

5th Tidal and Water Level Working Group Meeting

14 - 16 May 2013, Finnish Transport Agency, Helsinki, Finland

Report to the 5th meeting of the Hydrographic Services and Standards Committee

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

1 Opening

- 1.1 Mr Chris Jones (UK-UKHO) opened the meeting at 0910 in the absence of Steve Gill (USA-NOAA), chair, and Zarina Jayaswal (Australia), vice-chair. He stated the chair had requested he undertake the role of chair for the meeting and he asked if there were any objections or others wishing to undertake this task. It was agreed Chris Jones should act as chair for the meeting. He then thanked all participants for coming. He also thanked Finland for hosting the meeting and providing excellent support and facilities.
- 1.2 All participants – representing Brazil, Chile, Finland, France, Norway, Peru, Spain, Sweden and UK – introduced themselves and, on behalf of the Finnish Transport Agency, Mr Jukka Varonen, Head of Hydrographic Survey welcomed all participants and wished them a successful meeting. The acting-Chair asked for volunteers to keep notes to assist in the writing of the final meeting report, Finland and France volunteered for this duty.
- 1.3 David Wyatt (IHB), on behalf of the Directing Committee thanked Finland for hosting the meeting and providing a high level of support and excellent facilities. The outcomes from the 4th meeting of the Hydrographic Services and Standards Committee (HSSC 4) were highlighted along with the anticipation of progress by the TWLWG on a number of Work Programme (WP) items, in particular Dynamic application of tides in ECDIS, Standard for the transfer of real time tidal data and Standard for digital tide tables. Also noted was the expectation of HSSC that a final draft version of IHO Resolution 3-1919, as amended, would be an output from this meeting. It was reported that the agreement for SHOM to print and publish online the English translation of the French Manual of Tides had been signed by the IHB and SHOM and it was anticipated the online version would be available mid-year with the hard copy printed version towards the end of the year.

Acting-chair endorsed these sentiments and he highlighted a need for a more active engagement by the TWLWG members during and between meetings to progress action and WP items.

2 Administrative Arrangements

- 2.1 The acting-Chair introduced the Agenda which was adopted. See Annex B. He reported that apologies for non-attendance had been received from Australia, Canada, Denmark, Germany, New Zealand, Portugal, South Africa and USA.
- 2.2 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.
- 2.3 The acting-Chair reported on the HSSC 4. Although the current Chair had been unable to attend he had been able to introduce the TWLWG report by telephone

conference, he briefed on the presentation provided. The acting-Chair was able provide further insight, having attended the meeting in person, in particular the tone of a number of questions raised by HSSC delegates on the TWLWG activities. He noted the requirement to liaison with other IHO bodies and external bodies, which worked in similar areas to the TWLWG.

2.4 IHB reported on the action items from TWLWG 4. A new list of Action Items would be prepared for this meeting. See Annex E.

4-2.5 Tide gauge sampling rates and web links – all were urged to provide up-dates whenever known, including from adjacent states and other contacts. **Action All.**

4-4.1.2 Standard constituent list – to be taken under Agenda Item 4.1.

4-4.2.1 Standard for digital tide tables – little progress beyond initial draft generation, to be taken under Agenda Item 4.2.

4-4.8.2 Compare tidal predictions – to be taken under Agenda Item 4.9.

4-4.9.2 Compare tidal predictions – acting-Chair requested additional data sets be provided by members, all to pass suitable data set to IHB by 30 Sep 2013 and all to report progress on results and analysis at TWLWG 6. **Action All.** Norway suggested longer periods would be of benefit in removing meteorological and other anomalies. To be discussed further under Agenda Item 4.9.

4-4.10.3 IHO Resolution 3-191, as amended – to be taken under Agenda Item 4.6

4-4.12.1 Exchange of harmonic constituents and predictions – to be taken under Agenda Item 4.13.

4-4.12.2 Review the Technical Resolution on Times Zones – acting-Chair highlighted UK method of depicting time zones, no further action was considered necessary and would be discussed under Agenda Item 4.5.

4-4.13.1 Representation of the TWLWG at the GLOSS meetings – to be taken under Agenda Item 4.14.

4-5.2 Actual Tides On-line Link – acting-Chair urged all to check and provide up-dates and amendments to the information provided to ensure content is current and all links work. **Action All.**

3 National Presentations

A national presentation was made by Chile, a pdf version of which can be downloaded from the TWLWG 5 web page on the IHO web site (TWLWG 5-3.1.1). Sweden gave a verbal brief on national activities covering the recalculation of MSL and establishment of a revised baseline.

4 Programme matters

4.1 Standard Constituent List

UK gave a presentation (TWLWG 5-4.1), which highlighted variations in the angular speed of harmonic tidal constituents and orbital elements based on the most helpful correspondence with the Korean delegate following TWLWG4. UK and France to investigate the angular speed of harmonic tidal constituents with a view to improve the precision of tide predictions; it was considered as a minimum 7 decimal places should be quoted. **Action UK and France.**

4.2 Standard for Digital Tide Tables

.1 The Chair call via teleconference link; he gave brief details explaining his absence and he confirmed his intention to stand down as Chair with immediate affect.

An update on NOAA progress towards direct time series predictions based on Chart Datum (CD) for on-line availability. Where sufficient information was available for harmonic analysis for predicted tides, this was being conducted whilst maintaining time and height for areas of sparse data. NOAA intend to move away from domestic hard copy tide tables but the issue of international uses still required to be addressed.

Acting-Chair highlighted the draft document, which contained suggested feature attributes to be included in digital tide tables. The document is available on the TWLWG2 website. All were encouraged to study the document, providing comments and input to UK for passing to TSMAD. **Action All.**

4.3 IHB provided a background brief on S-100 (TWLWG 5-4.3). Assistant Director Tony Pharaoh was contacted at the IHB via teleconference to provide additional advice and guidance on appropriate initial areas to be discussed and considered within the TWLWG capabilities. The use of gridded data component should be an area for further discussion.

4.4 Dynamic Application of Tides in ECDIS

4.5 Standard for the Transmission of Real Time Tidal Data

These items were taken together.

.1 IHB, AD Wyatt and AD Pharaoh (via teleconference), provided extensive guidance on the initial requirements and considerations which needed to be discussed, see Annex H.

.2 After discussion an agreed basic outline scope requirement was generated for review by TSMAD, see Annex H.

4.6 Definitions of MSL and relevance of IHO Technical Resolutions

.1 Finland introduced the revised text resulting from intersessional discussions between Brazil, Finland, France and Sweden. Concerns were raised over the consistency with other related IHO publications, in particular S-4 and C-13. IHB explained the administrative process which would be required before the revised Resolution was approved and any considered review or revision of associated publications would be highlighted at HSSC 5.

Finland briefed on the discussions and principles involved, including a detailed explanation on the complex issues between adjacent areas and how these could be considered by national HOs. The main challenges were the articulation of the correct terminology for areas connected to ocean areas with appreciable variations of water level and areas with minimal variation in water level and limited connection to oceans.

An agreed text to IHO Resolution 3-1919, as amended, was generated for submission to HSSC 5 and subsequent member state approval, see Annex G.

4.7 Inventory of tide gauges used by IHO Member States

.1 IHB highlighted that few up-dates to the inventory had been received; the acting-Chair encouraged all to check their data listings and to pass any amendments or changes to IHB. TWLWG members were encouraged to approach cooperating and non-IHO member states to provide information to increase the geographical spread of the information held. As had been noted earlier, the acting-Chair encouraged all to provide tide gauge sampling rates and web links for inclusion in the Inventory on the IHO website. **Action All.**

4.8 The study of long term data sets for the determination of global sea level rise

.1 France reported on work being undertaken to recover old long term tidal records to aid in the study and determination of sea level change; SHOM was working in cooperation with Météo France.

.2 US gave a presentation, via teleconference, on the long term variations in amplitudes and phases of harmonic constants (TWLWG 5-4.8). The US requested comment and feedback from TWLWG members, the US also indicated their intention to conduct further studies over the next year. It was suggested there was a need to study additional stations and review harmonic constants over long periods of time. The acting-Chair requested Member States to take long term records of their best quality data to conduct analysis of constituents (M2, S2, N2, K1, O1 and P1) and to exchange the results to generate a data set for further research. **Action All.**

4.9 Compare Tidal Predictions generated as a result of analysis of a common data set by different analysis software

.1 Chile, Norway and UK agreed to supply suitable data sets for general analysis. Data sets with unusual or particular tidal regimes would provide for interesting and testing analysis and discussion. **Action Chile, Norway and UK.**

4.10 Establishment and maintenance of vertical reference frameworks for the high resolution bathymetric surfaces

.1 UK briefed on background and work in progress by NSHCTWG and previous work undertaken by Belgium, Denmark, Germany, France, Netherlands, Norway and UK. Norway highlighted the similarities with their work and that of France. Spain noted the different models being used for Atlantic and Mediterranean Sea areas. Sweden highlighted associated work and the connection with the EVR System and its similarities with the EVRF and the move towards a common reference model.

.2 UK highlighted the actions required and noted the liaison required with NSHCTWG, of which France, Norway and UK were members, in addition to Belgium, Denmark, Germany and Netherlands. The work undertaken by the Netherlands and the BLAST Project were noted. Sweden introduced a paper from the University of Southern Mississippi (TWLWG 5-4.10.2).

.3 Acting-Chair encouraged all to investigate the numerous papers and documents available on this issues and the experiences of other organizations

involved in this work. Chile noted the large quantity of work already being undertaken by specialists in various countries and organizations, including the associated workshops on Geodetic Vertical Monitoring developed in conjunction of the sessions of the Group of Experts of GLOSS.

.4 UK agreed to draft a response to the proposed action items for later review by the TWLWG. **Action UK.**

4.11 Review of relevant IHO resolutions

.1 The IHB introduced document TWLWG 5-4.11-1 listing those IHO resolutions which fell within the area of competence of TWLWG.

.2 Acting-Chair went through each Resolution, asking all to identify if any changes or amendments were necessary. It was noted Resolution 2/1977 still referred to IHOTC in paragraph d. IHB to delete IHOTC and add TWLWG prior to submission to HSSC for approval. **Action IHB**

.3 It was felt Resolution 27/1919 could be updated to reflect the supply of digital tidal data. Chile agreed to coordinate with draft proposed wording for review and comment by TWLWG no later than 14 June and to prepare a final draft proposal to HSSC by 19 July. **Action Chile**

4.12 Review of relevant IHO Charting Specifications (S-4)

.1 The IHB introduced document TWLWG 5-4.12-1 reporting on the outcome of correspondence with CSPCWG and outlining the sections of publication S-4 which relate to tidal issues.

.2 It was agreed to recommend to HSSC 5 to move Resolution 1/2008, as amended, from Section 2.3.1 to Section 2.2 of IHO publication M-3.

.3 After discussion it was felt Resolution 3/1947, as amended, still had relevance and a number of occurrences on charts where this Resolution applied. It was felt there remained a need to retain this Resolution. TWLWG wished to liaise further with CSPCWG before providing any recommendation on the removal of Resolution 3/1947.

.4 It was considered S-4 may require further review by CSPCWG after approval of the revised wording to Resolution 3/1919 has been approved by Member States.

4.13 Exchange of harmonic constants / predictions

.1 UK provided a brief update on work since TWLWG 4 and discussions at NSHCTWG meeting with France, which has a suitable XML structure which could be incorporated into the schemas available on the TWLWG website. The presentation given at TWLWG 4 remained a valuable information document.

.2 France demonstrated the website and data available (<http://data.shom.fr>).

4.14 Update on IOC GLOSS programme

.1 Norway lead on the presentation provided by IOC-GLOSS (TWLWG 5-4.14-1). It was noted the next GLOSS meeting would be held in Liverpool 28 October – 1 November. Norway also highlighted the on-going request for past tidal records. The

acting-Chair requested any TWLWG members attending the GLOSS meeting to submit a report to TWLWG 6.

4.15 Determining Ellipsoidal Height of MSL at the Coast

.1 Acting-Chair noted the similarities and connection with the GLOSS project and near real-time tidal data.

.2 Chile highlighted the GLOSS view that only continuous GNSS observations at tidal stations fulfil the requirements to measure milli-metric variations of water level change and short duration GNSS observations were insufficient, although regularly practised.

4.16 Actual Tides On-line Link (ATOL).

.1 Acting-Chair provided background on the work to create the ATOL list. It was requested IHB to reinstate the link on the TWLWG website when received from UK. **Action UK & IHB** All were requested to check the list to ensure accuracy and currency. **Action All**

4.17 Tides and Water Levels Workshop

.1 IHB briefed on the IHO CB process and how requirements were generated. Acting-Chair provided background on the request received RHCs via the CB Coordinator at UKHO for a Tides and Water Levels Workshop to be delivered to a number of developing maritime nations.

.2 Acting-Chair confirmed course material was available from a previously delivered US NavOceanO International Hydrographic Surveying course. The outline details, as discussed at TWLWG 3 (TWLWG 3-4-9A) was highlighted and it was agreed this remained a suitable format for a course.

.3 All were urged to review commitments with a view to assessing capacity to provide training personnel to deliver this course. US to circulate current proposed course content for further review by TWLWG. **Action US** UK to contact EAHC members for further details on the previously delivered course. **Action UK**

.4 Norway indicated that they may have suitable personnel to assist with the delivery of such a training course, and offered to make the necessary enquiries in order to investigate this further. **Action Norway**

4.18 TWLWG Work Programme 2014-2015

.1 The IHB displayed the draft work programme for 2014-2015 which had been prepared in advance of the meeting (TWLWG 5-4.18-2). Amendments were made to reflect discussion and progress during this meeting. It was noted that the updated version would be included in the meeting report and that all delegates would therefore have a further opportunity to comment before it was submitted to HSSC 5 for approval.

5 Any other business

.1 Chile suggested time could be made available at future meetings for a selected topic for in-depth discussion or a workshop.

.2 In view of the increased work load and requirements and the complex S-100 issues, which require to be progressed – particularly Standards for digital tide tables, Dynamic application of tides in ECDIS, Standard for the transmission of real time tidal data, it was suggested future meetings could be programmed for 4 days.

.3 **Election/Re-election of Chairman and Vice-Chairman**

The IHB explained the current situation regarding the positions of chair and vice-chair and gave a detailed brief on the anticipated roles and requirements of these offices. Gwenaële Jan (SHOM – France) and Chris Jones (UKHO – UK) were unanimously elected as chair and vice-chair respectively.

6 Venue and dates of the 6th TWLWG Meeting

.1 The IHB reported that Australia had generously offered to host TWLWG 6 at the Australian Hydrographic Offices in Wollongong. There was general agreement this was a very suitable venue and thanked Australia for the offer. After discussion it was agreed the week 7-11 April appeared the preferred period set against already known other commitments. IHB was requested to liaise with Australia to confirm the dates and circulate an initial letter of invitation with attached draft agenda and Work Programme to allow members to obtain funding and approvals. **Action IHB**

7 Review of Action Items

.1 A draft list of Action Items from the meeting were reviewed and agreed. All Action Items are marked in this report and are collected together at Annex D. It should be noted that the list of action items does **NOT** include tasks that are in the TWLWG Work Programme. An updated list of the Action Items will be maintained on the TWLWG 6 web page and all those who have actions to complete should keep the IHB informed of any progress. **Action ALL.**

8 Draft Report to the HSSC / Draft Agenda for TWLWG 6

.1 It was agreed that the IHB would circulate a draft meeting report to all attendees by 24 May. **Action IHB** Attendees were requested to provide any comments by 7 June. **Action ALL** It was intended the final meeting report would be published by 21 June. **Action IHB**

.2 The IHB, Chair and vice-Chair would prepare the final report to HSSC 5 using the format required by HSSC. Representation of TWLWG at the HSSC 5 meeting would be discussed between the Chair and the vice-Chair. **Action IHB, France & UK**

.3 A draft Agenda was presented to the meeting and is included at Annex F to this report. The draft Agenda may require further amendment following the outcome of HSSC 5.

10 Closing remarks

.1 The acting-Chair thanked everyone for coming to the meeting, wished them a safe journey home. He also thanked the Finnish Transport Agency for their excellent support and organization, both of which helped greatly in the success of the meeting.

.2 IHB on behalf of the Directing Committee thanked Finland for their excellent support and facilities for the meeting which had undoubtedly contributed to a successful meeting.

.3 The meeting closed at 1830.

The following Annexes are attached:

- A. List of Participants.
- B. TWLWG 5 – Agenda
- C. TWLWG 5 – List of Documents
- D. TWLWG 5 – List of Actions
- E. TWLWG Draft Work Programme 2014-2015
- F. TWLWG 6 – Draft Agenda
- G. IHO Resolution 3/1919, as amended, – Final Proposed Draft
- H. Proposed Dynamic Tides and Water Levels in ECDIS Scope Requirements

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Tidal and Water Level Working Group
Helsinki, Finland, 14-16 May 2013
Draft Agenda – (TWLWG 5)

1 Opening

- .1 Opening address by the Acting Chairman
- .2 Address by host nation
- .3 Welcome by the IHB

2 Administrative Arrangements

- .1 Adoption of the Agenda and Apologies
- .2 Programme and timetable of the Sessions
- .3 Report on Intercessional Activities including HSSC 4
- .4 Matters arising from TWLWG 4/Review of Action Items

3 National Presentations

- .1 Presentations by delegates on “National Tidal Issues”

4 Programme Matters

Note:{xx} indicates TWLWG Work Plan reference

- .1 Standard Constituent List {A.1} (Chris Jones)
- .2 Standard for digital Tide Tables {B.2} (Stephen Gill)
- .3 Introduction to S-100 presentation {C.1 & C.2} (IHB)
- .4 Dynamic application of tides in ECDIS {C.1} (Ian Halls, industry representative)
- .5 Standard for the transmission of real time tidal data {C.2} (Stephen Gill, industry representative)
- .6 Definitions of MSL/Water Datum in non-tidal waters and relevant of IHO Resolution 3-1919, as amended {E.1} (Jukka Varonen + IHB)
- .7 Inventory of Tide gauges used by IHO Member States {F.1} (IHB)
- .8 The study of long term data sets for the determination of global sea level rise. {H.1}(Chris Jones, TørTorresen, Stephen Gill &Salvador Moreno)
- .9 Compare Tidal Predictions generated as a result of analysis of a common data set by different analysis software {A.2} (Stephen Gill)
- .10 EU submission on Establishment and Maintenance of VRF for High Resolution Bathymetric Surfaces (IHB)
- .11 Review of relevant IHO Technical Resolutions (IHB)
- .12 Review of relevant IHO Charting Specifications (IHB)
- .13 Exchange of Harmonic Constants / Predictions (Chris Jones)
- .14 Update on IOC/GLOSS Programme (GLOSS/IHB)
- .15 Determining ellipsoidal height of MSL at the coast (ALL)
- .16 Actual Tides On-line Link status (All)
- .17 Request from UKHO for support in Tides and Water Levels Workshops (Chris Jones and Stephen Gill)
- .18 TWLWG Work Plan up-dates (IHB)

5 Any Other Business

- .1 Election of new TWLWG chair and vice-chair

6 Venue and dates of the 6th TWLWG Meeting (TWLWG 6)

7 Review of Action Items from TWLWG 5

8 Draft Report to HSSC 5/Draft Agenda for TWLWG 6

9 Closing remarks

DRAFT

8 Draft Report to HSSC 5/Draft Agenda for TWLWG 6

9 Closing remarks

DRAFT

TWLWG 5 - List of Documents

Document No	Document Title
TWLWG 5 Letter 1	TWLWG 5 Invitation, Registration Form and Logistics Information Letter
TWLWG 5 Registration Form	TWLWG 5 Registration Form (Word Format)
TWLWG 4 Actions	TWLWG 4 List of Action - 17 April 2013
TWLWG 5 Participants	List of Participants - 14 May 2013
TWLWG 5	Agenda
TWLWG 5	Programme
TWLWG 5-2.3-1	Extract from HSSC 4 Report
TWLWG 5-3.1.1	Chile National Presentation
TWLWG 5-4.1	Standard Constituent List Presentation
TWLWG 5.4.3	S-100 Presentation
TWLWG 5-4.4-1	Dynamic Tides in ECDIS
TWLWG 5-4.6-1	Resolution 3-1919 Version 12 October 2012+Australia+Brazil
TWLWG 5-4.6-2	Resolution 3-1919 Finland Comments
TWLWG 5-4.6-3	Resolution 3-1919 BSHC CDWG Comments (track change on 5-4.5-1)
TWLWG 5-4.8-1	Long-term Variations in Amplitudes and Phases of Harmonic
TWLWG 5-4.10-1	EC Submission on Establishment and Maintenance of VRF for High Resolution Bathymetric Surfaces
TWLWG 5-4.10.2	University of Southern Mississippi Paper
TWLWG 5-4.11-1	IHO Resolutions
TWLWG 5-4.12-1	Review of Relevant IHO Charting Specifications
TWLWG 5-4.18-1	Work Programme 2013-2014

LIST OF ACTIONS – Updated 7 June 2013

Agenda Item	Subject	Status/Date	Comments	Action
TWLWG 4				
2.5	Tide gauge sampling rates and web links	On going	To provide up-dates	All
4.9.2	Compare tidal predictions	30 Sep	Additional suitable data sets to be provided by members to IHB	All
4.9.2	Compare tidal predictions	TWLWG 6	Report progress on results and analysis	All
5.2	Actual Tides On-line Link	On going	Check and provide up-dates and amendments to the information provided to ensure content is current and all links work	All
TWLWG 5				
4.1	Standard Constituent List	30 Nov	Investigate the angular speed of harmonic tidal constituents with a view to improve their precision	France & UK
4.2	Standard for Digital Tide Tables	30 Nov	Study the document, providing comments and input to UK	All
4.4	Dynamic Application of Tides in ECDIS	31 May Complete	Provide basic outline scope requirement to TSMAD	UK
4.8	Study of long term data sets	TWLWG 6	All to take long term records to conduct analysis of constituents and to exchange the results	All
4.9	Compare Tidal Predictions	30 Jun	Supply suitable data sets for general analysis	Chile, Norway & UK
4.10	Establishment and maintenance of vertical reference frameworks for the high resolution bathymetric surfaces	30 Jun	Draft a response to the proposed action items	UK
4.11	IHO Resolution 2/1977	31 May Complete	Amend to replace IHOTC with TWLWG – amended version to be submitted with report to HSSC 5	IHB
4.11	IHO Resolution 27/1919	14 Jun	Draft proposed amended wording to reflect supply of digital tides and circulate to TWLWG members for comment	Chile
4.11	IHO Resolution 27/1919	28 Jun	All to pass comments on draft amendments to Chile	All

4.11	IHO Resolution 27/1919	19 Jul	Circulate final draft proposal to TWLWG	Chile
4.16	Actual Tides On-line Link	31 May	Place link on IHO-TWLWG website when received from UK	UK & IHB
4.16	Actual Tides On-line Link	On going	All to check and confirm details provided are correct, pass any amendments or additions to IHB	All
4.17	Tides and Water Levels Workshop	31 Aug	All to review commitments with the view to assessing capacity to provide training personnel to support workshops and inform UK	All
4.17	Tides and Water Levels Workshop	6 Jun	US to circulate current proposed course content for further review and comment by TWLWG	US & IHB
4.17	Tides and Water Levels Workshop	30 Jun	Contact EAHC members for further details of previously delivered course	UK
6	TWLWG 6 venue and dates	31 August	Discuss appropriate dates with Australia and circulate an initial letter of invitation	IHB
7	Action List	TWLWG 6	Keep IHB informed of progress with allocated actions	All
8	TWLWG 5 Draft Report	24 May Complete	Draft to be circulated for comment	IHB
8	TWLWG 5 Draft Report	7 Jun Complete	All to provide comments on draft report	All
8	TWLWG 6 Final Report	21 Jun Complete	Publish final report	IHB
8	Report to HSSC 5	30 Jun	Draft report for review and amendment by France and UK	IHB

10 TWLWG Work Plan 2014-2015

10.1 TWLWG Tasks

A	Maintain and extend Standard Tidal Constituent List (IHO Task 2.7.2 refers)
B	Develop, maintain and extend a Product Specification for Digital Tide Tables (IHO Task 2.7.3 refers)
C	Liaise with TSMAD on tidal matters and develop, maintain and extend a Product Specification for Dynamic Application of Tides in ECDIS (IHO Task 2.7.5 refers) and a product Specification for the transmission of real-time tidal data (IHO Task 2.7.4 refers)
E	Establishing and maintaining vertical reference frameworks for high resolution bathymetric surfaces in order to develop associated work elements and identify tasks which could benefit from external support.
F	Prepare and maintain an inventory of tide gauges used by Member States and to publish it on the IHO/TWLWG web site (IHO Task 2.7.2 refers).
G	Compare the tidal predictions generated as a result of analysis of a common data set using different analysis software (IHO Task 2.7.2 refers).
H	Review and provide feedback of On-line real time water level observation document (IHO Task 2.7.2 refers).
I	Conduct the 2014 and 2015 meetings of TWLWG (IHO Task 2.7.3 refers)

Task	Work item	Priority H-high M-medium L-low	Milestones	Start Date	End Date	Status P-planned O-ongoing C-completed	Contact Person(s) * indicates leader	Related Pubs/Standard
A.1	Maintain Standard Tidal Constituent List	M	Update precision of speed of constituents	Continuous		O	Chris Jones* Gwenaële Jan Do-Seong Byun	
A.2	Compare the tidal predictions generated as a result of analysis of a common data set using different analysis software.	M	Add additional data sets Analyse using different software Predict common set of tides Compare results	Continuous		O	Stephen Gill* All TWLWG	

Task	Work item	Priority H-high M-medium L-low	Milestones	Start Date	End Date	Status P-planned O-ongoing C-completed	Contact Person(s) * indicates leader	Related Pubs/Standard
B.2	Prepare a Standard for Digital Tide Tables	M	Prepare draft Standard	2009	2013 2014	O	Chris Jones* Gwenaële Jan Stephen Gill Zarina Jayaswal	
C.1	Liaise with TSMAD and DIPWG on tidal matters relevant to the Dynamic Application of Tides in ECDIS	H	Prepare draft scoping requirements. Prepare draft Product Specifications (S10x) for tidal data in S-100.	2010 2012	2012 2014 2013 2015	O O	Chris Jones* Gwenaële Jan Zarina Jayaswa Stephen Gill Juan Fierro Ruth Farre Dan Pillich	IHO Resolution 2/2007
C.2	Develop a Standard for the transmission of real-time tidal data	M		2009	2013 2014	O	Chris Jones* Gwenaële Jan Zarina Jayaswal Stephen Gill Juan Fierro	IHO Resolution 2/2007
E.1	Liaise with NTWG and RHCs to assess progress in defining and implementing coastal vertical reference frameworks.	M	Identify additional work required to establish and maintain regional and international vertical reference frameworks.	2013	2014	P	Chris Jones Tor Tørresen* Gwenaële Jan Lars Jakobsson	
E.2	Identify tasks which could benefit from external support	M	Draft associated statements of requirements	2013	2014	P	Chris Jones Tor Tørresen* Gwenaële Jan Lars Jakobsson	
E.3	Propose relevant elements to be inserted into work plan and any liaison requirements with other IHO bodies	M	Generate associated appropriate timelines	2013	2014	P	Chris Jones Tor Tørresen* Gwenaële Jan Lars Jakobsson	

Task	Work item	Priority H-high M-medium L-low	Milestones	Start Date	End Date	Status P-planned O-ongoing C-completed	Contact Person(s) * indicates leader	Related Pubs/Standard
F.1	Prepare and maintain an inventory of tide gauges used by Member States and to publish it on the IHO/TWLWG web site.	M	Initial inventory from TWLWG members available on IHO web site. CL36/2010 sent to Member States seeking wider input.	Continuous		O	David Wyatt* All TWLWG	
G1	The study of long term data sets for the determination of global sea level rise.	M		2011	2014	O	Chris Jones Salvador Moreno Stephen Gill Tor Tørresen Gwenaële Jan Do-Seong Byun	
H1	Actual Tide On-line Link	H	Review and maintain	Continuous		O	David Wyatt All TWLWG	

10.2 TWLWG Meetings (IHO Task I)

Date	Location	Activity
8 – 10 May 2012	Fish Hoek, South Africa	4 th Meeting
14 – 16 May 2013	Helsinki, Finland	5 th Meeting
7 – 11 April 2014	Wollongong, Australia	6 th Meeting (tbc)

Chair: Gwenaële Jan

Email: gwenaele.jan@shom.fr

Vice-Chair: Chris Jones

Email: christopher.jones@ukho.gov.uk

Secretary: David Wyatt

Email: David.Wyatt@iho.int

Tidal and Water Level Working Group
Wollongong, Australia, 7 – 11 April 2014 (tbc)
Draft Agenda – (TWLWG 6)

1 Opening

- .1 Opening address by the Acting Chairman
- .2 Address by host nation
- .3 Welcome by the IHB

2 Administrative Arrangements

- .1 Adoption of the Agenda and Apologies
- .2 Programme and timetable of the Sessions
- .3 Report on Intercessional Activities including HSSC 4
- .4 Matters arising from TWLWG 4/Review of Action Items

3 National Presentations

- .1 Presentations by delegates on “National Tidal Issues”

4 Programme Matters

Note: {xx} indicates TWLWG Work Plan reference

- .1 Standard Constituent List {A.1} (Chris Jones)
- .2 Standard for digital Tide Tables {B.2} (Stephen Gill)
- .3 Dynamic application of tides in ECDIS {C.1} (Gwenaële Jan & Chris Jones, industry representative)
- .5 Standard for the transmission of real time tidal data {C.2} (Gwenaële Jan & Chris Jones, industry representative)
- .6 Inventory of Tide gauges used by IHO Member States {F.1} (IHB)
- .7 The study of long term data sets for the determination of global sea level rise. {G.1} (Chris Jones, Tør Torresen, Stephen Gill & Salvador Moreno)
- .8 Compare Tidal Predictions generated as a result of analysis of a common data set by different analysis software {A.2} (Stephen Gill)
- .9 EU submission on Establishment and Maintenance of VRF for High Resolution Bathymetric Surfaces {E} (Gwenaële Jan, Chris Jones & Tør Torresen)
- .10 Review of relevant IHO Technical Resolutions (IHB)
- .11 Review of relevant IHO Charting Specifications (IHB)
- .12 Exchange of Harmonic Constants / Predictions (Chris Jones)
- .13 Update on IOC/GLOSS Programme (GLOSS/IHB)
- .14 Actual Tides On-line Link status {H.1} (All)
- .15 TWLWG Work Plan up-dates (IHB)

5 Any Other Business

- .1

6 Venue and dates of the 7th TWLWG Meeting (TWLWG 7)**7 Review of Action Items from TWLWG 6****8 Draft Report to HSSC 6/Draft Agenda for TWLWG 7****9 Closing remarks**

TITLE	Reference	Last amendment (CL or IHC)	1 st Edition Reference
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DATUMS AND BENCH MARKS	3/1919 as amended	[19/2008]	A2.5
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1 It is resolved that the datum of tide/water level observations and predictions for mariners shall be the same as chart datum (datum for sounding reduction).

2 It is resolved that chart datum and other tidal/water level datums used should be clearly stated on charts and all other navigational products.

3 It is resolved that chart datums (datums for sounding reduction), the datums of tide/water level prediction and other tidal/water level datums shall always be connected with the general land survey datum, and, in addition, with a prominent and permanent fixed mark in the neighbourhood of the tide gauge, station, observatory etc.

4 It is resolved that ellipsoidal height determinations of the vertical reference marks used for tidal/water level observations should be made, in order to support the production of seamless data sets; i.e. to allow the translation between data sets with differing vertical datums. It is further resolved that such observations should relate to a geocentric reference system, preferably the International Terrestrial Reference System (ITRS) or one of its realizations e.g. the World Geodetic System 1984 (WGS84).

In oceans and geographical areas connected to oceans

5 It is resolved that heights on shore, including elevations of lights, should be referred to a HW datum.

6 It is resolved that the Lowest Astronomical Tide (LAT), or as closely equivalent to this level as is practically acceptable to Hydrographic Offices, be adopted as chart datum. Alternatively the differences between LAT and national chart datums may be specified in nautical documents. If low water levels in a specific area frequently deviate from LAT, chart datum may be adapted accordingly.

7 It is resolved that Highest Astronomical Tide (HAT) be adopted as the datum for vertical clearances. Alternatively the differences between HAT and national datums for vertical clearances may be specified in nautical documents. If high water levels in a specific area frequently deviate from HAT, the datum for vertical clearances may be adapted accordingly.

Note: LAT (HAT) is defined as the lowest (highest) tide level which can be predicted to occur under average meteorological conditions and under any combination of astronomical conditions. It is recommended that LAT and HAT be calculated either over a minimum period of 19 years using harmonic constants derived from a minimum of one year's observations or by other proven methods known to give reliable results. Tide levels should, if possible, reflect the estimated uncertainty values obtained during the determination of these levels.

In geographical areas with limited connection to oceans and negligible tidal range (< 30 cm)

8 It is resolved that depths, and all other navigational information should be referred to Mean Sea Level (MSL) or other level as closely equivalent to this as is practically acceptable to Hydrographic Offices.

Note: The adopted level may be a well-defined geodetic datum as used for heights in land survey applications or an observed local Mean Sea Level (MSL) based on long series of water level observations.

9 In order to support other non-navigational applications as UNCLOS and also to indicate the characteristics in the area, it is recommended to adopt the mean of yearly lowest/highest water levels observed over a long time period.

Inland Waters

10 It is resolved that depths, and all other navigational information should be referred to an appropriate level practically acceptable to Hydrographic Offices or if needed LW as a reference level for depths and HW for vertical clearances. The selection of which one of the alternatives to be used is a difficult issue which can only be determined locally and which will be largely dependent on seasonal hydrological conditions. LW and HW are defined preferably as the mean of lowest/highest water levels, or as a suitable percentile of lowest/highest water levels, observed over a long time period

Guidance Notes on S-100 for TWLWG

Need to decide what want to do and intend to do, create road map for progress.

Create a common data standard acceptable to equipment manufacturers, data providers and software creators.

Need to identify metadata items in file which define reality; how often (time interval for different tidal regimes and content)

How often should data be up-dated in display (time interval for different tidal regimes and content)

Dynamic tides – predicted and/or real time
 what included in model – meteorological effects, surges, negative tides, depth intervals, etc.
 overhead clearances, limits of safe water
 height and time or harmonics (how many)
 horizontal movements (SCWG)

Scope out requirements for: Transfer standard/specifications for tidal data
 S-100 and ENC Product Specification – recommend what to be displayed and how

Format and how data to be transferred between organizations, systems (internal – bridge systems) and systems (external – gauges, meters)

Scope out the product that TWLWG are going to develop – suggest that the WG concentrate on the product that will be used in the ECDIS first and leave the transfer format for later. Once the WG has a clear understanding of the nature of the requirement, it will be in a better position to define components / services that are needed make it happen.

What is required is a type of bathymetric attributed grid, product that can be used as a layer within an ECDIS (look at S-102). The grid would be based on full resolution survey data, and the choice of grid interval would be determined by the quality of the underlying survey data and the intended use; i.e. in a port area where depths are critical and tidal variations significant, a small (fine) grid interval grid would be more appropriate (provided that the underlying survey data can support it) than a course one. It would be worth mentioning in the scope that the depth information in existing ENC is not sufficiently comprehensive to support this type of application – for the reasons discussed.

The gridded dataset would effectively become a navigational surface (based on chart datum CD), and the next issue to consider would be how to apply the tidal model including the temporal component to the navigational surface in order that CD depths are adjusted to reflect the tidal / time variables. The tide adjusted depth at each grid cell would drive the portrayal within the EDCIS. This could simply be as a colour coded bathymetric surfaces, or green (safe) amber (beware) and red (no go) areas based on the vessels draft.

There are a number of issues that may need further discussion such as;

- appropriate metadata for data quality, grid resolution, source bathymetry, tidal regime
- portrayal
- what would trigger alarms (e.g. grounding alarm etc ...) in the ECDIS

Suggest that the WG should attempt to draft a rough scope for the product and submit it to TSMAD for discussion and feedback. There will be several OEMs at the meeting who will be sure to provide useful comments.

'Scoping Document' Dynamic Tides and Water Levels in ECDIS

Basic Outline Scope and Requirement

Generate a time variable layer which displays, as designated by the user, the appropriate available safe water on an ENC in an ECDIS.

Depth variability should be based on the available gridded bathymetric surface or triangulated irregular network (TIN) surface, with water level predictions or near real-time observations, generated from single point, simple zone model, complex zone model or co-tidal models. Also it should be based on forecast meteorological surge where these are available.

The display should be capable of showing predicted tides for voyage planning and near real-time tides for voyage execution.

The metadata associated with the display should be available with the delivered tidal data.

Deliver this information with an ENC, or make it available to be applied to an ENC in an ECDIS.

Deliverables