

Tides, Water Level and Currents Working Group
VTC, 20 – 22 February
Minutes – (TWCWG8)

(Paragraph numbering is the same as the Agenda Item numbering and does not necessarily reflect the order in which matters were discussed. ISO three letter country codes have been used to identify individual participants)

1. Opening

1.1 Opening Address - Chair

The Chair welcomed all in attendance. A special note of thanks to all for their dedication in attending the VTC especially for those attending from very early or late time zone differences.

Apologies were expended for meeting being a VTC, however he noted that an in-person meeting is planned for November 2024 at the IHO Headquarters in Monaco, this will then “re-set” the time line for the TWCWG annual meeting schedule to meet the required deadlines as set by HSSC.

Glen Rowe (NZ) will be retiring from LINZ on Friday 1st March 2024. Glen Rowe was thanked for his many years with the Working Groups and for all of his valuable and important contributions. The Chair wished him well for his retirement and noted that he was being replaced by the equally competent Jennifer Coppola.

The Chair stated that it was an ambitious agenda once again, with the emphasis being S-104 and S-111 in order to maintain the momentum on edition 2 in terms of the timelines set out by the IHO and IMO deadlines for the S-100 Implementation Decade (2020-2030). HSSC are really counting on TWCWG to deliver as is already being done. Editions 2.0.0 of both specifications are key ‘Phase 1’Route Monitoring Mode products and services. He added that some detailed work has been completed on the anticipated timeline for S-10x implementation, specifically for S-104 & S-111.

The Chair handed over to Ruth Farre, Vice Chair (ZAF), where she added her opening remarks and comments, wishing all a successful meeting and re-iterating the comments of the Chair.

1.2 IHO welcome. - IHO

Sam Harper, Assistant Director at the IHO, introduced himself, stating he was looking forward to the group making further progress on the development of the S-104 and S-111 Product Specifications. He noted the very busy agenda with clear priorities that would follow. The meeting would be recorded for minute purposes with the chat logs being saved as well.

He noted that in reviewing working practices, it is the norm that a secretary would normally be a representative of a member state. However, were there is a need, the IHO secretariat can provide a secretary as has been the case for the TWCWG in recent years. In preparation for the meeting, the Chair team discussed the current arrangement and noted that in light of the growing complexity of S-100 and the need for the IHO representative to play an active role in advising the TWCWG on cross cutting issues relating to other working groups, an alternative solution should be investigated. As a consequence, and in order to make sure documentation gets out in a timely manner, the Vice-Chair will now act as secretary.

2. Administrative Arrangements - Chair

As a VTC meeting, administrative arrangements are not applicable, other than to mention the Agenda Items might be discussed 'out of sequencing order', and that timings were approximate and subject to change. Breaks would be taken as required. The 3 days of the meeting will be recorded, and the chat-log saved, both being made available to delegates as part of the meeting report.

2.1 Adoption of the Agenda and Apologies - Chair/IHO

Discussion	Decisions	Actions
Apologies received from Julio Castro Barraza, SHOA, Chile.	The Chair noted SHOA were well represented through representatives Eugenio San Martin and Carmina Gonzalez	N/A
Apologies received from Bernardo Aliaga Rossel, UNESCO-IOC, Chile.	The Chair noted he was involved in running the Tsunamis & Other Hazards Related to Sea-Level Warning & Mitigation Systems (TOWS) Working Group & Task Teams, which clashed with TWCWG8.	N/A
The Chair offered the agenda for adoption	Agenda adopted	N/A
He noted the full agenda and the limited time that we had. He asked everyone to be mindful of the time limits for presentations and ensuing discussions, so that the timing of the agenda could be met as much as possible.	Agenda items may not necessarily be discussed / covered in the order of sequence listed in the final agenda; at the discretion of the Chair.	N/A

2.2 Programme and timetable of the Sessions – Chair/IHO

The Chair introduced the draft timetable, it was explained that this was intended for guidance only and was not intended to be a rigid structure. Where necessary time spent on individual topics would be amended to allow an appropriate discussion. Regarding 'Meeting Administration' the Agenda Items might be discussed 'out of sequencing order', and that timings were approximate and subject to change. Breaks would be taken as required.

It was announced that Vice Chair will take the minutes, and effectively become the Secretary for TWCWG and create the Actions List. Article 3C of the ToR's is the re-election of the Chair & Vice-Chair; both indicated they were happy to continue in their current roles. However if there was anybody who wished to volunteer for the elections at the end of the meeting (as is constituted that elections take place after every council meeting) to let the IHO know before know before Thursday 22 February.

2.3 Report on Intercessional Activities including HSSC15 – Chair

Discussion	Decisions	Actions
<p>HSSC15 The Chair went through the report to HSSC15.</p> <p>The Chair noted that the report is on the TWCWG8 website and HSSC15 website https://iho.int/uploads/user/Services%20and%20Standards/HSSC/HSSC15/HSSC15_2023_05.7A_Rev1_EN_TWCWG_Report_Recommendations_v1_updated%2020230601.pdf</p> <p>The Chair went through the actions that relate to TWCWG, specifically:</p> <ul style="list-style-type: none"> ○ HSSC15/66: timeline for Editions 2.0.0 of S-104 & S-111 ○ HSSC15/67: This was the latest revision to the Resolutions, as advised by Circular Letter (CL) CL 03/2022; was there any outstanding action? ○ HSSC15/88: Ed. 2.0.0 approval timelines. HSSC agreed on the cut-off time window for the IHO MS approval process of Ed. 2.0.0 of all PS (Phase 1): September – November 2024. <p>The Chair stated that HSSC had noted the TWCWG7 report summary, as presented at HSS15, commending the TWCWG for their achievements, specifically on the progress made on S-104 and S-111</p> <p>The Chair briefed HSSC on correspondence with the Maritime Autonomous Surface Ship (MASS) Working Group with concerning analysis discussions, Hydrographic Specifications Working Group (HSWG) with regards to uncertainty standards and the Digital Chart Working group (DCWG) with regards to cross checking of data quality challenges.</p> <p>The Chair noted the 1st edition of the survey questionnaire done by KHOA.</p>	<p>Completed</p> <p>Chair considered this to be complete</p>	<p>Chair / Vice Chair / IHO to confirm this post-meeting</p> <p>TWCWG invited to pay special attention to S-104 specifically</p>
<p>Intersessional Activities</p> <p>Hydrographic Surveys Working Group (HSWG) – the Chair again detailed the offer from HSWG to collaborate to improve tidal observation uncertainty standards within S-44, as had been the case for TWCWG7. He noted that the topic is back on the Agenda for TWCWG8, where the previous presentation would be provided on this topic, under Agenda Item 8.1 and would be discussed in detail then; the idea being to re-invigorate this task.</p>	<p>Cover HSWG S-44 collaboration under Section 8.1</p>	

Discussion	Decisions	Actions
<p>International Association for the Physical Sciences of the Oceans (IAPSO) Best Practice Study group on Tidal Analysis. The Chair recapped some details of this group, which has been established by Dr. Andrew Matthews, National Oceanography Centre (NOC, UK). He mentioned the workshop in Liverpool, UK, which took place on 27-28 November 2023.</p> <p>S-104 & S-111 Developments. The Chair stated that there had been a lot of detailed and excellent work going on in the developments of S-104 and S-111, to be briefed on later in the meeting. This includes the excellent support from Sumin-An (KOR, KHOA), in the work relating to the Survey on tides, water level and currents; data production method and data format (S-104 & S-111 products).</p>	<p>Cover IAPSO collaboration under Section 3.3</p> <p>Cover S-104 & S-111 developments under Section 4</p>	
<p>IHO Resolutions and Charting Specifications The Chair mentioned the detailed work undertaken by Felipe Rodriguez Santana (BRA), specifically the resolution on Chart Datum (M-3)</p>	<p>Cover IHO Resolutions – Chart Datum definition in non-tidal areas (and tidal areas) under Section 5.2</p>	

HSSC endorsed the work programme and the continued work with IAPSO. The timelines for S-104 and S-111 in line with phase 1 and 2 layered stacks were adjusted

2.4 Matters arising from TWCWG7/Review of Action Items - Chair

	Discussion	Decisions	Actions
2.4.1	Vertical reference datums (VRD): Put together a list of various HO's/Agencies VRD and how they are calculated (indicate how this may affect bathymetric data holdings in terms of sea level rise.)	<p>Possibly include other reference levels (such as MLWS, MHWS, MSL, MLWN, MHW, MLLW, MHHW etc. etc</p> <p>Rename the task Vertical Reference Frames (VRF)</p>	<p>ALL Peter Stone (USA)</p> <p>UK/RSA to add the additional values to the VRF list</p>
2.4.2	Add links to all documents that need updating to the relevant sections of the minutes/action items	Ensure all documents are updated and loaded onto the site in a timely manner.	IHO UK/RSA
2.4.3	To revisit resolutions feedback before submission to HSSC in June	as discussed above at HSSC15/67	ZAF/UK/IHO
2.4.4	Assist with revision of Constituent List	This now has links to the IAPSO best practice work, where the Chair gave a presentation on the Standard Constituent list; a discussion during the workshop suggested identifying the 'core' harmonics in the main list, and giving an explanation of why there are sometimes 2	AUS

	Discussion	Decisions	Actions
		'versions' of the same harmonic constituent.	
2.4.5	TG inventory list to be updated	Permanent objective of TWCWG : Inventory of National Tide Gauges and Current Meters (Agenda Item 3.7)	ALL
2.4.6	Look at and create database/ combination of relevant TWCWG docs such as the inventory list, VRD list etc.		IHO/ZAF
2.4.7	Mariner feedback required for S-111 and S-104		ALL
2.4.8	Need to remember that not all Hydrographic Offices/Agencies will be using real time S-104, but modelled or astronomical gridded data. Would it be useful if the TWCWG provided some form of roadmap for going towards S-104 products? For some countries the first step might be providing tide tables (or tide predictions for a point) as S-104, which would be a different roadmap than for those going straight for gridded, advanced output	S-104 being 'pared back' / reduced scope as per S-100WG requirements, this will be addressed in section 4. This has developed into S-104 being just Water Level Adjustment (WLA); the Chair has enquired with HSSC about a possible S-105 for everything else; no answer yet	Chair/ ALL
2.4.9	PRIMAR to give feedback on TSM9	TSM10 is 12-15 March 2024 in Monaco, USA (Raphael Malyankar) will be attending	PRIMAR
2.4.10	Majority of people suggested <u>Magnitude</u> for the definition as requested by Raphael Malyankar. Look over the requested definitions and give feedback before 30 March 2023. Canada suggested Magnitude (speed) and this was also agreed to by several MS.	agreed to at TWCWG7	CLOSED
2.4.11	Further discussion is required on the uncertainties for S-44 as different equipment, location and environmental conditions affect the uncertainties. Questions relating to the required "definition" of the use of uncertainties were discussed, i.e. is it the uncertainty of the observed, predicted, equipment etc. working group to be created to explore this further as do not want S-44 and IOC manuals clashing.	TWCWG feels this needs to be revisited as a possible dedicated project group. As the deadline was missed for this cycle the WG will aim for the next review with a deadline of 18 months from now. The point of contact for S-44WG is the Chair (David Parker)	CAN (Phil MacAulay) ARG AUS BRA FIN (Jyrki Moronen) GBR NOAA (Carl Kammerer) NOR

3. Programme Matters

3.1 Standard Constituent List - GBR/Chair

Discussion	Decisions	Actions
<p>UK reported that there have been no new updates. It can be accessed on the TWCWG website (https://iho.int/en/miscellaneous-6)</p> <p>Discussion at the last IAPSO workshop in November 2023 in Liverpool included “degree 3” tidal constituents, which are currently not included, and likely not used, by the majority of user groups. It was noted that Harmonic analysis generally doesn’t cater to degree 3 tides.</p>	<p>The Standard Constituent List was discussed at the International Association for the Physical Sciences of the Oceans (IAPSO) workshop in November 2023, where it was suggested that the list could be improved, for example by identifying the commonly used ‘core’ constituents by various user groups, and explaining why there are sometimes two or even three ‘versions’ of the same harmonic constituent.</p>	<p>ALL</p>

3.2. The study of long-term data sets for the determination of global sea level rise and changes in tidal range - NOR/USA

Discussion	Decisions	Actions
<p>The UK reported that this has been discussed at many meetings, with the concept of epochs being used. TWCWG7 referred to a need to request, from Member states, details about their ‘epochs’ used in their selection / calculation of their national vertical datums and add them to the List of vertical datums in use to describe Chart Datum.</p> <p>The USA (Peter Stone) commented that the TWCWG-specific work relating to long term data sets could potentially be considered as having been superseded by the IAPSO work, and that thought could be given to focussing on that from here on. Canada (Phil MacAulay) commented that the CHS has worked with Caris to recognise their related epochs in EPSG.</p>	<p>Epoch information could be added to the List of vertical datums used by Member States to describe Chart Datum. This should be applied if and when required, thus the epoch will indicate when the update to a Member State Chart Datum was applied.</p>	<p>ALL</p>

3.3 **Compare Tidal Predictions generated as a result of analysis of a common data set by different analysis software (including Application for an International Association for the Physical Sciences of the Oceans (IAPSO) Best Practice Study group on Tidal Analysis) - USA/NOR/GBR [UK National Oceanography Centre, NOC]**

Discussion	Decisions	Actions
<p>NOC (Dr Andy Matthews) gave an update on the IAPSO Best Practice workshop held 27/28 November 2023. One of the issues of discussion was on how best to compare results in a meaningful way. IAPSO is starting work on a final best practice document that is not going to be a thorough scientific analysis of the subject, but a practical guide aimed at non experts, students and scientists working in Ocean Sciences disciplines. Upon completion of the document it will be submitted to the IOC Ocean Best Practices repository. As part of the approval process the document will be referred to GLOSS and TWCWG for review. Once approved the intention is to have it translated into the official UN languages.</p> <p>The document will contain items such as: what are the data requirements for analysis?; sampling rate; length of analysis; what are you trying to achieve, i.e. just removing the tide for some specific purpose, or safety of navigation, or something else?</p> <p>There is a planned poster session at the 2024 European Geosciences Union, 14-19 April 2024, on this topic.</p> <p>Italy (Luca Repetti) commented on the methods currently used by the Italian Hydrographic Office.</p>	<p>A first draft, written by Colin Bell of NOC and other members of his team, is planned to be placed on an accessible shared area (such as Google docs) for editing and plan who needs to contribute to particular sections (for example Andreas Boesch, Germany, BSH, on BSH's "Harmonic Representation of Inequalities for use in areas with asymmetric tides").</p> <p>Post meeting note: Poster Session details are here.</p>	<p>TWCWG participants in the IAPSO group to continue involvement and keep TWCWG informed of progress / synergies. (ongoing).</p>

3.4 Historical data recovery/data archaeology - Chair / GBR [UK National Oceanography Centre (NOC)] / All

Discussion	Decisions	Actions
<p>NOC (Dr Andy Matthews) and UK (Chris Jones, Chair, UKHO) gave feedback on the status of Historical data recovery/data archaeology. GLOSS has set up a Data Rescue Working Group (DRWG) specifically for this project. They will be holding a working group meeting in July 2024 in order to assess the main objectives and required actions for this working group.</p> <p>FR (Shom, Gael André) mentioned that it is an ongoing topic also within the North Sea Hydrographic Commission Tidal Working Group (NSHC TWG), where they referenced an interesting article within the NSHC TWG25 minutes.</p> <p>NOC mentioned the Citizen Science project on data in Liverpool Bay, UK.</p> <p>In August 2024, Birmingham UK, there will be the Archives & Records Association UK & Ireland 'Climate and Crisis: Tackling It Together'.</p>	<p>NOC will be creating a DOI (Digital Object Identifier) for the Zooniverse UK tides project, with a group authorship, to acknowledge 4000+ volunteers</p>	<p>TWCWG to continue to monitor activities and opportunities for engagement in historical data recovery / archaeology. (Ongoing action)</p>

3.5 Establishment and Maintenance of VRF for High Resolution Bathymetric Surfaces - GBR/NLD

Discussion	Decisions	Actions
<p>UK and the Netherlands (NLHO, Ronald Kuilman) gave feedback from the North Sea Hydrographic Commission Tidal Working Group (NSHC TWG) 26th meeting (NSHC TWG25).</p> <p>His presentation during NSHC TWG26 showed multiple boundary differences, thus there are differences in LAT between countries. Many of these differences are significantly large which is problematic. Further investigation into this matter is required, and is an ongoing action of the NSHC TWG.</p>		<p>TWCWG to be kept informed of NSHC TWG progress on this work. (TWCWG9)</p>

3.6 Determining ellipsoidal height of MSL at the coast - NLD

Discussion	Decisions	Actions
<p>There were no updates on this item. However Australia (Zarina Jayaswal) reported that they are looking at machine learning language to investigate the relationship between the geoid and MSL. It is still very early in the process and is already showing promising results. The process looks at the ellipsoidal to Chart Datum separation to determine which locations need to be focused on with short term observations. Can be used as a starting point for variance in the ellipsoid to geoid fit in sparse data regions.</p> <p>Another success story in this regard is the work of the IHO Baltic Sea Chart Datum Working Group (BSHC WG), which has realised a new geoid model of the Baltic Sea.</p>		<p>TWCWG to continue to monitor activities and opportunities for engagement in historical data recovery / archaeology. (Ongoing action)</p>

3.7 Inventory of Tide gauges used by IHO Member States - IHO/Chair

Discussion	Decisions	Actions
The Chair stated that the last update of this document was 19 May 2020	All member states to review and submit updates as required IHO suggested they may be able to explore an alternate format, such as a web-based form which could be routinely updated by Member States.	ALL IHO

3.8 Actual Tides On-line Link status - IHO/Chair

Discussion	Decisions	Actions
No updates have been received	All member states to review, check that the links still work and submit updates as required.	ALL

3.9 List of vertical datums in use to describe Chart Datum - IHO/Chair

Discussion	Decisions	Actions
No updates have been received TWCWG7 referred to a need to request, from Member states, details about their 'epochs' used in their selection / calculation of their national vertical datums and add them to the List of vertical datums in use to describe Chart Datum. Definition of Chart Datum and exceedance should be added as well.	All member states to review and submit updates as required IHO suggested they may be able to explore an alternate format, such as a web-based form which could be routinely updated by Member States.	ALL IHO

Section 4 – Product Specification Presentations & Updates

4.1 – Water Level Information for Surface Navigation Product Specification (S-104); working toward Ed 2.0.0 - AUS/USA

Discussion	Decisions	Actions
USA (Raphael) presented on the new 'pared back' / reduced scope S-104, which now deals only with Regular Grid coverage S-104 data, (DCF=2] TWCWG original requirement for other types of WL's was removed by S-100WG8 Decision 8/27] as they only require WL with a focus on station information as well as traditional tide tables with a provision for tabular information, not for 'adding' to S-102 gridded bathymetry. Recommended only regular grid format in WL adjustment for route planning so Ed 2.0.0 will focus on this. Work being done is in line with the S-100 phase 1	All MS to review the draft S-104 Ed 2.0.0 and report their questions and comments to USA (Raphael) by 15 March 2024. S-104 Ed 2.0.0 is aligned with	ALL S-104 developments to be worked on intersessionally, co-ordinated by the S-104 PT.

<p>implementation timeline. MS agreed to USA adding a new optional real attribute in the data record for <i>uncertainty</i>. The existing concept in the IHO registry is re-used for this.</p> <p>MS felt that the information in the original scope S-104 is still of great importance to the mariner. It was decided to request HSSC endorse a new product S-XXX (i.e. S105) that will contain some or all of the spatial and data types that were removed for S-104. Additionally allowing ECDIS to support the adaptive generation or adjustment of safety contours (to replace the ENC safety contours) from S-104 and S101/S102.</p>	<p>S-100 Ed 5.2.0.</p> <p>The importance was expressed of using the same vertical and horizontal datums between S-102 & S-104.</p>	
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4.2 S-104 Papers: presentation and discussion - PRIMAR (Svein Skjaeveland)

Discussion	Decisions	Actions
<p>PRIMAR discussed S-104 noting that comments they had made had been incorporated to ensure that S-104 Ed 2.0.0 is compliant. USA (Raphael) commented that he had seen the document and applied all the changes. PRIMAR noted that the removal of the ISO metadata file (already removed from S-104) should also be removed from S-111; again USA (Raphael) advised that this was already done.</p>	<p>PRIMAR (Sven Skjaeveland) to interrogate the S-104 Ed 2.0.0 product specifications to confirm that USA (Raphael Malyankar) had not missed any of the required changes.</p>	<p>PRIMAR Raphael Malyankar (Portolan)</p>
<p>PRIMAR explained how, as the service provider, the S-100 and resultant products would be distributed to their clients. A <i>replaceData</i> and <i>dataReplacement</i> attribute has been added and this will be used to build automation for removal from the system, at a product specification level, for the provision of their services. MS to consider these references where instructions are given in the mandatory fields within the metadata encoding, if this information is available. A discussion was held regarding this topic.</p> <p>USA (Raphael) queried what was meant by “removal from the system”. PRIMAR responded that when a dataset is no longer valid, it is cancelled in service; thus it is no longer available and removed from the system. USA (Raphael) stated that this has been done in the new draft however, it was questioned as to how S-100 would delete/cancel an entire dataset such as a series of datasets consisting of water level/year; this is something that will need to be looked at and possibly discussed with the S-100WG for their input. NL commented that with the rapidly developing S-128, as a result of constantly changing inputs from the exchange catalogue, a solution to cancellation of S-128 datasets was also being investigated.</p> <p>PRIMAR proceeded to explain that there are two mechanisms to cancel a dataset. The first being a cancellation by the distribution of an update. At present S-104 and S-111 does not include this. The second mechanism being a dataset cancellation notice. This is a cancellation instruction that is a dataset with no data, just the instruction and catalogue information. At present S-104 and S-111 only support this second mechanism (informative), however, with this method</p>	<p>A discussion will be held and subsequent decision made regarding the breaches in security after the WEND WG-14 meeting and the results from their discussions.</p> <p>WEND WG-14 will be focusing on discussions regarding who to stop breaches in the security chain/scheme. NOTE: S-104 and S-111 Project Teams</p>	<p>S-104 developments to be worked on intersessionally, co-ordinated by the S-104 PT.</p>

Discussion	Decisions	Actions
<p>of fileless cancellation the file does not contain a digital signature and has raised serious concerns regarding the security and resultant possible security breaches. S-104 & S-111 clause 8.4.2.4 does not currently conform to S-100 Ed 5.2.0 chapter 17, clause 4.4.1.</p> <p>There was some discussion (Phil MacAulay, CHS) on the 'reality' of being readily in a position to updating information '4 times a day' for environmental data, and do we need other tools to be able to support this? PRIMAR commented they are already supporting this data type (4 x a day, every 6 hours). Providers think of the data sets as products.</p> <p>Ruth Farre (SANHO) raised the possibility to provide a '1 year product' (i.e. an annual tide table, which is cancelled after a year); it was stated that this could still be signed appropriately.</p>	<p>should take note of Annex A of the WEND meeting documents for additional information. (Note that S-102 preference was for fileless cancellation).</p>	

4.3 Surface Current Product Specification (S-111); working toward Ed 2.0.0 – USA (Raphael Malyankar, Portolan Sciences)

Discussion	Decisions	Actions
<p>USA (Raphael) gave a briefing on the state of the phase 1 S-111 Ed 2.0.0 and the transition from Ed 1.2.0 to draft Ed 2.0.0</p> <p>Fewer changes were made for S-111 in the same way as S-104 (i.e. S-111 has not required to be 'pared back' / reduced scope). Historical and hindcast, along with all the originally chosen attributes have been left in. The metadata file has been amended to the required specifications. All portrayals will now be symbol-based in accordance with S-100 ed 5.2.0, however this does not allow for plots. The arrow size has been increased for better visibility. It is proposed that cursor picks be left in to allow pick reports as with ENC's.</p> <p>Raphael's presentation covered the following issues to be addressed in Ed 2.0.0:</p> <ul style="list-style-type: none"> • Node wise uncertainty (<i>directionUncertainty</i> or <i>orientationUncertainty</i>)? • Include historical observations and hindcasts? • Finalization of dataset cancellation. (dependency on S-100 WG and Security Scheme PT) • Portrayal catalogue • Update Ed. 1.0 PC (XSLT) or develop new Lua PC? • Update SVG symbols to conform to new S 100 Ed. 5.2.0 SVG schema. • Finalization of validation checks depends on developments in the S-100 Validation Checks and S 98 sub groups. 	<p>SVG symbols are to be updated and checked for consistency with S-100 Ed 5.2.0 SVG schema.</p> <p>All portrayal for S-111 will be based on the arrow - symbols (no graphical timeseries plots).</p> <p>S-111 needs to include attributes for speed and direction as well as uncertainties for speed and direction.</p>	<p>Raphael Malyankar (Portolan)</p>

<ul style="list-style-type: none"> • “S-100 level” checks • Cross product checks to verify compatibility for the purpose of water level adjustment as described in S-98 • “Product specific” checks cannot be finalized until “S 100 level” and “interoperability” checks are finalized • Redundancies, Conflicts, Gaps? 		
<p>A discussion was held, led by Canada (Phil MacAulay), USA (Raphael Malyankar) and USA (Gregg Seroka), regarding the ability for data to be plotted. For example, would the mariner be able to plot modelled forecast vs hindcast vs actual data therefore allowing for self-validation by the mariner, increasing confidence within the data and allowing for best practise in reality? USA stated that S-100 does not allow for one dataset to have multiple applications in which it can be used. Essentially each application must be a completely separate product where the dataset and the product only have one purpose. It is possible that HSSC could ask the question “will these additional features be used in ‘Phase 1 navigation’?”</p>		<p>Raphael Malyankar (Portolan)</p>

4.4 Strategies and accommodations for use of newly restricted S-104 - CAN

Discussion	Decisions	Actions
<p>Canada introduced the document “Strategies and accommodations for use of newly restricted S-104”. A brief discussion was held regarding this topic and the way forward to keep the original requirements for S-104 before it was ‘pared back’ / reduced scope</p>	<p>It was decided that a sub-group would be created to go through this document and seek a way forward. Discussions regarding Canada’s presentation continued and volunteers for the sub-group were identified. It was suggested that the IRCC be approached about this topic of additional specifications for S-104.</p>	<p>CAN (Phil MacAulay) BRA (Felipe Santana) NOAA (Greg Seroka, Peter Stone) GBR (Tom Cropper) USA (Raphael Malyankar) 7Cs (Hendrik Goehmann) ARG (Fernando Oreiro) AUS Zarina Jayaswal) FIN (Anni Jokiniemi) NOR (Hilde Sande Borck) DEN (Nicki Andreasen) ESP (Silvia Costa)</p>

4.5 S-100 Part 10c Metadata File Name - USA (RM)

Discussion	Decisions	Actions
<p>USA (Raphael Malyankar) gave feedback on this agenda item. The proposal to make that attribute optional in S-100 Part 10c will change the multiplicity.</p>	<p>Once this ISO metadata file exists, it will be removed from the attribute for S-104 & S-111 Eds 2.0.0.</p>	<p>Raphael Malyankar (Portolan) to take forward the proposal to the S-100 TSM10 meeting in March 2024.</p>

4.6 S-104 & S-111 Member State developments, Use cases, etc - All

Discussion	Decisions	Actions
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<p>The following have relevance to this agenda item and should be viewed by Member States.</p> <ul style="list-style-type: none"> • Refer to the recent NSHC TWG26 meeting : https://www.bshc.pro/working-groups/twg/ • Presentations on developments in S-104 & S-111 • Germany https://www.bshc.pro/wp-content/uploads/2024-02-06_TWIG26_Germany_S104-S111_status.pdf • Denmark https://www.bshc.pro/wp-content/uploads/NSHC_TWIG26_DK_S104S111.pdf • Netherlands https://www.bshc.pro/wp-content/uploads/NSHC_TWIG26_S1XX-Stacked-data-trial-production-Netherlands.pdf • Sweden https://www.bshc.pro/wp-content/uploads/TWIG26_Baltic-Sea-e-nav_2024-02-06.pdf 	<p>Any use cases from member states are encouraged to be brought to the attention of TWCWG</p>	<p>ALL</p>
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4.7 Survey on Tides, Water Levels and Currents - KHOA

Discussion	Decisions	Actions
<p>KHOA (South Korea) showed the results of their survey on Tides, Water Levels and Currents; data production method and data format. This survey identified the status of S-104 and S-111 in each country, however only 9 Member States responded. Canada and RSA stated that they had completed the survey, but it appears it was not received by KHOA. The results of the survey were discussed.</p>	<p>It was suggested that KHOA repeat the survey with more MS participation encouraged.</p>	<p>ALL</p>

Section 5 – IHO Resolutions and Charting Specifications

5.1 Review of relevant IHO Resolutions - ZAF

Discussion	Decisions	Actions
<p>Discussion focussed on an outstanding work item regarding the finalisation of Resolution 3/1919 as amended. In summary, the changes were minor, following some comments from MS at the Circular Letter stage. ZAF stated that this matter is still outstanding, although it was acknowledged that the finalised version has been prepared and is ready to be published.</p>	<p>Document to be submitted to next HSSC for approval</p>	<p>UK/Chair</p>

5.2 IHO Resolutions - Chart Datum definition in non-tidal areas (and tidal areas) - BRA

Discussion	Decisions	Actions
<p>Brazil (BRA, Felipe Rodrigues) delivered a highly detailed presentation on a Member State survey on the topic of ‘datums in non-tidal waters’. BRA proposed a change to the resolutions to include more complex situations relating to non-tidal waters;</p>	<p>This was tabled for the next “in-person” meeting as an in-depth review of the proposed changes will</p>	<p>ZAF/UK</p>

highlighting the parameters that should be taken into account for this specific topic.	need to be done before any decisions can be made.	
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5.3 Review of relevant IHO Charting Specifications - IHO

Discussion	Decisions	Actions
<p>Chile (Julio Castro Barraza, SHOA) commented that B-406.1 mentions positions to the <i>nearest minute</i>, however this does not conform to B-130 and B-131 which indicates that locations must be to the <i>decimal minute or second</i>; creating discontinuity. He requested that section B-406.1 is re-worded to agree with B-130/131.</p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p>B-406.1 Places for which tidal levels are given. On large scale harbour charts, and in harbour approaches, it is likely that only one or two sets of figures are required, identified in the table by the name of the place or places.</p> <p>On the largest scale continuous coastal cover, figures must be given for the main ports and other places which differ significantly. Not more than 10 places should be shown in the table on any chart. Where some places may be difficult to identify on the chart by name only, and exceptionally where the place does not fall within the limits of the chart, <u>latitudes and longitudes (to the nearest minute) may be quoted in addition to the names.</u></p> </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p>B-130 UNITS</p> <p>The standard units for depths and heights must be metres (m) and decimetres (dm).</p> <p>The standard units for positional accuracy must be metres (m).</p> <p>The standard units for distance 'on the ground' must be nautical miles (M) and cables, or metres (m).</p> <p>The standard units for dimensions of charts must be millimetres (mm).</p> <p>The standard units for time must be hours (h), minutes (min or m) and seconds (sec or s), referred to Universal Time Co-ordinated (UTC).</p> <p>The standard units for speed must be knots (kn).</p> <p>The standard units for geographical positions should be degrees (°) minutes (') and decimals of a minute. Degrees (°), minutes (') and seconds (") may be used if appropriate.</p> <p>The standard units for bearings, such as for a recommended track or magnetic variation, should be degrees (°) and decimals of a degree. Degrees (°) and minutes (') may be used if appropriate.</p> <p>B-131 GEOGRAPHICAL POSITIONS</p> <p>Geographical positions quoted on charts and in related publications should be:</p> <ul style="list-style-type: none"> • expressed in degrees, minutes and decimals of a minute • with a single space between the coordinates and no other spaces • without punctuation • with a decimal separator according to national practice (comma, decimal point or full stop – comma is the preferred ISO sign) • with leading zeros for single number minutes, but not for degrees • with the minute tick following the fractional part <p style="margin-left: 40px;">for example: 51°42,03'N 5°07,14'E 51°42.03'N 5°07.14'E 51°42.03'N 5°07.14'E</p> <p>Exception:</p> <ul style="list-style-type: none"> • Degrees, minutes and seconds may be used if the graduation of the chart concerned is in that format, to avoid confusion. <p>B-131.1 The four cardinal points must be denoted by the following abbreviations whenever their names are not inserted in full:</p> <p style="margin-left: 40px;">North = N South = S East = E West = W</p> </div> <p>He also brought attention to the fact that the Spanish translation of S-44 indicates in that section that you should review and refer to paragraph B-496.4, which does not exist. See the Spanish version here. For comparison, the English version is here.</p>	<p>It was proposed that this should be changed to the <i>“nearest minute as a minimum”</i>.</p>	<p>IHO</p>

<p>B-406.1 Lugares para los cuales se dan niveles de mareas. En los portulanos a gran escala y sus accesos, es probable que solamente se requieran uno o dos juegos de datos, identificados en dicha tabla por el nombre del lugar o lugares.</p> <p>En las cartas de mayor escala con cobertura costera continuada, se darán datos para todos los puertos principales y otros lugares que tengan diferencias significativas. En una tabla de cualquier carta no se deberían incluir más de 10 ubicaciones. Para aquellos lugares que sean difíciles de identificar en la carta solamente mediante el nombre, y excepcionalmente cuando el lugar no quede dentro de los límites de la carta, además de los nombres, pueden añadirse latitudes y longitudes (al minuto más cercano). (Véase también B-496.4).</p>	<p>In the Spanish version B-496.4 does not appear in the English version and should thus be removed from the Spanish edition</p>	
<p style="text-align: center;">Especificaciones Cartográficas de la OHI B – 490 Cartas de mediana y gran escala Página 7</p> <p>Si se considera útil, la ubicación de un marcógrafo registrador puede indicarse mediante una leyenda.</p> <p style="text-align: center;">• Marcógrafo T32.2</p> <p>B-496.2 Las señales de marea se visualizan de forma destacada en algunos puertos y varían desde un sistema simple que sólo indica si hay bastante agua para entrar a un puerto, que queda en seco durante la bajamar (o si el nivel está subiendo o bajando), hasta un elaborado y codificado sistema de formas y luces que, sumados, dan una indicación bastante precisa de la profundidad del agua. Deberán representarse en las cartas a escalas mayores mediante un círculo de posición con la leyenda 'SS (Mareas)' o equivalente. Las señales de tráfico, véase B-495, deberían tener preferencia sobre las señales de mareas si no espacio suficiente para representar a ambas.</p> <p style="text-align: center;">• SS(Mareas) T33</p> <p>B-496.3 Las señales de corrientes de mareas informan sobre la velocidad y dirección del flujo de la marea, deberán representarse de forma similar a otras señales con información de mareas. Éstas se suelen ubicar en las aproximaciones de canales estrechos donde la velocidad de la corriente es fuerte y se puedan leer desde la distancia, de este modo permite al navegante planificar o calcular su aproximación. Se deberían representar de la misma forma que las estaciones de mareas, empleando la leyenda 'SS (Corrientes)' o equivalente. En algunas áreas, el control del tráfico marítimo depende de las corrientes de marea; en dichos casos, las reglas pueden ser explicadas en una nota.</p> <p style="text-align: center;">• SS(Corrientes) T34</p> <hr style="border: 1px solid red; width: 100px; margin-left: 0;"/> <p>B-497 OTRAS ESTACIONES DE SEÑALES</p> <p>B-497.1 Las estaciones de señales de temporal, meteorológicas y de hielos deberían ser representadas en las cartas de mayor escala, si se consideran de interés para el navegante ya sea como fuente de avisos o como marcas en tierra, mediante un círculo de posición y leyenda, por ejemplo: 'SS(Temporal)' u otra equivalente. Si no hay espacio suficiente para representar ambas, las señales de tráfico deberían tener preferencia sobre las de temporal.</p>		

Section 6 IOC Programmes

6.1 Update on IOC Global Sea Level Observing System (GLOSS) Programme items and events - USA

Discussion	Decisions	Actions
<p>Professor Gary Mitchum, as chair of GLOSS, reported back on GLOSS activities, including the updating of their Implementation Plan. A steering group/committee has now been established within GLOSS, comprising of a representative from each of the 5 data centres, in order to make the group more pro-active specifically with regards to updating of GLOSS processes. The steering group will meet more regularly, and last month's meeting (January 2024) resulted in some exciting developments, specifically a unified data portal, with transparency of the source data and avoiding the current situation of 'more than one version of the same data across multiple portals'. At the next GLOSS meeting (Autumn / fall of 2024, Central South America Region) a new Chair will be elected.</p> <p>He referred to the '30 Years of Progress in Radar Altimetry Symposium', which will cover sea level observing via remote sensing techniques.</p>	<p>To continue to maintain TWCWG / GLOSS links on topics of joint interest.</p>	<p>N/A</p>

6.2 Update on IOC Tsunamis & Other Hazards Related to Sea-Level Warning & Mitigation Systems (TOWS) Programme items and events - CHL

Discussion	Decisions	Actions
<p>As the TOWS meeting was taking place at the same time as the TWCWG8 meeting, there was no feedback to be given.</p>	<p>N/A</p>	<p>N/A</p>

6.3 The Japan 2024 Noto Peninsula Earthquake – JAP (JHOD)

Discussion	Decisions	Actions
<p>A very interesting presentation was given by the JHOD (Masahiro Nambu) on the Noto Peninsula Earthquake (01/01/2024; magnitude 7.6, death toll 241). The main focus of the presentation was the land uplift during the quake which has resulted in the coastline moving approximately 200m offshore from its previous position and the emergency surveys of the area that have to be carried out to update charts and ENCs. There was huge uplift of land at some ports; for example, at Kaiso port a 3.8m to 3.9m drop in MSL was observed.</p> <p>He explained the response to the ground uplift and its effect on CD (to remove all CD references until they are re-established through new levelling and tide gauge installation).</p>	N/A	N/A

Section 7 Capacity Building

7.1 Tides and Water Levels Workshop training material – ZAF

Discussion	Decisions	Actions
ZAF (Ruth Farre, SANHO, Vice Chair) introduced the topic and called for any comments or revisions that needed to be made to the work already completed regarding the latest version of the Tides Training Course.		To review the Tides raining course and suggest any amendments to Ruth Farre ALL
USA (Peter Stone) gave a presentation on the recently run (November 2023) course for Spanish speaking participants. It was emphasised how important it was to have facilitators/lectures who were native in that language and who could bring their own expertise to the training experience. As the participants have different levels of experience it was important to send out a survey in order to establish these levels in order for the facilitators to adjust their training accordingly. Additionally, it was expressed how the learners wanted additional time out in the field actually doing field work. A note of special thanks was extended to Silvia Costa (ESP) and Ceasar Borba (BRA) for their contributions and excellent work as trainers.		N/A
AUS commented that the 'CAT A' (S-5A) and 'CAT B' (S-5B) courses also gloss over tides and geodesy, resulting in a shortage of understanding from the hydrographic surveying side, thus there is a demand to better understand tides more technically. Liz Bradshaw (NOC) mentioned NOC are looking at putting information on the ocean teacher website, with videos, presentations, documents etc. which could be used to put together a training course. CAN (Phil MacAulay, CHS) highlighted the challenge of continuity in maintaining all the training material.		
<p>The Chair summarised communications with the Capacity Building Committee, via Lucy Fieldhouse (UKHO, International Capacity Building Manager).</p> <p>A question was raised by Shom at a recent IHO eLearning Steering Committee Meeting, as follows:</p> <p><i>TWCWG developed a digital course on Tide. This course is hosted on UNESCO/IOC platform here : https://classroom.oceanteacher.org/course/view.php?id=355 a priori without the consent of the IHO. For its part, the IHO platform hosts a different tidal course from that on the IOC platform.</i></p> <p><i>This situation should be clarified. Maybe some of the members of the SC can help explain this situation.</i></p> <p>Following discussion between the Chair, Lucy Fieldhouse (UKHO) and Ruth Farre (ZAF, SANHO, TWCWG Vice Chair), it was agreed that the version on the IOC website is outdated, and indeed should not have been posted there without the IHO's permission from the outset.</p>		

Discussion	Decisions	Actions
<p>The Chair duly contacted Luigi Sinapi and Sam Harper at IHO, respectfully requesting they contact the IOC and notify them of the need to remove that content, and to advise them the sole source of this material is to be that of the IHO eLearning portal accordingly.</p> <p>Ruth Farre provided the details of the latest version directly to infokhoa@korea.kr for upload to the eLearning portal, including the Chinese-translated version of the course material.</p>		

Section 8 Any Other Business

8.1 Offer by the Hydrographic Surveys WG (HSWG) for TWCWG collaboration to improve tidal observation uncertainty standards within the relevant sections of S-44 (Standards for Hydrographic Surveys) - HSWG Chair / Chair / All

Discussion	Decisions	Actions
<p>The Chair gave a presentation, originally given during TWCWG7, on how TWCWG can contribute to the work being done by HSWG on S-44. The IHO gave some background to the project. In the broader context changes to S-44 will be taking on a matrix approach due to advances in technology over the years. S-44 is evolving in order to allow for “more intelligent” systems to be included in these standards. It was suggested that, at the very least, it would be beneficial for a TWCWG sub-group to look at this request from the HSWG to improve the S-44 and identify if any changes are needed should be established.</p> <p>Water level and currents observation uncertainties need to be ‘equipment agnostic’ and they must cover all possible methods of data capture for both water levels and currents.</p> <p>There is now an established 2-year ‘refresh cycle’ for S-44; HSWG will finalise S-44 Ed 6.2.0 in February / March 2024, then propose it to HSSC16 in May 2024, then endorsed by Member States, then published. Therefore TWCWG’s collaborative work could potentially be published in Ed. 6.3.0.</p>	<p>Chair to engage with HSWG to establish exactly what is required from TWCWG with regards to S-44.</p> <p>A call for volunteers to form a sub-group, to review S-44 and co-ordinate any possible changes that need to be made/ comments was made.</p> <p>Volunteer sub-group: -Fernando Oreiro (ARG) -Zarina Jayaswal (AUS) -Felipe Rodrigues Santana (BRA) -Phil MacAulay (CAN) -Jyrki Moronen (FIN) -Chris Jones (GBR) -Carl Kamerer (USA) -Hilde Sande Borck (NOR)</p>	<p>Chair / Sub-Group</p>

8.2 Minimum metadata requirements for tide & water level gauges - GBR [UK National Oceanography Centre (NOC)]

Discussion	Decisions	Actions
<p>NOC (Dr Andy Matthews and Liz Bradshaw) reported back on the minimum metadata requirements for tide & water level gauges. The PSMSL are carrying out a survey on tide gauge data flow as part of the work done with Copernicus (EU earth observation platform) on producing a tide gauge data product. The survey covers what formats, transmission methods etc. are used, what quality control is done and which portals it goes to.</p> <p>Peter Stone (USA) raised a question regarding the survey, referencing some confusion interpreting some of the questions, specifically the issue on “pull / push” of data to / from NOAA. Part of their issue is that they don’t know what is being picked up. Liz Bradshaw response, clarifying that the intention was “where does a data provider put their data so it can be picked up by other users....what is that they need?... so that the traceability is recorded.”</p>	<p>The survey has already been circulated to PSMSL suppliers, so some IHO Member States will have completed it. Additional Member States who wish to complete the survey can do so.</p>	<p>All</p> <p>https://www.surveymonkey.com/r/marinedataflow</p>
<p>The PSMSL is planning a metadata crosswalk this year, this involves the analysis of minimum metadata requirements of organisations that use or distribute tide gauge data, and how different standards used compare. Copernicus sea level reprocessed product update is due in November 2024 and there</p>		

Discussion	Decisions	Actions
is the opportunity to add/improve metadata in the netCDF files		
GLOSS are planning a central data portal that aggregates data from each of the data centres. As part of that an agreement will need made on a core set of metadata. PSMSL is currently putting together what they consider to be desirable information that users would want about a tide gauge (so considerably more than the strict minimum). ISO 19115-1 and ISO 19115-2 are the standards being referred to – controlled vocabularies.		

8.3 Any Other Business cont.

Discussion	Decisions	Actions
Canada noted that in the GI Registry (TOR 3/1919) the definition for Low Water is contradictory with the definition and remarks needing to be amended. The change might have to start with a change in the Hydrographic Dictionary	Canada to propose the amended wording and submit it to the Chair for distribution to the Working group member to approve. Once approved by TWCWG, the proposed changes will be submitted to the GI Registry Chair (Jeff Wootton.)	CAN By TWCWG9
USA (Raphael) suggested that the IHO (Yong Baek) create a repository on Github for TWCWG		Chair / IHO

Discussion	Decisions	Actions
The IHO Dual Fuel Circular letter was discussed. As part of the actions from the S-100WG8 meeting (Action 8/26) the S-100WG, along with NIPWG and TWCWG have been requested to provide inputs to update Dual Fuel Concept for S-100 ECDIS that was approved at the 3rd Session of the Assembly. It should be noted that this document has not had any edits since it was first drafted and finalized in 2022 and as the S-100 concept has matured it will require some updates. Inputs are to be put into the attached comment sheet and returned to Yong.Baek@iho.int and Julia.Powell@noaa.gov for incorporate any new inputs into the DFConcept for submission to HSSC. ECDIS dual fuel concept PDF document can be found at https://iho.int/uploads/user/About%20IHO/Council/S-100 ImplementationStrategy/S-100%20Roadmap Annex4 v1.0 May2023.pdf It is in the S-100 Roadmap webpage under the council for your information. https://iho.int/en/s-100-implementation-strategy	Review of the dual fuel with a deadline of 15 March 2024.	CAN (lead), USA (Raphael and Greg)

Section 9 Work Plan and ToRs

9.1 TWCWG Work Plan 2024-2025 updates

The work plan for 2024-2025 was amended and will be submitted to HSSC.

9.2 Review TWCWG ToRs and RoPs

The chair stated that only a few changes were made to these documents to accommodate for gender neutral language.

10 Venue and dates of the 9th TWCWG Meeting (TWCWG9)

TWCWG 9 is to take place in Monaco 19-22 November 2024

11 Review of Action Items from TWCWG8

The Action Items captured during the three days' sessions were presented on screen, discussed, and all members present endorsed these accordingly¹²**Development of TWCWG8 report to HSSC16**

The Chair stated that this was in hand and he and the Vice-Chair would have this ready for HSSC16

13 Draft Agenda for TWCWG9

The Chair stated that this was in hand.

14 Elections

Both the Current Chair and Vice-Chair were unanimously voted in for the next 3 year term. The Vice-Chair was voted in as Secretary.

15 Closing

The Chair expressed his appreciation to all for making the meeting possible with the various time zones and their commitment to TWCWG. The Chair, Vice-Chair and IHO thanked all those in attendance for their participation in what was yet another very productive meeting and how they were looking forward to seeing as many people as possible at the in-person meeting in November 2024.