7th IHO-HSSC Meeting

Report of the Tidal and Water Level Working Group

Submitted by:	Chairman, TWLWG
Related Documents:	Report of TWLWG7 meeting (available from IHO web site).
Related Projects:	None

Chair:	Gwenaële Jan, France
Vice-Chair:	Christopher Jones, UK
Secretary:	David Wyatt, IHB
Member States:	Argentina, Australia, Brazil, Canada, Chile, China, Denmark, Ecuador, Egypt, Estonia, Finland, France, Germany, India, Indonesia, Italy, Japan, Netherlands, Korea Rep of, New Zealand, Norway, Peru, Poland, Portugal, Russian Federation, Singapore, South Africa, Spain, Sweden, Ukraine, UK, Uruguay, USA, Venezuela.
Expert Contributor:	Bohdan Pillich (Tidal Expert)
Organisations:	IOC-GLOSS
	see Annex A for full details

Meetings Held During Reporting Period
TWLWG7 21-24 April 2015, Silver Spring, MD, USA

Next Meeting
TWCWG1 25-29 April 2016, Brazil

Work Program
The 7th meeting was held at the Civic Building, Silver Spring, Maryland, USA from 21 to 24 April 2015 and was hosted by the Office of Coast Survey, NOAA. The meeting was attended by 17 representatives from 12 IHO Member States, the IHB and expert contributors from the Centre for Coastal and Ocean Mapping, University of New Hampshire, and SPAWAR Atlantic. In the absence of the chair of the TWLWG, Ms. Gwenaële Jan (France), Mr Christopher Jones (UK), Vice-Chair of the TWLWG, ran the meeting.

Progress was made on a standard for digital tide tables with the development of a list of fundamental attributes. It was agreed to highlight the inventory of tide gauges through Regional Hydrographic Commissions with the view to raising awareness and encouraging additional inputs. The compiled list of Actual Tides On-line Links was highlighted; a process for validating and updating the list was agreed so that the list can be uploaded to the website and maintained as a resource for Member States.

A full day was set aside to work on the S-100 based product specifications guided by the Chair of S-100WG. The Chair S-100WG provided briefs on S-100 and S-101 - the ENC Product Specification, as well as work undertaken at TSMAD29 on S-112 - dynamic water level data product specification. The meeting also received presentations on various aspects of the work of the Surface Current Working Group and S-111 - Surface Current Data Product Specification. Significant progress was achieved in reviewing a draft Tidal Height product specification and work was started on developing the Tidal Zone feature attributes; it was agreed an application for a S-1xx number should be made to the 7th meeting of the HSSC.

Proposed revised wording of IHO Resolution 3/1919, as amended, was agreed after a review of the comments received in response to IHO CL 17/2014 - Proposed Revisions to IHO Resolutions on Tides, Water Levels and Tidal Publications. The proposed revisions are submitted to the 7th meeting of the HSSC for endorsement prior to seeking adoption by IHO Member States, see Annex C.

The intended outcomes and the presentation for the Tide and Water Level Capacity Building course, developed by South Africa, were reviewed and a process for incorporating proposed amendments was agreed.

The draft Work Plan, attached at Annex B, was discussed and agreed.

Progress on HSSC Action Items
HSSC6-5.8:

TWLWG7 completed its review and developed draft wording for IHO Resolution 3/1919, as amended, for submission to HSSC7, see Annex C.

Chair of S-100WG presented the work undertaken by TSMAD on S-112 and progress on the documentation was achieved.

A draft Product Specification was presented by Australia and numerous amendments were made during the meeting, guided by the Chair S-100WG, with the revised draft to be circulated prior to TWCWG1. Work was also commenced on the development of Tidal Zone feature attributes.

South Africa submitted presently developed presentation material and intended course outcomes. TWLWG7 identified various amendments to slides, which individuals undertook to propose changes, all of which will be submitted to South Africa, who will remain custodian and editor of course material; it is intended the work would be completed prior to next deliveries of the course later in the year.

TWLWG7 considered the need to add a new task in its future programme of work on the applications of water level and current products for non-navigation purposes. This was identified as an integral part of S-111, S-112 and Tidal Height PS development and will be progressed as part of PS development, no new task was considered necessary at present

Problems Encountered
N/A

Any Other Items of Note
N/A

Conclusions and Recommended Actions
N/A

Justification and Impacts
N/A

Action Required of HSSC

The HSSC is invited to:

a. note this report
b. appoint the TWCWG to commence its work under the revised Terms of Reference, see Annex D
c. Consider allocation of a number to the Tidal Height product specification
d. revised draft text for Resolution 3/1919, as amended, for submission to IHO Member States at Annex C
e. endorse the draft Work Plan at Annex B

Tides, Water Level and Surface Currents Working Group (TWCWG) – Updated 9 June 2015

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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 and portrayal of navigationally significant current surface data (S-111 - IHO Task 2.13.3)
F	Develop, maintain and extend a Product Specification for dynamic tides in ECDIS (IHO Task 2.7.5)
G	Liaise with S-100WG on tidal and current matters relevant to ECDIS applications
H	Liaise with industry experts on the development of product specifications for tides and currents
I	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)
J	Review feedback of on-line real time water level observation document
K	Maintain and extend the relevant IHO standards, specifications and publications as required (IHO Tasks 2.7.2 and 2.13.2)
L	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)
M	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 surface current data (S-111)	H		2013	2017	O	Kurt Hess* Louis Maltais Mark Opdyke		Establish joint project teams as required. Liaise with S-100WG (see H.1) Liaise with industry experts (see I.1)
E.2	Develop and maintain a product specification for the portrayal of navigationally significant surface currents	H		2013	2017	O	Louis Maltais* Kurt Hess Mark Opdyke		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 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)

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	Liaise with S-100WG on tidal and current matters relevant to ECDIS applications	H		-	Permanent	O	Gwenaële Jan Kurt Hess Louis Maltais		Establish joint project teams as required.
H.1	Liaise with industry experts on the development of product specifications for tides and currents	H		-	Permanent	O	All		
I.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.
J.1	Review feedback of on-line real time water level observation document	L		-	Permanent	O	Zarina Jayaswal* All		
K.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	
M.1	Develop and maintain material for course on Tides and Currents	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 L)

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
25-29 April 2016	Tbc, Brazil	TWCWG-1

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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 another geodetic system; e.g. the World Geodetic System 1984 (WGS84).

In 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 a datum as closely equivalent to this level as is practically acceptable to Hydrographic Offices, be adopted as chart datum. Alternatively, another, similar datum may be used if low water levels in a specific area frequently deviate from LAT, or a different datum has been established by national policy.

7 It is resolved that Highest Astronomical Tide (HAT*), or a datum as closely equivalent to this level as is practical and acceptable to Hydrographic Offices, be adopted as the datum for vertical clearances. Alternatively, another, similar datum may be used if high water levels in a specific area frequently deviate from HAT, or a different datum has been established by national policy.

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.

In mixed water (where water level variability is due to both tidal and regionally specific forcing mechanisms) and inland waters

9 It is resolved that depths, and all other navigational information should be referred to an appropriate level that is practical and acceptable to Hydrographic Offices (such as lowest water (LW) as a reference level for depths and highest water (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 where the tidal range is negligible and in non-tidal areas

10 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.

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

** 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.*

Tides, Water Level and Currents Working Group (TWCWG)

Terms of Reference and Rules of Procedure

Reference: 7th *HSSC Meeting (Busan, Republic of Korea, November 2015)*

1. Objective

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

(ii) advise on the use of vertical datums;

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

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

(v) study principles and contribute to the development of improved methods for conveying tidal, water level , ~~and~~ current information and relevant physical 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.