

Hydrographic Lidar Survey – Sound of Harris

HI 1086

Specification v1.2

*Hydrography, Meteorology & Ports
Branch*

26 January 2004

Contents

1	Scope	4
2	Related Standards.....	4
3	Project Specifications.....	5
4	Project Deliverables	11
5	Survey Geodesy	12
	Annex 1 – Primary Survey Area.....	13
	Area A	13
	Area B	13
	Area C	14
	Annex 2 - Secondary Survey Area.....	16
	Annex 3 – Payment Schedule	17
	Annex 4 – Price.....	18
	Annex 5 – Government Furnished Data	19
	Annex 5 – Benchmark Details	20
	LEVERBURGH.....	20
	BAYS LOCH	20
	Annex 6 – Wreck Data (Primary Area)	22
	Annex 7 – Tender Evaluation Criteria	23

Record of Changes

Version	Date	Amendment
Draft for Consultation	23 rd January 2004	
1.1 – Final Draft	26 th January 2004	Incorporated suggested changes from UKHO (Chris Howlett, David Parker and Cdr John Page) as well as from John Hallam.
1.2 – Final Issue	26 th January 2004	Incorporation of tender evaluation criteria and benchmark details

Symbols & Abbreviated Terms

DGPS	Differential Global Positioning System
HI	Hydrographic Instruction
MCA	Maritime & Coastguard Agency
RoS	Report of Survey
UKHO	United Kingdom Hydrographic Office
WADGPS	Wide Area DGPS (i.e. multiple reference station)

Acknowledgements

1. Hydrographic Survey Specifications – Shipping Lane 2 (v1.2) 17/10/00 *Land Information New Zealand*
2. Hydrographic Instruction HI1043 Scotland, West Coast, Crossapol Bay 19/11/02 *United Kingdom Hydrographic Office*
3. Technical Specifications for HI1059 Western Approaches to English Channel 20/08/03 *United Kingdom Hydrographic Office*

HYDROGRAPHIC LIDAR SURVEY SPECIFICATION - SOUND OF HARRIS HI1086

1 Scope

This document details the project-specific requirements for conducting the “Sound of Harris” hydrographic survey (Hydrographic Instruction Number 1086).

2 Related Standards

The most recent versions of the following publications are to be adhered to in conjunction with this specification:

Hydrographic Quality Assurance Instructions for Admiralty Surveys (HQAI)s
NP145. *United Kingdom Hydrographic Office*

Standards for Hydrographic Surveys. Special Publication No. 44. April 1998.
International Hydrographic Organisation

3 Project Specifications

No.	Activity	Required Y/N	Note
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	Project Nomenclature		
1.1	Labelling of records & deliverables	Y	<p>Project Name: Sound of Harris Hydrographic Survey</p> <p>Hydrographic Instruction Number 1086</p> <p>Contract Number: (To be Advised)</p> <p>Each rendered item of hard-copy and digital data shall be signed by the Charge Surveyor and is to bear a depiction of the MCA logo, together with the project name and the HI number.</p>

	Personnel		
2.1	Charge Surveyor	Y	<p>A Charge Surveyor (Party Chief/Surveyor in Charge) shall be on site at all times during survey operations. The Charge Surveyor shall be an IHO/FIG Category A qualified surveyor with a minimum of 5 years offshore 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 UKHO/MCA 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.</p>

	Sounding		
3.1	Sounding of Survey area including Check-lines and Cross-lines	Y	At least four cross lines shall be run at right angles to the main lines at suitable intervals over the area to be surveyed.
3.2	Depth Accuracy	Y	Depth accuracy shall be in accordance with IHO Order 1. The contractor shall demonstrate (by the

			inclusion of a fully developed error budget in the RoS), that this requirement has been met.
3.3	Target Detection	Y	For all parts of the survey area: Cube with sides of 2m in depths < 40m Cube with sides of 10% of depth in depths >40m
3.4	Reduction of Soundings	Y	Soundings shall be reduced for tides in all depths. Soundings are to be presented as depths below Chart Datum. The contractor shall demonstrate that the method chosen for tidal reduction results in the overall depth accuracy requirements being met (see 3.2).
3.5	Survey line spacing	Y	All survey areas shall be flown at 200% coverage (i.e. 100% overlap). Overlapping swaths are to be flown at significantly different states of the tide so as to minimise the effects of surf.
3.6	Laser spot spacing	Y	All survey lines shall be flown with a laser spot spacing of 3m or less.
3.7	Examinations and elimination of doubtful data	Y	All significant shoals together with suspected wrecks located during the course of the survey shall be reported (wrt position, extent and least depth). However, investigations in excess of the standard survey lines are not required. A definitive list of any newly discovered shoals, together with charting recommendations, shall be presented in the Report of Survey.
3.8	Environmental Limitations	Y	As a tender deliverable, the contractor shall provide details of the maximum sea state and weather conditions in which the survey system can meet the stated specifications and standards of the survey
3.9	Presentation of depth data	Y	Depth data recorded shall be logged to two decimal places of a metre.

	Tides		
4.1	Establishment of Tidal stations and Establishment of Vertical Control	Y	It is understood that there is a significant tidal gradient over the survey area. At least two primary tidal stations shall be established within the extents of the entire survey area, to allow observations to both

			the north and south of Cope Passage. Tidal observations shall cover the duration of the survey. The tide stations shall be levelled to at least two permanently monumented and documented benchmarks (ideally Ordnance Survey benchmarks). Levelling shall be conducted in accordance with HQAIs. Spheroidal heights of any existing or newly established benchmarks shall be determined by GPS carrier-phase techniques tied in to the Ordnance Survey Active Network (see section 5).
4.2	Pole-to-gauge calibration	Y	Automatic tide gauges shall be calibrated against a tidepole in accordance with HQAIs. The exact method of this calibration – including the recording interval and calibration duration shall be included as a tender deliverable.
4.3	Reduction of soundings	Y	The contractor shall provide recommendations for observing tides and sounding reduction to MCA for approval as a tender deliverable. Recommendations shall utilise tidal models based on actual tidal observations (see 4.1). It is the contractors responsibility to ensure that tidal data is of suitable quality to attain IHO Order 1 survey requirements.
4.4	Record tidal time, height and data. Conduct Datum Transfer	Y	See 4.1. All soundings shall be reduced to Chart Datum (Chart BA 2642), which is currently quoted as 2.93m below Ordnance Datum (Stornoway). See Table II of Admiralty tide Tables for present Chart Datum / Ordnance Datum connection.
4.5	Confirmation of Chart Datum	Y	The connection between benchmarks utilised to establish the current Chart Datum (including all those at Bays Loch and Leverburgh) and Ordnance Datum Stornoway is to be confirmed by physical observation. See Annex 5. The contractor shall make a clear statement if any change to the currently listed Chart Datum statement is required – or whether it is still valid
4.6	Recording and analysing Tidal Stream information	N	Not required for this survey
4.7	Eddies and Over-falls	N	Not required for this survey

	Positioning & Control		
5.1	Extension of existing control	Y	Any extension of existing geodetic control and the establishment of new stations shall be fully documented. The derivation of the co-ordinates of existing stations shall be stated. Adjustment of all observations shall be by the method of Least Squares.
5.2	Establishment of geodetic stations	Y	All geodetic stations shall be fixed using dual frequency carrier phase GNSS techniques. The Contractor must state how they propose to co-ordinate stations. Where necessary, co-ordinate conversion shall be conducted using the Ordnance Survey (OS) OSTN02 conversion program and an estimated final accuracy stated.
5.3	Station marking and documentation	Y	All geodetic stations established during the survey shall be described, photographed and permanently marked to assist their future recovery in accordance with HQAIs.
5.4	Primary aircraft Positioning System	Y	WADGPS or RTK GPS.
5.5	Secondary aircraft positioning system	Y	Entirely independent WADGPS, RTK GPS or Post-processed carrier phase GPS
5.6	Order of Survey Horizontal Accuracy	Y	IHO Order 1
5.7	Static Positioning Check	Y	Perform at the start of survey
5.8	Dynamic Navigational Calibration	Y	Perform on each survey flight
5.9	Primary / Secondary Comparisons	Y	The contractor shall provide a summary for each survey line showing differences between primary and secondary positioning systems.

	Coastline / Topography		
6.1	Obtaining Coastline Data	Y	Coastline and topography shall be obtained up to at least 50m above Chart Datum.

	Miscellaneous Requirements		
7.1	Side-scan sonar	N	Not required
7.2	Magnetometer	N	Not required
7.3	Wire-Sweep	N	Not required
7.4	Bottom Sampling	N	Not required
7.5	Sound Velocity	N	Not required
7.6	Secchi Disk	N	Not required
7.7	Amendments to sailing directions		The West Coast of Scotland Pilot (NP66) 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.
7.8	Views for sailing directions	Y	Existing views in The West Coast of Scotland Pilot (NP 66) shall be consulted and aerial views obtained if considered useful. New photography shall be in colour and prepared in accordance with NP100. Digital cameras shall have a least 3M pixel resolution.
7.9	Permissions	Y	The contractor shall be responsible for arranging all permits, permissions and licenses for flight, access and frequency clearance for all survey operations whether ashore, afloat or in the air.
7.10	Fixed and floating aids to navigation	Y	The positions of all fixed and floating aids to navigation are to be determined via LIDAR, where the objects are detected, and the positions presented in tabular format. “Soundings” taken on surface aids to navigation are to be removed from the main bathymetry data set.
7.11	Light characteristics	N	Light characteristics and sectors are not required to be rendered.

	Safety		
8.1	Responsibility	Y	Vessels, aircraft, equipment, survey personnel and crews provided by the Contractor for work in connection with the contract shall be the Contractor's

			responsibility at all times. The said vessels, aircraft, equipment, survey personnel and crews and any loss, injury or damage suffered or caused by them shall be at the Contractor's risk throughout.
8.2	Safety Management Plan	Y	Details of the company safety policy and Safety Management Plan shall be supplied as part of the tender.

4 Project Deliverables

No.	Deliverable	Required Y/N	Note
9.1	Required deliverables	Y	The following records shall be rendered in accordance with HQAIs and these instructions: <ol style="list-style-type: none"> a. Navaid Calibration/validation data b. Processed LIDAR data (HIPS/SIPS Format) c. Raw LIDAR data (HIPS/SIPS Format) d. Digital Report of Survey (UKHO format) e. Co-tidal factors (if used) f. Geodetic data g. Wreck records h. Tidal records i. Amendments to Lights' List j. Photographic Views k. Miscellaneous observations records
9.2	Hydrographic Note	Y	Reports of dangers to navigation shall be passed immediately to the UK Hydrographic Office, in accordance with HQAIs.
9.3	Authoritative Standard Sheets	N	Not required
9.4	“H Forms”	Y	“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.
9.5	Digital Data Media	Y	All Data shall be delivered on CD or DVD.
9.6	Report of Survey (RoS)	Y	A Report of Survey (RoS) shall be rendered in digital format in accordance with the latest UKHO requirements for digital RoS.
9.7	Format of Bathymetric Data	Y	Processed bathymetric data shall be rendered as files readable in Caris HIPS/SIPS. Corresponding raw (i.e. unprocessed) files shall also be supplied which are capable of being read in HIPS/SIPS. Files are to contain lidar wave forms. Files shall be full density (i.e. not “thinned”).
9.8	Comparison with published charts	Y	The detail shown on each published UKHO chart of the survey area is to be critically examined and any significant errors, ambiguities or other defects shall

			be reported on an annotated copy.
9.9	Presentation of data		A complete set of field records shall be delivered to the UK Hydrographic Office when all points raised in the appraisal have been clarified. They shall be packaged and labelled using standard forms as supplied by the UK Hydrographic Office. Standard UK Hydrographic Office forms are available through the MCA.
9.10	Retention of data		All raw and processed digital records shall be retained and maintained by the Contractor for a period of 2 years from the date of the final contract payment. On completion of this two year period, the Contractor may seek permission from UKHO/MCA to dispose of the data as they so wish.
9.11	Crown copyright		All data and accompanying documents and records, both working and fair, originating from the survey become the property of HM Government and must be handed over on demand. Where appropriate, they are to carry the following official markings: CROWN COPYRIGHT 2004 FOR OFFICIAL USE ONLY

5 Survey Geodesy

The survey shall be rendered using the following geodetic parameters

Datum: ETRF'89
 Spheroid: GRS '80
 Projection: UTM Grid Zone 29 North (Central Meridian 9° West).

All rendered positions shall be quoted as geographical co-ordinates (i.e. in terms of Lat. / Long) as degrees and decimal minutes.

Annex 1 – Primary Survey Area

The contractor shall quote for each of the following survey areas to be surveyed. All co-ordinates are quoted as WGS'84.

Area A

Point	Latitude	Longitude
1	57° 46' 59.3" N	007° 02' 40.8" W
2	57° 44' 06.5" N	006° 58' 06.2" W
3	57° 39' 01.5" N	007° 09' 18.9" W
4	57° 41' 29.7" N	007° 13' 13.9" W
5	57° 42' 12.0" N	007° 13' 13.9" W

Total area = 101 km² approx

Area B

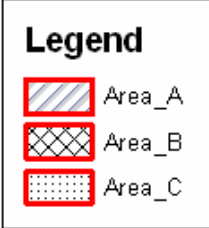
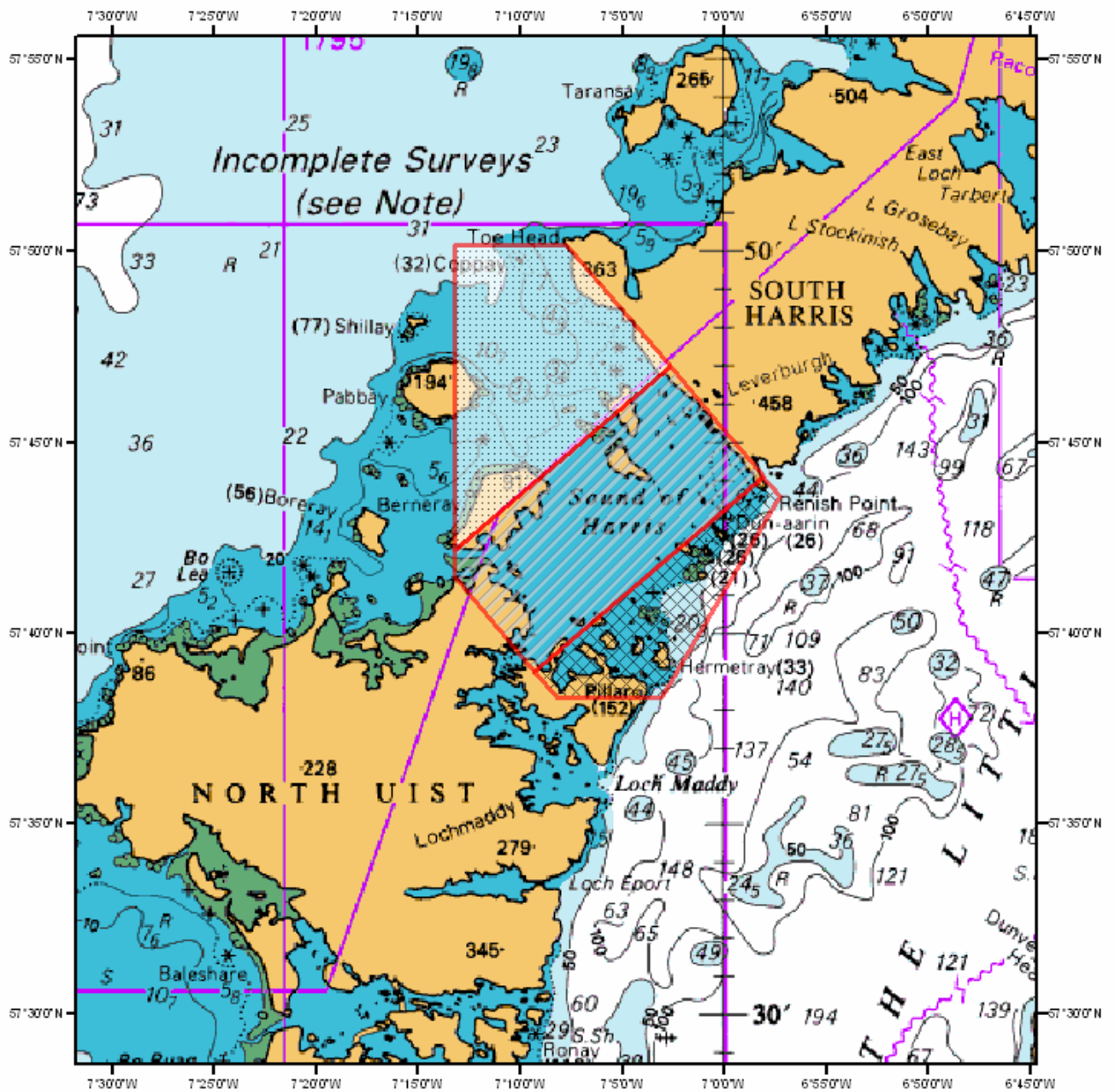
Point	Latitude	Longitude
1	57° 44' 06.5" N	006° 58' 06.2" W
2	57° 43' 36.0" N	006° 57' 17.8" W
3	57° 38' 19.7" N	007° 03' 05.0" W
4	57° 38' 19.7" N	007° 08' 12.7" W
5	57° 39' 01.5" N	007° 09' 18.9" W

Total area = 46.2 km² approx

Area C

Point	Latitude	Longitude
1	57° 50' 10.8" N	007° 13' 13.9" W
2	57° 50' 10.8" N	007° 07' 44.6" W
3	57° 46' 59.3" N	007° 02' 40.8" W
4	57° 42' 12.0" N	007° 13' 13.9" W

Total area = 93.0 km² approx



Overview

Annex 2 - Secondary Survey Area

A secondary survey area shall be nominated by the MCA in order to give an alternative area of operations if weather and environmental conditions preclude survey operations over the primary area for an extended period of time. The secondary survey area shall only be surveyed if the contractor can demonstrate that they are not able to survey the primary area due to weather and environmental reasons during the period of survey.

The secondary survey area shall be within 100 miles of the primary area and shall not be of a larger size than the contracted primary area.

The secondary survey area shall be specified prior to award of contract.

Annex 3 – Payment Schedule

The contractor shall only undertake survey operations in the identified areas on approval of the MCA project manager and if they consider that environmental conditions are suitable for producing acceptable survey data.

All data gathering operations must be completed before 1st April 2004.

All deliverables shall be rendered before 1st August 2004.

The following are the stages at which invoices may be submitted to MCA for payment subject to the written agreement of MCA's Project Manager:

1. 8% of the total contracted sum on flying the LIDAR-equipped aeroplane over the survey area.
2. 50% of the total contracted sum on flying the LIDAR-equipped aeroplane over all required survey lines on either the primary or secondary survey area, and approval of preliminary survey data (excluding tidal observations). This payment will only be made if at least 50% of the survey area which is less than 20m deep has valid soundings at the required spot density.
3. 10% of the total contracted sum on approval of the rendered tidal and levelling observations.
4. 32% of the total contracted sum on approval of the final report of survey and digital data.

Note: each of the above milestones will not be paid if a preceding milestone has not been met. Each milestone will only be paid once.

Annex 5 – Government Furnished Data

The following government furnished data accompanies this specification:

1. Hydrographic Quality Assurance Instructions for Admiralty Surveys (HQAI) (Edition 1/03)
2. Electronic copy of current UK Hydrographic Office “H-Forms”
3. Format example of UKHO “Electronic Report of Survey”
4. Benchmark Details
5. Details of all known wrecks

Note: Government furnished data remains the property of the Maritime and Coastguard Agency. As such, the data must be returned to the Maritime and Coastguard Agency once the contract has been awarded (for unsuccessful tenderers) or completed (for successful tenderers). All government furnished data is Crown Copyright and must not be duplicated or distributed without the permission of the MCA. Government Furnished Data must not be used for navigation.

Annex 5 – Benchmark Details

The following benchmark details are supplied as Government Furnished Data:

Chart Datum (CD) is 2.93m below Ordnance Datum

(Stornoway) at both locations

LEVERBURGH

CD is 7.09m below Ord BM cut in end of wall at top of ramp on N side of jetty just below coping. (source HMS SHACKLETON 1959).

CD is 19.64m below Ord BM (16.71m)(NG.0173.8597) a rivet set in a rock outcrop 8.2m NE of road and 9.5m SE of a house.

(source OS 1976)

BAYS LOCH

CD is 5.10m below BM cut alongside upper flight of steps leading down to lower portion of Bays Loch Pier on its N side.

(source HMS SHACKLETON 1958)

CD is 6.44m below BM cut in low approach wall to pier 5.5m from end where wall curves towards grey wooden shed and about 0.15m above ground.

(source HMS SHACKLETON 1960)

CD is 15.30m below Ord BM (12.37m)(NF.9216.8119) a bolt set in rock outcrop 0.3m above ground 20m from northerly production of fence 8.4m W

of road junction.

(source OS 1976)

Annex 6 – Wreck Data (Primary Area)

[Wreck Data has been removed from the web-published version for copyright reasons]

Annex 7 – Tender Evaluation Criteria

The following broad headings will form the basis of the Tender Evaluation.

They are given in no particular order of priority

1. Track Record for SOLAS Charting Surveys
2. Quality Control Procedures
3. Quality Control Certificates
4. Evidence of Compliancy with IHO order 1.
5. Vessel suitability
6. Multibeam equipment
7. Ancillary Equipment
8. Tidal Reduction Methodology
9. Primary/Secondary Positioning Details
10. Calibration Procedures
11. Survey Line Spacing
12. Details of proposed Data Flow
13. Environmental Criteria for cessation of surveying
14. Details/Experience of Key Personnel
15. Details of Sub-contractors
16. Safety Management Plan
17. Price