1st Crowd-Sourced Bathymetry Working Group (CSBWG1) Meeting

7 October 2015, Kuala Lumpur, Malaysia

(Paragraph numbering is the same as the Agenda Item numbering and does not necessarily reflect the order in which matters were discussed.)

1. Opening

The Chair, Ms Lisa Taylor (NOAA-USA), opened the meeting at 0907. She thanked the Royal Malaysian Navy for the meeting arrangements and for hosting the first meeting of the IHO CSBWG. Ms. Taylor thanked the GEBCO Chair for accommodating the need to shuffle GEBCO meeting schedules to allow the maximum number of GEBCO subject matter experts to attend and contribute to the WG meeting. She then thanked all participants for coming and gave a brief background to the setting up of the CSBWG.

Mustafa Iptes (IHB Director), on behalf of the Directing Committee thanked the Royal Malaysian Navy for hosting the meeting and providing a high level of support and excellent facilities. The outcomes from IRCC7 were highlighted along with the extensive set of tasks set for the CSBWG. He stressed the importance of liaison with other IHO bodies and the appropriate engagement with industry to progress the work items.

The Chair endorsed these sentiments and she highlighted a need for active engagement by the CSBWG members during and between meetings to progress action and work items.

2. Introductions

All participants – representing France, Malaysia, Russia, UK and USA (NOAA-NECI, NOAA-OCS, NGA, NAVO), and Sea-ID – introduced themselves. A number of IHO-IOC GEBCO delegates also participated.

3. Background and Review of Progress

The Chair gave a presentation on the background to crowd-sourced bathymetry and some ideas on how the WG is going to move forward – why the WG exists, how the WG will work and what the WG will do. A common vision was articulated 'The floors of our oceans and seas revealed' and the mission: 'Empower mariners to map the gaps'.

A number of communication agreements were articulated:

- Clear effective communication;
- Reply within 7 days; and
- Hold people accountable.

Initial four focus areas on which IHO publication on standards and guidelines for collection and assessment of CSB data will be based:

- Collection Models
- Uncertainty
- Hardware
- Data Formats

The chair described the current model for which mariners download data to a central 'trusted node' prior to up-loading to the IHO DCDB. She described the current pilot projects in coordination with the IHO, GEBCO, PYA and Sea-ID being run with the super yacht community in the Mediterranean Sea and the Royal Malaysian Navy in Malaysia. She described the possible future model of individual contributors up-loading data directly to the DCDB.

A number of issues which need to be addressed for greater participation by mariners were discussed including current hardware in use (reluctance to purchase, suitable installation locations), CBS data formats (GeoJSON, XYZT) and the methods for determining CSB data uncertainty, remembering it is crowd-sourced bathymetry not necessarily crowd-sourced hydrography.

A representative from the PYA noted that CSB was not understood generally by mariners and that the title could be considered for change, chart improvement project was better understood. He also noted that deep water (over 200 m) was not within current equipment capabilities. He articulated the need for rapid visualization of data and that it is needed for and will be used as a risk management and planning tool.

NOAA-OCS introduced the 'ActiveCaptain' website and explained its capabilities and how contributors interact with the website and other users. 'OpenSeaMap' was also highlighted along with a number of other websites. It was suggested that these sites, already operating, should be studied and used to guide the development of the guidelines document.

UK suggested the participants should revisit the ToRs as a basis on which to progress discussions and ensure the WG was focused on the tasks set by IRCC. Director Iptes emphasised the objectives detailed in the ToRs, which resulted from the submission to EIHC by USA and France.

Sea-ID raised the concerns of gathering data in the maritime areas of some coastal states, and it was agreed that guidance needed to be included. UK suggested clarification of the legal aspects of data gathering within coastal state territorial seas. USA noted this issue was outside the remit of the CSBWG and that the interpretation of UNCLOS varied considerably between coastal states. IHB noted that this issue had been highlighted to ITLOS for some non-legal guidance and advice for the DC and the WG. The current pragmatic solution was to collect data where there are no restrictions and refrain in other areas.

The USA suggested the WG agrees upon and scopes its efforts along agreed and focused lines. It was recommended avoiding working on products and services, defining acceptable use of CSB data, and addressing in depth LOS issues other than identifying the need for expert opinion. The guidance document, as defined in the ToRs, should focus on the preferred end format, understanding that many efforts will not be completed in the initial draft.

The USA suggested that the WG clearly define the specific roles of collector, trusted node, aggregator and consumer of CSB; audit current practices by existing Trusted Nodes including systems, metadata, processing, physical corrections; define minimum metadata standards; define broad system requirements regarding the application of external processes to the data streams; improve the ability to identify the uncertainty of CSB; establish a collector feedback loop; and identify future issues regarding LOS concerns and data collection.

4. Breakout Groups

Two breakout groups were created to discuss:

- Collection Models/Uncertainty
- Hardware/Data Formats

Reports from the breakout groups were provided and discussed:

Collection Models/Uncertainty:

Considered the wider user communities – GEBCO, HOs, mariners (for planning/risk assessment), scientific research, resource management and law enforcement. It was agreed there was a need to fill in the gaps in global coverage and identify what data already exists and where it has been stored and by whom.

The need to establish the minimum recommended metadata for CSB data, which participating vessels would follow and importantly were simple enough to encourage participation in the initiative. It was recognized that all data should be considered good data and that it was for end users to determine the quality of the data and its suitability for the purpose to which they intended to use it.

It was recognized that offset and layback data for sensors needed to be measured to determine the vessel reference point. It was acknowledged that SV, tides and sea conditions would be unknowns, although some of this information could be added during post-processing. Additionally the location from which the data was collected could have a significant impact on the GPS positional data quality.

Hardware/Data Formats:

It was agreed guidance on how data loggers could perform to assist developers and manufacturers create 'type approved' equipment; this standard description should not be too strict to allow competition, which will promote innovation. It was noted that the development should be output driven and the data format should be standardized to some degree but not be too restrictive. It was important to keep the process simple to encourage participation and to identify the minimum data required (xyzt); the logger unique ID was considered to be useful data but it is important for contributors to remain anonymous if desired. There were a number of additional items identified which were considered of use but not essential.

Concern was raised over the possibility that the logger ID number could be used to trace and identify a particular vessel. This is an issue as it is important that it should not be possible to trace back through the data to the data source. Safeguarding vessel anonymity could be achieved via a Trusted Node buffer for DCDB to manage.

Importantly it was highlighted that a common easily useable data format was needed to encourage participation and make data handling quick and simple. It was suggested that the WG could engage with other crowd-sourcing efforts to gain access to additional data sources. It was noted that many ships were logging echo sounder data to ECDIS. Unfortunately, this data is being collected but not shared. There is a willingness to translate from the proprietary format. It was suggested the guidelines could include best practices for HO's on how to use the data and assess its quality.

Director Iptes highlighted that IRCC7 had discussed the issue of access to data from other non-HO sources. He also suggested a target could be the International

Hydrographic Conference in April 2017 for presenting the comprehensive draft guidelines to Member States.

5. Use of the IHO Webpage

The IHB encouraged all participants to regularly check the website for information, documents and meeting up-dates. **Action All** The meeting report and list of actions would be maintained on the CBSWG section of the IHO website.

6. Any other business

The Chair asked all present to indicate whether they wished to become active members of the WG and to provide their contact details to the IHB. UK confirmed it wish to participate. The list of current members will be published in the CSBWG section of the IHO website, Annex G.

The Chair also highlighted the need to develop the outline of the guidelines document for presentation at IRCC8 in June 2016.

It was agreed that legal concerns should be discussed after advice and guidance had been received by the Directing Committee in response to its correspondence with ITLOS. It was suggested a disclaimer might be appropriate to allow users to assess the appropriate use for particular data sets.

SHOM highlighted they are proposing an internship for a student (MSc) who will look at developing methods to evaluate (statistically) crowd-source data.

It was agreed to create a correspondence group led by NOAA-OCS to develop the data format and minimum metadata for consideration by the WG. NOAA-OCS agreed to coordinate membership. **Action NOAA-OCS**

7. Venue and dates of the 2nd CSBWG Meeting

It was agreed there was a need for a further meeting of the WG prior to IRCC8. The IHB would canvas the views of declared members to identify a suitable period early in 2016 as the report to IRCC8 needs to be submitted by 10 April 2016. **Action IHB**

8. Action Items

It was agreed that there was a need to identify actions and deliverables to move the development process forward. A draft list of Action Items from the meeting was generated. All Action Items are marked in this report and are collated together at Annex D. An updated list of the Action Items will be maintained on the CSBWG2 web page and all those who have actions to complete should keep the Chair and the IHB informed of any progress. **Action ALL**

It was agreed that the IHB would circulate a draft meeting report to all attendees by 16 October. **Action IHB** Attendees were requested to provide any comments by 30 October. **Action ALL** It was intended the final meeting report would be published by 13 November. **Action IHB**

The IHB, the Chair and the Vice-Chair would prepare the final report to IRCC8 using the format required by IRCC. Representation of CSBWG at the IRCC8 meeting would be discussed between the Chair and the Vice-Chair. **Action IHB & Chair**

The Chair requested IHB to generate a draft Agenda for CSBWG2 and include as Annex F to the report. The draft Agenda may require further amendment following intersessional progress.

9. Closing remarks

The Chair thanked everyone for coming to the meeting and for the effort and enthusiasm towards the task. She also thanked the Royal Malaysian Navy for their excellent support and organization, both of which helped greatly in the success of the meeting.

The meeting closed at 1235.

The following Annexes are attached:

A. CSBWG1 – List of Participants.
B. CSBWG1 – Agenda
C. CSBWG1 – List of Documents
D. CSBWG1 – List of Actions
E. CSBWG1 – ToRs and RoPs
F. CSBWG1 – Draft Agenda for CSBWG2
G. CSBWG1 – List of Members

IHO Crowd-Sourced Bathymetry Working Group (CSBWG)
List of Participants CSBWG1

Member State	Organization	Name	E-mail
China	National Marine Data Information & Service	Fan Miao	fm_nmdis@163.com
France	SHOM	Thierry Schmitt	thierry.schmitt@shom.fr
UK	UKHO	Jamie McMichael-Phillips	Jamie.McMichael-Phillips@ukho.gov.uk
USA	NOAA National Centers for Environmental Information (NCEI)	Lisa Taylor (Chair)	Lisa.A.Taylor@noaa.gov
USA	NOAA NCEI	Jennifer Jencks	jennifer.jencks@noaa.gov
USA	NOAA Office of Coast Survey (OCS)	Anthony Klemm	anthony.r.klemm@noaa.gov
USA	NAVO	Raymond Sawyer	raymond.sawyer@navy.mil
USA	NGA	John Lowell	John.E.Lowell@nga.mil
USA	NGA	James Ford	James.D.Ford@nga.mil
USA	NOAA NCEI	Karen Marks	Karen.marks@noaa.gov
IHB	IHB	David Wyatt (Secretary)	adso@iho.int
IHB	IHB	Mustafa Iptes	DCoord@iho.int
IHB	IHB	Anthony Pharaoh	addt@iho.int
Expert Contributor	Sea-ID	Kenneth Himschoot	Kenneth@sea-id.org Kenneth.himschoot@sea-id.org
Expert Contributor	PYA/Sea-ID	Andrew Schofield	Andrew.schofield@sea-id.org
Expert Contributor	GEBCO/Stockholm University	Martin Jakobsson	martin.jakobsson@geosu.se
Expert Contributor	GEBCO/JHA	Shin Tani	soarhigh@mac.com
Expert Contributor	GEBCO/Namria-Philippiness	Jaya Roperez	jayaroperez@gmail.com
Expert Contributor	Ztin Consulting-Korea	Eunmi Chang	emchang21@gmail.com

Expert Contributor	Marine Science Technology Sdn Bh-Malaysia	Zainul Ghazali	zainul.ghazali@mast.com.my
Expert Contributor	AimsGlobal-Malaysia	M Termizi	mtermizi@aimsglobal.com.my

1st Crowd-Source Bathymetry Working Group (CSBWG1) Meeting
Kuala Lumpur, Malaysia - 7 October 2015

1. Welcome and opening remarks by the Chair.

2. Domestic and administrative arrangements (*Secretary*).

3. Introduction of participants, apologies and approval of agenda.

4. Review of progress from Google Hangouts.

5. Key topics for discussion:

   .1 WG Internal Guidance Document;
   .2 Research on other Crowd-sourced initiatives;
   .3 Drafting framework.

6. Use of IHO web page by WG.

7. Review of ToRs and RoPs.

8. Any other business.

9. Election of vice-chair.

10. Date and venue of next meeting – CSBWG2 – and intersessional activities.

11. Review of Action List and draft agenda for CSBWG1.

12. Closing remarks by Chair.

CSBWG1 - List of Documents

Document No	Document Title
CSBWG1-Invitation Letter	Letter of Invitation
CSBWG1-Registration Form	Registration Form - Word Version
CSBWG1-Logistic Information	See GEBCO website fro details
CSBWG1-Document Template	Document Template (Word version)
CSBWG1-3-Agenda	CSBWG1 Draft Agenda v1.0
CSBWG1-Participants	CSBWG1 List of Participants
IRCC7-06A	EIHC5 Decisions related to IRCC
IRCC7-11B	Guidance on Access to Bathymetric Data
IRCC7-11E	Maximizing Access Hydrographic Information
IRCC7-11F	Agenda proposal for SDB
IRCC7-List_of_Decisions	IRCC7 Draft List of Decisions
IRCC7-List_of_Actions	IRCC7 Draft List of Actions
IRCC7-Final Report	IRCC 7 Final Report Extract

LIST OF ACTIONS – Updated 5 November 2015

Agenda Item	Subject	Status/Date	Comments	Action
CSBWG 1				
5	Data Format and Metadata	CSBWG2	Create CG to define minimum metadata and appropriate data format usable to data users and provide recommendations	NOAA-OCS
6	IHO website	On going	Check IHO website for documents and information	All
~~10~~	~~CSBWG2~~	~~16 Oct~~ Complete	~~Circular potential dates and request to host meeting in late January/February~~	~~IHB~~
~~10~~	~~CSBWG2~~	~~7 Nov~~ Complete	~~Confirm availability and offers to host~~	~~All~~
10	CSBWG2 venue and dates	30 Nov	Circulate an initial letter of invitation	IHB
11	Action List	CSBWG2	Keep IHB informed of progress with allocated actions	All
~~11~~	~~CSBWG 1 Draft Report~~	~~16 Oct~~ Complete	~~Draft to be circulated for comment~~	~~IHB~~
~~11~~	~~CSBWG 1 Draft Report~~	~~30 Oct~~ Complete	~~All to provide comments on draft report to IHB~~	~~All~~
~~11~~	~~CSBWG 1 Final Report~~	~~13 Nov~~ Complete	~~Publish final report~~	~~IHB~~
11	Report to IRCC8	19 Mar	Draft report for review and amendment by Chair and vice-Chair	IHB
11	Report to IRCC8	10 Apr	Comments back to IHB	Chair, Vice Chair

CROWD-SOURCED BATHYMETRY WORKING GROUP (CSBWG)

Terms of Reference

(as adopted by IRCC-7, June 2015**)**

1. Preamble

The 5th Extraordinary International Hydrographic Conference (EIHC-5) considered Proposal 4 on Crowd Sourced Bathymetry (CSB) and decided by Decision 8 to task the IRCC to establish a Working Group (WG) to prepare a new IHO publication on policy for trusted crowd-sourced bathymetry, taking into account EIHC-5 Proposal 4 and the comments made during the Conference.

2. Objectives

a. Prepare a draft IHO publication on policy for trusted crowd-sourced bathymetry for consideration and endorsement by the 8th meeting of the IRCC in 2016.

b. The draft IHO publication on policy for trusted crowd-sourced bathymetry should provide guidelines on the collection and assessment of CSB data, not only for potential use for charting purposes but also for its wider use in non-navigational applications. The WG should:

(1) take into account EIHC-5 Proposal 4 and the comments made during the Conference;

(2) take into account the ongoing work to enhance the IHO Data Centre for Digital Bathymetry (DCDB) as a data discovery and upload/download portal for Crowd-Sourced Bathymetry;

(3) take into account the lessons learned and specifications created during the IHO CSB pilot project involving the Professional Yachting Association, Sea-ID and the DCDB, together with any other relevant CSB trials or operational services;

(4) actively seek input from other international organizations, industry and invited Expert Contributors on their methods and use of crowd-sourced information;

(5) seek advice and input from relevant HSSC Working Groups as required;

(6) identify the nature and minimum level of metadata required to accompany any crowd-sourced bathymetry data;

(7) identify methods for assessing and designating the uncertainty of crowd-sourced bathymetry, both as individual observations from a single observer and as repeat or duplicate observations from the same or different observers;

(8) identify preferred formats for the submission, exchange and preservation of crowd-sourced bathymetry data, taking into account the relevant international standards and existing industry or community practices; and

(9) base its recommendations, wherever possible, on established and accepted crowd-sourced data gathering principles.

c. The WG should provide IRCC with general advice on any relevant liability or legal issues associated with the collection or use of crowd-sourced data.

3. Authority

a. The WG is a subsidiary of the Inter Regional Coordination Committee (IRCC) and its work is subject to IRCC approval.

b. The need for the WG to continue shall be confirmed at each meeting of the IRCC.

4. Composition and Chairmanship

a. The WG shall comprise representatives of IHO Member States, invited Expert Contributors, including members of IHO-IOC Technical Sub Committee on Ocean mapping (TSCOM) and Observers from accredited NGIO, all of whom have expressed their willingness to participate, and a representative of the IHB ("IHB" to be replaced by "IHO Secretariat" when the IHO Secretariat is established).

b. Member States, invited Expert Contributors and Observers may indicate their willingness to participate at any time. A membership list shall be maintained, posted on the IHO website and confirmed annually.

c. Invited Expert Contributor membership is open to entities and organizations that can provide a relevant and constructive contribution to the work of the WG.

d. The Chair and Vice Chair shall be a representative of a Member State. Unless already decided by the IRCC, the election of the Chair and Vice-Chair should be decided at the first meeting following each ordinary session of the Conference ("Conference" to be replaced by "Assembly" when the revised IHO Convention enters into force) and, in such case, shall be determined by vote of the Member States present and voting.

e. If a secretary is required it should normally be drawn from a member of the WG.

f. If the Chair is unable to carry out the duties of the office, the Vice-Chair shall assume the Chair with the same powers and duties.

g. Invited Expert Contributors shall seek approval of membership from the Chair.

h. Invited Expert Contributor membership may be withdrawn in the event that a majority of the MS represented in the WG agree that an Expert Contributor's continued participation is irrelevant or unconstructive to the work of the WG.

i. All members shall inform the Chair in advance of their intention to attend meetings of the WG.

j. In the event that a large number of Invited Expert Contributor members seek to attend a meeting, the Chair may restrict attendance by inviting the Invited Expert Contributors to act through one or more collective representatives.

5. Procedures

a. The WG should work primarily by correspondence.

b. The WG should attempt to meet annually, and wherever possible, with another convenient forum.

c. The WG should seek advice and input from relevant HSSC WGs as required.

d. Decisions should generally be made by consensus. If voting is required on issues or to endorse proposals presented to the WG, only IHO Member States may cast a vote. Votes at meetings shall be on the basis of one vote per MS represented at the meeting. Votes by correspondence shall be on the basis of one vote per MS represented in the WG. In all cases of voting, a majority shall be determined based on the number of Member States casting a vote.

2nd Crowd-Source Bathymetry Working Group (CSBWG2) Meeting
Boulder, Colorado, USA – tbc February 2016

1. Welcome and opening remarks by the Chair.

2. Domestic and administrative arrangements (*Secretary*).

3. Introduction of participants, apologies and approval of agenda.

4. Approval CSBWG1 Report and Review of Actions.

5. Review of progress from Google Hangouts.

6. Preparation of CSB Guidance Document (CSBGD) for use by data collectors and data users:

   .1 Initial layout, section/chapter headings and supplementary sections;
   .2 Outline section/chapter and supplementary format/style (maximize use of diagrams rather than descriptive text);
   .3 Outline section/chapter and supplementary contents.

7. Key topics/areas for discussion:

   .1 Introduction – background, need for document and CSB, scope of CSBGD, etc.;
   .2 Basic system/sensor descriptions with diagrams – echo sounder, position system, off-sets and determination/measurement, show link/reference to metadata, examples of metadata showing relation/reference to system;
   .3 Metadata – minimum requirement, useful additional data (weather, sea state, etc.), explain relationship between time/date with tide and SV, weather/sea state with data quality;
   .4 Uncertainty – single point, multi-point-single observer, CSB data;
   .5 Data formats – suggested appropriate preferred formats;
   .6 DCDB development – up-load protocols (trusted node, single observer), data mining/viewing, download protocols, description of data flow (processing/validation/quality assessment of data) - collection→trusted node→DCDB→user.
   .7 Identify lead individual for each topic/area, willing assistance and milestones.

8. CSBGD development timeline and milestones – IRCC7, CSBWG3, IRCC8/19th IHC.

9. Review of ToRs and RoPs.

10. Any other business.

11. Date and venue of next meeting – CSBWG3 – and intersessional activities.

12. Review of Action List and draft agenda for CSBWG3.

13. Closing remarks by Chair.

IHO Crowd-Sourced Bathymetry Working Group (CSBWG)
List of Members

Member State	Organization	Name	E-mail
Argentina	Servicio de Hidrografia Naval	Fabián Alejandro Vetere	fvetere@hidro.gov.ar
Australia	Australian Hydrographic Office	Andrew Coulls	Andrew.coulls@defence.gov.au
China	National Marine Data Information & Service	Fan Miao	fm_nmdis@163.com
France	SHOM	Thierry Schmitt	thierry.schmitt@shom.fr
India*	Indian Navy Hydrographic Office	RM Thomas	ia-inho-navy@nic.in
Nigeria	Nigerian Navy Hydrographic Office	C Azuike	info@nnho.org.ng
Portugal	Portuguese Hydrographic Institute	Ricardo Cordeiro de Almeida	cordeiro.almeida@hidrografico.pt
Turkey*	Turkish Hydrographic Office	Bülent Gürses	bgurses@shodb.gov.tr
UK	UKHO	Jamie McMichael-Phillips	Jamie.McMichael-Phillips@ukho.gov.uk
USA	NOAA National Centers for Environmental Information (NCEI)	Lisa Taylor (Chair)	Lisa.A.Taylor@noaa.gov
USA	NOAA NCEI	Jennifer Jencks	jennifer.jencks@noaa.gov
USA	NOAA Office of Coast Survey (OCS)	Anthony Klemm	anthony.r.klemm@noaa.gov
USA	NOAA OCS	James Miller	james.j.miller@noaa.gov
USA	NOAA OCS	Patrick Keown	patrick.keown@noaa.gov
USA	NOAA OCS	Percy Pacheco	percy.pacheco@noaa.gov
USA	NOAA NCEI	Evan Robertson	evan.robertson@noaa.gov
USA	NAVO	Raymond Sawyer	raymond.sawyer@navy.mil
USA	NGA	John Lowell	John.E.Lowell@nga.mil
USA	NGA	James Ford	James.D.Ford@nga.mil
USA	NOAA NCEI	Karen Marks	Karen.marks@noaa.gov

USA	NGA Centre for Coastal and Ocean Mapping, University of New Hampshire	Brian Calder	brc@ccom.unh.edu
IHB	IHB	David Wyatt (Secretary)	adso@iho.int
IHB	IHB	Anthony Pharaoh	addt@iho.int
Expert Contributor	Caris, Pan American Institute of Geography and Histroy	Paul Cooper	pcooper@caris.us
Olex AS	Managing Director	Ole Benjamin Hestvik	oleb@olex.no
Expert Contributor	Sea-ID	Kenneth Himschoot	Kenneth@sea-id.org Kenneth.himschoot@sea-id.org
Expert Contributor	PYA/Sea-ID	Andrew Schofield	Andrew.schofield@sea-id.org
Expert Contributor	GEBCO/Stockholm University	Martin Jakobsson	martin.jakobsson@geosu.se
Expert Contributor	GEBCO/JHA	Shin Tani	soarhigh@mac.com
Expert Contributor	GEBCO/Namria-Philippiness	Jaya Roperez	jayaroperez@gmail.com
Expert Contributor	Ztin Consulting-Korea	Eunmi Chang	emchang21@gmail.com
Expert Contributor	Marine Science Technology Sdn Bh-Malaysia	Zainul Ghazali	zainul.ghazali@mast.com.my
Expert Contributor	AimsGlobal-Malaysia	M Termizi	mtermizi@aimsglobal.com.my
Expert Contributor*	SevenCs/Chartworld	Emma Fowler	emma.fowler@chartworld.com
Expert Contributor	GEBCO	Vicki Ferrini	ferrini@ldeo.columbia.edu