

## Report of the Crowdsourced Bathymetry Working Group

<b><i>Submitted by:</i></b>	Jennifer Jencks, CSBWG Chair
<b><i>Related documents:</i></b>	IHO CSBWG15 report, IHO CSB Guidance Document (B-12) Edition 3.0.0, IHO CL 21/2020 dated 3 June 2020, IRCC CL 1/2020 dated 15 June 2020, IRCC 12-08A.2: CSBWG paper on raising the awareness of CSB within RHCs and proposed actions within RHCs to support the IHO CSB initiative
<b><i>Related Projects</i></b>	GEBCO, Nippon Foundation-GEBCO Seabed 2030 Project, IHO Data Centre for Digital Bathymetry

<b><i>Chair:</i></b>	Jennifer Jencks, USA
<b><i>Vice-Chair:</i></b>	Belen Baron Jimenez, New Zealand
<b><i>Secretary:</i></b>	Sam Harper, IHO
<b><i>Member States:</i></b>	Argentina, Canada, China, Denmark, France, Germany, India, Iran, Italy, Jamaica, Lebanon, Mexico, Netherlands, New Zealand, Norway, Portugal, Spain, South Africa, Sri Lanka, Sweden, UK, Uruguay, USA
<b><i>Expert Contributors:</i></b>	CCOM-JHC, CIDCO, CIRES, COMIT, Da Gama Maritime Ltd, Dongseo U, Dock Tech, ECC AS, ESRI, FarSounder, FLIR Systems AB, Fugro, GMATEK, Inc., Great Lakes Observing System (GLOS), H2i, Inkfish, International Seakeepers, James Cook U, JAMSTEC, Navico/C-Map, ONE Data Tech Co., Orange Force Marine, PYA, Seabed 2030, Sea-ID, SevenCs/ChartWorld, Teledyne CARIS, World Maritime University, and World Ocean Council
<i>See Annex B for full details</i>	

### 1. Meetings Held During Reporting Period

Three working group meetings have been held since IRCC15. The 14th meeting (hybrid), from 16-18 August 2023, was hosted by the Norwegian Mapping Authority Hydrographic Service in Stavanger, Norway and attended by ~60 participants (25 in person). A 3 hour intersessional meeting was held virtually on 13 December 2023. The 15th meeting (hybrid), from 23 – 25 April 2024, was hosted by the IHO Secretariat in Monaco and attended by ~80 participants (20 in person).

See Annex B for a list of active working group members based on attendance at CSBWG15.

All meetings were led by the Chair and Vice-Chair. IHO Assistant Director Sam Harper (Secretary) represented the IHO Secretariat.

## 2. Work Programme

Following the publication of B-12 Ed. 3.0.0 (which had been the major focus of the CSBWG for several years), the January 2023 CSBWG13 meeting focused on a critical review of the group's operating mandate, as set out in the ToRs. In doing so, the CSBWG identified ten high level priority work areas and developed a multifaceted work plan.

In turn, this work plan was cross referenced with the WGs existing ToRs which were then updated. Both the updated ToRs and the newly drafted work plan were approved at IRCC15. Within the last year, the work plan progressed and was discussed at three meetings which has led to a better understanding on what the WG focus should be and to an adjustment of several work items and associated activities (Annex A).

Work Item B (*Submit IHO CSB Initiative as a UN Decade Action*) is one such discussed item. At CSBWG14 (August 2023), it was noted that in order to draft a submission to the UN Decade, an “IHO CSB Initiative” would first need to be more formally defined. This would include defining its shape, nature and governance in terms that deliver measurable outputs, outcomes and impacts.

The IHO Secretariat was tasked with drafting a proposal for how to incorporate the development and governance of an IHO CSB Initiative into the CSBWG Work Plan, which was then presented to CSBWG15 by the IHO Secretariat (Figure 1).

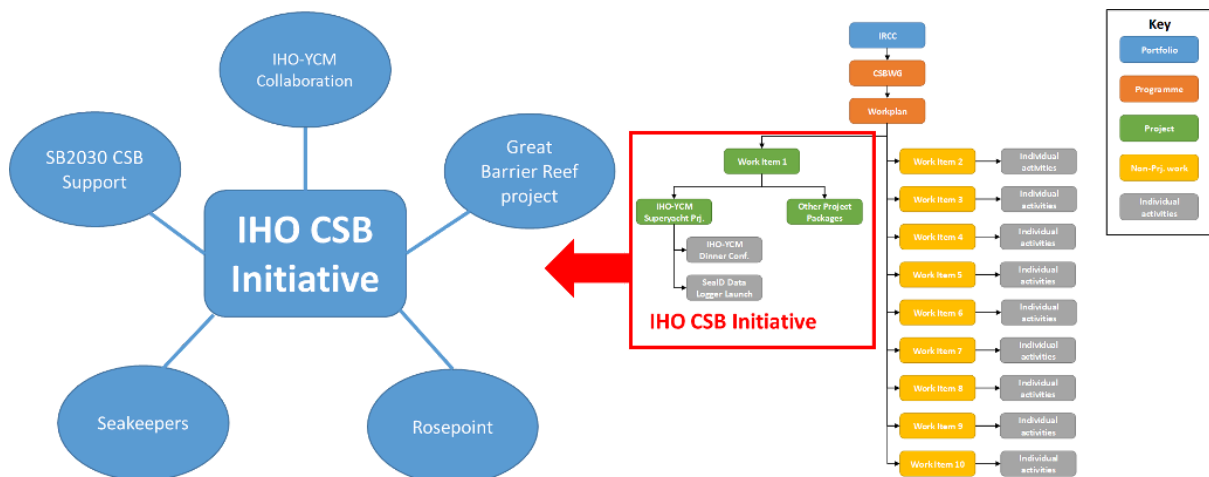


Figure 1 shows the entire CSBWG Work Plan as having the characteristics of a ‘programme’, with its subordinate work items characterised as either a project (the IHO CSB Initiative) or non-project (all other CSBWG work items). The two principal distinguishing characteristics between project and non-project work items in this context are 1) the type of governance that is placed around it and 2) the size and complexity of the task.

At CSBWG15 it was agreed that there was a need to clearly distinguish between the IHO CSB Initiative from the original work items. The Initiative would serve as the outward facing, enduring point of entry for those who wished to align themselves or their activity under its umbrella, draw on all of the resources created and maintained by the CSBWG, and contribute to the collective aims.

These individual CSB projects/activities (such as The Great Barrier Reef Project, the joint IHO & Yacht Club of Monaco, etc) are governed and maintained by organisations outside of the CSBWG. The IHO CSB Initiative would serve as the central point of standardisation, policy and technical

guidance - coordinated and administered by the CSBWG - into which these various CSB projects feed into and/or draw from. This approach means that CSB as a concept is standardised, while individual CSB activities can be tailored to the needs of a specific crowd. It's also worth noting that taking this approach also allows people to participate in the IHO CSB Initiative, without the burden of being a member of the CSBWG.

The proposed structure was agreed to at CSBWG15 and a new work item was added to the work plan (*Work Item K: Deliver a CSB Initiative*). Initial work will focus on developing specific governance and clarifying next steps. The IHO Secretariat will commit to managing a dedicated IHO CSB Initiative Web Page on the IHO website.

### **3. Progress on IRCC Action Items**

IRCC 15 Action 9: CSBWG in liaison with the IHO Secretariat to host an IRCC workshop on the benefits of CSB and to extend the contribution of CSB.

Update: An *IRCC Workshop on Crowdsourced Bathymetry* was organised and hosted by members of the CSBWG and the IHO Secretariat on 26 April 2024.

National Hydrographers, or their Deputies, were strongly encouraged to participate and attend.

Workshop topics included:

- CSBWG Background, Workshop Purpose & Objectives, Current CSB data flow
- How CSB is supporting the UN Decade, GEBCO and the IHO Strategic Plan.
- Legal Considerations & Misconceptions
- Utility of CSB (The NOAA Example)
- Implementation of CSB in waters of national jurisdiction: the FRANCE case.
- CSB and the world of Yachting: the experience of the Yacht Club de Monaco (YCM)

The workshop drew 107 participants from over 50 coastal States. The IHO and the CSBWG consider the workshop a success as there was very active engagement with over a dozen questions posed, time to provide adequate answers, and very positive feedback provided during the event and afterwards.

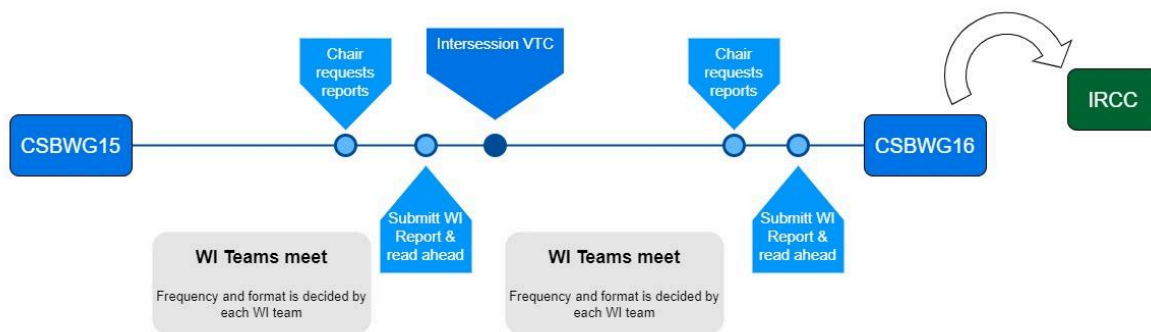
Several member states have since reached out reiterating the value of this type of engagement and highlighting that previous modes of communications around the various aspects of CSB had not always been clear.

The CSBWG is thankful for the opportunity to hold this Workshop.

### **4. Problems Encountered**

During the three meetings held this last year, it became obvious that we had yet to develop a way to effectively measure progress against our work item objectives. The CSBWG Chair Team has prioritised the development of metrics gathering and reporting templates to be shared with Work Item leads before our next intersessional meeting.

The following diagram represents the process as presented and agreed at CSBWG15. The first iteration of this process will be implemented during the intersessional work between CSBWG15 and CSBWG16 and will be adjusted as needed based on experience and feedback.



## 5. Any Other Items of Note

The CSBWG continues to enjoy strong industry participation and this is reflected in the membership of the group. At IRCC15, a concern over dwindling participation from hydrographic offices and authorities was reported. Likely, in part, to the IHO-led social media efforts around promoting the IRCC CSB Workshop, registration and attendance to the CSBWG15 (held that same week) by HOs was record breaking, with over 80 registrants.

The CSBWG would like to emphasise that the group is not only for HOs that are active in CSB efforts, but for all offices to discuss their concerns or questions on the topic. The CSBWG strongly believes that increasing the collection, sharing and use of CSB data will only happen if we can hear the full perspectives of all.

The CSBWG would also like to stress that we are an IHO resource, here to support all HOs, whether they are members of the CSBWG or not.

Finally, since IRCC14, the number of positive MS respondents to IHO CL21/2020 and IRCC CL1/2020 has risen to 36 with the additions of Palau and Kiribati.

## 6. Conclusions and Recommended Actions

As the CSBWG continues to progress activities associated with their work plan, specific work items will continue to be refined and changes to the work plan are expected.

Following the last 3 meetings, the CSBWG would like to propose a new work item: Work Item K: *Deliver the IHO CSB Initiative*. The IRCC are requested to review the description of this work item (above) and approve its addition.

## 7. Justification and Impacts

N/A

## 8. Actions Required of IRCC

The IRCC is invited to:

- A. Note the contents of this report;

- B. Approve addition of new Work Item K: *Deliver the IHO CSB Initiative*
- C. Encourage all Member States to engage with the IHO CSBWG, either formally (by joining the CSBWG) or informally (attending CSBWG meetings, engaging with CSBWG members or their RHC CSB Coordinators with questions, concerns).
- D. Encourage Member States to support CSB with positive actions, such as encouraging vessels, from all sectors, to collect and contribute bathymetric data when involved in routine maritime operations;
- E. Take what other action is deemed necessary.

**Annexes:**

- A. CSBWG Tasks and Work Plan
- B. List of active members based on attendance at last meeting

**Annex A: CSBWG Tasks and Work Plan**

<b>A</b>	Maintain and update IHO CSB Guidance Document (B-12)
<b>B</b>	Submit IHO CSB initiative as a UN Decade Action
<b>C</b>	Gather, prioritize and respond to HO-specific issues/opportunities regarding national policy/ regulations related to CSB
<b>D</b>	Gather and prioritize HO-specific issues relating to CSB data, including but not limited to Nautical Cartography
<b>E</b>	Support CSB/SB2030 Coordinators in their RHC engagement
<b>F</b>	Discuss and propose potential software tool support for HOs
<b>G</b>	Clarify support identified by current Trusted Nodes needed for current and future Trusted Nodes.
<b>H</b>	Clarify all aspects of the CSB data cycle and capture known issues, requirements and suggested enhancements.
<b>I</b>	Develop a communication plan in coordination and collaboration with related efforts (SB2030, GEBCO, etc)
<b>J</b>	Develop a recognition & incentive strategy plan
<b>K</b>	Deliver the IHO CSB Initiative

<b>Work Item</b>	<b>Title</b>	<b>Priority</b> <i>H-high</i> <i>M-medium</i> <i>L-low</i>	<b>Next milestone</b>	<b>Start Date</b>	<b>End Date</b>	<b>Status</b> <i>P-planned</i> <i>O-ongoing</i> <i>C-completed</i> <i>S-Superseded</i>	<b>Contact Person(s)</b>	<b>Related Pubs / Standard</b>	<b>Remarks</b>
A-1	Review B-12 Edition 3.0.0	M	Identify review cycle	2023	Ongoing	O	G Morissette	B-12 Edition 3.0.0	
A-2	Capture suggested updates to B-12 Edition 3.0.0	M	Consolidate and share suggestions	2023	Ongoing	O	G Morissette	B-12 Edition 3.0.0	Discussion topic at CSBWG15
A-3	Develop proposal for maintenance of B-12	H	CSBWG16	2023	March 2025	O	G Morissette	B-12 Edition 3.0.0	Discussion topic at CSBWG15
B-1	Define the shape and nature of the IHO CSB Initiative and how this relates to the work of the CSBWG	H	CSBWG15 IRCC16	Aug 2023	March 2025	C	S. Harper	B-12 Edition 3.0.0	Presented at CSBWG15 and proposed to IRCC16
B-2	Produce proposal and submit to UN Decade as an action	H	CSBWG16 IRCC17	Aug 2023	March 2025	O	E Flier	B-12 Edition 3.0.0	
C-1	Capture issues (and propose solutions) regarding national policy/regulations /culture affecting the endorsement of CSB	H	Consolidate and draft solutions to overcome them	2023	CSBWG15 & 16	O	C. Rathnayake	CSBWG10: Responses to IHO Circular Letters on CSB	First five issues investigated, solutions captured, activities underway.
C-2	Draft proposed rationale to the issuing of a new brief circular letter (and questionnaire) to MS explaining the purpose of IHO CL 21/2020 and encouraging a positive response	L	Present to CSBWG and determine whether to issue to MS	2023	CSBWG14	C	Chair	IHO CL 21/2020	Decision made at CSBWG15 that, at present, the rationale does not exist to draft a new CL. Will coordinate with Outreach Team on future messaging and engagement (includes for IRCC Workshop)

C-3	Request the policy framework(s) or guideline(s) adopted by selected coastal States who positively responded to IHO CL 21/2020 or IRCC CL 01/2020	M	Identify States who might be willing to share their experience and request their feedback and guidance.	2023	CSBWG1 5 & 16	O	Chair	IHO CL 21/2020, IRCC CL 01/2020	The chair has discussed the original milestone with the IHO and has been encouraged to reach out directly to a select States that could offer unique experiences that may be applicable to others.
C-4	International Law of the Sea as it pertains to passage sounding collection.	H	S Keating to provide presentation to CSBWG14; provide resource materials to CSBWG	2023	CSBWG1 4	C	S. Keating	CSBWG14-3.1: CSB and International Law	Presentation given at CSBWG14
D-1	Produce guidance for use of CSB data for SOLAS nautical cartography and other product	M	Share with coastal States	2023	CSBWG1 5	O	H Oais		Hans Oias (Sweden) has submitted the wording in S-44 regarding Annex A (the matrix for aiding data quality classification):
D-2	Evaluate the CSB data stored in the IHO DCDB for use in nautical cartography.	M	Provide feedback to DCDB	2023	Ongoing	O	A Klemm		Testing and feedback is ongoing. CHS & NOAA exploring tool generation and developing data processes
D-3	Engage with industry to ensure the required tools exist to efficiently use DCDB-hosted CSB data for navigational products.	M	Dependent on progress made on D-1 and D-2	2023	Ongoing	O	A Klemm		CA has started discussions with Teledyne on a project to build tools for CSB processing, CA using VBI Compare Tool; NOAA developing in-house/open-source tools to extract, process, and store/export CSB data
D-4	Engage with other IHO WGs to ensure suitable standards exist for describing CSB data and displaying CSB data on ECDIS.	M	Dependent on progress made on D-1 and D-2	2023	Ongoing	P	A Klemm		No updates



E-1	Revisit and update (if necessary) the original intent of the CSB/SB2030 Coordinator (Co) role.	H	Revisit current definition(s) of Co role & draft a simple & clear role description.	2023	Dec 2023	C	B. Baron		
E-2	Work with each Co to develop a regional strategy to aim to achieve the goals of the CSBWG and SB2030	H	Make a plan on how will we support Cos	2023	Ongoing	C/O	B. Baron		
E-3	Raise awareness of CSB in IHO Capacity Building Subcommittee	M	Present at CBSC22	2023	Ongoing	P	B. Baron		Will present virtually at upcoming CBSC meeting on the role of CSB in capacity building toolbox
F-1	Identify objectives of industry team	H	Broaden group participation	2023	Ongoing	O	Teledyne/B Jensen		Lots of turnover. Reconsidering purpose of Work Item and whether is should combine with Group D.
G-1	Capture known issues identified by current Trusted Nodes	M	Develop guidance for current and future Trusted Nodes	2023	Ongoing	O	CIDCO/G Morisette		Creation and publication of an open-source uncertainty model. Creation and maintenance of a free portal to showcase CSB partners and projects
H-1	Review, recommend, and document the data flow of standard processing stages for data capture	M	Present to CSBWG for discussion	2023	Dec 2024	O	CCOM/B Calder		
H-2	Review current metadata structure for CSB data for completeness, encoding methods, validation mechanisms, and support for end-user database mapping	M	Recommend modifications	2023	March 2025	P	CCOM/B Calder		

H-3	Consider potential extensions of the current GeoJSON	M	Recommend modifications	2023	Dec 2024	O	CCOM/B Calder		
H-4	Investigate possible extensions to the DCDB S3 data store and OGC services	H	Consolidate suggestions for future development at DCDB.	2023	May 2024	C	CCOM/B Calder		
H-5	Establish recommendations for one or more use cases of CSB, and associated guidelines for data products	M	Collaborate with other working groups preparing specialized products (e.g., for HO use)	2023	Ongoing	O	CCOM/B Calder		
I-1	Develop draft outreach coordination plan	H	Establish collaborative workspace and aggregate materials; Finalize C&O strategy v1; Start drafting v2; Draft a mechanism to prioritize C&O activities	2023	Ongoing	O	S Grasty		Drafted version 1 of C&O strategy
J-1	Compile a list of potential types of recognition and potential incentives that would motivate individuals and/or organizations to participate in CSB	M	For each potential type, develop a short summary of action required to support its implementation	2023	July 2024	O	Fugro/D Millar	B-12 Edition 3.0.0	List drafted and currently being validated via on-line questionnaires
J-2	Develop Recognition and Incentive Strategy Plan		Gather feedback at CSBWG14 and finalize	2023	Dec 2023	P	Fugro/D Millar	B-12 Edition 3.0.0	Strategy Plan to be written after validation complete
K-1	Develop a management plan for the IHO CSB Initiative	H	Initial analysis and proposal presented to CSBWG16	2024	Mar 2015	o	IHO Sec		

**Annex B**  
**List of Members based on Attendance at CSBWG15 Meeting**

Organization / Company	Name
Bangladesh Navy	Sheikh FIROZ AHMED
Bangladesh Navy	M YOUSUF ALI
Bangladesh Navy	M SHAHID ULLAH
MCD-COASTAL DIVISION - Flemish Hydrography/MDK -Afdeling Kust-Vlaamse Hydrografie	Koen VANSTAEN
CANADIAN HYDROGRAPHIC SERVICE	Michel BRETON
HRVATSKI HIDROGRAFSKI INSTITUT (Hydrographic Institute of the Republic of Croatia)	Vinka KOLIC BUBIC
HRVATSKI HIDROGRAFSKI INSTITUT (Hydrographic Institute of the Republic of Croatia)	Andrea ZLOIC BOJKIC
HRVATSKI HIDROGRAFSKI INSTITUT (Hydrographic Institute of the Republic of Croatia)	Ljerka Vrdoljak
PORTS AND MARITIME ORGANIZATION (PMO)	ALI KOUROSH NIYA
National Land Agency	Diego BILLINGS
LEBANESE NAVY HYDROGRAPHIC SERVICE	Christian FAHED
LEBANESE NAVY HYDROGRAPHIC SERVICE	Afif GHAITH
South African Navy Hydrographic Office (SANHO)	Christoff THEUNISSEN
INSTITUTO HIDROGRAFICO DE LA MARINA (IHM)	SANTIAGO RUBEN DIAZ PORTILLO
SERVICIO DE HIDROGRAFIA NAVAL	Fabricio CARDILLO
MARITIME SAFETY ADMINISTRATION (MSA)	Zhibin WANG
MARITIME SAFETY ADMINISTRATION (MSA)	Chengsheng QIAN
MARITIME SAFETY ADMINISTRATION (MSA)	Lingzhi WU
MARITIME SAFETY ADMINISTRATION (MSA)	Ruiran WANG

HEADQUARTERS OF DEPARTMENT OF LANDS AND SURVEYS	Chrysanthi KLEANTHOS
DANISH GEODATA AGENCY - GEODATASTYRELSEN (GST)	Giuseppe MASETTI
DANISH GEODATA AGENCY - GEODATASTYRELSEN (GST)	Ove ANDERSEN
FINNISH TRANSPORT AND COMMUNICATIONS AGENCY	Seppo MAKINEN
SERVICE HYDROGRAPHIQUE ET OCEANOGRAPHIQUE DE LA MARINE	Thierry SCHMITT
Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung (AWI)	Natalie CORNISH
BUNDESAMT FÜR SEESCHIFFFAHRT UND HYDROGRAPHIE	Patrick WESTFELD
MARITIME AUTHORITY	Marilyn EGHAN
NATIONAL HYDROGRAPHIC OFFICE	YV RAMAKRISHNA
Geological Survey of Ireland	Aileen BOHAN
ISTITUTO IDROGRAFICO DELLA MARINA (Italian Hydrographic Institute)	Nunziante LANGELLOTTO
HIDROGRAFIJAS DIENESTS, LATVIJAS JURAS ADMINISTRACIJA (Hydrographic Service, Maritime Administration of Latvia)	Liva GOBA
National Institute of Water and Atmospheric Research (NIWA)	Belen JIMENEZ BARON
NIGERIAN NAVY HYDROGRAPHIC OFFICE	Abubakar Aminu GIGINYA
Norwegian Mapping Authority	Evert FLIER
HYDROGRAPHIC DEPARTMENT	Muhammad FARAZ
NATIONAL MAPPING AND RESOURCE INFORMATION AUTHORITY (NAMRIA)	Maylord DE CHAVEZ
ISTITUTO IDROGRAFICO	Telmo Dias
GLAVNOE OUPRAVLENIE NAVIGATSII I OKEANOGRAFI (Dept of Navigation and Oceanography of the Ministry of Defence)	Gennadiy NEPOMILUEV
Sri Lanka Navy	Chandana RATHNAYAKE

Sri Lanka Navy	Gayan JAYAWARDHANA
Sri Lanka Navy	Jayamal JAYAWARDANE
Sri Lanka Navy	Randunu DESHAPRIYA
MARITIEME AUTORITEIT SURINAME (MAS)	Christy WARMOEN
UNITED KINGDOM HYDROGRAPHIC OFFICE	Andrew TALBOT
NATIONAL GEOSPATIAL-INTELLIGENCE AGENCY (NGA)	Steven KEATING
NATIONAL GEOSPATIAL-INTELLIGENCE AGENCY (NGA)	Akim MAHMUD
IHO Data Centre for Digital Bathymetry (DCDB)	Georgie ZELENAK
COMMANDER, NAVAL METEOROLOGY AND OCEANOGRAPHY COMMAND (CNMOC)	Stacy JOHNSON
Office of Coast Survey / National Ocean Service (OCS/NOS)	Jeff MARSHALL
National Oceanographic and Atmospheric Administration (NOAA)	Jennifer JENCKS
National Oceanographic and Atmospheric Administration (NOAA)	Anthony KLEMM
NATIONAL GEOSPATIAL-INTELLIGENCE AGENCY (NGA)	Mason ALINGER
World Ocean Council (WOC)	Isabella GLUŠAUSKAITE
World Ocean Council (WOC)	Fred MEITZ
HARTIS Integrated Nautical Services Ltd	Stelios CONTARINIS
FarSounder INC	Heath HENLEY
Orange Force Marine Ltd	Colin THOMSON
DockTech	Shaul SOLOMON
H2i	Denis HAINS
Orange Force Marine Ltd	Derek NILES
Fugro	David MILLAR
Raymarine	Paolo CIGNONI
Da Gama Maritime Limited	Stephen MONK
SevenCs	Emma WISE

SevenCs	Idris SALAUDEEN
Raymarine	BRIAN JENSEN
International Hydrographic Organization	Luigi SINAPI
Marine Department	Daniel BRIMMO
Namibian Ports Authority	Immanuel HANGO
Centre for Coastal and Ocean Mapping - Joint Hydrographic Center, University of New Hampshire (CCOM-JHC/UNH)	Brian MILES
The International SeaKeepers Society	Haley DAVIS
University of New Hampshire	Brian CALDER
Centre Interdisciplinaire de Développement en Cartographie des Océans (CIDCO)	Guillaume MORISSETTE
NF-GEBCO Seabed 2030	Mohamed ELSAIED
USF COMIT	Sarah GRASTY
-	Adil AL-KUWAILI
NF-GEBCO Seabed 2030	Pauline WEATHERALL
NF-GEBCO Seabed 2030	Jennifer CHEVEAUX
Inkfish	JAYA ROPEREZ
-	Hazem ELZOGHBY