7th Tidal and Water Level Working Group Meeting

21 - 24 April 2015, Civic Building, Silver Spring, MD, USA

Report to the 7th 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 The vice-Chair, Christopher Jones (UK) opened the meeting and welcomed all participants. He also thanked NOAA for hosting the meeting and providing excellent support and facilities. He then invited all delegates – representing Australia, Brazil, Canada, Chile, Ecuador, Japan, Norway, Republic of Korea, Spain, UK, USA and invited expert contributors from academia and industry – to introduce themselves, Annex A.

1.2.1 Rear Admiral Gerd Glang, Hydrographer of the Navy, welcomed all participants and noted the pending integration of the two specialist groups [namely the Tides & Water Level Working Group (TWLWG) and the Surface Currents Working Group (SCWG), thus forming the Tides Water Level & (Surface) Currents Working Group (TWCWG)]. He acknowledged the work of the two groups highlighted the move away from single products to those that met the operational requirements of the customer to aid with their planning and operations.

1.2.2 Mr Richard Edwing, Director NOAA Center for Operational Oceanography Products and Services, welcomed all to the meeting on behalf of the NOAA Office of Coast Survey and wished all a successful meeting. He noted the advances in technology which generate added value and demanded integrated information to aid situational awareness. He highlighted the desire for information to aid future decisions but cautioned on creating information overload for the mariner and bridge teams and indicating the need to focus on what was required not what could be provided.

1.3 David Wyatt (IHB), on behalf of the vice-Chair of TWLWG and the Directing Committee, thanked NOAA for hosting the meeting and providing a high level of support and excellent facilities. He then gave a combined Chair/IHB welcome and introduction, highlighting a number of topics and issue on which the participants should focus during the meeting.

The vice-Chair endorsed these sentiments and highlighted a need for continued active engagement by the TWLWG members during and between meetings to progress actions and WP items.

2 Administrative Arrangements

2.1 The vice-Chair introduced the Agenda which was adopted, Annex B. He reported that apologies for non-attendance had been received from Denmark, Finland, France, Germany, New Zealand, Netherlands, Portugal and South Africa.

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. The list of documents is at Annex C.

2.3 USA provided a short brief covering the extracurricular activities and the visit to NOAA Science Center and the US Coast and Geodetic Survey Tide Predicting Machine.

2.4 The vice-Chair reported on the HSSC6 and the TWLWG report. He highlighted the importance of the HD and the HDWG work and the necessity of engagement with this group. This generated discussions on the relationship between the HD, the S-100 registry and S-57 and the need for TWLWG and SCWG to consider carefully terms and their associated definitions used in S-111 and S-112. CHL asked for clarification on the term non-navigational uses, the numerous uses in areas such as coastal zone management, risk and inundation modelling, offshore structure sites, etc. were highlighted. S-100WG Chair (Julia Powell – USA) noted the work on viewers and test beds, particularly those developed by the Republic of Korea (RoK); she also noted that the S-111 and S-112 PS were the most desired S-100 based PS for which there was considerable customer interest and demand.

2.5 The vice-Chair went through the action items from TWLWG6. The IHB reiterated the need for all those leading on actions to keep the Chair, vice-Chair and IHB informed of progress and completions, so that the Action List can be kept up-dated intersessionally. A new list of Action Items would be prepared for the meeting, Annex D.

It was noted a significant number of items were covered in the agenda for the meeting and it was agreed these should be taken under their appropriate agenda item.

S-100WG Chair suggested there was a need to export S-100 knowledge and expertise to the relevant S-100 Project teams (PT). She considered relevant PTs could meet in association with S-100WG so that members could work with the PT to progress their Product Specifications (PS).

The vice-Chair encouraged all to provide feedback on progress of agenda item actions and to regularly check the website for new items and information.

3 National Presentations

National presentations were received from USA, Canada, Brazil, Norway, Chile and Republic of Korea, all of which are available under the meeting document section, Annex C.

3.1 The USA gave an overview presentation on the current work being undertaken by NOAA and future developments.

3.2 Canada provided an overview presentation on current work and developments, highlighting the customer demand for tide and current PS to enhance navigational safety and operations in the St Lawrence River.

3.3 Brazil gave a presentation on the structure of the Hydrographic Organization and current working being undertaken, including the revitalization of the national tidal network.

3.4 Norway gave a presentation on current work, including the challenge of establishing a tide station on Jan Mayen Island.

3.5 Chile gave a presentation on current work and developments, including details of the upgrade to the national tidal network.

3.6 Republic of Korea gave a presentation the High Accuracy Laser Tide Gauge (LTG-100) used by KHOA.

The presentations generated numerous questions and discussion on open water and stilling-well generated measurements and the impact of rough weather on the resultant data quality.

4 Product Specification Presentations

4.1 Surface Current Product Specification

The vice-Chair of SCWG gave an overview presentation on the work undertaken in the development of S-111 PS, highlighting the future developments.

4.2 Dynamic Water Level Data Product Specification

The Chair of S-100WG gave a presentation covering the work completed by TSMAD29 on the initial development of a draft S-112 PS for dynamic water level data, she highlighted the areas which the TWLWG would need to progress as well as those which may not be relevant as potentially covered by developments of other related PS (S-111, S-411 and S-412).

The Chair of S-100WG continued with a presentation covering the work undertaken during a S-112 PS implementation plenary breakout session during TSMAD29. This generated discussion on a number of topics, including the areas for water level zone change and the maximum acceptable value of step between areas; it was acknowledged this needed to be identified within the PS parameters. Discussion continued into a zone model for water level change – how it could be constructed and applied and, given the potential constraints and impacts on ENCs, how the visualization of the layer and possible variations could be developed. Feature attribute model and tidal zone datasets were identified as topics on which the WG should focus. An in-depth discussion followed around the advantages and disadvantages between gridded and zonal solutions for the application of tidal data in an ECDIS.

5 Product Specification Work Packages

The Chair of SCWG gave a presentation on the Progress in the Formulation of the S-111 Surface Current Data Product; he covered characterisation of the surface current data, definition of the surface current data product and the next steps in developments. He highlighted the HDF5 format is suitable for multiple regular grids. It was agreed that the SCWG needs to finalize the surface current feature so it can be registered and the feature catalogue developed. This presentation initiated discussions on how to define the streamline within the feature catalogue; UNH demonstrated an example portrayal of streamline and gridded surface current data.

The Chair of S-100WG then gave an overview presentation on S-100 and S-101 as background information for all participants. CAN noted that each layer/PS should be independent and stand alone to allow non-navigational uses. The roles and differences between the Registry, Registers and Domain managers were highlighted and explained, particularly the relationship between them.

AUS then led the participants through the current draft Tidal Height PS, amending and altering the document as the discussion progressed. In-depth discussions on definitions of names and origin, most of which were ISO19100 series and therefore

already set, however the differences with the IHO HD were also noted. The review of the draft was completed, AUS agreed to completed further editorial work prior to circulating to participants for further comment before publishing on the website. It was agreed that an application for a S-1xx number would be made to HSSC7. **Action AUS/All**

Work then commenced on developing the Tidal Zone feature attributes.

6 Programme Matters

6.1 Standard constituent list

UK provided a background brief, noting the data and speeds had been received from AUS and agreed the constituent list could be improved. UK agreed to take the additional speed precisions and update the list prior to publication on the IHO website. All were requested to provide feedback on the revised list ready for TWCWG1. **Action UK/All**

6.2 Standard for digital tide tables

USA provided an update on the work and progress for a standard for Digital Tide Tables. A list of fundamental attributes, which had been developed, was displayed; versions of the USA and UK online pages were displayed as examples. The fundamental list is to be included as Annex E to the final meeting report and feedback should be provided to the USA to allow a revised list to be developed for discussion at TWCWG1. **Action USA/All**

6.3 Inventory of tide gauges used by IHO Member States

IHB highlighted that a number of up-dates to the inventory had been received; the vice-Chair encouraged all to check regularly their data listings and to pass any amendments or changes to IHB. Methods for increasing the MS input to the inventory were discussed and it was agreed requests through RHCs was the most likely method to achieve the additional inputs and updating desired. It was agreed all would contact their representative attending RHCs to ensure the issue was raised. **Action All**.

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

The vice-Chair introduced the topic highlighting a new book recently published by Professors David Pugh and Philip Woodworth titled 'Sea Level Science – Understanding Tides, Surges, Tsunamis and Mean Sea-Level Changes'.

NOR informed about a new report on sea level changes for Norway that will be published in September. NOR agreed to provide the URL. **Action NOR** URL for the site: www.klimaservicesenter.no/rapporter

USA provided further background on the issues; the USA agreed to provide a document on the results obtained to date for publication on the IHO website to encourage further study and discussion. **Action USA**

The vice-Chair requested all to take long term records and conduct analysis to extract constituents and exchange the results for further comment and discussion. **Action All.**

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

The vice-Chair took participants through the comparison work undertaken by NZL, which were discussed. It was noted the comparison was originally to provide confidence in the tidal predictions and harmonic constants exchanged between organizations; the idea had been to gain some quantified scientific basis to support the long standing confidence built-up. The vice-Chair thanked NZL for their work and for providing the results for discussion at the meeting. The vice-Chair requested participants to consider providing additional data sets for comparisons. **Action All**

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

UK updated on the work undertaken by the NSHC TWG as well as interaction with the EU and the background to involvement with IENWG. The establishment of EVRF2000 and EVRF2006 were highlighted and the differences between EVRS and LAT as well as between EVRF.

6.7 Exchange of harmonic constants / predictions

UK provided a background brief on past work on the exchange of harmonic constants, predictions and forecast data between MS and increasingly other users of the data. It was noted that a number of IHO resolutions cover this topic. The IHO-UKHO website link to the Digital Transfer of Tidal Harmonic Constants and the current exchange formats was highlighted. The vice-Chair suggested there was room to expand the current formats and schemas, acknowledging the expansion in uses and the demand for better and more comprehensive datasets.

It was considered a standard for transmission of predicted tidal data and harmonic constants should be developed. It was agreed to investigate harmonization of various metadata formats and descriptions of standard formats for harmonic constants. ROK agreed to provide a copy of an XML constituent file to UK. **Action ROK** UK, CAN and NOR agree to investigate differences and commonalities of metadata and propose a way ahead for further development of the standard transfer format. **Action UK/CAN/NOR**

6.8 Determining Ellipsoidal Height of MSL at the Coast

The vice-Chair gave a brief introduction, which was followed by a presentation from AUS on the work undertaken at Port Headland on the establishment of a LAT Hydroid model.

6.9 Actual tides on-line link status

The vice-Chair provided background to the creation of the list. AUS agreed to convert the list into an Excel spread sheet for circulation by IHB. All were requested to review the contents and provide update/corrections. **Action AUS/IHB/All**

7 IHO Resolutions and Charting Specifications

7.1 Review of relevant IHO resolutions

The vice-Chair briefed on the current status of the revisions to the Resolutions and the HSSC6 directive for the TWLWG to resolve the issues with Resolution 3/1919, as

amended, and to generate a revised version for submission to HSSC7. The replies received for IHO CL 44/2014, dated 13 June 2014, were highlighted. The current text of Resolution 3/1919, as amended, was displayed for participants to comment and develop alternative wording.

CAN provided additional details further expanding on the comments provided by them in CL 44/2014; CAN suggested additional criteria to cover datums in rivers and a proposed text was provided. USA (NGA) questioned why HW datum was stated in paragraph 5 of the resolution, which appeared inconsistent with the use of MSL for other uses. Definitions from the HD for Height and Elevation were highlighted as a guide to the use of terms in the resolution.

Comments submitted by the Chair were read by the vice-Chair and displayed for all participants. CAN noted the preference should be to set the datum so that water level changes should be added therefore trying to avoid having to subtract the values. The vice-Chair requested CAN to provide proposed text for all to see and comment as well as removing the 30cms reference from the text.

The vice-Chair went through the proposed amended version, highlighting the changes proposed by the meeting. All participants agreed to the revised text, which would be included as Annex F to the final meeting report and the TWLWG report to HSSC7 for endorsement and subsequent approval of IHO Member States. **Action Chair/IHB**

The meeting then reviewed all other relevant IHO Resolutions. It was acknowledged the wording was styled to accommodate all MS, both the developed and developing, and to take into account the available technologies and capabilities. The background to a number of the resolutions was explained. No amendments were recommended. It was agreed at future meetings the process would be to ask participants if they considered collectively whether any amendments were required rather than go through each one individually.

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

The relevant IHO Charting Specifications were reviewed and it was agreed to recommend to HSSC7 that the TWCWG took responsibility for Resolution 1/2008, as amended, and for its maintenance. It was recommended the resolution be moved into section 2.2 of IHO publication M-3. **Action Chair/IHB**

After discussion it was felt Resolution 3/1947, as amended, still had relevance and a number of occurrences do exist on charts where this Resolution applies. It was felt there remained a need to retain this Resolution and that it should be moved into section 2.2 of IHO publication M-3 and the TWCWG would take responsibility for future maintenance. **Action Chair/IHB**

8 IOC/GLOSS Programme

JPN gave a report on the recent IOC TOWS-8 meeting held in Morioka, 12-13 March 2015.

IHB highlighted the common areas and encouraged attendance at GLOSS meetings. USA noted there was planned to be a USA presence at the meeting planned for Goa, India, in October.

CHL highlighted preparations of a GLOSS manual on experiences and best practices for radar gauges, version 5. It was noted the IOC was requesting expert contributions

and the target for the draft was the 14th session of GLOSS in Goa, India, in October. Background information was provided:

At the GLOSS GE 13 meeting (28 Oct-1 Nov 2013, Liverpool, UK) it was proposed to develop a GLOSS manual on experiences and best practices for radar gauges. The manual will be volume 5 in the series of GLOSS manuals that have been published by IOC since 1990. The manual will build on the volume IV published in 2006 (http://unesdoc.unesco.org/images/0014/001477/147773e.pdf).

The Chair of GLOSS GE has asked Professor Philip Woodworth to serve as editor of the new volume. The envisioned content of the manual is in TWLWG7-81. As in volume IV it is planned to have an annex that provides examples of practical experiences with radar gauges from operators/institutions in the GLOSS network. IOC would be interested both in hearing about experiences with radar gauges used for sea level measurements and wave measurements. The aim is to have a final draft of the Manual available for discussion at the GLOSS GE14 meeting (19-23 October 2015, Goa, India) so a first draft should be available by second half of June 2015.

The Chair suggested in future, any Member State attending could circulate a brief report to TWCWG members after the meeting and it was request that IHB should ordinarily represent the IHO TWCWG at future GLOSS meetings in addition to any individual Member States attending.

9 Capacity Building (CB)

The vice-Chair introduced the documents provided by RSA. IHB gave a brief background on CB and the course requirements. The participants reviewed the intended outcomes of the course; the IHB gave background on the course criteria and the method of delivery through TWCWG members. CAN noted that GPS was missing from the outcomes. The IHB CB levels of development were explained and their relationship with SOLAS. It was noted that the course could be delivered in any of the IHO languages, although this would require translation of the source material.

The meeting commenced a review of the presentation created by RSA and noted that a number of the slides required amendments. Initially a slide by slide review was conducted, however it was agreed for individuals to take sections and provide comments and amendments directly to RSA (Ruth Farre at ruth.farre@sanavy.co.za or hydrosan@iafrica.com), who it was agreed should retain custodianship of the base documents and presentations. It was suggested RSA should review the associated teaching notes once the amended slides had been received to ensure consistency. UK agreed to provide information on the "slide-by-slide" review mentioned above. **Action UK**

It was agreed the following sections would be reviewed:

Pages 27 – 33 and 64 – 75 Currents and Tidal Streams Observations/Measurements – Hess
Pages 38 – 40 Co-tidal charts – Gill
Pages 34 – 38 Tidal levels and datums – Knuuti
Pages 41 – 63 Types of gauges and add in information on the Temporary installation of gauges – Fierro
Pages 76 – 81 Data analysis and predictions – Gill

All were requested to provide the amendments and comments to RSA in sufficient time to allow preparation for the next course delivery in September. **Action UK/USA/CHL**

It was agreed that RSA would remain central to the development of this course, acting as custodian of the base material and coordinating editor. The decision which slides to use on a particular course should be decided between the instructor and the course material editor/custodian (RSA), taking into account any comments from the Regional CB Coordinator, who proposed the course, and the intended audience. All instructors, who deliver the course, should discuss amendments to course material with RSA both before, noting any new developments in technology or techniques, and after, in light of feedback and experience. Although the course may be delivered to various levels of ability, it was agreed one complete presentation and associated material should be developed and subsequently adapted to meet the individual course requirements.

10 TWLWG Work Plan and ToRs

10.1 TWCWG ToRs and RoPs

The ToRs and RoPs for TWCWG as approved by HSSC6 were displayed, Annex G. USA suggested Water Density be added to the paragraph 1.a list of related matters. It was agreed to propose 'relevant oceanographic data' be added to cover this and other closely related parameters. The amendments would be submitted in the report to HSSC7. **Action Chair/IHB**

10.2 TWCWG Work Plan 2016-2017

The IHB displayed the draft work programme for 2016-2017 which had been prepared in advance of the meeting. Amendments were made to reflect discussion and progress during this meeting, Annex H. 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 HSSC7 for approval. **Action Chair/IHB**

10.3 SCPT ToRs and RoPs

The ToRs and RoPs for SCPT were displayed, Annex I. USA suggested Water Density be added to the paragraph 1.a list of related matters. The draft ToRs and RoPs would be presented at SCWG3 **Action Chair/IHB**

10.4 SCPT Work Plan 2016-2017

The IHB displayed the draft work programme for 2016-2017 which had been prepared in advance of the meeting. Amendments were made to reflect discussion and progress during this meeting, Annex H. 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 further. **Action Chair/IHB**

11 Any other business

11.1 WG reorganization plans and integration of SCWG

The vice-Chair provided some background on the outcome of HSSC6 and explained the suggested process; the SCWG, on completion of their meeting SCWG3 in Tokyo

in May, would be asked to reform as the SCPT. CAN suggested to create balance that a TWPT could be considered. Considerable discussion followed on future composition of the WG and PTs and how they should progress the WPs, including format of meetings and locations. Considerations of MS on ability to support the WG and PTs were discussed. BRZ suggested having combined meetings with sessions dedicated to certain topics and work items, it was also suggested to extend the meeting to 5 days. It was agreed the 1st session of TWCWG will be 5 days and include all WP items; the vice-Chair TWLWG requested the Chair of SCWG either for that WG to reform as the SCPT or to be absorbed as a Work Package item on completion of their meeting in Tokyo in May, this process would be discussed at SCWG3. **Action vice-Chair TWLWG/Chair SCWG** It was agreed to review the format and processes at the end of TWCWG1.

12 Venue and dates of the 1st TWCWG Meeting

The vice-Chair asked if any MS would volunteer to host TWCWG1. BRZ agreed to investigate hosting during the week 18-22 April 2016.

13 Review of Action Items

13.1 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 TWCWG Work Plan. An updated list of the Action Items will be maintained on the TWCWG1 web page and all those who have actions to complete should keep the IHB informed of any progress. **Action ALL.**

14 Election of chair, vice-chair and secretary of TWCWG

The vice-Chair asked whether there were any volunteers for the role of Chair. Gwenaële Jan (SHOM - France) was elected as Chair and Louis Maltais (CHS - Canada) as vice-Chair of TWCWG. The meeting requested IHB to continue in the role of secretary.

15 Draft Report to the HSSC / Draft Agenda for TWCWG1

15.1 It was agreed that the IHB would circulate a draft meeting report to all attendees by 8 May. **Action IHB.** Participants were requested to provide any comments by 22 May. **Action ALL.** It was intended the final meeting report would be published by 5 June. **Action IHB**

15.2 The IHB, Chair and vice-Chair would prepare the final report to HSSC7 using the format required by HSSC. Representation of TWLWG at the HSSC7 meeting would be discussed between the Chair and the vice-Chair. **Action IHB, Chair & vice-Chair**

15.3 A draft Agenda was presented to the meeting and is included at Annex I to this report. The draft Agenda may require further amendment following the outcome of HSSC7.

16 Closing remarks

The vice-Chair closed the meeting by thanking all for their efforts and hard work, he noted the benefits value of interaction with the Chair of S-100WG, and he felt significant benefit had been gained. He also highlighted the considerable contribution by the members of the SCWG and looked forward to working with them in the new

TWCWG. The vice-Chair highlighted the progress achieved on the numerous tasks, whilst identifying the focus of future work. He particularly thanked Stephen Gill for all his hard work over many years and for his valued contribution to the success of the meeting. He welcomed Peter Stone and looked forward to his future contribution.

Mr Stephen Gill (USA) thanked all for all their contributions over the years and how pleased he was to host the final TWLWG meeting and how much he had enjoyed engaging with the many participants over the year. He wished the new group every success in the future.

The vice-Chair thanked the USA delegate and NOAA for the venue, facilities and the support provided throughout the meeting, all of which helped to ensure the overall success and significant progress on a number of key issues. He also thanked the IHB for the support and guidance provided throughout the week.

The meeting closed at 1215 on 24 April 2015

The following Annexes are attached:

A. TWLWG7 – List of Participants.
B. TWLWG7 – Agenda
C. TWLWG7 – List of Documents
D. TWLWG7 – List of Actions
E. TWLWG7 – List of fundamental attributes for Digital Tide Tables
F. TWLWG7 – Proposed revised IHO Resolution 3/1919, as amended
G. TWLWG7 – TWCWG ToRs and RoPs
H. TWLWG7 – TWCWG draft Work Programme 2016-2017
I. TWLWG7 – SCPT draft ToRs and RoPs
J. TWLWG7 – TWCWG1 Draft Agenda

LIST OF PARTICIPANTS

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Tidal and Water Level Working Group
Silver Spring, Maryland, USA – 21-24 April 2015
Agenda – (TWLWG7)

1 Opening

.1 Opening address by the Chair
.2 Address by host nation
  i. Rear Admiral Gerd Glang (NOAA Office of Coast Survey)
  ii. Mr Richard Edwing (Director NOAA Center for Operational Oceanographic Products and Services)
.3 Welcome by the IHB

2 Administrative Arrangements

.1 Adoption of the Agenda and Apologies – Chair/Secretary
.2 Programme and timetable of the Sessions – Chair/Secretary
.3 Meeting administration, including H&S – Host
.4 Report on Intercessional Activities including HSSC 6 – Chair
.5 Matters arising from TWLWG 6/Review of Action Items – Secretary

3 National Presentations

.1 Presentations by delegates on "National Tidal Issues"

4 Product Specification Presentations

.1 Surface Current Product Specification (S-111) – chair & vice-chair of SCWG
.2 Dynamic Water Level Data Product Specification (S-112) – chair S-100 WG

5 Product Specifications Work Packages

.1 WP1 Product Specification - Dynamic application of tides in ECDIS {C.1} - (Leader: Australia/Participants: All) – Australia
.2 WP2 Real time data transfer format - Standard for the transmission of real time tidal data {C.2} - (Leader: UK/Participants: All) – UK
.3 WP3 Gridded product (Leader: USA/Participant: All) – USA
.4 WP4 Surface Tidal Current - Navigationally significant surface current - (Leader: SCWG chair/Participants: All) – chair SCWG

6 Programme Matters

Note:{xx} indicates TWLWG Work Plan reference

.1 Standard Constituent List {A.1} – UK
.2 Standard for digital Tide Tables {B.2} – USA
.3 Inventory of Tide gauges used by IHO Member States {F.1} – IHB
.4 The study of long term data sets for the determination of global sea level rise. {H.1} – UK, Norway, USA & Spain
.5 Compare Tidal Predictions generated as a result of analysis of a common data set by different analysis software {A.2} – USA
.6 Establishment and Maintenance of VRF for High Resolution Bathymetric Surfaces {E.1 – E.3} – UK and ??
.7 Exchange of Harmonic Constants / Predictions – UK
.8 Determining ellipsoidal height of MSL at the coast – All
.9 Actual Tides On-line Link status – All

7 IHO Resolutions and Charting Specifications

.1 Review of relevant IHO Resolutions – IHB
.2 Review of relevant IHO Charting Specifications – IHB

8. IOC/GLOSS Programme

.1 Update on IOC/GLOSS Programme items and events – GLOSS/IHB
.2 TOWS-8 meeting report - JAP

9. Capacity Building

.1 Tides and Water Levels Workshop training material

10. Work Plan and ToRs

.1 Review TWCWG ToRs and RoPs – IHB
.2 TWCWG Work Plan up-dates – IHB
.3 Review SCPT ToRs and RoPs – IHB
.4 Review SCPT Work Plan – IHB

11 Any Other Business

.1 WG reorganization plans and integration of SCWG

12 Venue and dates of the 1st TWCWG Meeting (TWCWG1)

13 Review of Action Items from TWLWG7

14 Election of chair and vice-chair of TWCWG

15 Draft Report to HSSC7/Draft Agenda for TWCWG1

16 Closing remarks

TWLWG 7 - List of Documents

Document No	Document Title
TWLWG7 Letter 1	Letter of Invitation
TWLWG7 Annex B	Foreign Visitors Form (Word version)
TWLWG7 Annex C	TWLWG 7 Logistics
TWLWG7 Introduction	TWLWG Chair Introduction
TWLWG7-2.1-Agenda	Agenda
TWLWG7-2.2- Programme	Programme
TWLWG7-2.4-1	TWLWG Report to HSSC 6
TWLWG7-2.4-2	TWLWG Presentation to HSSC 6
TWLWG7-2.4-3	SCWG Report to HSSC 6
TWLWG7-2.4-4	SCWG Presentation to HSSC 6
TWLWG7-2.4-5	Extract from HSSC 6 Report
TWLWG7-2.5- Actions	TWLWG 6-List of Actions - 3 December 2014
TWLWG7-4.2.1	Zone model for dynamic tide and water level for ECDIS
TWLWG7-4.2.2	TSMAD29_DIPWG7-06.4B_Dynamic_Water_Level_Data_Transfer_Product_Specification
TWLWG7-4.2.3	TSMAD29_DIPWG7-06.4C_Draft_S-112_DynamicWaterLevelDataProductSpecification
TWLWG7-4.2.4	Information paper for the S-112 implementation plenary breakout session
TWLWG7-6.3	IHO CL36_2010
TWLWG7-6.5	Data Analysis Comparison-New Zealand
TWLWG7-7.1-1	IHO Resolutions
TWLWG7-7.1-2	IHO Resolution 3-1919
TWLWG7-7.1-2	IHO Resolution 3-1919 notes
TWLWG7-7.2	Review of relevant IHO Charting Specifications
TWLWG7-8.1	Draft GLOSS manual on experiences and best practices for radar gauges - table of contents
TWLWG7-8.2	GLOSS TOWS-8 Report
TWLWG7-9.1.1	SAIHC Tides and Water Levels Workshop Presentation
TWLWG7-9.1.2	SAIHC Tides and Water Levels Workshop Outcomes
TWLWG7-10.1	TWCWG Work Plan 2016-2017
TWLWG7-10.2-1	TWCWG ToR
TWLWG7-10.2-2	Draft SCPT ToRs

TWLWG7-15	TWCWG 1 - Draft Agenda
TWLWG7 Presentations	Presentations.zip
TWLWG7 Participants	List of Participants

LIST OF ACTIONS – Updated 29 May 2015

Agenda Item	Subject	Status/Date	Comments	Action
Continuous				
6.5	Compare tidal predictions	On going	Additional suitable data sets for general analysis to be provided by members to IHB	All
6.5	Compare tidal predictions	On going	Report progress on results and analysis	All
6.4	Study of long term data sets	On going	All to take long term records to conduct analysis of constituents and to exchange the results	All
6.3	Inventory of tide gauges	On going	Contact national representative attending RHCs to raise awareness of inventory and encourage input and updating of information	All
6.3	Inventory of tide gauges	On going	Regularly check entries and provide up-dates and amendments to IHB as necessary	All
6.9	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 7				
5	Tidal Height Product Specification	29 May	Complete editorial review of current draft the circulate for comment	AUS
5	Tidal Height Product Specification	12 Jun	Provide feedback on draft Tidal Height Product Specification	All
5	Tidal Height Product Specification	26 Jun	Collect feedback comments and upload to TWCWG website	AUS/IHB
6.1	Standard Constituent List	TWCWG1	Add additional data and upload to website for further comment.	UK/IHB/All
6.2	Standard for Digital Tide Tables	TWCWG1	Provide feedback on list of fundamental attributes to allow revised list to be created	USA/All
~~6.4~~	~~Study of long term data sets~~	~~22 May~~ Complete	~~Provide URL of government website for inclusion in final meeting report~~	~~NOR~~
6.4	Study of long term data sets	26 Jun	Provide a document on the results obtained to date for publication on the IHO website	USA/All
6.7	Exchange of harmonic constants / predictions	22 May	Provide a copy of an XML constituent file to UK	ROK

6.7	Exchange of harmonic constants / predictions	TWCWG1	Investigate differences and commonalities of metadata and propose a way ahead for development of a standard transfer format	UK/CAN/NOR
6.9	Actual Tides On-line Link	26 Jun	Convert the list into an Excel spread sheet for circulation by IHB	AUS/IHB
7.1	IHO Resolution 3/1919	HSSC7	Included revised version as an Annex to the final meeting report and the TWLWG report to HSSC7	Chair/IHB
7.2	Review of IHO Charting Specifications	HSSC7	Recommendation Resolution 1/2008 be moved into section 2.2 of IHO publication M-3 to be report to HSSC7	Chair/IHB
7.2	Review of IHO Charting Specifications	HSSC7	Recommendation Resolution 3/1947 be moved into section 2.2 of IHO publication M-3 to be report to HSSC7	Chair/IHB
9	Capacity Building	26 Jun	Provide information on the slides reviewed during the meeting to RSA	UK
9	Capacity Building	26 Jun	Provide the amendments and comments on sections to RSA	UK/USA/CAN/CHL
10.1	TWCWG ToRs and RoPs	HSSC7	Propose 'relevant oceanographic data' be added to cover water density and other closely related parameters. The amendments would be submitted in the report to HSSC7.	Chair/IHB
10.2	TWCWG Work Plan 2016-2017	31 Jul	Provide comment prior to submitting draft to HSSC7 with TWLWG report	Chair/IHB/All
10.3	SCPT ToRs and RoPs	13 May	Draft ToRs and RoPs would be presented at SCWG3	IHB
10.4	SCPT Work Plan 2016-2017	2 May	Provide Word version to Chair SCWG	IHB
10.4	SCPT Work Plan 2016-2017	14 May	Submit draft to SCWG3 for confirmation and submission to TWCWG1	Chair/IHB
11	Any other business	14 May	Vice-Chair TWLWG requested the Chair of SCWG either for that WG to reform as the SCPT or to be absorbed as a Work Package item on completion of their meeting in Tokyo in May, this process would be discussed at SCWG3.	Vice-Chair TWLWG/Chair SCWG
12	TWCWG 1 venue and dates	26 Jun	BRZ to investigate hosting TWCWG1 and to discuss appropriate dates and circulate an initial letter of invitation and posted on the website. Notification received that BRZ unable to host TWCWG1 due to	BRZ/IHB

			other commitments; alternative host requested	
13	Action List	TWCWG1	Keep IHB and the Chair informed of progress with allocated actions	All
~~15~~	~~TWLWG7 Draft Report~~	~~8 May~~ Complete	~~Draft to be circulated for comment~~	~~IHB~~
~~15~~	~~TWLWG7 Draft Report~~	~~22 May~~ Complete	~~All to provide comments on draft report~~	~~All~~
~~15~~	~~TWLWG7 Final Report~~	~~5 Jun~~ Complete	~~Publish final report~~	~~IHB~~
15	Report to HSSC7	31 Jul	Draft report for review and amendment.	Chair/vice-Chair/IHB

TWLWG 7 Programme Matters – skgill draft 4/14/2015

6.2 Standard for Digital Tide Tables

The following is a list of fundamental attributes that digital tide prediction tables should have:

A. Station Information
- Station Name
- Body of Water Descriptor (if appropriate)
- Station Number (as appropriate)
- Latitude and Longitude (degrees:min:sec and tenths? or decimal equivalent)
- Location Map with nearby stations

C. Earth-Moon-Sun Astronomical Calendar Information (Tabular and/or integrated with graphical data output)

D. Sunrise/Sunset Calendar Information (Tabular and/or integrated with graphical data output)

E. Datum reference for all predicted data
- Default Reference Datum is the Chart Datum used by the Country.
- Ability to reference predictions to LAT if not the default Reference Datum.
- Ability to reference predictions to other tidal datums (such as HAT, MHW, MSL) and user identified datum such as a national geodetic datum or other coastal engineering or threshold datums.

F. Data displays and tables in Metric or English units, with default depending upon country

G. Time Zone display with Local Standard Time as default, with user selected option for UTC/GMT , daylight savings time, etc.

H. Source of tidal predictions is provided via links to metadata information:
- Harmonic Constants or Time and Range Correction to Reference Station
- Dates of Harmonic Analyses time series used to create the set of Harmonic Constants used in the prediction.
- Links to list of the Harmonic Constants used in the Prediction
- Dates of the observations used to create tabular time and height corrections (for Table 2 or secondary port stations) to a reference Station.

I. Ability to obtain graphical and tabular output for desired time period (historical and into the future) for:

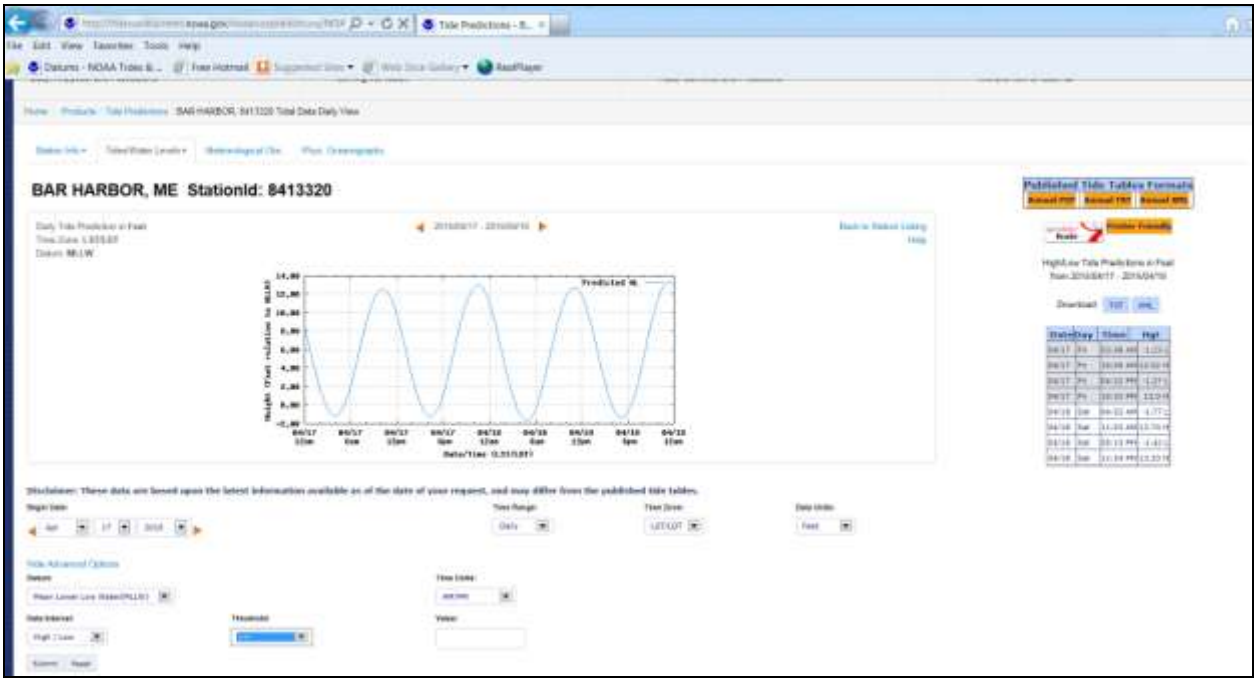
- Time series at minimum 1- hour increments.
- Times and heights of predicted high and low tides.
- Time series plots non-harmonic stations using curve fit to times and heights of high and low waters

J. Ability to obtain output in PDF, TXT, XML, CSV, S-112 formats

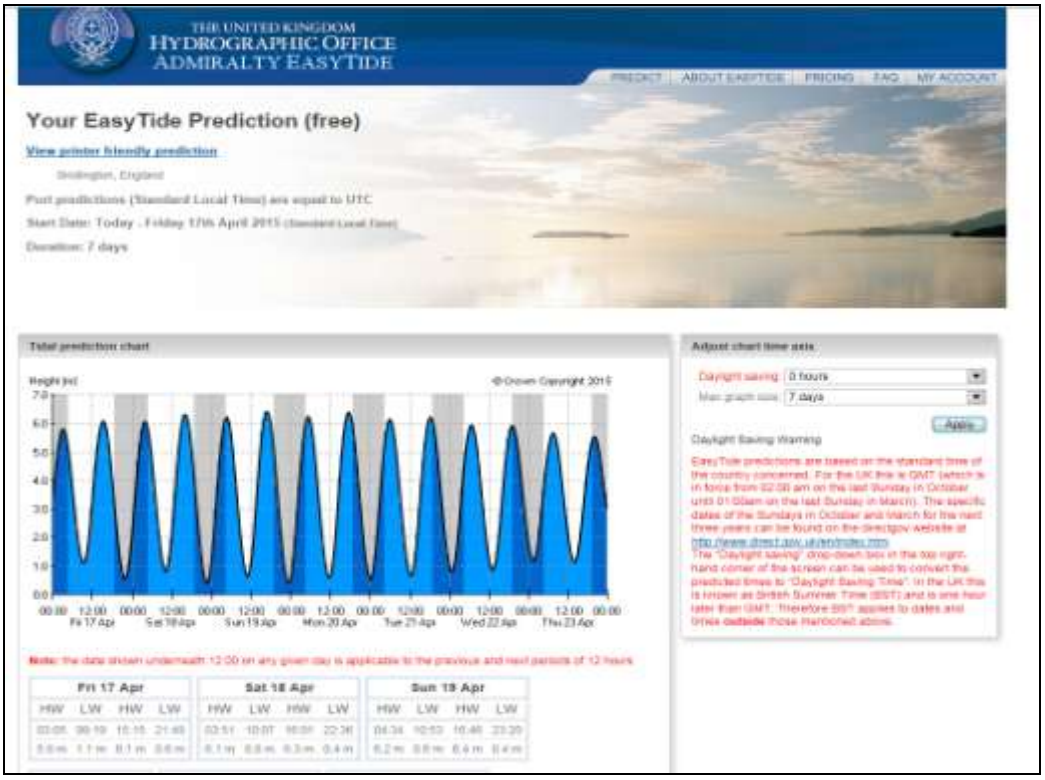
K. Readme files for special warning notes explaining areas of anomalous tidal conditions or special datums (dual high or low waters, tidal bores, river flow dependencies and river datums, frequent non-tidal conditions, etc..)

L. Estimates of uncertainty in the predicted times and heights of high and low waters.

NOAA Example



UK Example


THE UNITED KINGDOM
HYDROGRAPHIC OFFICE
ADMIRALTY EASYTIDE
Your EasyTide Prediction (free)
View printer friendly prediction
Tidal prediction chart
Adjust chart time axis
Daylight Saving Warning
Fri 17 Apr
Sat 18 Apr
Sun 19 Apr

IHO Resolution 3/1919, as amended – Draft Proposal

TITLE	Reference	Last amendment (CL or IHC)	1st Edition Reference
DATUMS AND BENCH MARKS	**3/1919 as amended**	***19/2008***	**A2.5**

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~~ Ocean tidal areas

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.

8 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.

Mixed (where water level variability is due to both tidal and regionally specific forcing mechanisms) and Inland Waters

It is resolved that depths, and all other navigational information should be referred to an appropriate level practically acceptable to Hydrographic Offices (such as 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.

In geographical areas ~~with limited connection to oceans and negligible tidal range (< 30 cm)~~ where the tidal range is negligible and in non-tidal areas

~~8~~9 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~~10 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~~11 ~~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.~~

Tides, Water Level and Currents Working Group (TWCWG)

Terms of Reference and Rules of Procedure

Reference: *6th HSSC Meeting (Viña del Mar, Chile, November 2014)*

1. Objective

a) To provide technical advice and coordination on matters related to tides, water levels, currents, relevant oceanographic data and vertical datum, including integrated water level/current data models.

b) To support the development and maintenance of related specifications in liaison with the relevant IHO bodies and non-IHO entities;

c) To develop and maintain the IHO publications for which the WG is responsible.

2. Authority

This WG is a subsidiary of the Hydrographic Services and Standards Committee (HSSC). Its work is subject to HSSC approval.

3. Composition and Chairmanship

a) The WG shall comprise representatives of IHO Member States (MS), Expert Contributors (EC), observers from accredited NGIO, and a representative of the IHB ("IHB" to be replaced by "IHO Secretariat" when the IHO Secretariat is established). A membership list shall be maintained and posted on the IHO website.

b) EC membership is open to entities and organizations that can provide a relevant and constructive contribution to the work of the WG.

c) The Chair and Vice-Chair shall be a representative of a MS. The election of the Chair and Vice-Chair shall be decided at the first meeting after each ordinary session of the Conference (Conference to be replaced by Assembly when the revised IHO Convention enters into force) and shall be determined by vote of the MS present and voting.

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

e) If the Chair is unable to carry out the duties of the office, the Vice-Chair shall act as the Chair with the same powers and duties.

f) ECs shall seek approval of membership from the Chair.

g) EC membership may be withdrawn in the event that a majority of the MS represented in the WG agrees that an EC's continued participation is irrelevant or unconstructive to the work of the WG.

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

i) In the event that a large number of EC members seek to attend a meeting, the Chair may restrict attendance by inviting ECs to act through one or more collective representatives.

4. Procedures

a) The WG should:

(i) monitor and develop the use of tidal, water level, ~~and~~ current information and relevant oceanographic data including integrated water level/current data models;

(ii) advise on the use of vertical datums;

(iii) advise on tidal, water level and current observation, analysis and prediction;

(iv) advise on matters concerning exchange, distribution and use of tidal, water level , ~~and~~ current information and relevant oceanographic data related data/information;

(v) study principles and contribute to the development of improved methods for conveying tidal, water level , ~~and~~ current information and relevant oceanographic data to mariners and other users;

(vi) keep under review the relevant IHO publications and resolutions in order to advise HSSC on their updating;

(vii) draft or revise guidance document(s), resolutions and specifications as appropriate and as instructed by HSSC; and

(viii) consider new related topics as instructed by HSSC and advise HSSC accordingly.

b) The WG should work by correspondence, teleconferences, group meetings, workshops or symposia. The WG should meet about once a year. When meetings are scheduled, and in order to allow any WG submissions and reports to be submitted to HSSC on time, WG meetings should not normally occur later than nine weeks before a meeting of the HSSC.

c) Decisions should generally be made by consensus. If votes are required on issues or to endorse proposals presented to the WG, only MS may cast a vote. Votes at meetings shall be on the basis of one vote per MS represented at the meeting. Votes by correspondence shall be on the basis of one vote per MS represented in the WG.

d) The date and venue of group meetings shall normally be announced by the Chair at least six months in advance.

e) The draft record of meetings shall be distributed by the Chair (or the secretary) within six weeks of the end of meetings and participants' comments should be returned within three weeks of the date of despatch. Final minutes of meetings should be posted on the IHO website within three months after a meeting.

f) Sub-working groups and project teams may be created by the WG or proposed to HSSC to undertake detailed work on specific topics. The terms of reference and rules of procedure of the sub-working groups and project teams are determined or proposed by the WG as appropriate.

g) The WG should liaise with other IHO bodies, international organizations and industry to ensure the relevance of its work.

h) The WG should prepare annually a report on its activities and a rolling two-year work plan, including expected time frame.

TWCWG WORK PLAN 2016-17

Objective

a) To monitor developments related to tidal and water level observation, analysis and prediction and other related information including vertical and horizontal datums;

b) To develop and maintain the relevant IHO standards, specifications and publications for which it is responsible in liaison with the relevant IHO bodies and non-IHO entities;

c) To develop standards for the delivery and presentation of navigationally relevant current information; and

d) To provide technical advice and coordination on matters related to tides, water levels, currents and vertical datum.

Tasks

A	Maintain the list of standard tidal constituents (IHO Task 2.7.2.3)
B	Compare the tidal predictions generated as a result of analysis of a common data set using different analysis software
C	Develop, maintain and extend a Product Specification for digital tide tables (IHO Task 2.7.3)
D	Develop, maintain and extend a Product Specification for the transmission of real-time tidal data (IHO Task 2.7.4)
E	Develop, maintain and extend a Product Specification for the transmission of real-time surface current data (S-111 - IHO Task 2.13.3)
F	Develop, maintain and extend a Product Specification for dynamic surface currents in ECDIS (IHO Task 2.13.4)
G	Develop, maintain and extend a Product specification for dynamic tides in ECDIS (IHO Task 2.7.5)
H	Liaise with S-100WG on tidal and current matters relevant to ECDIS applications
I	Liaise with industry experts on the development of product specifications for tides and currents
J	Prepare and maintain an inventory of tide gauges and current meters used by Member States and publish it on the IHO/TWLWG web site (IHO Task 2.7.2.4)
K	Review feedback of on-line real time water level observation document
L	Maintain and extend the relevant IHO standards, specifications and publications as required (IHO Tasks 2.7.2 and 2.13.2)
M	Conduct the 2016 and 2017 meetings of TWCWG and its sub-group(s) and project team(s) (IHO Tasks 2.7.1 and 2.13.1)
N	Develop and maintain material for course on Tides, ~~and~~ Water Levels and Currents

Work item	Title	Priority H-high M-medium L-low	Next milestone	Start Date	End Date	Status P-planned O-ongoing C-completed S-Superseded	Contact Person(s)	Related Pubs / Standard	Remarks
A.1	Maintain the list of standard tidal constituents	M		-	Permanent	O	Chris Jones*		Review current list of published tidal constituents
B.1	Compare the tidal predictions generated as a result of analysis of a common data set using different analysis software.	M		-	Permanent	O	Hilda Sande * All		Select Common data set Analyze using different software Predict common set of tides Compare results
C.1	Develop, maintain and extend the standard for digital tide and tidal current tables	H	Prepare draft Standard	2009	2016	O	Peter Stone* Chris Jones Zarina Jayaswal		
D.1	Develop and maintain a standard for the transmission of real-time tidal data (S-112)	H		2009	2017	O	Chris Jones* All		Establish joint project teams as required. Liaise with S-100WG (see H.1) Liaise with industry experts (see I.1)
E.1	Develop and maintain a product specification for the transmission of real-time surface current data (S-111)	H		2013	2017	O	Kurt Hess* Louis Maltais		Establish joint project teams as required. Liaise with S-100WG (see H.1) Liaise with industry experts (see I.1)
F.1	Develop and maintain a product specification for dynamic application of navigationally significant surface currents in ECDIS	H		2013	2017	O	Louis Maltais* Kurt Hess		Establish joint project teams as required. Liaise with S-100WG (see H.1) Liaise with industry experts (see I.1)

Work item	Title	Priority H-high M-medium L-low	Next milestone	Start Date	End Date	Status P-planned O-ongoing C-completed S-Superseded	Contact Person(s)	Related Pubs / Standard	Remarks
G.1	Develop and maintain a product specification for dynamic application of tides in ECDIS	H	Prepare draft Product Specifications (S-1xx) for tidal data in S-100. Prepare draft Portrayal model for tidal data in S-100.	2009	2017	O	Zarina Jayaswal* Glen Rowe Jimin Ko Peter Stone* Zarina Jayaswal		Establish joint project teams as required. Liaise with S-100WG (see H.1) Liaise with industry experts (see I.1)
H.1	Liaise with S-100WG on tidal and current matters relevant to ECDIS applications	H		-	Permanent	O	Gwenaële Jan Kurt Hess		Establish joint project teams as required.
I.1	Liaise with industry experts on the development of product specifications for tides and currents	H		-	Permanent	O	All		
J.1	Maintain an inventory of tide gauges and current meters used by Member States and publish it on the IHO/TWCWG web site.	H		-	Permanent	O	David Wyatt* All		Initial inventory from TWCWG members available on IHO web site.
K.1	Review feedback of on-line real time water level observation document	L		-	Permanent	O	Zarina Jayaswal* All		

Work item	Title	Priority H-high M-medium L-low	Next milestone	Start Date	End Date	Status P-planned O-ongoing C-completed S-Superseded	Contact Person(s)	Related Pubs / Standard	Remarks
L.1	Maintain and extend the relevant IHO standards, specifications and publications	M M	 Review wording of IHO Resolution 3/1919, as amended, in light of revised definitions for MSL and LAT	- 2014	Permanent 2015	O O	Gwenaële Jan	IHO Resolutions in M-3 S-60 User's Handbook on Datum Transformations involving WGS 84	
N.1	Develop and maintain material for course on Tides	H	Delivery in 2015	-	Permanent	O	Ruth Farre* Louis Maltais Peter Stone Zarina Jayaswal		Adapt currently available course material to create a course suitable for delivery in support of CBSC requests

Meetings (Task M)

Date	Location	Activity
25-28 Mar 2014	Wollongong, Australia	TWLWG-6
3-5 Jun 2014	Quebec City, Canada	SCWG-2
21-24 April 2015	Silver Spring, Maryland, USA	TWLWG-7
13-15 May 2015	Tokyo, Japan	SCWG-3
2016 (TBD)	TBD	TWCWG-1

Chair: Gwenaële Jan (France) Email: gwenaele.jan@shom.fr
Vice Chair: Louis Maltais (Canada) Email: Louis.maltais@dfo-mpo.gc.ca
Secretary: David Wyatt Email: adso@iho.int

Surface Currents Project Team (SCPT)

Terms of reference and rules of procedure

Reference: 1st TWCWG Meeting [location, date]

1. Objective

To develop standards for the delivery and presentation of navigationally significant surface current information.

2. Authority

This Project Team is a subsidiary of the Tides, Water Level and Currents Working Group (TWCWG). Its work is guided by the work plan established by TWCWG and subject to its approval.

3. Procedures

a. The PT should:

i) develop S-100 based product specifications for navigationally significant currents, including definitions and content, and display requirements with technical characteristics;

ii) advise IHO on matters concerning the exchange, distribution, display, and use of navigationally significant current data; and

iii) liaise with relevant IHO WG's to ensure technical feasibility and compatibility of relevant developed proposals.

b. The WG should work primarily by correspondence, although face to face meetings at the project start is desirable, and thereafter may be convenient when held in conjunction with another convenient IHO forum.

c. The WG should liaise with other international bodies as appropriate.

4. Composition and Chairmanship

a) The Project Team shall comprise representatives of IHO Member States (MS), Expert Contributors (EC) and observers from accredited NGIO. The IHB may be represented ("IHB" to be replaced by "IHO Secretariat" when the IHO Secretariat is established). A membership list shall be maintained and posted on the IHO website.

b) EC membership is open to entities and organizations that can provide a relevant and constructive contribution to the work of the Project Team.

c) The PT Leader is designated by the parent body.

d) If a secretary is required it should normally be drawn from a member of the Project Team.

e) ECs shall seek approval of membership from the PT Leader.

f) EC membership may be withdrawn in the event that a majority of the members in the Project Team agrees that an EC's continued participation is irrelevant or unconstructive to the work of the Project Team.

5. Procedures

a) The Project Team should work primarily by correspondence and teleconferences, although face to face meetings at the project start, and at other significant milestones, may be convenient when held in conjunction with another convenient IHO forum.

b) Decisions should be made by consensus. Dissenting opinions if any should be reflected in the Project Team report.

c) The Project Team should liaise with other IHO bodies, international organizations and industry to ensure the relevance of its work.

d) The Project Team should report in accordance with its work plan.

Tides, Water Level and Currents Working Group
??, ?? – ??-?? ?? 2016
Draft Agenda – (TWCWG 1)

1 Opening

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

2 Administrative Arrangements

.1 Adoption of the Agenda and Apologies – Chair/Secretary
.2 Programme and timetable of the Sessions – Chair/Secretary
.3 Meeting administration, including H&S – Host
.4 Report on Intercessional Activities including HSSC 7 – Chair
.5 Matters arising from TWLWG 7/Review of Action Items – Secretary

3 National Presentations

.1 Presentations by delegates on "National Tidal and Current Issues"

4 Product Specifications Work Packages

.1 WP1 Product Specification - Dynamic application of tides in ECDIS {C.1} - (Leader: Australia/Participants: All) – Australia
.2 WP2 Real time data transfer format - Standard for the transmission of real time tidal data {C.2} - (Leader: UK/Participants: All) – UK
.3 WP3 Gridded product (Leader: USA/Participant: All) – USA
.4 WP4 Surface Current Product Specification - Navigationally significant surface current - (Leader: SCWG chair/Participants: All) –

5 Product Specification Presentations

.1 Surface Current Product Specification (S-111)
.2 Dynamic Water Level Data Product Specification (S-112)
.3 Tidal Height Product Specification (S-1xx)

6 Programme Matters

Note:{xx} indicates TWCWG Work Plan reference

.1 Standard Constituent List {A.1} – UK
.2 Standard for digital Tide and Current Tables {B.2} – USA
.3 Inventory of Tide gauges used by IHO Member States {F.1} – IHB
.4 The study of long term data sets for the determination of global sea level rise. {H.1} – UK, Norway, USA & Spain
.5 Compare Tidal Predictions generated as a result of analysis of a common data set by different analysis software {A.2} – USA
.6 Establishment and Maintenance of VRF for High Resolution Bathymetric Surfaces {E.1 – E.3} – UK and ??
.7 Exchange of Harmonic Constants / Predictions – UK
.8 Determining ellipsoidal height of MSL at the coast – All
.9 Actual Tides On-line Link status – All

7 IHO Resolutions and Charting Specifications

.1 Review of relevant IHO Resolutions – IHB
.2 Review of relevant IHO Charting Specifications – IHB

8. IOC/GLOSS Programme

.1 Update on IOC/GLOSS Programme items and events – GLOSS/IHB

9. Capacity Building

.1 Tides and Water Levels Workshop training material

10. Work Plan and ToRs

.1 TWCWG Work Plan up-dates – IHB
.2 Review TWCWG ToRs and RoPs – IHB
.3 Review SCPT ToRs and RoPs – IHB

11 Any Other Business

.1

12 Venue and dates of the 2nd TWCWG Meeting (TWCWG2)

13 Review of Action Items from TWCWG1

14 Draft Report to HSSC 8/Draft Agenda for TWCWG2

15 Closing remarks