csv file format as follows:

```
dd/mm/yyyy,hh:mm:ss,m.mm
13/01/2018,02:00:00,1.08
13/01/2018,02:10:00,1.07
13/01/2018,02:20:00,1.06...etc.
```



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## D6 Deliverables – Tidal Data Continued

Alternatively, the minimum data above Microsoft Excel format (.xlsx).

Metadata pertinent to the deployment must include, where known:

- I. Tidal Instrument Type, Make & Model
- II. Position of Tide Gauge Horizontal Datum (degrees, minutes and decimal minutes, dddmm.mm)
- III. Coordinate type
- IV. Projection (if applicable)
- V. Vertical Datum (i.e. what is the gauge zero referred to, i.e. its connection to Chart Datum, or Ordnance Datum etc)
- VI. GNSS Height of the gauge zero (if known)
- VII. Data format of supplied file(s) preferably .csv (see above paragraph for details)
- VIII. Likely frequency of supplied data set if applicable (e.g. monthly, quarterly, annually, just for the purposes of the survey etc.)
- IX. Tidal Observations Start Date, Time and Time Zone (in the format: yyyy-mm-ddThh:mm:ss±hh:mm) and Tidal Observations End Date, Time and Time Zone (in the format: yyyy-mm-ddThh:mm:ss±hh:mm)
- X. If there are any data gaps in the record, enter the gap date range in the format yyyy-mm-ddThh:mm:ss±hh:mm to yyyy-mm-ddThh:mm:ss±hh:mm  
  
(Note: for the above two bullet points the hyphens are required, as is the “T” character between the date & time fields. The “±hh:mm” refers to the Time Zone of the observations (so for GMT this would be +00:00 [positive east and negative west of Greenwich Meridian]).
- XI. Time Zone of the supplied data
- XII. Time interval of the tidal records (e.g. 1, 6, 10, 12, 15 minutes etc.)
- XIII. Note any specific details regarding the tidal data record submission, i.e. surge, noisy data etc, or if the data been adjusted or manipulated in any way (i.e. differs to the original instrument raw data, a vertical datum adjustment part-way through, etc)

The tide gauge observations must be rendered in metres and not solely in pressure readings on a **HI43**.

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D7 Deliverables – Tidal Stream Data

ADCP Tidal Stream data (and if applicable tidal heights combined, see above) should be supplied in a netCDF format or directly in Excel spreadsheet format. The tidal stream data must be available for each bin recorded and show either:

- › the ‘departures East and North’ (i.e. the rates of the stream in both the Easterly and Northerly direction); and/or
- › the resultant Magnitude and Degrees (true) which themselves are derived from the Departures East and North.

An Excel spreadsheet containing the following meta-data about the deployment should be supplied, and include:

- XIV. Position of instrument
- XV. Depth of water at the deployment site
- XVI. Height of instrument above the seabed
- XVII. Start/ End of deployment time and date
- XVIII. Time zone
- XIX. Units of stream rates
- XX. Any general notes of use pertaining to the deployment (e.g. any tilt unable to resolve, missing data)
- XXI. Local variable parameters:
  - › Magnetic Variation, Mean Water Density and Barometric Pressure

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Part E

Positioning



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E1	Survey Geodesy	<p>Unless otherwise stated, every survey shall be rendered using the following geodetic parameters</p> <p>Datum: ITRF2014</p> <p>Spheroid: GRS '80</p> <p>Projection: UTM Grid Zone: As specified in the HI</p> <p>Geoid model: EGM08</p> <p>Unless an alternative format is stipulated by a particular H-Form, all rendered positions shall be quoted as geographical co-ordinates (i.e. in terms of Lat. / Long) as decimal degrees to at least 8 decimal places. The realisation of ITRF used (i.e. 2014) should be clearly stated in the Report of Survey.</p>
E2	Geodetic Parameters Check	<p>If a datum other than ITRF is specified, a Geodetic Parameters Check should be conducted using the survey navigation system's inbuilt test feature to demonstrate the correct transformation of coordinates between ITRF and the survey datum. If this is required it will be specified in the HI, together with a specimen set of coordinates to use in the Check.</p> <p>If a Geodetic Parameters Check is required, the result of the check shall be reported in the Mobilisation and Calibration Report.</p>
E3	Horizontal Uncertainty	<p>The Horizontal Uncertainty of all soundings and positions shall be in accordance with the Standard as stated in the HI.</p>
E4	Positioning	<p>The Contractor shall demonstrate that the method chosen for sounding positioning results in the overall horizontal and vertical uncertainty requirements for the Standard as stated in the HI being met.</p> <p>The Contractor will state methodologies for positioning as a tender deliverable. This can be post-processed or real time.</p>

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## E5 Establishment of Survey Control

- › Three-dimensional position of any existing or newly established survey control shall be determined by dual frequency carrier phase GNSS techniques, tied in to a Continuously Operating Reference Station network.
- › Multiple reference stations are to be used where available and a full network adjustment carried out to ensure the positional accuracies are met as stated below.
- › Data should be logged at 15 second intervals.
- › Where the maximum baseline length does not exceed 715km, a minimum of twelve hours' observations are required per station.
- › The observation period should be divided into two sessions of equal duration. At the end of the first session the antenna should be physically moved away from the mark and then re-established over the mark (at an appreciably different antenna height) before commencing the 2nd observation session.
- › Where the maximum baseline length is greater than 715km the following formula should be used to calculate the minimum required duration of observations per station in minutes:
- ›  $\text{Baseline length (in km)} + (\text{recording interval (in secs)} \times 0.5)$ .
- › The absolute uncertainty with respect to the coordinate system used (ITRF2014) for any existing or newly established survey control shall not exceed 1cm + 0.1ppm in horizontal and 2 cm + 0.1ppm in vertical (at the 95% confidence level).
- › When logging GNSS data care must be taken to use a suitable elevation mask (a minimum of 15°) and minimise the effects of multipath signals. This information must be included in the Report of Survey.
- › The height of the GNSS antenna should be measured before each logging session and clearly recorded and reported. If the height measured is a slope distance from the edge of the antenna, this shall be appropriately corrected to obtain the true vertical offset.
- › The static GNSS antenna shall be positioned directly over the control point using an optical plummet.
- › An orthometric height as described in the HI and appropriate UTM coordinate for each station shall be computed. Where necessary, co-ordinate conversion shall be conducted using appropriate (as agreed by the Authority) conversion programs and an estimated final uncertainty stated.

The Authority will consider, but is not under any obligation to accept, alternative solutions to that described above. If the Contractor wishes to suggest an alternative solution, they must provide detailed technical evidence of their methodology and compliance with the absolute uncertainty requirements to the Authority within their tender.

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## E6 Optical Levelling

To perform a redundant check on any control established and/or utilised using GNSS techniques, all control points shall be optically levelled from two pre-existing control points referred to the appropriate Datum.

The correct practices for traditional optical Differential Levelling are to be adhered to. In particular:

- › Prior to commencing a traverse, the correct calibration of the instrument is to be confirmed by performing a Two Peg Test. If required the instrument is to be adjusted and the test repeated to demonstrate that it meets the anticipated accuracy for the technique. The results of this test are to be recorded and presented as an attachment to the H532 Levelling Reduction Form.
- › Levelling is to be conducted between the 2 established control points, the tide pole and any existing benchmarks in the vicinity and provided in the HI. Levelling is to comprise a looped traverse, starting on the first known point and finishing on the second; no inter-sights shall be taken. Levels should be read and recorded to a precision of 0.001m. The maximum acceptable misclosure for a looped traverse is 0.02m. Any misclosure is to be in line with the apriori sounding budget.
- › The Authority recommend levelling is to be conducted using the Three Wire (top; middle and bottom of stadia) technique.
- › Levelling is to be conducted using *Foresights* and *Backsights* positioned at *Turning Points* in the traverse. The optical instrument is to be positioned at a point equidistant between the Foresight and Backsight with observations taken to both staffs.
- › If an area exists over which it is impossible to run differential levels with balanced sights, a new geodetic mark should be established in a location which eliminates this requirement. If this is impossible or impractical then the correct Reciprocal Levelling technique is to be employed to bridge the gap.
- › Every effort shall be made to ensure that the survey staffs are held vertically whilst observations are being taken. An appropriately mounted bubble Staff Level shall be employed for this purpose.
- › On soft or uneven ground, a Change Plate or similar is to be used to provide a footing for the survey staff at all Turning Points.
- › A Staff Baseplate with a pointed tip is to be used if geodetic marks used have a pronounced indentation at the measurement point.
- › Levelling shall be recorded using the H532 Levelling Reduction Form. Any levelling field records should also be supplied, including the results of the Two Peg Test. The calibration certificate for the optical level is to be appended.

In some cases, this levelling requirement may be replaced by an entirely GNSS based redundant technique upon agreement with the Authority, should pre-existing control prove unsuitable or non-existent.



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E7 Station Marking & Documentation

All geodetic stations established during survey operations shall be described, photographed and permanently marked to assist their future recovery.

They shall be marked with a stainless steel, brass or bronze bolt drilled into concrete, in an area where they are unlikely to be disturbed. The bolt shall be punched to mark the precise horizontal measurement point. Stations shall not be established in tarmac. Stations should only be established on jetties or piers if assessed to be extremely stable. If a station is established on such a structure, the second station must be established on the shore.

Stations deviating from the above requirements due to site conditions will only be permitted at the prior discretion of the Authority. The Authority will have the final say on geodetic station location suitability.

A full station description shall be recorded using the **HI59** Description of Geodetic Control Station Form, including photographs and diagrams to aid recovery.

All stations are to be described in terms of ITRF2014 position and the following height datums:

- › ITRF ellipsoidal height.
- › Chart datum.
- › EGM08.
- › Local land datum (if known).

Appropriate permissions must be obtained by the Contractor prior to establishing any permanent marks.

Any new stations should be suitably positioned for GNSS observations and not be located close to buildings or anything that could obscure the sky or cause multipath problems. They should also be easily recoverable and on solid ground that is unlikely to move or be developed in the foreseeable future.

HI 59 Description of Geodetic Control Station Forms are to be appended to the Mobilisation and Calibration Report.



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## E8 Vessel Dimensional Control

An appropriate dimensional control survey of each vessel utilised shall have been conducted prior to commencement. Permanent and recoverable control points are to be established on each vessel utilised, coordinated to the vessel reference frame to within a tolerance  $\pm 0.01\text{m}$  relative (at the 95% confidence level) in X, Y and Z.

All sensors shall be established within the vessel reference frame within a tolerance of  $\pm 0.02\text{m}$  relative (at the 95% confidence level) in X, Y and Z.

Where appropriate, the rotations of each sensor around the X, Y and Z axis shall be initially determined by the dimensional control survey to within  $\pm 0.2$  degrees (at the 95% confidence level). Values may be later adjusted during the sonar patch test if required.

The centre of gravity of the vessel (rotation) should also be estimated and its location within the vessel reference frame and method of establishment clearly stated in the Report of Survey.

A copy of the dimensional control report for each vessel shall be supplied with the Report of Survey for each HI.

Any deviation from the above must be discussed and agreed by the Authority.

The results of the Vessel Dimensional Control may be presented as a stand-alone document or, if conducted in the field, are to be included in the Mobilisation and Calibration Report.

## E9 Heading Calibration

A Heading Calibration shall be performed at the start of fieldwork for each HI and after changing out or significantly reconfiguring any sensor (e.g. GNSS system, IMU or gyrocompass) which contributes to the heading solution.

The Heading Calibration shall establish the relationship between the vessel's reference frame and the survey reference frame. The offset between the two is to be entered into the survey navigation and/or motion sensor software as appropriate to the system in use.

The detail of the proposed methodology and analysis shall be presented in the tender. If a specific methodology is required or excluded (e.g. optical, RTK or taped offset), this will be stated in the HI. Whatever the methodology utilised, the spread of results should be commensurate with the anticipated accuracy and precision of the heading sensor in use and the A Priori THU.

The results of the Heading Calibration are to be included in the Mobilisation and Calibration Report.

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## E10 Dynamic Positioning Check

A Dynamic Position Check shall be performed at the start of fieldwork for each HI and after changing out or significantly reconfiguring any GNSS sensor or antennae.

The Dynamic Position Check shall graphically and statistically compare the computed positions of a single defined point on the vessel reference frame as computed by the survey system based on the positions of the antennae of the primary and secondary GNSS systems and the vessel heading.

Positions shall be logged at 5 second intervals for a period of 30 minutes whilst the vessel is underway at survey speed and performing a series of turns simulating end of line turns. All logged positions should be included in the analysis. The spread of results should be commensurate with the anticipated accuracy and precision of the GNSS positioning sensors, the heading sensor in use and the A Priori THU.

The detail of the proposed methodology and analysis shall be presented in the tender.

The results of the Dynamic Position Check are to be included in the Mobilisation and Calibration Report.

## E11 Static Positioning Check

A Static Positioning Check shall be performed at the start of fieldwork for each HI and after changing out or significantly reconfiguring any GNSS sensor or antennae.

The positioning data to be compared must be derived using the same equipment and configurations which will subsequently be used to obtain all positions associated with the bathymetric data.

The Static Positioning Check shall monitor either:

- › The three-dimensional position of both the primary and secondary GNSS antennae, for a period of no less than 30 minutes at a 6 second resolution; or
- › The three-dimensional position of another appropriate point within the vessel reference frame as calculated by navigation system computations from positions supplied by both the primary and secondary GNSS antennae and the vessel heading sensor, for a period of no less than 30 minutes at a 6 second resolution.

The Static Positioning Check report should separately state the computed statistical reliability of both the horizontal position and the height measured.

Any local survey control utilised in this procedure shall be compliant with the requirements above in **Establishment of Survey Control**.

The detail of the proposed methodology and analysis shall be presented in the tender.

The results of the Static Positioning Check are to be included in the Mobilisation and Calibration Report.

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## E12 Vertical Offset Check

A vertical offset gross error check shall be performed at the start of each HI; after changing out or significantly reconfiguring any survey sensor and regularly throughout the survey.

The detail of the proposed methodology and analysis shall be presented in the tender.

The check shall compare the physical measurements of the distance from the waterline to the seabed. This shall be performed in one location using a method entirely independent of the vessel's survey systems (e.g. level staff or leadline in a berth). These measurements shall be compared to data logged with respect to the waterline simultaneously in the same location using the vessel's survey system and software and, where available, the navigational echosounder. The results should be compared and detailed in the Report of Survey and included in the Mobilisation and Calibration Report.

## E13 Swathe Bathymetry Calibration (patch test)

A calibration of the Swathe system and associated sensors (e.g. "patch test") shall be performed at the start of field work for each HI or after changing out or significantly reconfiguring any survey sensor (methodology shall be detailed in tender). Final post calibration repeatability shall be proven by means of the **Swathe Repeatability Test**.

The detail of the proposed methodology and analysis shall be presented in the tender.

The results of the Patch Test are to be included in the Mobilisation and Calibration Report.

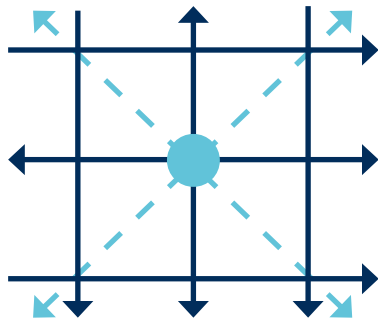
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E14 Swathe Bathymetry Repeatability Test

A bathymetry repeatability test shall be performed following all previous checks and calibrations:

This should be undertaken at the start of field work for each HI or after changing out or significantly reconfiguring any survey sensor (methodology shall be detailed in tender).

The test shall monitor the three-dimensional position of a clearly defined small but easily detectable feature on the seabed. The feature should be first surveyed near nadir from multiple directions – as a minimum from north, south, east and west. Secondly the feature should be boxed in, so that it appears in the outer beams on port for 2 lines, and the outer beams on starboard for 2 lines.



The Report of Survey should separately state the computed statistical reliability of both the horizontal position and the depth measured for the feature.

The results of the Swath Bathymetry Repeatability Test are to be included in the Mobilisation and Calibration Report.

E15 Position Quality

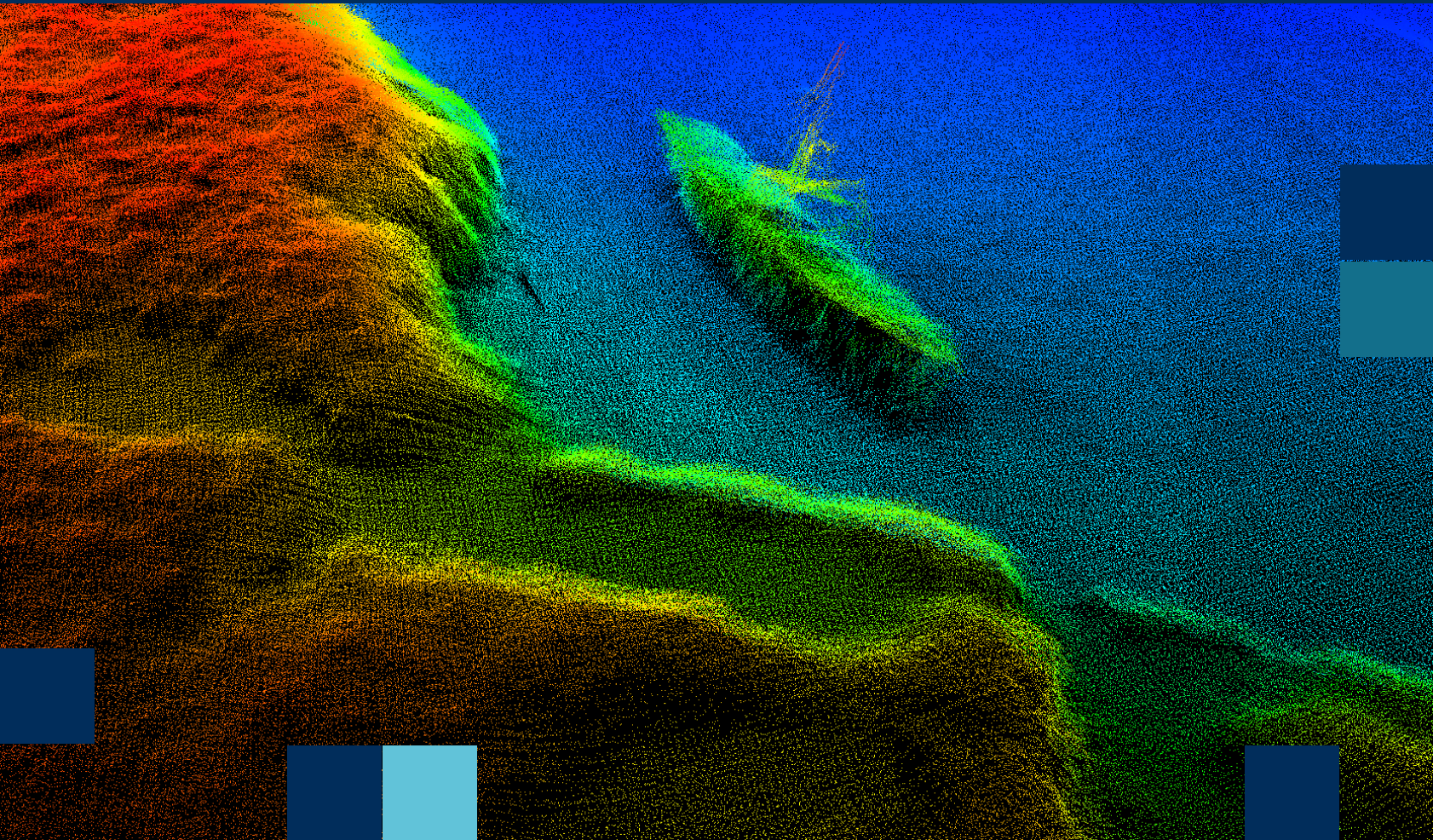
The navigation display shall be configured to provide a real-time indication of the quality of the 3D position and received GNSS augmentation data.



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# Part F

## Bathymetry



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F1	Primary Depth Sensor		<p>Depth will be measured throughout the survey area using an acoustic swathe bathymetry system capable of meeting all of the requirements stated below.</p> <p>The Contractor shall provide empirical evidence of each system’s ability to meet the stated requirement to the Authority as a tender deliverable.</p> <p>In addition, the same requirement as mentioned above is applicable where the HI specifies open spaced survey lines.</p>								
F2	Uncertainty		<p>Sounding uncertainty (in three dimensions) shall be in accordance with the Standard as stated in the HI.</p>								
F3	Uncertainty Model		<p>The Contractor shall provide a fully developed uncertainty model to the Authority prior to survey operations commencing. The model shall state all component uncertainties, as well as the combined total uncertainty.</p> <p>Details from this model as well as real time factors should be entered into the processing system to ensure all soundings are attributed with realistic TPU values.</p>								
F4	Draught Measurements		<p>A full understanding of the effect of draught is to be maintained and used to ensure vertical measurements remain within the proposed sounding error budget.</p>								
F5	Sound Speed Check		<p>Prior to commencing survey operations, the correct function of all sound speed sensors and profilers shall be confirmed by conducting a comparative check, in a representative body of water. This check should include sound speed and depth.</p> <p>The results of the Sound Speed Check are to be included in the Mobilisation and Calibration Report.</p>								
F6	Object Detection		<p>For all parts of the survey area the minimum size of object detected shall be in accordance with the Standard as stated in the HI.</p>								

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## F7 Sounding Density

Each Feature as described in **Object Detection (F6)** is to be detected by at least 3 valid soundings in the along-track direction and 3 valid soundings in the across-track direction, forming a minimum 3x3 grid of 9 soundings.

After processing/cleaning these valid soundings should be evenly distributed across each grid cell in the processing surface. A collection of soundings in one corner of the grid cell with the bulk of the grid cell empty is not acceptable.

Grid cell size is to be equal to the size of object required to be detected as specified in the HI.

All grid cells are to meet the above requirements.

Companies proposing a phase measuring bathymetric sonar must submit a proposal when tendering stating how individual samples will be aggregated into a sounding for a given part of the acoustic footprint. Single interferometric samples will not be considered as a sounding unless they can be proven to meet the uncertainty requirements without any form of aggregation. For example, samples could be aggregated into a fixed across track bin size or binned by number of samples.

## F8 Acoustic Coverage

Special Order & Order 1a

- › Full seafloor coverage shall be achieved to the limits of the supplied bounding polygon or the defined depth contours whichever is specified in the HI.
- › Where a survey block lies adjacent to the coastline, data coverage (meeting the above requirements) shall extend into the 2m CD depth contour unless specified differently in the HI.

Order 1b & Order 2

- › Line spacing and coverage requirements will be detailed in the HI.

Extinction depth

- › To ensure safety of navigation throughout defined polygon areas, full acoustic coverage is to be achieved even where depths extend deeper than the extinction depth of the sonar. This is to ensure that any isolated features shoaler than the minimum required extinction depth as stated in the HI will be detected.



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## F9 Crosslines

A minimum of 4 bathymetric crosslines shall be run for each Survey Block, the number of Blocks will be defined within the HI. Crosslines shall be at approximately equal spacing, and be approximately perpendicular to the typical mainline orientation in that block.

Crosslines shall be rendered in folders separate from the mainline data structure, but may be used in the final dataset and therefore should be cleaned as per **Data Cleaning (F16)** to allow for analysis.

An analysis between cross-lines and the main data set against compliancy with IHO depth accuracies is to be given in the Report of Survey.

## F10 Detailed Investigations of Wrecks

All suspected (or obvious) wrecks located during the course of the survey shall be reported on form H525 with as much information as feasible<sup>(x)</sup>.

Any stranded wreck located adjacent to the survey area should be reported on a H525 with as much information as feasible.

All wrecks are to be investigated by running one survey line, centred over the centre of the wreck and orientated along the major axis, followed by two further parallel lines offset either side from the major axis. Sufficient lines run at right angles to the first to cover the entire length shall also be run. All investigation lines are to be run at as slow a speed as is possible and appropriate adjustments made to the swathe angle if possible, to maximise the sounding density in the area.

The Contractor shall clearly indicate within the Report of Survey whether the least depth for each wreck has been determined by the real-time bottom detect, by analysis of swathe bathymetry water column data, or by other means if previously agreed by the Authority.

The H525 shall include at a minimum 4 x representative images of the wreck and any associated debris field and area of scour. The images shall be viewed from the bow, stern and the port and starboard beam. MBES data is to be presented as fully cleaned point clouds at full data density. The part of the structure identified as the shoalest point / least depth is to be annotated.

Exceptionally, (typically only in the case of very recent/intact and uncharted wrecks), additional views should be presented as will best represent any evidence of isolated anomalies including cracks, apertures and structural collapse, e.g. collision damage or other structural failure.

In addition, the HI may state an Ancillary Requirement to undertaken investigations with Magnetometer or ROV. Any requirement for this will be detailed in the HI.

All uncharted wrecks detected during the survey should be reported to UKHO within 48 hrs, using the HI02 Hydrographic Note.

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## F11 Detailed Investigation of Obstructions

All Obstructions located during the course of the survey shall be investigated and reported using form H525, Report of Wrecks and Obstructions.

The list of Obstructions should include but not be limited to Anomalous Features and the obstructions as defined in IHO S57 Feature Object Attributes.

The investigation appropriate to a given Obstruction will vary depending upon the nature of the feature and should be agreed between the Party Chief and the UKHO Client Representative or Survey Manager. This will ensure that the agreed investigation is appropriate and will allow the data to pass Validation as IHO Order 1a.

Factors to consider will generally be the same as for Wreck Investigations, namely position, orientation, extent and least depth. Typically using the same line pattern as described above in **F10**.

The Contractor shall clearly indicate within the RoS whether the least depth for each Obstruction has been determined by the real-time bottom detect, by analysis of swath bathymetry WCD or by other means if previously agreed by the Authority.

Any Obstructions that do not require investigation will be listed in the HI. This will typically apply to Obstructions the location of which are already fully known and charted, for example oil and gas and offshore renewables infrastructure including pipelines, wellheads and cables.

If, however the mainline bathymetry indicates that these Obstructions may now be shoaler than charted, the Authority should be informed and a full investigation should be undertaken.

All uncharted Obstructions detected during the survey should be reported to UKHO within 24 hrs, using the HI 02 Hydrographic Note.

## F12 ROV Inspections

Where requested in the HI, ROV Inspections may be conducted. These will typically utilise hand launched Mini and Micro observation class ROVs – larger ROVs requiring a Launch and recovery system for deployment may be used, but will not be specified.

ROV inspections will typically be specified for designated wrecks and obstructions listed in the HI but may include wider inspections of debris in sensitive areas or of areas with local environmental or fisheries interest.

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### F13 Swathe Bathymetry Water Column Data (WCD)

Swathe bathymetry Water Column Data (WCD) shall be logged for further analysis during all wreck investigation lines.

By default, WCD shall be logged for all Obstruction investigations. In some Obstruction Investigations however, the logging of WCD may not be required, for example when investigating a cable or pipeline laid on the seabed which, due to engineering realities will be of relatively consistent and predictable height above the seabed along the entire length of the engineered feature. In this case the Charge Surveyor should discuss the requirement with the Authority's Client Representative or Survey Manager. This will ensure that the agreed investigation is appropriate and will allow the data to pass Validation as IHO Order 1a.

The WCD shall be analysed in an appropriate software package to compare the data digitised in real time by the swathe bathymetry with other features present in the water column. The water column data must be visible in the final CARIS HIPS project. The surveyor shall have the ability to re-pick fully geo-referenced depths from the water column data for inclusion in the final sounding data if a shoaler depth over a given feature has been found within the water column data. These depths must be visible in the final CARIS HIPS data structure, and be fully corrected for sound speed and tide.

The Contractor shall supply details of the procedure, software and file formats to be utilised for swathe bathymetry water column data interpretation prior to survey operations commencing.

Any Contractor proposing phase measuring bathymetric sonars must clearly indicate how they intend to meet this water column requirement as a tender deliverable.

### F14 Leading Lines & Tracks

The leading lines and recommended tracks along channels and into harbours and anchorages marked by lights or fixed daymarks must be very carefully examined. An additional survey line is to be run along the course of the line or track as early in the survey as practicable. If navigational significant differences between physical features and their depiction on the current ADMIRALTY nautical charts and publications are detected, then this should be immediately reported to the relevant Port Authority and the Authority using form HI 02 or H Note Application.

### F15 Depth Data Precision

Depth data recorded shall be logged to at least two decimal places of a metre.

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F16 Data Cleaning

All accepted soundings within the final bathymetric dataset shall fall within the uncertainty allowance for the IHO S44 Order as stated in the HI.

All systematic errors and obvious outliers shall be suppressed within the bathymetric data. Soundings falling within the uncertainty allowance, but still numerically distant from the main dataset, will be regarded as outliers and should be flagged as rejected.

All manmade vertical structures that extend above the waterline and are dry at all states of tide (for example quay walls, Jetties and Windfarm structures) are to be rejected from the dataset back to the valid seabed soundings, ie sediment build-up or rock armour.

F17 Deliverable

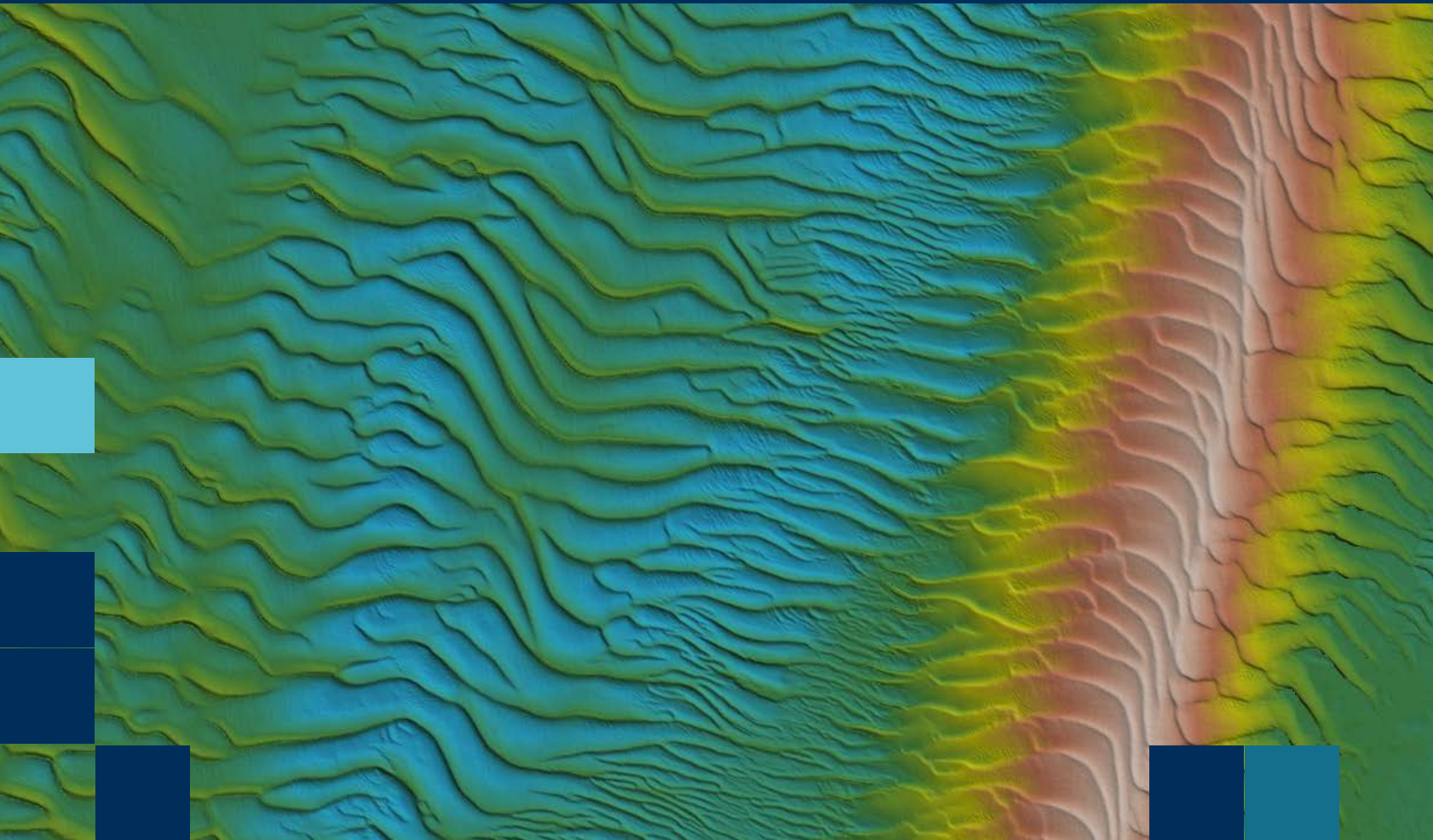
- The following deliverables are required for bathymetric data:
- › Processed (cleaned)<sup>4</sup> sounding data in a CARIS HIPS Project including all accepted, rejected depths & water column data, structured by vessel and including cleaned crosslines in separate folders. The CARIS HIPS software version shall be up-to-date at time of rendering. Projects delivered using CARIS HIPS v9 (and later) must not be indexed and the user must select “carry over raw data” during import. The data must be converted to full HDCS format.
  - › Raw data (proprietary format) containing full backscatter record.
  - › Raw data (proprietary format) and the processed files of the gathered positional data, including all data used to process.
  - › Raw and processed Water Column Data from wreck investigations.

4 See Annex E for processing guidance

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Part G

Seabed Textures



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## GI Backscatter

High resolution, geo-referenced swathe backscatter data shall be collected at all times that bathymetry is being collected.

The Contractor shall ensure that systemic variations to backscatter intensity are kept to a minimum and that system changes which affect backscatter (e.g. gain, pulse length) are minimised during data acquisition.

Attention must be paid to settings that can automatically change without operator intervention. Changes affecting backscatter intensity within a single data file are to be kept to an absolute minimum, and ideally changes will only be made during line turns. Any user changes affecting backscatter intensity must be noted in the Report of Survey, including exact date, time (to the nearest 5 seconds), filename and nature of the change. Where site conditions require the use of different settings throughout the survey area, the Authority is to be informed and the survey area may need to be divided in blocks of similar settings as agreed with the Authority.

The number of vessels or swathe systems used to collect data at a survey site will be kept to a minimum. This will minimise differences in backscatter intensity collected from different vessels. Where multiple vessels or swathe echo sounders are used within a single survey area, the Contractor will ensure that:

1. Data from different vessels or systems will be collected in separate blocks.
2. An inter-calibration between the backscatter intensity values from the different vessels or systems is undertaken. A single repeat survey line for each system in the same direction may be sufficient to meet this requirement.

The survey area is to be crossed prior to main data collection to obtain an understanding of the range of seabed types and backscatter responses. Optimal system settings are to be derived and applied to minimise changes in settings affecting backscatter responses during the survey.

During the mobilisation the ability to acquire high quality backscatter data may be verified by the Authorities representative. Alternatively, a sample of processed backscatter data may be requested during main data collection.

Processes to assess and maintain the quality of backscatter data during the survey are to be in place and agreed with the Authority.

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## G2 Seabed Sampling (Physical)

Where requested in the HI, Seabed sampling is to be conducted with at least one sample being taken in each major textural area identified. Sampling will not be conducted until all bathymetry and backscatter for a given block or HI is complete, to inform the required positions for samples within the major textural areas. A major textural area is typically defined as a polygon with area greater than 10km<sup>2</sup>.

At least one sample should also be taken in all charted anchorage areas.

Before demobilisation, the client representative is to be appraised on the samples taken in relation to the identified textural areas to ensure sufficient samples have been taken.

A high-resolution colour close-up image should be taken immediately after the sample is brought to the surface. The sample should be placed on a plain white surface and include a millimetric scale and relevant Munsell Rock-Colour Chart.

Where requested in the HI, samples are to be retained and forwarded to the relevant local authority and logged on a H575 with images named and tagged suitably to cross reference with the sample serial number on the H575 form. Plastic screw top containers are to be used to preserve the samples. The use of polythene bags for preserving retained samples is not acceptable.

The Authority's decision on sampling requirements is final.

## G3 Seabed Sampling (Remote Imaging)

Where requested in the HI, Seabed Sampling (Physical) may be replaced by an appropriate Remote Imaging technique at the same spatial resolution. This may include:

- › Drop camera with high resolution colour video and/or high-resolution colour still photo capability.
- › Towed camera system with high resolution colour video and/or high-resolution colour still photo capability.
- › Remotely Operated Vehicle (typically Micro or Mini Observation Class) fitted with high resolution colour video and/or high-resolution colour still photo capability.

Before demobilisation, the client representative is to be appraised on the samples taken in relation to the identified textural areas to ensure sufficient samples have been taken.

Additionally, Remotely Operated Vehicles (typically Micro or Mini Observation Class) may be fitted with tooling suitable for physical sampling.

ROVs will typically be free-swimming, although benthic crawlers/a free swimming ROV fitted with a crawler skid may be appropriate in some circumstances at the discretion of the Authority.

Samples need only be retained for the period of the survey operations unless their retention is requested by local authorities.



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G3 Seabed Sampling (Remote Imaging) Continued

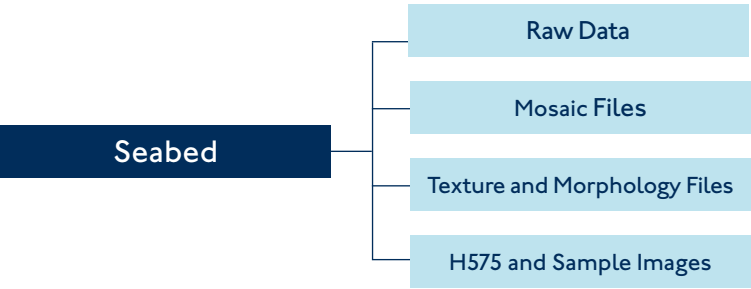
Remote Imaging may be offered as an alternative to physical samples, but must be capable of achieving a clear high-resolution colour image down to at least a depth of 100m. Images should be included as a supplement to the H575.

Where requested in the HI; images taken of the seabed shall include a scale within the image, taken in situ, to assist in differentiating between grain sizes and are to be colour corrected for light absorption or ambient light from additional light sources.

The Authority's decision on sampling requirements is final.

G4 Deliverable – General

Seabed sampling and textural data is to be rendered using the following structure.



G5 Deliverables – Raw Data

The bathymetric raw data (in proprietary format) containing full backscatter record is to be rendered as part of the first 3 milestone payment deliverables.



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## G6 Deliverables – Backscatter Mosaic

The backscatter mosaic should be a representation of the backscatter intensity across the respective HIs. The backscatter data derived from the swathe echo sounder will be processed using any software package that uses an industry standard backscatter engine (eg Geocoder<sup>5</sup>. Artefacts and backscatter changes within homogenous areas shall be corrected for.)

Where blocks of data were collected using different settings, separate outputs will be generated for each block. Calibration and cross lines will not be included in the backscatter deliverable.

Outputs will be provided as an internally referenced 32 bit Floating Point GeoTIFF images (which preserves actual backscatter decibel levels, rather than just greyscale values) or a GeoTIFF image with separate ASCII text file (at same resolution as GeoTIFF) containing the following information:

- › Latitude/Longitude or Easting/Northing.
- › Corrected backscatter intensity in dB.

The resolution of the backscatter mosaics will be a minimum of:

- › 0.5 m in water less than 20 m.
- › 1 m in water less than 50 m.
- › 2 m in water depths more than 50 m.

A full description of the backscatter processing workflow (including data assessment and cleaning steps), software (including name and version) and settings (including software specific settings used during processing, e.g. overlapping data blending mode, algorithm options selected, etc) will be included in the Report of Survey. Where corrective action was taken to produce a high-quality backscatter mosaic, the report will detail how this was resolved.

## G7 Deliverables – Seabed Samples

- › Seabed sampling records (**H575**) and associated Shapefile **Annex B**.
- › High resolution colour images of all samples.
- › If requested in the HI, any physical samples are to be forwarded in sample pots labelled with the HI Number, Date and Serial Number as recorded on the H575.

<sup>5</sup> Developed at Center for Coastal and Ocean Mapping, University of New Hampshire by Luciano Fonseca

Fonseca, L. and Calder, B. (2005) Geocoder: an efficient backscatter map constructor. Proceedings of the US Hydrographic Conference 2005, San Diego, 9pp

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## G8 Deliverables – Seabed Classification

Where required a seabed classification will be requested in the HI. Dependent on individual locational requirements, this deliverable will be segmented into three levels of complexity. The level(s) required will be specified in the HI.

1. Sediment textures based on categorisation of grain size – These are to be delivered in a singular Shapefile or feature class within a Geodatabase containing underlying sediment texture using the categories supplied in **Annex B**.
2. Landforms, morphology and anthropogenic features – Each feature is to be rendered as their own shapefile or as an additional feature class within the Geodatabase (**Annex B**).
3. Geological interpretation – Each geological feature is to be rendered as their own shapefile or as an additional feature class within the Geodatabase. The level of this requirement will be specified in the HI (**Annex B**).

For each seabed classification deliverable, there shall be no gaps or overlaps between adjacent polygons within that individual a shapefile or feature class.

The Contractor shall interpret seabed textural changes across their respective HIs using a combination of the bathymetry, backscatter interpretation and ground-truthing from seabed sampling as specified in the respective HI.

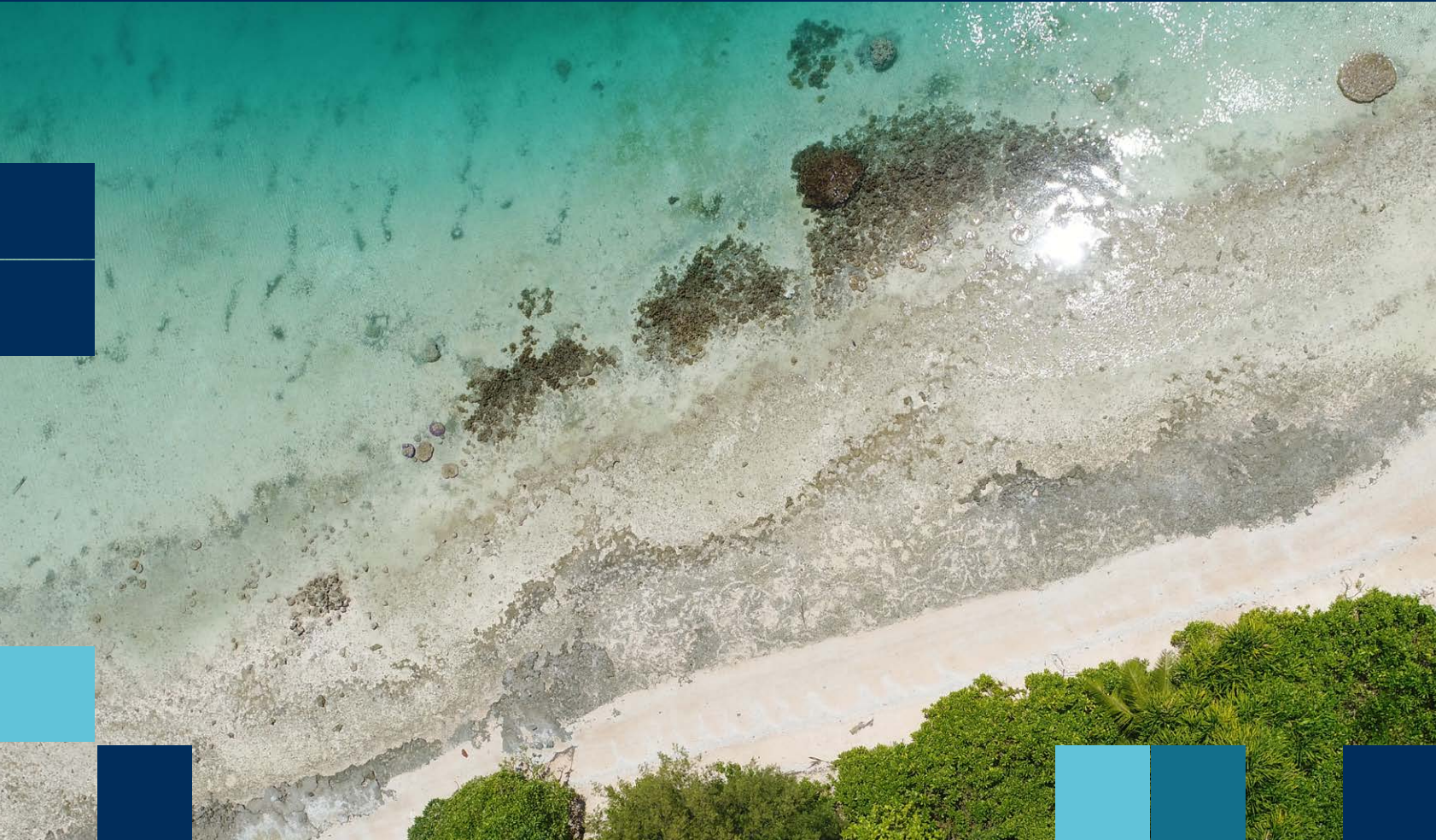
The Contractor shall provide details of the procedures and software to be employed as a tender deliverable.

See **Annex B** for further details.

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Part H

# Shoreline Mapping and Imagery



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H1	Inclusion of Topographic data		Topographic data and georeferenced imagery of the shoreline may be required for some surveys. The HI will give full details if required.								
H2	Topographic Mapping		If requested, georeferenced data of the shoreline and manmade structures both at sea and ashore are to be collected using a mobile lidar system that provides accurate georeferenced ranging to the following standards.								
H3	Safety		<p>The following additional safety considerations are to be adhered to when using lidar systems:</p> <ul style="list-style-type: none"><li>› All systems utilised for this purpose are to be classified as eye-safe.</li><li>› All staff onboard are to be fully briefed as to any additional safety requirements required when using lidar equipment.</li><li>› While it is expected that systems will generally be collocating on the afloat vessel, proposals for systems flown from drones will be considered if the safety requirements noted in Section C are followed Systems flown will have to comply with any local legislation.</li></ul>								
H4	Coverage		<p>Ranges are to be measured to all land and structures adjacent to the survey as well as any offshore structures. The system utilised is to have:</p> <ul style="list-style-type: none"><li>› A minimum range of 200m at 10% reflectivity.</li><li>› A minimum scan frequency of 300 lines / second.</li></ul>								
H5	Topographic Data Uncertainty		<p>Topographic data should conform to the following uncertainties:</p> <ul style="list-style-type: none"><li>› +/-0.25m vertically at 95% confidence level.</li><li>› +/-1.0m horizontally at 95% confidence level.</li></ul> <p>The lidar unit may utilise the same positioning system as the bathymetric system or may be separate.</p>								

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## H6 Panoramic Views

Where requested 360° georeferenced images of the coastline and offshore structures are to be taken. This requirement will be specified in the HI, if at all, and comprises of three tiers.

Tier 1 – Still colour images taken from a specified location(s) with the subject occupying as much of the photograph as possible.

Tier 2 – Continuous colour imagery taken along a specified stretch of coastline, stitched together to form an interactive virtual tour, enabling users to view and navigate through 360° horizontal and 290° vertical panoramic images at vessel level.

Tier 3 – Lidar and continuous colour georeferenced imagery. The Lidar point cloud is to be used as a DTM to drape over the imagery to provide enhanced 3D image analysis.

Systems for tiers 2 and 3 must capture an image at least one every second at normal survey speeds (4–5 knots) so that any post-processing and image stitching is not affected. Images are to be captured at an appropriate distance from the shore/object so that the subject occupies as much of the photograph as possible with some sea and sky included.

## H7 Positioning

All images are to be georeferenced with embedded GNSS position in the image metadata. For Tier 3, all geo-referencing between images and lidar are to be coherent, in the same horizontal co-ordinate system and vertical datum, using the same accuracy level.

## H8 Stabilisation and image quality

Image stabilisation needs to be suitable so that vessel movement in all axis is compensated for in order to provide an image that is in focus, sharp and with good contrast. Images need to be captured to at least 12 Megapixels with an appropriate aspect ratio for the chosen data processing software.

## H9 Comply with UK data protection laws

Any images taken must comply with UK Data Protection Act 2018. In order to protect people's privacy and limit privacy intrusion personal data shall be removed from any images, eg: the blurring of faces and vehicle number plates.

## H10 Deliverables

The final output of the shoreline mapping system is a point cloud georeferenced to the same datum as the bathymetric data set as described in the HI.

Images are to be captured as JPEG or RAW files types only, using a standard naming convention using only standard ASCII characters in the filename (examples of characters not allowed: ü, á, ã etc.) and shall at the very least include basic metadata such as time, date, position, collecting organising, HI Number, HI Name and all camera descriptors used in taking the image.

All deliverables for tiers 2 and 3 are to be provided in an appropriate platform that allows a restricted list of viewers to interact with the virtual tour or DTM. A specified software might be provided in the HI.



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Part I

# General Requirements



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I1	Customs, Licenses, Consents and Permissions		The Contractor shall be responsible for arranging all licences, consents, customs clearance and permits, for access and radio communication clearance for all survey operations whether ashore or afloat to enable the survey to be conducted.								
I2	Hydrographic notes		Reports of any newly discovered dangers to surface navigation shall be passed immediately to the Authority using the HI 02 Hydrographic Note form or UKHO H Note Application.								
I3	Eddies and Over-falls		Observations of any eddies or over falls which may be significant to small craft are to be rendered in the Report of Survey, stating the approximate geographic extents of such features, and how they relate to tidal and weather conditions  All previously charted eddies and over-falls must be reported on, even if just to state that the current charted information is correct.								
I4	Sound Speed		The Contractor shall observe sound speed profiles at an interval consistent with the proposed error budget.								
I5	Water Clarity		The Contractor shall provide an indication of the water clarity in term of secchi disc depths throughout the survey area. Observations are to be made on an approximate 5km grid with at least one observation being given for each major area of noticeably different clarity.  Other methods of obtaining water clarity may be used but all measurements must be reported in terms of secchi disk depths unless otherwise agreed with the Authority.								
I6	Amendments to Sailing Directions and Port Approach Guides		The relevant ADMIRALTY Pilot and Port Approach Guide (if applicable) shall be checked in the field and appropriate amendments rendered. Particular attention shall be paid to any recommended approach routes and anchorages within or adjacent to the survey area. If no changes to the relevant ADMIRALTY Pilot are thought to be required by the Contractor, this should also be recorded in the Report of Survey.								



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## I7 Fixed and Floating Aids to Navigation

The positions and characteristics of all fixed and floating aids to navigation visible from the survey area should be checked to ensure that they are as charted and as stated in the ADMIRALTY List of Lights. Nil returns are not required, i.e. specific details do not need to be reported where no changes are noted

Where differences in the positions or characteristic of marks are noted, local authorities should be asked whether the changes are permanent. Discrepancies are to be noted in the Report of Survey or by Hydrographic Note if more urgent, e.g. safety of navigation is directly and immediately affected due to a buoy being out of its charted position or unlit.

Any marks found to have significantly modified characteristics are also to be reported immediately to the Authority by Hydrographic Note. To avoid ambiguity, the Light List publication and the International Number of the light are always to be quoted when reference is made to a listed light.

Where it is apparent that floating navigational marks, including lightships, lightfloats and buoys are out of position or newly installed/uncharted they are to be fixed in position. This should be the centre of the feature in both its flood and ebb positions thereby determining the range of movement (i.e. the 'scope' of the mark. The mean position and the limits of the scope of the mark should be stated in the Report of Survey together with any light and sound signals observed.

## I8 Fishing Industry

Liaison with, and compensation to, fishermen for loss/damage to fishing gear are matters which rest entirely with the Contractor. The Contractor is to liaise closely with local fisheries groups and the appropriate Local Fisheries Authorities well in advance of the commencement of fieldwork

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I 9 Progress Reports

A daily progress report shall be supplied during fieldwork, in line with requirements stated in Annex D.

In addition to DPRs, a weekly progress report shall be completed and e-mailed to the Authority on at least a weekly basis throughout the duration of each HI. It will include:

- › Progress to date.
- › Planned activities.
- › Weather downtime.
- › Problems encountered.
- › The predicted delivery dates for each active HI.
- › Data processing progress.
- › Associated vessel plans.
- › Any safety incidents and concerns.

Any specific incidents or concerns should be raised directly to the Authority as they occur.

I 10 Quality Control

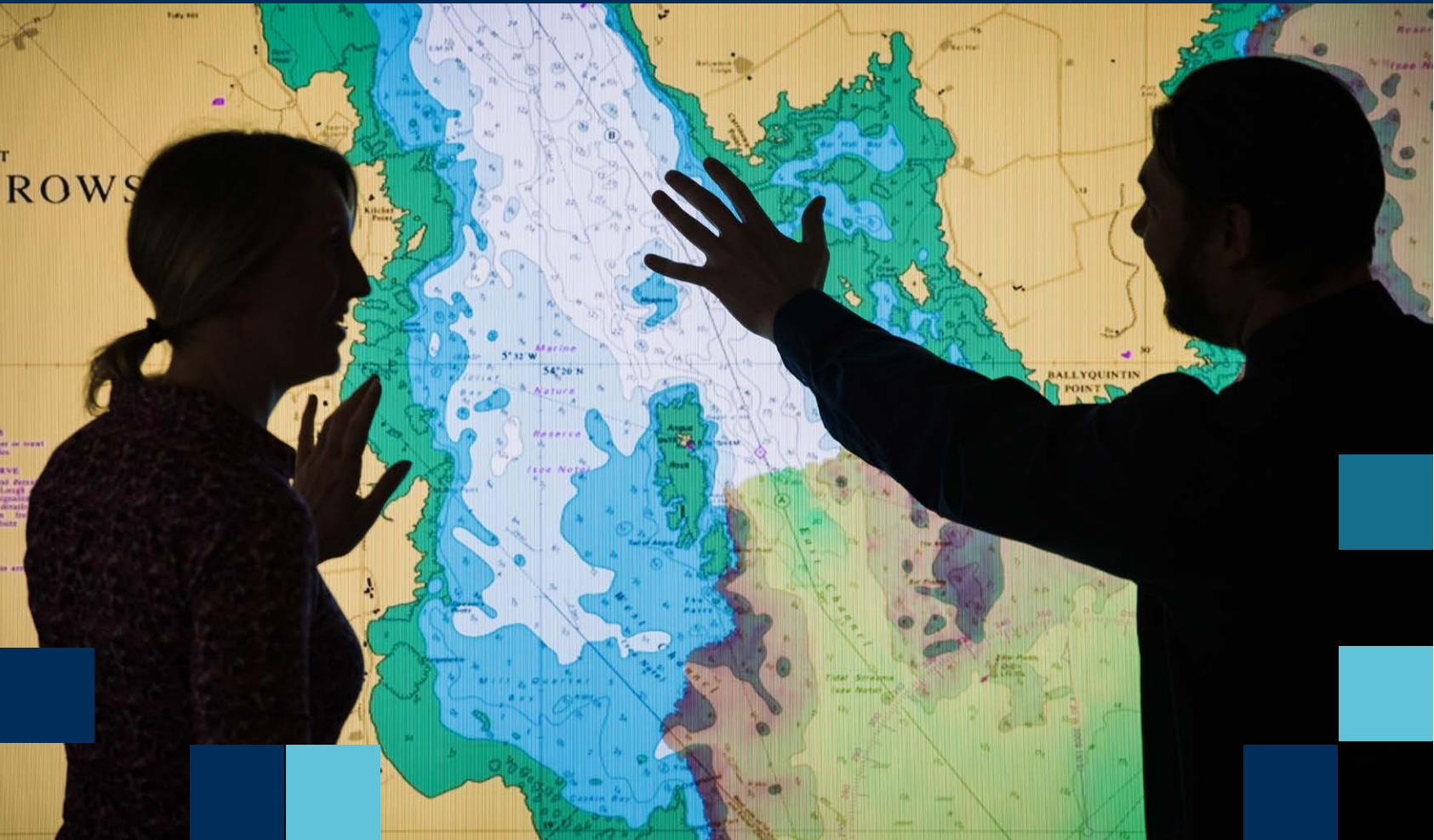
Robust quality control procedures shall be provided and adhered to during processing of all data. These procedures shall be provided to the Authority prior to survey operations commencing.

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Part J

Additional Requirements

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## J1 Views for Sailing Directions

The following items may be required for some surveys. Details will be given in the HI if required.

Where requested in the HI, photographs required to update existing views in the relevant ADMIRALTY Pilot will be detailed in each HI. Views shall be supported by appropriate records in accordance with **NPI00**. New photography shall be in colour and prepared in accordance with **NPI00**.

Digital cameras shall be used and must:

- › Be either Single Lens Reflex or described by their manufacturer as a “Bridge” or “Bridging” camera.
- › Have at least 16 Megapixel resolution.
- › Have GPS capability and be capable of embedding position in the image metadata.

When conducting photography, GPS (and compass if fitted) should be enabled and the GPS position (and compass heading if available) embedded in the metadata of each photo.

Images should be rendered in both .raw and .jpeg formats.

## J2 Magnetometer

Where requested in the HI, all suspected (or obvious) wrecks are to be investigated by obtaining magnetometer data. A minimum of two lines are required, one centred over the centre of the wreck and orientated along the major axis, and the second run at right angles to the first across the minor axis.

The magnetometer shall be capable of detecting deflections of 10 nano-Teslars from the background noise.

## J3 Magnetic Anomalies

Where requested in the HI, charted or newly discovered magnetic anomalies are to be investigated.

The ship should be steamed slowly in a wide octagon shape centred on the charted anomaly, both to port and starboard, made with the standard magnetic compass on 8 equidistant points during each turn. The ship should be steadied on each heading for at least a minute before the observation to allow the sub permanent magnetism resulting from the last course, to disappear. On each leg of the octagon, both magnetic and GNSS derived headings shall be logged and compared.

Any anomaly found, or charted anomaly not found, shall be reported in the Report of Survey, including the extent and magnitude of local variations.

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J4	Cetaceans & Marine Mammals	The OOW is to hold a Cetacean & Marine Mammal Sighting Log on the bridge. This is to be completed for every sighting of a marine mammal and the data rendered on form H637.
J5	Marine Life & Seabirds	Where requested in the HI, in addition to the mandatory reporting of Cetaceans & Marine Mammals, sightings of other specified marine life and seabirds are to be recorded. Any ornithological observations are to rendered on form H634.



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Part K

General Deliverables

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The delivery address will be provided in the HI.



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## K5 Required Deliverables

While the specification is the core document for the description of deliverables, the Authority reserve the right to amend any of the specific deliverable depending on the specific project in question. Any such changes will be fully described in the individual Hydrographic Instructions.

Deliverable to the Authority

- › Raw data and processed files of gathered tidal data.
- › ADCP data (when requested in HI).
- › Backscatter mosaic in high resolution GeoTIFF format.
- › Seabed classification of backscatter data (digital seabed texture information), see details at **Annex B**.
- › Water Clarity Information as ASCII file containing columns of Time(UTC), lat, lon, secchi depth in metres.
- › Sound-speed records in Raw data (proprietary format) and ASCII format and a minimum of four records per day in H635 digital format.
- › Digital Report of Survey (UKHO format including appropriate H forms). Including:
  - › Dimensional control/Calibration/Validation data.
  - › All logged survey control geodetic observation data and reference station data. All data must be in RINEX format.
  - › All ephemeris data used for computations.
  - › Baseline processing and network adjustment reports for all geodetic observations.
  - › Wreck records (**H525**). Including Images showing the water column replay for each wreck investigated.
  - › Tidal Records.
  - › Amendments to ADMIRALTY publications.
  - › Photographic views with supporting data.
  - › Seabed sampling Records.
  - › Miscellaneous Observation Records.
  - › Processing workflows for bathymetry and backscatter.

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K6	<b>H Forms</b>		<p>“H Forms” have been designed by the UKHO to facilitate checking and validation of rendered data. The Contractor shall always use the appropriate “H Form” where one exists for a process which is undertaken.</p> <p><b>Annex D</b> provides a list of all the relevant forms.</p>								
K7	<b>Digital Data Media</b>		<p>All Data shall be delivered on USB 3.0 hard drives.</p> <p>The Contractor shall provide all USB 3.0 media required for rendering completed surveys to the Authority.</p>								
K8	<b>Bathymetric Data Attribution</b>		<p>Processed bathymetric data shall contain the following attributes for each sounding as a minimum: position and depth; swathe and beam number; backscatter intensity; 95% statistical uncertainty estimation for position; 95% statistical uncertainty estimate for depth. Files shall be full density (i.e. not “thinned”) with rejected soundings flagged but not deleted from the data set.</p>								
K9	<b>Comparison with Published Chart</b>		<p>The sounding detail shown on the largest scale published UKHO chart of the survey area is to be critically examined and any significant differences reported. In particular, a comment is required for any charted dangers that were not discovered during the survey, or where the least depth found over a danger during the survey is deeper than charted. Any other errors, ambiguities or other defects shall be reported.</p>								
K10	<b>Ancillary deliverables</b>		<p>If requested in the HI the following deliverables will also be required:</p> <ul style="list-style-type: none"> <li>› Seabed sampling records (<b>H575</b>).</li> <li>› Magnetometer data must be processed and mosaicked and a GeoTIFF supplied showing the signal strength variations across the survey area at a resolution suitable for distinguishing wreck-like objects.</li> </ul>								
K11	<b>Data Blocks</b>		<p>While the HI will detail the number of survey blocks required, the Contractor may propose an alternate rendering strategy dependent on final data volumes. The Authority’s decision is final.</p>								
K12	<b>Retention of Data</b>		<p>All raw and processed digital records shall be retained and maintained by the Contractor for a period of 3 years from the date of the final contract payment.</p> <p>On completion of this 3 year period, the Contractor is to destroy/remove data from all systems and media and confirm to the Authority that this has been completed.</p>								

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Part L

Annexes



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Annex A – File conventions

Naming Convention:

File naming used for each type of data ‘product’ will follow these conventions (unless otherwise stated in this specification):

- › Filenames will contain a series of elements that give information about the file contents.
- › These elements will be separated by an underscore (\_).
- › Elements will contain only letters (AaBbCc etc...) and numbers (0123...).
- › Filenames should not contain spaces. If required, ‘CamelCase’ (capitalising the first letter in each word) can be used to make concatenated words easier to read.
- › Filenames will finish with the conventional extensions (.jpg, .tif, .csv etc).

File naming for final products (e.g. image files, bathymetric surfaces) will adhere to the following convention. The use of elements within raw data and working files is encouraged, where appropriate, as ‘good practice’:

HlNumber\_Title\_DataType\_CoordSys\_BinSize

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## Annex A – File conventions continued

Element	Description
HI number	The Hydrographic Instruction number for the survey
Title	Abbreviated survey title as supplied by the Authority.
DataType	SBXYZ = ASCII XYZ of fully corrected Swathe bathymetry SB = Swathe bathymetry GeoTIFF SBFP = floating point GeoTIFF from Swathe bathymetry SBSXYA = ASCII X, Y, Backscatter in decibels SBS = Swathe backscatter GeoTIFF SBSFP = floating point GeoTIFF from Swathe backscatter
CoordSys	Datum and projection of the output data product. e.g. UTM29N, WGS84, ITRF2008
BinSize	Grid resolution, in metres, for raster data and XYZ. Express as a decimal, but substitute the letter 'd' for the decimal point. 0d5 = 0.5 m, 1d0 = 1.0 m, 1d5 = 1.5 m etc If Full density XYZ output use the abbreviation: FD
Additional	Further information can be added if relevant. E.g. TileI, VI
Null values	Use NA (not applicable) to represent a null value for mandatory elements

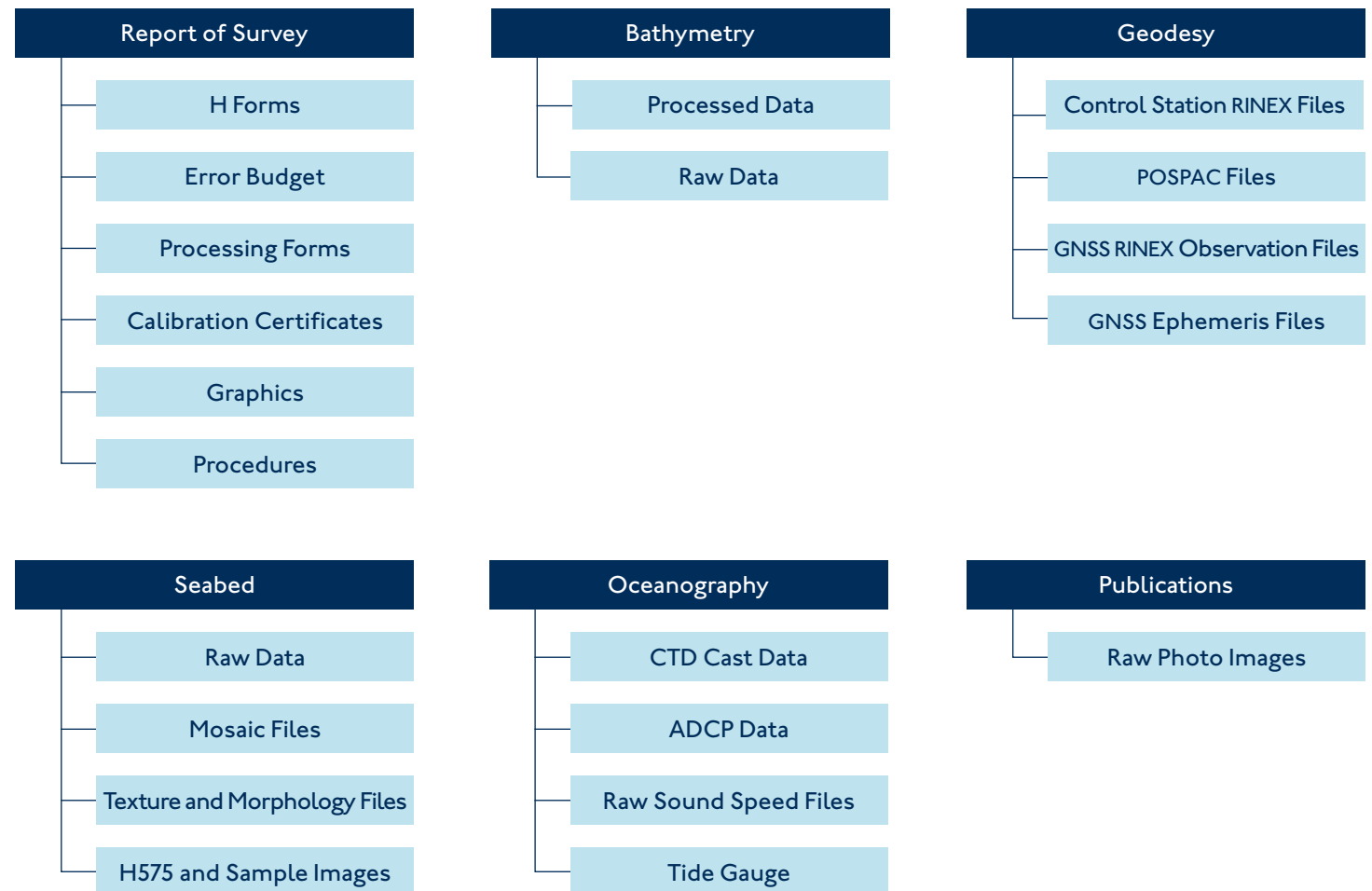
Example:

GBR\_HI1234\_LittleHarbour\_SBXYZ\_UTM30N\_2d0

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## Annex A – File conventions continued

Data should be delivered using the following structure:



The Contractor is free to create and name new sub-folders as required.

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## Annex B – Seabed Texture requirements

### 1.1 Shape Files or Feature classes within a Geodatabase

- › May only hold features with the same geometry, which is defined as; point, line, or polygon.
- › Must be of polygon type (not polygon ZM or other type).
- › That contain adjacent polygons, shall join together such that there are no overlaps or gaps.
- › Must have the appropriate assigned coordinate system.
- › Contain all specified attributes, even if field is left blank.

### 1.2 Metadata

ESRI ISO 19115-1:2014 Metadata shall be fully populated and must include geospatial information.

### 1.3 General

The following requirements, listed in respect of their geometry, describe the typical types of features to be included for Seabed Texture deliverables. Each survey is unique and as such not all of the types of features may be found in an individual survey or additional features may be requested in individual HI. The Report of Survey should detail the types of Seabed Texture information that has been found and delivered.

Each type of Seabed Texture feature has a number of attributes to be included. The attributes listed are based on information required by the Authority and are not absolute – extra features and/or attributes may be added at the discretion of the surveyor.

Where Seabed Texture deliverables require a Texture Description and Texture Code, these are to be completed using the table below in **1.4**.

Features can be classified as only one of the following; point, line, or polygon, depending of the features physical representation. Where there are multiple features in an area, features should be grouped into area features.

Each Seabed Texture Shape file shall contain all instances of that feature type. For example:

- › All Seabed Samples are held together in a single point Shape File.
- › All Cables are held together in a single line Feature Class.
- › All Texture Areas are held together in a single polygon Feature Class.

Orientation of an object is defined as its major axis.



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Annex B – Seabed Texture requirements continued

1.4 Sediment Texture Codes

Texture Code	Texture Description
0	Rock/Sediment Absent
1	Mud
2	Sandy mud and muddy sand
3	Sand
4	Mixed
5	Coarse sediment
6	Cobbles and Boulders (with or without finer sediment)

Any additions to the above table are to be approved by the authority before submission.

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## Annex B – Seabed Texture requirements continued

### 1.5 Textural description

Descriptions are to be classified with the largest composition by weight followed subsequently by the next using terms from the below table.

Main Terms	Symbol	Secondary Terms	Symbol	Qualifying Terms	Symbol	
Sand	S	Ooze	Oz	Fine	f	Only to be used for sand
Mud	M	Marl	ML	Medium	m	
Clay	Cy	Shingle	Sn	Coarse	c	
Silt	Si	Chalk	Ck	Broken	bk	
Stones	St	Quartz	Qz	Sticky	sy	
Gravel	G	Madrepore	Md	Soft	so	
Pebbles	P	Basalt	Ba	Stiff	sf	
Cobbles	Cb	Lava	Lv	Volcanic	v	
Rock, Rocky	R	Pumice	Pm	Calcareous	ca	
Boulders	Bo	Tufa	T	Hard	h	
Coral	Co	Scoriae	Sc	Small	sm	
Shells	Sh	Cinders	Cn	Large	l	
Weed (including kelp)	Wd	Manganese	Mn	glacial	ga	
Two Layers e.g Sand over Mud	S/M	Glaucinite	Gc	Speckled	sk	
		Oysters	Oy	White	w	
		Mussels	Ms	Black	bl	
Mixed: main constituent is given first, e.g. fine Sand with Mud and Shells	fS.M.Sh	Sponge	Sp	Blue	b	
		Algae	Al	Green	gn	
		Foraminifera	Fr	Yellow	y	
		Globigerina	GL	Red	rd	
		Diatoms	Di	Brown	br	
		Radiolaria	Rd	Chocolate	ch	
		Pteropods	Pt	Grey	gy	
		Polyzoa	Po	Light	lt	
				Dark	d	

Any additions to the above table are to be approved by the authority before submission.

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## Annex B – Seabed Texture requirements continued

### 1.6 Feature Class Name: Texture\_Area

Attributes:

Field Name	Field Alias	Field type	Example
Code	Texture Code	Short Integer	2
Descript	Textural Description	Text	fS.M.Sh.Wd
Comments	Comments	Text	

This Feature Class shall encompass the entire survey area (as detailed in each Hydrographic Instruction) such that no gaps or overlaps shall remain.

### 2.1 Categories of Landforms, general morphology and anthropogenic features

1	Ridge (includes: bank, dune, wave)
2	Ripple
3	Shoal/reef
4	Mound
5	Mountain (e.g. seamounts)
6	Groove or gully
7	Channel
8	Valley (includes: canyon)
9	Depression
10	Slope (includes: lobe, apron, escarpment)
11	Plane (includes: platform, terrace, sheet)
12	Vegetation areas
13	Scour Areas
14	Cable
15	Pipeline

Each Landforms, general morphological or anthropogenic feature is to be rendered as their own shapefile or as an additional feature class within the Geodatabase.

Any additions to the above table are to be approved by the authority before submission.

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## Annex B – Seabed Texture requirements continued

### 2.2 Ridge

Feature Class Name: Ridge

Attributes:

Field Name	Field Alias	Field Type	Units	Accuracy	Example
Type	Type	Text		N/A	Dune
Aspect	Aspect	Text	Asymmetric or Symmetric	N/A	Symmetric
Height	Height (m)	Double	Metres	1 decimal place	2.7
Orient	Orientation (degrees)	Short Integer	Degrees	Whole number	155
Wavelength	Wavelength (m)	Double	Metres	1 decimal place	25.0
Comments	Comments	Text			

Where many Ridges occur in groups these shall be classed as a Ridge Area. The values given for Aspect, Height, Orientation and Wavelength shall be chosen to give a general description of the features found in this area. Where one or more of these values changes a new polygon shall be created

A ridge is defined as having a height greater than 1 metre. Features smaller than this shall be classed as ripples.

### 2.3 Ripple

Feature Class Name: Ripple

Attributes:

Field Name	Field Alias	Field Type	Units	Accuracy	Example
Height	Height (m)	Double	Metres	1 decimal place	0.7
Orient	Orientation (degrees)	Short Integer	Degrees	Whole number	270
Wavelength	Wavelength (m)	Double	Metres	1 decimal place	57.6
Comments	Comments	Text			
Comments	Comments	Text			

Where many ripples occur in groups these shall be classed as a Ripple Area. The values given for Height, Orientation and Wavelength shall be chosen to give a general description of the ripples found in this area. Where one or more of these values changes a new polygon shall be created.

A ripple is defined as having a height less than 1 metre. Features greater than this shall be classed as ridges.

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## Annex B – Seabed Texture requirements continued

### 2.4 Shoal/Reef

Feature Class Name: Shoal/Reef

Attributes:

Field Name	Field Alias	Field Type	Units	Accuracy	Example
Type	Type	Text		N/A	Coral Reef
Diameter	Diameter (m)	Double	Metres	1 decimal place	210.7
Orient	Orientation (degrees)	Short Integer	Degrees	Whole number	270
Comments	Comments	Text			

### 2.5 Mound

Feature Class Name: Mound

Attributes:

Field Name	Field Alias	Field Type	Units	Accuracy	Example
Diameter	Diameter (m)	Double	Metres	1 decimal place	2.7
Height	Height (m)	Double	Metres	1 decimal place	3.5
Comments	Comments	Text			

### 2.6 Mountain

Feature Class Name: Mountain

Attributes:

Field Name	Field Alias	Field Type	Units	Accuracy	Example
Type	Type	Text			Thermal vent
Diameter	Diameter (m)	Double	Metres	1 decimal place	210.7
Height	Height (m)	Double	Metres	1 decimal place	340.5
Comments	Comments	Text			

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## Annex B – Seabed Texture requirements continued

### 2.7 Groove or gully

Feature Class Name: Groove/gully

Attributes:

Field Name	Field Alias	Field Type	Units	Accuracy	Example
Type	Type	Text			Gully
Length	Length (m)	Double	Metres	1 decimal place	210.7
Width	Width (m)	Double	Metres	1 decimal place	30.4
Depth	Depth (m)	Double	Metres	1 decimal place	4.8
Orient	Orientation (degrees)	Short Integer	Degrees	Whole number	270
Comments	Comments	Text			

### 2.8 Channel

Feature Class Name: Channel

Attributes:

Field Name	Field Alias	Field Type	Units	Accuracy	Example
Length	Length (m)	Double	Metres	1 decimal place	1528.4
Width	Width (m)	Double	Metres	1 decimal place	300.2
Depth	Depth (m)	Double	Metres	1 decimal place	60.8
Orient	Orientation (degrees)	Short Integer	Degrees	Whole number	270
Comments	Comments	Text			

### 2.9 Valley (includes: canyon)

Feature Class Name: Valley

Attributes:

Field Name	Field Alias	Field Type	Units	Accuracy	Example
Type	Type	Text			Canyon
Length	Length (m)	Double	Metres	1 decimal place	1260.5
Width	Width (m)	Double	Metres	1 decimal place	420.7
Depth	Depth (m)	Double	Metres	1 decimal place	80.9
Orient	Orientation (degrees)	Short Integer	Degrees	Whole number	270
Comments	Comments	Text			

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## Annex B – Seabed Texture requirements continued

### 2.10 Depression

Feature Class Name: Depression

Attributes:

Field Name	Field Alias	Field Type	Units	Accuracy	Example
Width	Width (m)	Double	Metres	1 decimal place	80.6
Depth	Depth (m)	Double	Metres	1 decimal place	4.8
Comments	Comments	Text			

### 2.11 Slope (includes: lobe, apron, escarpment)

Feature Class Name: Slope

Attributes:

Field Name	Field Alias	Field Type	Units	Accuracy	Example
Type	Type	Text			Lobe
Length	Length (m)	Double	Metres	1 decimal place	210.7
Width	Width (m)	Double	Metres	1 decimal place	30.4
Depth	Depth (m)	Double	Metres	1 decimal place	4.8
Orient	Orientation (degrees)	Short Integer	Degrees	Whole number	270
Slope Angle	Angle (degrees)	Short integer	Degrees	Whole number	30
Comments	Comments	Text			

### 2.12 Plane (includes: platform, terrace, sheet)

Feature Class Name: Plane

Attributes:

Field Name	Field Alias	Field Type	Units	Accuracy	Example
Type	Type	Text			Platform
Length	Length (m)	Double	Metres	1 decimal place	210.7
Width	Width (m)	Double	Metres	1 decimal place	30.4
Depth	Depth (m)	Double	Metres	1 decimal place	4.8
Orient	Orientation (degrees)	Short Integer	Degrees	Whole number	270
Comments	Comments	Text			



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## Annex B – Seabed Texture requirements continued

### 2.13 Vegetation Areas

Feature Class Name: Vegetation\_Area

Attributes:

Field Name	Field Alias	Field Type	Units	Accuracy	Example
Type	Type	Text			Sea Grass
Height	Height from Seabed (m)	Double	Metres	To nearest 0.5 metre	4.5
Comments	Comments	Text			

### 2.14 Scour Areas

Feature Class Name: Scour\_Area

Attributes:

Field Name	Field Alias	Field Type	Units	Example
Type	Type	Text	Hydrodynamic, Dredging, Ice or Trawl	Trawl
Comments	Comments	Text		

### 2.15 Cable

Feature Class Name: Cable

Attributes:

Field Name	Field Alias	Field Type	Units	Example
Type	Type	Text	Power or Telecommunications	Power
Comments	Comments	Text		

### 2.16 Pipeline

Feature Class Name: Pipeline

Attributes:

Field Name	Field Alias	Field Type	Units	Example
Type	Type	Text	Oil or Gas	Oil
Comments	Comments	Text		

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## Annex B – Seabed Texture requirements continued

### 3.1 Geological interpretation

Below is a non-exclusive list of the anticipated Geological features. As each survey area is unique, the HI will provide a list along with expected attribution.

Class	Simplified geological description	Explanation
1	Bedrock	Including any kind of rocky outcrop, escarpment, dyke etc.
2	Lag deposit	Sediment consisting of sand, gravel and/or coarser material left behind when smaller particles are washed away by waves or currents
3	Biogenic reef (including coral)	Rock outcrops that are produced by the action of living organisms
4	Current-induced landform	Active or relict sediment landforms produced by the action of currents as waves or tides. It includes ripples, megaripples, sandwaves, dunes, bars etc.
5	Glaciogenic landform or deposit	Bedform or sediment deposit produced by the action of glaciers. It includes moraines (curved ridge deposited in front of glacier), eskers (linear glacial fluvial ridges), till covers etc.
6	Fluid-escape feature	Landforms created by the actions of fluids escaping from the seabed (e.g. pockmarks)
7	Mass-wasting deposit	Cover of sediments deposited by mass movements such as submarine slides, debris flows or turbidite currents. It can form lobes, mounds or sheets
8	Channel deposit	Sediments deposited in a channel
9	Suspension deposits	Fine grained sediments (usually clay and silt) transported by and deposited from suspension, it includes pelagic oozes or suspension-settling from glaciers
10	Unspecified landform or deposit	If it does not fall in any of the previous

Each Geological feature is to be rendered as their own shapefile or as an additional feature class within the Geodatabase.

### 4.1 Seabed Sample

Feature Class Name: Seabed\_Sample

Attributes

Copy of H575 attributes.

The H575.xls form has been designed in such a way that it can be directly brought into ArcGIS and converted into a Feature Class.

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## Annex C – Authority Provided Documentation

Form/Document Number	Name
NPI00	Mariner's Handbook
NPI22(2)	ADMIRALTY Tidal Handbook – Datums for Hydrographic surveys (2006)
	Relevant ADMIRALTY Sailing Directions
	Relevant ADMIRALTY Port Approach Guide where applicable
	Relevant GeoTIFFs of latest ADMIRALTY charts
	UKHO Electronic Navigation chart of the area where applicable
	ADMIRALTY Port Approach Guide where available
	UKHO Report of Survey Template
H102 (A/B)	Hydrographic Note Template
H143	Record of Tidal Observations (Fair)
H159	Description of Geodetic Control Station
H525	Report on Wreck Examination or Sweeping
H532	Levelling Reduction
H533	Transfer of Sounding Datum
H575	Record of Seabed Samples and Cores
H635	Oceanographic Observations
H637	Marine Life/Fishing Activity Form

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## Annex D – Specimen Daily Progress Report (DPR)

To include:

Overall survey progress against the tendered timeline

Overall processing progress against the delivery deadline

### <sup>1</sup> DAILY PROGRESS REPORT

The specific layout of the DPR may follow the Contractor's standard format. It shall however contain at a minimum the sections and information described in the template at Appendix F.

Activity Codes to be used in reporting, together with their definitions, are to be confirmed with the survey manager prior to mobilisation. Typical examples are as follows:

Code	Activity	Utilisation
OP	Data Collection (Lump Sum)	Start of first survey line to end of last survey line of a period of data collection when conducting Lump Sum activities
OP(DR)	Data Collection (Day Rate)	Start of first survey line to end of last survey line of a period of data collection when conducting Day Rate activities
SBW	Standby Weather	Environmental conditions out of limits for survey operations. May include current, sea state and swell. Amplifying comments to be made in text of DPR
SBE	Standby Equipment	Standing by conducting defect rectification
SBV	Standby Vessel	Standing by due to conflicting vessel activities preventing survey activity. Including machinery breakdown and logistical issues
SBO	Standby Other	Standing by due to other factors not covered by other codes. Amplifying comments to be made in text of DPR
SBON	Standing By Overnight	The overnight period of inactivity when conducting 12 hr operations
TR	On Transit	On transit, e.g. between survey areas or from port of mobilisation to the survey ground
IFT	In Field Transit	When on local transit inside a survey area, for example from wharf or anchorage to the actual area of operations On transit to the survey ground IFT commences when the vessel departs the wharf or the anchor clears the seabed and ends when the first survey line started On transit from the survey ground IFT commences when the last survey line ends and finishes when the vessel arrives the wharf or the anchor contacts the seabed

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## Annex E – Processing Guidance

All manmade features (jetties, piers) that extend above the surface are to be suppressed not rejected.

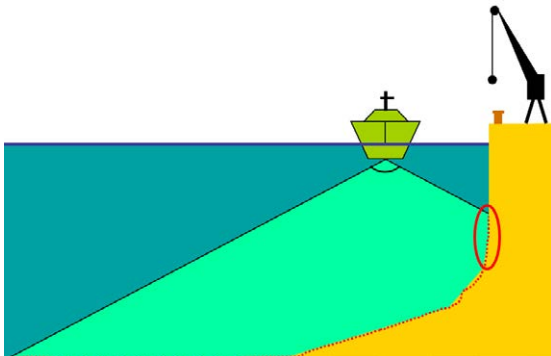
- › Set quay walls etc. to “suppressed” rather than “rejected”.
- › You can create a small surface covering the feature, and include the suppressed soundings.
- › Use this surface to help position the notes correctly.
- › The suppressed soundings will not be included in the final surface.

Use the chart to help guide as to where to check (around quays etc.).

Types of features to look for:

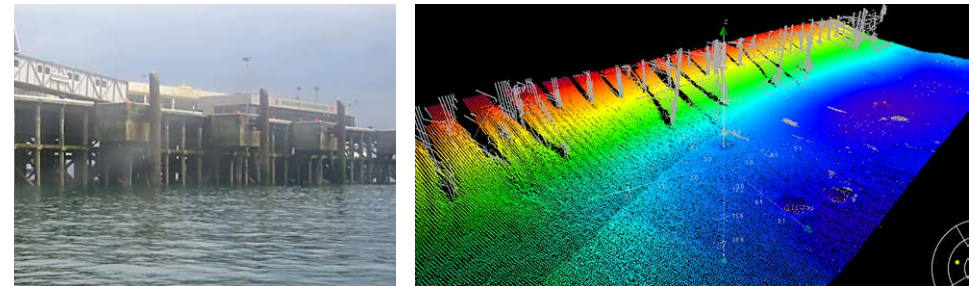


Data that should be suppressed:



Swath data is sometimes gathered underneath structures. In these situations the vertical dry structures should also be removed and the seabed left in as described opposite.

An example is shown in the images below:



The notes layer should be used to highlight where depths are likely to be underneath structure and the Authority will make the cartographic decision as to which depth to show.

A CARIS ‘notes’ .hob layer is to be used to bring attention to items of specific interest in the dataset as well as noting them in the RoS. The list of objects to be outlined includes but is not limited to:

- › Pipeline.
- › Bottom tackle for buoys and other floating objects.
- › Areas identified by local contacts as dump or dredge areas.
- › Areas identified as areas containing fishing equipment such as traps or (semi-) permanent nets.

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## Annex F – Amplifying Notes

The following amplifying notes are based on Client Representative observation, HOC Cards and Lessons Identified during CME and OT survey operations conducted under earlier versions of the Survey Specification. These notes are intended to add colour to the requirements articulated in the main body of this Survey Specification and identify foreseeable, recurrent and easily preventable issues which have in the past impacted on survey operations and data delivery:

- i Workload of the charge surveyor/party chief and dual-hatting of the position with that of the online surveyor**

It is highly undesirable for the Charge Surveyor to also perform the role of Online Surveyor. A tender which indicates that this is the manning intention will have scored accordingly. Experience repeatedly shows that when a surveyor is given the responsibilities of two people (s)he will inevitably (succumb to remote pressure (perceived or otherwise) from the Contractor office and) focus on achieving 12 hrs of data collection daily. I.e. (s)he will revert to performing the role of Online Surveyor and will 'load shed' all the other critical elements of the QC, leadership and management role with the exception of issuing the DPR. This is entirely predictable and defeats the intended purpose of the Charge Surveyor in his capacity of Offshore Manager; this workload is unavoidably to the detriment of his/her health and wellbeing, his/her management and leadership role, the overall conduct of the survey, adherence to the Survey Specification, data quality, the ability to recognise developing equipment/data problems which should be self-evident, attention to wider QHSE and his/her ability to oversee data processing and be to be available to communicate and develop survey operations as required with the Client Representative. This then has downstream impact on data quality, data cleaning and timely rendering of data to an acceptable standard.

A plan which amounts to having an Online Surveyor engaged in data collection for 12 hrs a day, leaving him to 'catch up' with his 'other duties' as Charge Surveyor in his supposed rest time (i.e. committing him to a routine of >14 hr days and eventual burn-out and under-performance in both roles) is unfair and not an acceptable plan as, fundamentally, it fails all reasonable QHSE considerations.

If, despite this advice, Contractor's intention is to 'dual-hat' the Charge Surveyor as the Online Surveyor, Contractor must demonstrate how the composition and duties of the rest of the survey team will allow the Charge Surveyor to first and foremost successfully perform his duties as such, whilst maintaining a moderate 12 hr working day and then additionally run the online data collection as a secondary duty.
- ii Hazard hunt**

In larger vessels it may be appropriate to include other personnel in the Hazard Hunt. Good results are often achieved by using personnel not familiar with a specific work area to look for hazards, e.g. the cook viewing the back deck – a fresh set of eyes of a person who has had no prior involvement in an area can bring a new viewpoint to an arrangement which other people have just come to accept.

Although not mandated it is often best practice, particularly in larger vessels with substantial geophysical survey spreads, to have the Vessel Master sign a pre-formatted release on completion of the Hazard Hunt, stating that the mobilisation of the survey spread has had no adverse impact on watertight integrity, smoke boundaries, fixed fire fighting arrangements, electrical safety or vessel stability or class requirements and that the vessel remains in class and safe to proceed to sea. This ensures that the Charge Surveyor can demonstrate after the event that the vessel master was content on sailing that the survey mobilisation had no effect on the safe operation of the vessel.

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## Annex F – Amplifying Notes continued

### iii Remote locations

For the purposes of the Framework, the working definition of ‘remote location’ is a survey (or accommodation) area which is far away in place or time from a populated area with a modern standard secondary care facility including a functional Casualty Department / Emergency Room. In practice if the transit time from the survey ground to a point where ambulance/EMT services can be rendered is greater than 60 minutes then the worksite is to be considered a Remote Location.

### iv Workboat safety standards

The Client Representative will verify that all items in this section have been provided to the project and are in date for inspection/test/ expiry as appropriate. If shortcomings are noted in respect of this minimum requirement, Stop Work Authority may be exercised until such time as defects or deficiencies are rectified.

If significant safety shortcomings are identified the Client Representative will conduct a full vessel audit and record findings on a UKHO vessel inspection form. This is based on IMCA’s “Marine Inspection for Small Workboats (Common Marine Inspection Document for Small Workboats)” with appropriate modifications drawn from IMCA’s “Common Marine Inspection Document” and additionally tailored to capture the specific requirements of this Survey Specification. As a starting point when the Contractor is considering the suitability of a proposed survey vessel prior to the Tender stage, if it is apparent that the vessel fails to meet the expectations for workboats articulated in the IMCA documentation then it is likely that it will also subsequently fail Authority requirements.

### v Noise

The Health and Safety Executive guidance on noise at work is to be adhered to. This is available [here](#). In summary the employer has a duty to prevent damage to employees, including hearing damage due to noise exposure. Previous projects have used vessels that have exhibited manifestly damaging levels of noise inside the accommodation, precluding conversation, increasing fatigue and necessitating the routine wearing of ear defenders at the survey desk.

Wearing hearing protection for 12 hrs per day for the entire duration of the survey is a solution (and in reality, was the only one possible after-the-fact) it should be considered unacceptable and a sign of poor vessel selection at the outset. Noise exposure should be considered by the Contractor during vessel selection in advance of Tender submission. This should include specific questions being asked about the ambient noise at the survey desk and other work areas inside the accommodation. Evidence that this has been investigated and the exposure quantified and demonstrated to be [safe](#) will be scored favourably during marking.

The Contractor is to provide a calibrated Sound Level Meter to quantify the extent of noise exposure.

If sound levels are found to be in breach of HSE guidance with attendant risk of injury of survey personnel, then the Client Representative may exercise Stop Work Authority until the problem is rectified.



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## Annex F – Amplifying Notes continued

### vi Workplace lighting

The UK Health and Safety Executive guidance on workplace lighting is to be adhered to. A user guide suggesting common problems and best practice is available on the UK HSE website:

<http://www.hse.gov.uk/pubnS/priced/hsg38.pdf>

In summary the employer has a duty to prevent damage to employees due to poor workplace lighting. The most commonly witnessed problems in previous projects have been associated with glare across VDU screens leading to discomfort, irritability, distraction, visual fatigue and, fundamentally an inability for the surveyor/processor to see the data presented well enough to operate the systems with the required level of attention and accuracy.

### vii Man overboard recovery

A Man Overboard (MOB) Recovery 'plan' which has the unconscious casualty brought to the side of the vessel and left floating in the water pending arrival of undefined 'external help' in an uncertain timeframe *will inevitably* result in the death of an unconscious, non-breathing casualty. This is not the basis for a MOB plan and is not acceptable. Experience shows that:

- › In small boat operations involving crews of 2 or 3 personnel, there must a robust manual handling plan which would allow a fully clothed, unconscious adult male casualty to be safely and quickly brought inboard.
- › Mechanical aids are almost inevitably appropriate unless the vessel has a removable section in the gunwales specifically designed for the recovery of swimmers or divers by reducing the freeboard at that point to a few centimetres.
- › When the boat crew comprises a qualified Cox'n and a Surveyor, it may be the Cox'n in the water leaving the Surveyor to effect the recovery including safe vessel handling. The plan and selection of the Surveyor should take account of this reality and, (whilst he need not be formally ticketed as a Cox'n), the surveyor should be able to practically demonstrate his ability to handle the vessel in an emergency to the extent required to safely recover a situation in which the Cox'n is no longer onboard or is incapacitated.

If doubt exists, Client Representative will ask the Charge Surveyor to demonstrate the practical execution of the plan. If this cannot be demonstrated it will be the subject of Stop Work Authority until adequate provisions can be put in place.

Introduction	Personnel	Quality, Health, Safety and Environment (QHSE)	Tides	Positioning	Bathymetry	Seabed Textures	Shoreline Mapping and Imagery	General Requirements	Additional Requirements	General Deliverables	Annexes
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Annex F – Amplifying Notes continued

viii	<b>Entry of personnel into the water for work purposes</b>	<p>Experience has shown that there are often emergent situations which, due to unavoidable circumstances, can be best and most safely be managed by a member of the survey team or vessel crew intentionally entering the water to conduct a survey related task. These have notably included removal of rope fouling a survey launch propeller, installation of the bracket supporting an over-side pole and achieving adequate securing of a tide gauge, installing a marker buoy on a submerged obstruction at very shallow depth and ADCP installation.</p> <p>Entering the water in the work context remains broadly undesirable as it inevitably increases exposure of personnel to additional hazards not experienced in the vessel. It may however be the least-worst option or even the safest one in practice. For example conducting the work from a small boat adjacent to a larger vessel or structure may actually present more significant hazards including motion, pinch points and risk of damage to equipment and vessel structure.</p> <p>If the survey plan evolves through circumstance to require personnel to enter the water or suggest that this is in practice the least hazardous way of conducting a task it should, like any other work activity, be fully risk assessed through the mechanism of the JHA/JSA with all hazards mitigated and risks reduced to an acceptable level. If this is not achievable then the activity is not to take place and an alternative solution is appropriate following the Hierarchy of Controls.</p> <p>Anyone entering the water should be a volunteer and should consider themselves a strong swimmer, ideally with an appropriate formally assessed competency and should be appropriately equipped and dressed for the task. A robust plan should be in place to recover the swimmer to the vessel or to dry land as well as an emergency plan to safely recover him if he becomes incapacitated.</p>
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Introduction	Personnel	Quality, Health, Safety and Environment (QHSE)	Tides	Positioning	Bathymetry	Seabed Textures	Shoreline Mapping and Imagery	General Requirements	Additional Requirements	General Deliverables	Annexes
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## Annex F – Amplifying Notes continued

### ix Commercial diving

A commercial dive team will generally comprise a Diver, Dive Supervisor, and Standby/Rescue Diver and a boat cox'n if an additional workboat/dive support vessel is involved. The Charge Surveyor should satisfy himself that any variation from this standard arrangement is both safe and explained. As with any activity, the Charge Surveyor or any other member of the has the right to exercise Stop Work Authority if (s)he is uncomfortable with an aspect of the operation.

The Charge Surveyor is to satisfy himself that any Commercial Divers employed have appropriate certification, an in-date dive medical and can present a current dive log. Absence of any of these, a cavalier attitude to appropriate documentation (e.g. JHA/JSA/PTW) or the presence of equipment which appears in poor repair, should be regarded with suspicion.

Note: Experience suggests that there are typically members of the survey team or vessel crew present who are certified recreational divers who can demonstrate, by qualification and log book, a level of competency far in excess of that required to safely carry out any of the minor tasks envisaged, e.g. righting of a capsized ADCP in 10m of water. In this case it may be appropriate for a member of the survey team or vessel crew to carry out the task however the formal risk assessment of this and liability for the decision lies entirely with the Contractor. It should be noted that a that a recreational diver is unlikely to have an appropriate HSE approved [Certificate of fitness to dive](#) as required for any diving at work requirements and that the investigation of any incident by UK HSE would start poorly if this was not in place. Whilst a 'grey area' may be envisaged by allowing recreationally qualified local national sub-contractors (i.e. the boat crew) to conduct the activity, it is suggested that the liability should be passed entirely to a local commercial diving company, thereby passing all liability to a third party operating under local legislative frameworks.

### x Information to be included in (H525) detailed investigation of wrecks

The H525 includes fields for the *Name* of the wreck (where known) and a *Description*. The completion of this information has previously been of variable quality. Notably poor recent examples of H525s have included reported wrecks which are very well known recreational diving locations about which every detail is known and easily available with 5 minutes of online research, but which fail to even state the vessel name on the H525.

Every effort is to be made in the field to ascertain as much detail about the wreck as possible to add value to the H525 report. This should draw upon local knowledge where possible (e.g. fisherman, divers and harbour authorities) and include basic internet research where applicable. The provenance of the information should be stated.