

Tides, Water Level and Currents Working Group
VTC, 5-7 April 2022
Draft Agenda – (TWCWG6)

(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 Opening address – Chair

- The chair opened the meeting and welcomed everyone
- He noted that it was yet again a VTC meeting but drew attention to the significant effort that the SANHO had put into the hosting of this meeting, and it was with regret that we had to revert to a VTC.
- He noted that the date and venue of the next TWCWG7 is to be decided and MS will have the opportunity to volunteer during agenda item 10.
- He introduced himself as the new Chair and thanked the previous Chair for their work. He also introduced Ruth Farre and Sam Harper and as Vice Chair and IH AD respectively

.2 Address by ‘host’ nation – Ruth Farre (RF, SANHO) & SA National Hydrographer SAN

- Capt. Theo Stokes, SA National Hydrographer, provided a welcome on behalf of the planned hosts of the meeting.
- He reflected that the enduring COVID situation continued to cause disruption both in South Africa and indeed globally.
- He covered the plans for the regeneration of SA’s Hydrographic Capability.
- He noted the importance of moving with the trends of data centricity, and the drive for provision of water level and surface current information within the ‘family of S-100 layers’ within S-100 ENC’s.
- Capt. Stokes thanked all attendees for taking the time to attend online, given the wide variety of time zones in delegates home countries.

.3 IHO comments – IHO

- IHO Secretariat, Assistant Director (Mr Sam Harper) introduced himself noting he has taken over from David Wyatt in September 2021. As such this is the first meeting of the group he had attended.
- He congratulated the group on the completion of the first edition of S-104
- He also noted that an update to the relevant resolutions was a forthcoming piece of work.
- He noted that the report to HSSC needs to be completed quickly after this meeting
- Of particular interest is the relationship between this group and the other groups e.g. HSWG

2. Administrative Arrangements

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 be changed. Breaks would be taken as required.

.1 Adoption of the Agenda and Apologies – Chair/IHO

Discussion	Decisions	Actions
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- The Chair offered the agenda for adoption	- Agenda adopted	
- 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.	

.2 Programme and timetable of the Sessions – Chair/IHO

The draft timetable was introduced, 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; see list of documents at Annex C.

.3 Meeting administration – Ruth Farre (RF, SANHO)

See above comments under 2. Administrative Arrangements.

.4 Report on Intercessional Activities including HSSC13 – Chair

Discussion	Decisions	Actions
<ul style="list-style-type: none"> - The Chair went through the report to HSSC13 - He noted that the report is on the TWCWG website and HSSC13 website - He went through the actions that relate to TWCWG. - He recapped the process of the revision of S-104 and noted this as a key success. - 		
<ul style="list-style-type: none"> - He ran through the interaction with the other IHO WGs. - DQWG – Discussions relating to time uncertainty and vertical accuracy/uncertainty. He noted that separate agenda items will cover these items as the DQWG has specific request of TWCWG. - CSBWG – he noted that this group has some specific questions but again these would be covered later in proceedings. - HSWG – he briefly touched on the request of TWCWG to assist with the revision of S-44 and C-15. He noted that a presentation would be provided on this topic under Agenda Item 8 - S100WG – He noted that there had been interaction with this group and this would be further discussed in Agenda item 4 - NIPWG – Requested comments from TWCWG on IMO MSC. To be covered under 8.3 - He noted that the Foreword sections of both PS S-104 & S-111 would include a tribute to Kurt Hess who pioneered the first and subsequent drafts of S-111 and later S-104. The 		

TWCWG thought it a fitting tribute to recognise his efforts in this way.		
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.5 Matters arising from TWCWG5/Review of Action Items – Chair

Discussion	Decisions	Actions
Actions from TWCWG5		
Action 1. Chair/All: initiate investigation for storing data and making it available for use by all TWCWG members.	Ongoing Chair clarified that ‘data’ here refers to water level and currents data sets for analysis by all TWCWG members who wish to analyse the data under the ‘analysis of common data sets’ ongoing task.	Ongoing
Action 2. Chair/All: develop a plan for further analysis of tidal harmonics.	To be discussed in 3.3	
Action 3. Zarina Jayaswal (ZJ) (AUS): provide some visual diagrams to explain concept of datum separation.	Complete	
Action 4. Chair/Vice-Chair: TWCWG to provide a list of vertical datums to be used (must be chart datum) by July 2021 with the list finalised and submitted to S-100 WG by October 2021 (e.g hydrographic zero (ZH (cf; 2017-2020 information TWCWG), Geoids, Ellipsoid.	Complete	
Action 5. Zarina Jayaswal (ZJ) (AUS): provided use case to S-100WG/IIC. Four other use cases from TWCWG members have been provided (2020) to TWCWG and shared using the cloud dedicated to documentation exchange	Ongoing	
Action 6. Chair/Vice-Chair: initiate discussion on water level trend threshold.	Ongoing	
Action 7. All: send the TWCWG/Chair your proposal for a method of calculating water level trend-threshold.	Ongoing	
Action 8. All: provide additional S-104 & S-111 use cases for discussion by TWCWG	Ongoing	
Action 9. Chair/Vice-Chair: initiate discussion on how to determine the separation vertical uncertainty ratio to allow use of CSB data.	Ongoing	
Action 10. All: provide feedback to Chair on data quality issues documentation for submission to DQWG Chair for July 2021	To be discussed in item 8.8	
Action 11. Ruth Farre (RF, SANHO): make the proposed amendments to A6.1 and circulate to the TWCWG for final approval.	Complete	
Action 12. Ruth Farre (RF, SANHO): provide final versions for submission to HSSC.	Complete	
Action 13. Ruth Farre (RF, SANHO): lead the review and revision process using the relevant Chart Specifications provided in the meeting documents.	To be discussed under item 6.2	
Action 14.	Complete	

Secretary: provide relevant specifications for review to Ruth Farre (RF, SANHO).		
Action 15. Ruth Farre (RF, SANHO): to provide relevant presentations and documents for translation into Chinese [Mandarin] by MSA.	Partially Complete	RF, SANHO, has received the translation in a PDF version of the PowerPoint presentation. Awaiting the PowerPoint version.
Action 16. LCDR Cesar Borba (CB, Brasil): Portuguese translation of supplementary documentation to be completed and 1 slide still to be translated – all to be sent to Ruth Farre (RF, SANHO).	To be discussed under item 7	
Action 17. Chair/Secretary: include updated WP in final meeting report and submit to HSSC13.	Complete	
Action 18. Chair/Secretary/RF: identify dates for TWCWG6 and inform TWCWG.	Ongoing	
Action 19. Ruth Farre (RF, SANHO): circulate initial letter of invitation to TWCWG6 no later than 6 months before meeting	Complete	
Action 20. All: all those who have actions to complete should keep the Chair, Vice-Chair and Secretary informed of progress.	Ongoing	

3. Programme Matters

.1 Standard Constituent List – GBR/Chair

Discussion	Decisions	Actions
<ul style="list-style-type: none"> - The Chair introduced the reference document and highlighted where it could be accessed. - He noted that there have not been any updates in the period. 	All Member States to suggest additions / continuous improvements to the Standard Constituent list as appropriate.	

.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
<ul style="list-style-type: none"> - The chair introduced the background to the agenda item. - He invited Peter Stone (PS) to lead the discussion PS noted this is an active area of discussion and has potential overlap with the Global Sea Level Observing System (GLOSS). 		
<ul style="list-style-type: none"> - LCDR Cesar Borba (CB, Brasil) presented on MSL Variation Guanabara Bay – Brazil 2000- 2020 (get ppt). 		

<ul style="list-style-type: none"> - He noted that over the observing period, they had seen an increase in MSL 0.74cm per year. - This was confirmed by observations at a second station which showed an increase of 0.77cm per year over the same period. - He reported that next steps were compare the results with other nearby stations. 		
<ul style="list-style-type: none"> - Paola Picco (PP) and Luca Repetti (LR) presented on the long-term observations undertaken by Italy. - He gave an overview of where the permanent gauges in Italy. - He showed the observations of MSL between 1884-2021. - He noted the general rise in MSL. - In contrast, he showed that in Genoa and Brindisi, the rise was basically 0 between 2007 and 2021. - He covered a number of other interesting phenomena. - He concluded that whilst monitoring long-term sea-level rise, we have to take into account other short-term phenomena that can counteract the apparent rising trend, appearing to be a lowering of sea level. - Phillip MacAulay (PM) asked whether observed low frequency observed behaviours were consistent across the med. 		
<ul style="list-style-type: none"> - Thomas Hammarklint (TH) presented on Future Sea levels in Sweden. - He noted the IPCC report “The Ocean and Cryosphere in a changing Climate”. - The Chair noted that the Gov of Sweden was using the worst-case scenario for sea level rise in their costal management decision making. - 		
<ul style="list-style-type: none"> - PS presented on the 2022 Sea Level Rise Technical Report. - It was an update to the 2017 report, refining the sea level rise scenarios. It gives greater confidence in MSL rise over the next 30 years and makes the case for the continued. monitoring of the causes of MSL rise. 		
<ul style="list-style-type: none"> - The Chair summarised the session and noted the action. 		What is the effect of the long-term changes in MSL rise on national vertical datums?

- .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
<ul style="list-style-type: none"> - Hilde Sande Borck recapped the history of the agenda item. 		IHO to investigate how to publish results of analysis on the IHO website.

<ul style="list-style-type: none"> - Original objective was to assess the performance of different software in use and what are the impacts. - This objective changed slightly after 2019 to consider “<i>How do countries do their analysis. Do we get similar results etc</i>”. - She went thought the status of the analysis of the common datasets. - She highlighted some of the activities and challenges. - She noted that some countries have done a lot of analysis but there have been challenges with sharing the results on the IHO website. - She noted that the different software in use gave similar results, but it is difficult to compare the results given there is a large variation in the set of resolvable and significant constituents. 		Continue to encourage Member States to take the common data sets and analyse them using their national approaches (software, methodologies etc).
<ul style="list-style-type: none"> - Andy Matthews (AM, NOC) gave a presentation on IAPSO Tidal Analysis Best Practice Study Group - He gave an overview of the work and clarified the goals of group being: <ul style="list-style-type: none"> - what is the current state of tidal analysis and where are the dangers? - Study of current software packages. - Making analysis repeatable. - The future work looking at what needs more study and who provides funds - He noted the next meeting would be in Berlin, July 2023 alongside the IUGG General Assembly. - Long term aim to develop a formal best practice document. - He offered to the TWCWG the opportunity to get involved should they wish. - Glen Rowe (GR) suggested that we should re-enforce the connection and collaboration between IOC and IHO activities such as this. 		Chair to Liaise with AM as to how TWCWG can contribute to this work.

.4 Establishment and Maintenance of VRF for High Resolution Bathymetric Surfaces – GBR/NLD

Discussion	Decisions	Actions
<ul style="list-style-type: none"> - The chair gave a high-level overview of the agenda item. He noted that there was nothing specific to report. - He noted the potential overlap with the question from the CSBWG and this topic could be explored during that agenda item. 		

.5 Determining ellipsoidal height of MSL at the coast – NLD

Discussion	Decisions	Actions
<ul style="list-style-type: none"> - The chair reported that there was no specific update on this agenda item. - He briefly gave an overview of the background and the relevance of this enduring agenda item and how it fitted into other work items. 		
<ul style="list-style-type: none"> - Seppo Makinen (SM) asked how detailed and dense a geoid model is needed for determining MSL. - Italy noted that a limiting factor was that you need MSL along with the gravimetry data to determine the geoid surface. 		

.6 Inventory of Tide gauges used by IHO Member States – IHO/Chair

Discussion	Decisions	Actions
<ul style="list-style-type: none"> - The Chair described the resource that is available and where it is linked. - He invited MS to review and pass any updates to IHO for updating the list. 		All to review and pass on updates to IHO Sec for the doc to be updated.

.7 Actual Tides On-line Link status – IHO/Chair

Discussion	Decisions	Actions
<ul style="list-style-type: none"> - The Chair provided an orientation of the record and location of the resource. He explained the mechanism for keeping it updated. 		All to review and pass on updates to IHO Sec for the doc to be updated.

.8 List of vertical datums in use to describe Chart Datum –IHO/Chair

Discussion	Decisions	Actions
<ul style="list-style-type: none"> - The Chair provided the background to the list of vertical datums in use by country. - The list has been created and the Chair asked for MS to add their details. 		All to review and pass on updates to IHO Sec for the doc to be updated.

4. Product Specification Updates & Presentations

.1 Water Level Information for Surface Navigation (S-104) – work done to produce Ed 1.0.0, and towards compliance with S-100 Ed 5.0.0– AUS/USA

Discussion	Decisions	Actions
<ul style="list-style-type: none"> - Greg Seroke (GS) gave a presentation S-104 PS Update. - He noted it was the work of the S-104 Project Team (PT). - He went through the changes needed to get to S-104 Ed 1.0.0, sample S-104 files and what work would be needed to get to S-104 Ed. 2.0.0. 		S-104 developments to be worked on intersessionally, co-ordinated by the S-104 PT.

<ul style="list-style-type: none"> - He concluded by reflecting on the next steps required to move toward S-104 compliance with S-100 Ed 5.0.0. - He also offered some slides on the next steps for S-111 to move towards compliance with S-100 Ed 5.0.0. 		
<ul style="list-style-type: none"> - Ronald Kuilman (RK) noted that TWCWG5 removed real-time data from S-104 PS, awaiting S-100 real time data, and asked whether this is also the case for S-111. - GS replied that it was indeed removed from S-111. 		
<ul style="list-style-type: none"> - Raphael Malyankar (RM) provided a presentation on relevant changes to S-100 Ed 5.0.0. - He noted that there may be further revisions to Ed 5.0.0 before it is published. - He noted that other PSs need to be considered such as S-98. - RK asked how you deal with 2 adjacent areas with different resolutions? Is this also controlled by S98 (all interoperability levels)? - RM replied that S-98 does not cover this. - GS asked whether Lua portrayal is required, or can S-111 still use XSLT for portrayal? - RM answered that this has not yet been decided and would have to be considered at a later date. - In summary he recommended that the next drafts of S-104 and S-111 are aligned with S-100 ed 5.0.0 but not as Edition 2 as this would require readiness level 2 	<p>Agreed that next drafts of S-104 and S-111 are aligned with S-100 Ed 5.0.0 but not as Edition 2.</p>	<p>PTs to provide specific actions for next steps to TWCWG to facilitate next revisions of S-104 and S-111.</p>

.2 Surface Current Product Specification (S-111) – towards compliance with S-100 Ed 5.0.0 – USA

Discussion	Decisions	Actions
<ul style="list-style-type: none"> - Raphael Malyankar (RM) provided a presentation on relevant changes to S-100 Ed 5.0.0. - He noted that there may be further revisions to Ed 5.0.0 before it is published. - He noted that other PSs need to be considered such as S-98. - RK asked how you deal with 2 adjacent areas with different resolutions? Is this also controlled by S98 (all interoperability levels)? 	<p>Agreed that next drafts of S-104 and S-111 are aligned with S-100 Ed 5.0.0 but not as Edition 2</p>	<p>PTs to provide specific requirements to TWCWG to facilitate next revisions of S-104 and S-111.</p>

<ul style="list-style-type: none"> - RM replied that S-98 does not cover this. - GS asked whether Lua portrayal is required, or can S-111 still use XSLT for portrayal? - RM answered that this has not yet been decided and would have to be considered at a later date. In summary he recommended that the next drafts of S-104 and S-111 are aligned with S-100 Ed 5.0.0 but not as Edition 2 as this would require readiness level 2 		

.3 Engagement with S-100WG and other relevant subordinate bodies – USA

Discussion	Decisions	Actions
Largely covered by previous agenda item.		

.4 Overview of datums/reference systems with reference to S-104 & S-111 – USA

Discussion	Decisions	Actions
<ul style="list-style-type: none"> - Dr Neil Weston (NW) gave a most helpful presentation on datums and reference systems as related to S-104 and S-111. - He covered how NOAA use their Vdatum tool to transfer between different vertical datums. - He finished with an overview of the various registries of reference datums. 		
<ul style="list-style-type: none"> - Michael Davies (UKHO) asked whether we should be clearer in S-111 and S-104 as to which Epoch is used within the different realisations of the common reference datums to account for, by way of an example, changing coordinate due to plate movements. - NW noted that this is an issue that needs further consideration as the implications are not fully understood. - GS noted that epoch is captured in S-104 in various metadata fields. 		
<ul style="list-style-type: none"> - Zarina Jayaswal (ZJ) gave a presentation on S-104 Data Separation models. 		

.5 S-104 & S-111 Member State developments, Use cases, etc – All

Discussion	Decisions	Actions
<ul style="list-style-type: none"> - Zarina Jayaswal (ZJ) gave a presentation on S-104 Data Separation models. 		
<ul style="list-style-type: none"> - Svein Skjaeveland (SS) gave a presentation on the S-100 		

<p>Demonstrator Project and S-129 Operations test from the Electronic Chart Centre in Norway.</p> <ul style="list-style-type: none"> - He described the scope of the project and the expected outcomes 		
<ul style="list-style-type: none"> - Gwen Jan gave a presentation on SHOMs work to build an S-104 test product. - She noted the support that NOAA had provided in this work. - SANHO asked whether the model that Gwen used could be overlaid on an ENC. - GJ thought that it could, but urged caution with regard to complications of portrayal and complicating the display. - 		
<ul style="list-style-type: none"> - Michael Davies (UKHO) gave a short update on the UKHO trial of S-100 data with the Mayflower autonomous ship which is an AI powered marine research vessel. - He noted some of the initial challenges experience with file sizes. - He gave an overview of next steps for the trial with both the Trans-Atlantic crossing and nearshore test with the GB Royal Navy. - 		
<ul style="list-style-type: none"> - Kwang nam HAN (KH) gave a presentation on KHOAs work on S-104 and S-111 datasets and provided them to test vessels. - She explained what each dataset comprised - Next steps included the PTs considering how do they prioritise in what order data should be made available. - GS noted that there is a solution to this in S-104, however this hasn't been reflected in S-111. - ZJ suggested that guidance be provided as to order of data portrayal, but it is then left to ECDIS users. 		<p>Prepare a list/survey of how MS water level data (S-104) and surface current data (S-111) are created. (KHOA)</p>

.6 Questions and Discussion on Implementing S-104 into 'products' – ZAF

Discussion	Decisions	Actions
Ruth Farre (RF, SANHO) raised the question of how S-104 would be implemented once it was finished?		Organise a dedicated workshop to tackle this topic, involving OEMS, RENCS etc.

Discussion	Decisions	Actions
<ul style="list-style-type: none"> - The chair led a conversation regarding next steps for S-104 and S-111. 		.

<ul style="list-style-type: none"> - The leads of the PTs went through the identified actions and agreed them in principle. - RM noted that he thought a User case annex for S-111 would be useful and should be added. - They highlighted the elements in Red that were likely to be larger pieces of work that would need significant consideration. 		<p>Prepare a list/survey of how MS water level data (S-104) and surface current data (S-111) are created.</p> <p>Prepare a User-case annex for S-111 RM</p>
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5. IHO Resolutions and Charting Specifications

.1 Review of relevant IHO Resolutions – ZAF

Discussion	Decisions	Actions
<ul style="list-style-type: none"> - Ruth Farre (RF, SANHO) provided an update on work undertaken so far. - She noted that following a review by the group there is a final version that has been submitted to HSSC. - Following decision by HSSC, changes to resolutions can be implemented that will then drive the follow-on work to the relevant IHO Charting Specifications. 		

.2 Review of relevant IHO Charting Specifications – ZAF

Discussion	Decisions	Actions
<ul style="list-style-type: none"> - She noted that this is on hold until HSSC have taken a decision on the status of the proposed changes to the technical resolutions. 		RF to initiate this work following decision by HSSC on technical resolutions.

6. IOC Programmes

.1 Update on IOC Global Sea Level Observing System (GLOSS) Programme items and events – USA

Discussion	Decisions	Actions
<ul style="list-style-type: none"> - The chair introduced Gary Mitchum (GM) of GLOSS. - GM gave an update on GLOSS activities. - He reported that they focused on keeping the data flowing during COVID. - He reported that they will adjust their operational structure, namely an executive advisory group to the Chair. 		

<ul style="list-style-type: none"> - He reported that Thorkild Aarup has retired and has been replaced by Bernado Aliaga. - He reported they are planning their next in person meeting in Paris in September. Main topic for discussion will be the update to their implementation plan. - He finished by reemphasising that the key message is that the network has remained stable and operational. 		

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

Discussion	Decisions	Actions
<ul style="list-style-type: none"> - J Castro (JC) presented on the Tsunami Warning and Mitigation WG – SE Pacific Region focusing on emergency response and data analysis. - JC started by describing the early warning network. . - He noted that following the Tonga eruption they noticed a number of anomalous readings. 		.

7. Capacity Building

.1 Tides and Water Levels Workshop training material – ZAF/AUS

Discussion	Decisions	Actions
<ul style="list-style-type: none"> - Ruth Farre (RF, SANHO)recapped progress. - She noted that she now had a number of translated material and thanked everyone for their contributions. - She noted that the links to the TWCWG CB material that was on the old IHO website are no longer there, however in consultation with the IHO, this will be remedied. - She noted that the more advanced course material still requires development as it had been delayed due to COVID. - She had received an offer from China to translate CB material but this had not gone any further. - Xiaoxue from China reported that an initial translation had been completed, but that they wished to do a further review to improve the accuracy. - 		<ul style="list-style-type: none"> - IHO to restore links to CB material. - China invited to submit the translated version once ready.

<ul style="list-style-type: none"> - PS noted he had previously submitted a proposal for Spanish speaking tidal CB course through the MACHC. He reported the funding is still available and he would pick this up again - Bernardo Aliaga (BA) reminded the group that IOC are still willing to co-fund the training. - This was acknowledged by PS 		<ul style="list-style-type: none"> - PS to liaise with RF with regard to reinvigorating the Spanish Speaking Tides course.
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8. Any Other Business

- .1 Request by the Hydrographic Surveys WG (HSWG) for TWCWG assistance in revising the relevant sections of S-44 (Standards for Hydrographic Surveys) and C-13 (Manual on Hydrography) –NGA/All

Discussion	Decisions	Actions
<ul style="list-style-type: none"> - Doug Roush (DR, NGA) provided a brief on the work of the HSWG and how this links to the TWCWG. - He noted that both S-44 and C-13 have significant tidal content and the desire is to assist with the updates. - He noted that the HSWG has three project teams, two of which are focusing on S-44 and C13 respectively. - He noted that the work is in the initial stages and it will become clearer soon what the ask of TWCWG will be. 		

- .2 Request by the Data Quality Working Group (DQWG) for TWCWG to investigate ‘data quality’ elements of water level and surface current data (including how to determine the “separation vertical uncertainty ratio” to allow use of Crowd Sourced Bathymetry (CSB) data – Chair / NLD / All

Discussion	Decisions	Actions
<ul style="list-style-type: none"> - The Chair provided a background to the agenda item. - He reiterated the request from the CSBWG for guidance on how HOs can use CSB data. He noted that if the CD – MSL separation was less than half the vertical uncertainty at a certain depth, the CSB data could be used, however this needed to be validated by the TWCWG. - IHO Sec suggested that the Chair liaise with the CSBWG chair to refine the task. 		Chair to liaise with Chair of CSBWG to understand the requirement for TWCWG support

- .3 Request by NIPWG / HSSC13 Action 37, to review the text of IMO MSC.1-CIRC. 1610 and propose amendments as necessary. Specifically, MSC12 & MSC15 – Chair

Discussion	Decisions	Actions
<ul style="list-style-type: none"> - TWCWG requested to review the sections of the doc that the NIPWG are responsible for. - This action has been undertaken and completed. - The document was circulated and the chair thanked those who contributed. All comments have been consolidated and passed back to the chair of NIPWG. 		

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

Discussion	Decisions	Actions
<ul style="list-style-type: none"> - Andy Matthews (AM, NOC) provided a brief on the use of citizen science to digitise historic tide gauge data. - He reported that he initiative was very successful. - Over 3000 volunteers. - Over 16000 scanned pages from two sites in the North-West of England. - He noted they were currently quality controlling the data but stated it was incredibly valuable for studying how tides have changed and validating storm surge events. 		

- .5 Water level measured using GNSS receivers using Interferometric Reflection – Chair / GBR [UK National Oceanography Centre (NOC)] / All

Discussion	Decisions	Actions
<ul style="list-style-type: none"> - Andy Matthews (AM, NOC) gave a presentation on the Permanent Service for Mean Sea Level (PSMSL) work to measure sea level using GNSS Interferometric Reflectometry. - He briefed on the EuroSea project. - He offered a number of links to further resources. 		
<ul style="list-style-type: none"> - The chair asked the WG whether any members were using this technique - Kurtis Readding (KR) noted that the technique could have significant utility where a tide staff / tide gauge isn't viable. - Phillip MacAulay (PA) noted they had considered the technique where 		

standard gauging is very difficult but had not yet attempted it.		
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9. Work Plan and ToRs

.1 TWCWG Work Plan 2022-2023 up-dates – Chair

Discussion	Decisions	Actions
<ul style="list-style-type: none"> - The chair took the group through the work programme with the various updates and changes - Link to WP - 		
<ul style="list-style-type: none"> - Task B2 proposed 	Agreed HB to lead	
<ul style="list-style-type: none"> - Task D1 – Issue edition 1.2.0 by the end of 2022 	Agreed	
<ul style="list-style-type: none"> - Task F1 Chair to lead 	Agreed	
<ul style="list-style-type: none"> - Task J1 to add C-13 and S-44 	Agreed	
<ul style="list-style-type: none"> - Task J2 – adjusted to reflect permanent status and to include Charting specifications 		

.2 Review TWCWG ToRs and RoPs – IHO

Discussion	Decisions	Actions
ToRs and RoPs reviewed	Accepted	

10. Venue and dates of the 7th TWCWG Meeting (TWCWG7) – Chair/IHO

Discussion	Decisions	Actions
April 2023 – SA to host.		SA to investigate the logistics of hosting in 2023.

11. Review of Action Items from TWCWG6 – IHO

Discussion	Decisions	Actions
To be circulated post meeting.		

12. Development of TWCWG6 report to HSSC14 – Chair

Discussion	Decisions	Actions
<ul style="list-style-type: none"> - Chair to finalise the report. - He advised members that they will only have a short period of time to review in order to get to HSSC in good time. 		

13. Draft Agenda for TWCWG7 – Chair/IHO

Discussion	Decisions	Actions
To be circulated post meeting		

Will reflect the work plan and emerging issues such as: IAPSO collaboration Progress on S-104 & S-111		
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14. Election of Chair and Vice Chair – IHO

Discussion	Decisions	Actions
Both positions are happy to proceed	Both Chris Jones and Ruth Farre will continue in their respective roles as Chair & Vice Chair	

15. Closing remarks – Chair/All

Discussion	Decisions	Actions
The Chair expressed his thanks to all participants for their valuable contributions, and was especially grateful for the high level of online attendance, given the time zone differences of several delegates.		
The ambitious agenda had covered several important topics and made significant progress.		
Closing remarks from both Ruth Farre (Vice Chair) and Sam Harper (IHO) re-iterated these sentiments.		

Meeting closed at 16:10 BST Thursday 7th April 2022