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IHO File No S3/8151 & S3/6004

CIRCULAR LETTER 04/2020
17 January 2020

ADOPTION OF A NEW IHO RESOLUTION ON DIGITAL TIDE TABLES

References:

A. IHO CL 31/2019 dated 26 June - Call for approval of a new IHO resolution on Digital Tide Tables.

B. Publication M-3, 2nd Edition 2010 – Updated to August 2018 – *Resolutions of the IHO*.

Dear Hydrographer,

1. The approval of Member States on the proposed new IHO Resolution 01/2019 – *Digital Tide and Tidal Current Tables* – was requested by Reference A.

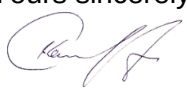
2. The Secretariat would like to thank the following 47 Member States that replied to Reference A: Algeria, Australia, Bangladesh, Belgium, Brazil, Canada, Chile, Colombia, Croatia, Cuba, Cyprus, Ecuador, France, Germany, Greece, Guatemala, Iceland, India, Iran (Islamic Republic of), Ireland, Italy, Japan, Kuwait, Malaysia, Malta, Mauritius, Mexico, Monaco, Netherlands, Nigeria, Norway, Oman, Peru, Republic of Korea, Saudi Arabia, Singapore, Slovenia, South Africa, Spain, Sri Lanka, Suriname, Sweden, Tunisia, Turkey, United Kingdom of Great Britain and Northern Ireland, United States of America and Uruguay.

3. In reply to Reference A, 46 member States voted to approve the new resolution and one voted against. A number of comments were received, all of which are included in Annex B, along with replies by the Chair of the Tide, Water Level and Current Working Group (TWCWG) and the IHO Secretariat.

4. When Reference A was issued, there were 90 Member States of the IHO with three States suspended. In accordance with the provisions of the Convention on the IHO, the minimum number of affirmative votes required is 30. As a result, the IHO Resolution 01/2019 has been adopted.

5. The final text of the IHO Resolution 01/2019 is provided in Annex A and will be incorporated into a new Edition of the IHO Publication M-3 Resolutions of the IHO (Reference B) to be completed by the Secretariat in due course.

On behalf of the Secretary-General
Yours sincerely,



Abri KAMPFER
IHO Director

Annexes:
A. Approved New IHO Resolution 01/2019.
B. Member States' comments with TWCWG Chair and IHO Secretariat replies

Annex A to IHO CL 04/2020

Approved new IHO Resolution 01/2019

TITLE	Reference	Last amendment (CL or IHC)	1st Edition Reference
Digital Tide and Tidal Current Tables	**01/2019**	**-**	**Ver 1.0**

1. It is resolved that member Hydrographic Organizations (HO) may choose to publish their tide and tidal current tables in either paper format or digitally. If digitally, they can be distributed either through the HO's web site, or representative complement or via portable media such as a DVD.

General Guidelines for Digital Tide and Tidal Current Tables

2. It is resolved that digital tide and tidal current tables should adhere to all the same requirements as existing paper tide and tidal current tables as specified in IHO publication M-3 (*IHO Programme 2 "Hydrographic Services and Standards" Section 2.2 – Tides and Water Levels).*

3. It is resolved that the issuing office should provide documentation on how to install or read the electronic tables, minimum computer specifications how to obtain product support and general information on the Digital Tide and Tidal Current Tables. This information should be provided in either hardcopy written form (for example, on a separate sheet of paper or on the cover of the disk or other media), or electronically in a plain ASCII text 'readme.txt' type of file. This file should also include user license and/or condition of use information.

4. It is resolved that the issuing office should provide its formal name, mailing address, web url and point of contact information on the cover of the media. It should also provide information on the production of the tables (including both address and website), information on how to obtain annual updates, and how to obtain interim updates or errata information.

5. It is resolved that the digital tide and tidal current tables should include a statement concerning the standing of the digital tables as meeting the applicable maritime regulations, either SOLAS and/or local country carriage requirements.

Formats for Digital Tide and Tidal Current Tables

6. It is resolved that there shall be two allowable formats for digital tide and tidal current tables.

A. Scanned images of the paper tide tables with the attributes described below in section 7 (*Detailed Specifications for Digital Tide Tables – Scanned Images of Tide Tables*).

B. Electronically generated Tide and Tidal Current Predictions: This format consists of software and a user interface that calculates tide and tidal current predictions from stored harmonic constituents or time and range offsets.

Detailed Specifications for Digital Tide Tables – Scanned Images of Tide Tables:

7. It is resolved that Scanned Images of Tide Tables should follow the following specifications.

a. Should be a faithful reproduction of all the pages of printed tide tables;

b. The images should be formatted in a widely available, common format. Examples formats include, but not limited to, PDF, tiff, Jpeg, Gif, png. If PDF files are provided, then information on how to download Adobe© Reader must be provided;

c. If multiple books are published, then each book should be located within its own folder and clearly identified;

d. No modification of the scanned images is permitted by users.

Detailed Specifications for Digital Tide Tables – Electronically Generated Tide Predictions

8. It is resolved that Electronically Generated Tide Predictions should follow the following specifications:

a. Station Selection: It is recommended that station selections can either be map based or list based, and should be organized by water body;

b. Station Information: It is recommended that the following information be available for each station:

Station Name and Number (or ID) as appropriate;
Body of Water Descriptor (if appropriate);
Latitude and Longitude (following ISO 6709 convention, stated in degrees and 6 decimals);
Horizontal and Vertical Datum convention;
Location Map with nearby prediction stations identified;
URL to station or data portal.

c. It is recommended that Earth-Moon-Sun Astronomical Calendar Information (Tabular and/or integrated with graphical data output) be provided;

d. It is recommended that Sunrise/Sunset Calendar Information (Tabular and/or integrated with graphical data output) be provided;

e. It is recommended that the default reference datum is the Chart Datum used by the Country furthermore, it is recommended that the user have the ability to reference predictions to other tidal datums supported by the HO (such as LAT, HAT, MHW, MSL) and user identified datums such as a national geodetic or ellipsoidal datum or other coastal engineering or threshold datums that are pertinent;

f. It is recommended that data displays and tables can be toggled to both in Metric or English units, with default depending upon country;

g. It is recommended that the time displayed is the legal local time as default, with user selected option for UTC/GMT, daylight savings time, etc. Legal time includes daylight savings time if applicable. Furthermore, when time zone information is displayed it should follow the convention that negative time zone offsets are used for east longitude and positive offsets for west longitude;

h. It is recommended that the following tide prediction source metadata information be provided:

Harmonic Constituents or Time and Range Correction to Reference Station;
Dates of Harmonic Analyses time series used to create the set of Harmonic Constituents used in the prediction;
Dates of the observations used to create time and height corrections (for non-harmonic based predictions) to a reference Station;
Links to the list of the Harmonic Constituents used in the Prediction. Furthermore, the display of the Harmonic Constituents should adhere to the IHO publication M-3 (*IHO National Tidal Constituent Banks Resolution 2/1977 as amended 44/2014 A6:8)*;
The name of the Harmonic Analysis program used to generate the harmonic constituents.

i. It is recommended that the HO provide and display tidal sea level amplitude prediction with a minimum of either centimetre (for metric systems) or tenths of foot (for imperial systems) precision;

j. It is recommended that users have the ability to obtain output in common formats such as PDF, TXT, XML, CSV;

k. It is recommended that additional information be provide special warning explaining areas of anomalous tidal conditions, special datums, or tidal based hazards to navigations (dual high or low waters, tidal bores, river flow dependencies and river datums, frequent non-tidal conditions, etc..);

l. It is recommended, when applicable, that estimates of uncertainty in the predicted times and heights of high and low waters be provided to users.

Detailed Specifications for Graphical Display of Electronic Tide Predictions

9. It is resolved that the predictions have the ability to obtain graphical and tabular output for desired time period (either historical and into the future) and should contain the following attributes with the objective not to prescribe a specific graphical view but rather to identify common elements that transcend all types of graphs:

a. It is recommend that the predictions can be displayed as discrete points or a continuous curve using a curve fit routine to times and heights of high and low waters or to the time series values;

b. It is recommended that all axes should be clearly labelled;

c. It is recommended that time series data should have 1- hour or shorter increments;

d. It is recommended that times and heights of predicted high and low tides should be provided;

e. It is recommended that the default datum should be the same as chart datum for the location of the prediction;

f. It is recommended that the tidal height units default should be the same as the HO's printed tables;

g. It is recommended that the display should include station information (as defined above);

h. It is recommended that the display include the name and/or the insignia of the source authority organization;

i. It is recommended that the display should have the option to view the tide prediction numerical values used to create the graphic;

j. It is recommended that the display of the graphical data should be able to be adjusted to suit daytime, twilight, and night time viewing.

Detailed Specifications for Digital Tidal Current Tables

10. It is resolved that Digital Tidal Current Tables can be in the same two formats as Digital Tide Tables and the same requirements that apply to digital tide tables pertain to tidal current tables.

11. It is resolved that electronically generated Tidal Current Predictions do have additional specifications as identified:

a. It is recommended that the depth of prediction be included in the metadata and include a the descriptor that the depth is either from the surface down or from the bottom up;

b. It is recommended, if applicable, flood and ebb current direction (referenced to True North) be presented;

c. It is recommended that for graphical display of tidal currents the default speed units should be knots;

d. It is recommended that for graphical display of tidal currents the default direction units should be degrees (referenced to true north).

Examples of Digital Tide Tables

USA - NOAA Example - Scanned Tide Table

80

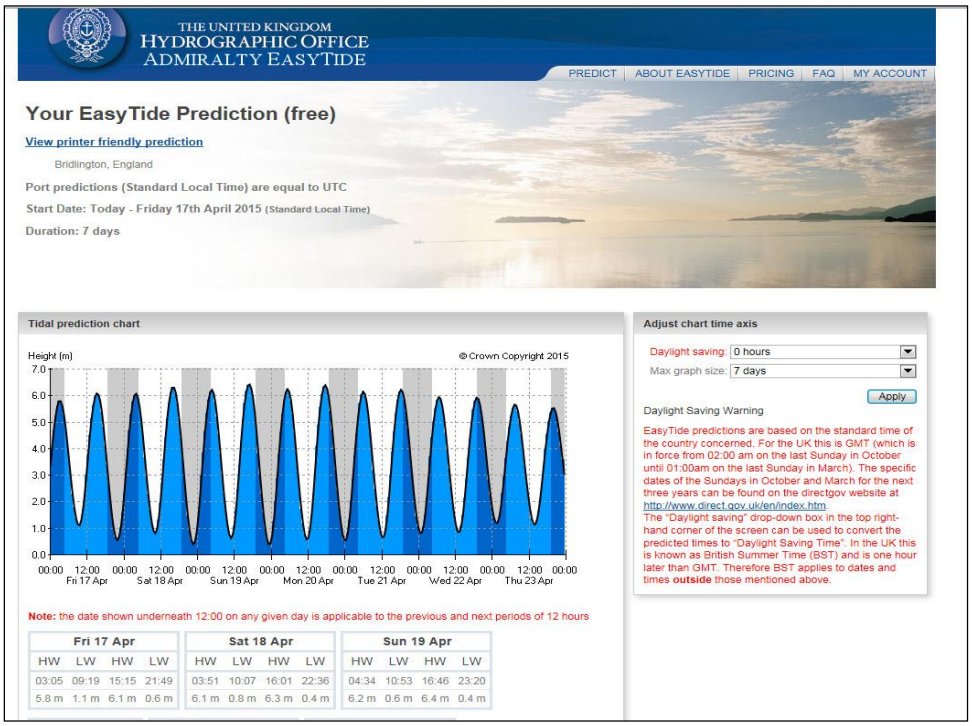
Albany, New York, 2015

Times and Heights of High and Low Waters

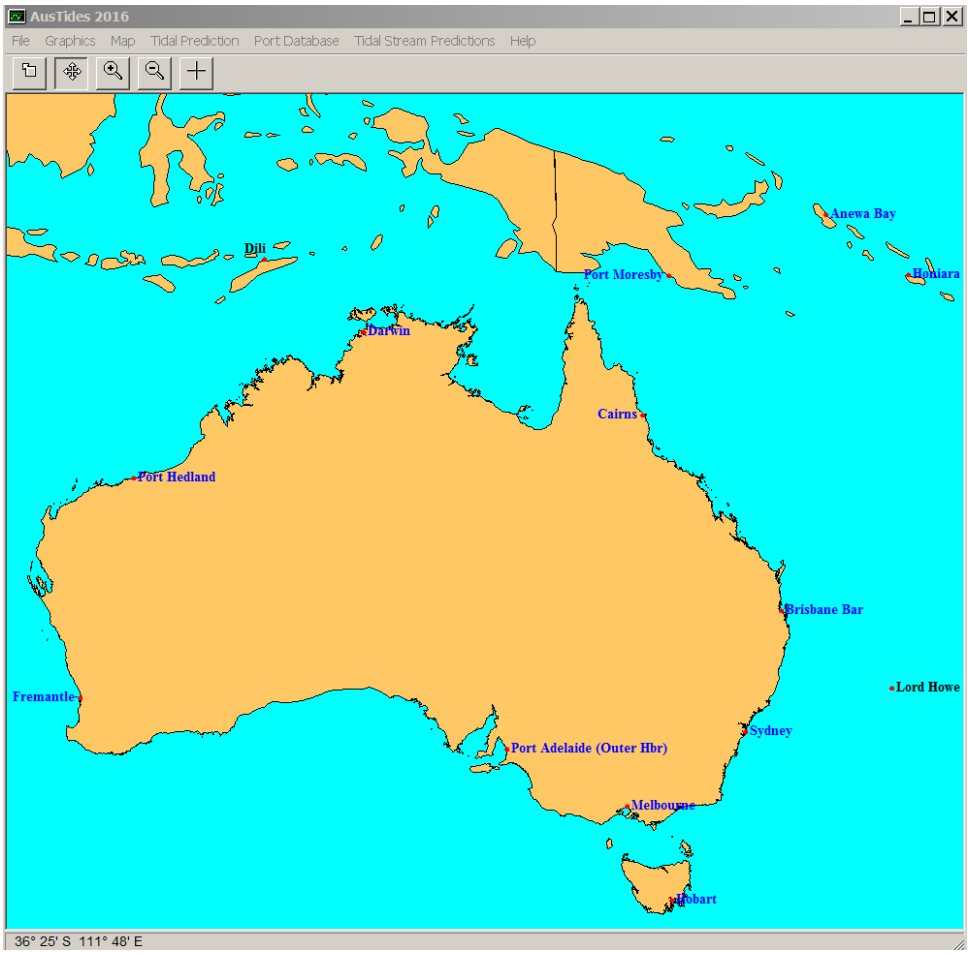
January								February								March							
	Time	Height		Time	Height			Time	Height		Time	Height				Time	Height		Time	Height			
	h m	ft	cm	h m	ft	cm		h m	ft	cm	h m	ft	cm			h m	ft	cm	h m	ft	cm		
1 Th	0048	5.1	155	16 F	0026	4.2	128	1 Su	0214	5.2	158	16 M	0144	4.8	146	1 Su	0102	5.4	165	16 M	0023	5.1	155
	0741	−0.3	−9		0705	0.4	12		0859	−0.1	−3		0836	0.3	9		0743	0.5	15		0715	0.9	27
	1317	5.5	168		1241	5.0	152		1435	5.4	165		1353	5.6	171		1324	5.5	168		1230	5.7	174
	2026	−0.4	−12		2006	0.4	12		2145	−0.3	−9		2127	0.1	3		2029	0.1	3		2066	0.7	21
2 F	0142	5.1	155	17 Sa	0121	4.3	131	2 M	0302	5.2	158	17 Tu	0234	5.0	152	2 M	0153	5.5	168	17 Tu	0120	5.4	165
	0833	−0.3	−9		0803	0.3	9		0946	−0.1	−3		0933	0.1	3		0834	0.4	12		0817	0.6	18
	1407	5.5	168		1331	5.2	158		1519	5.4	165		1445	5.7	174		1413	5.6	171		1333	5.9	180
	2120	−0.4	−12		2101	0.2	6		2230	−0.3	−9		2217	−0.1	−3		2117	0.1	3		2059	0.5	15
3 Sa	0233	5.1	155	18 Su	0211	4.4	134	3 Tu	0348	5.2	158	18 W	0322	5.3	162	3 Tu	0241	5.6	171	18 W	0212	5.7	174
	0922	−0.3	−9		0858	0.1	3		1030	0.0	0		1027	−0.2	−6		0922	0.4	12		0915	0.3	9
	1454	5.6	171		1417	5.4	165		1600	5.4	165		1535	5.9	180		1457	5.6	171		1428	6.0	183
	2210	−0.5	−15		2153	0.0	0		2313	−0.2	−6		2306	−0.2	−6		2201	0.1	3		2150	0.3	9
4 Su	0321	5.1	155	19 M	0257	4.6	140	4 W	0431	5.1	155	19 Th	0409	5.4	165	4 W	0325	5.7	174	19 Th	0300	6.0	183
	1009	−0.2	−6		0952	−0.1	−3		1112	0.1	3		1119	−0.3	−9		1006	0.4	12		1009	0.1	3
	1538	5.5	168		1503	5.6	171		1640	5.3	162		1626	5.9	180		1538	5.6	171		1519	6.2	189
	2256	−0.4	−12		2243	−0.2	−6		2352	−0.1	−3		2353	−0.3	−9		2241	0.1	3		2239	0.1	3
5 M	0408	5.0	152	20 Tu	0343	4.8	146	5 Th	0513	5.1	155	20 F	0458	5.6	171	5 Th	0406	5.7	174	20 F	0347	6.2	189
	1054	−0.1	−3		1044	−0.2	−6		1152	0.2	6		1211	−0.4	−12		1049	0.4	12		1102	−0.1	−3
	1621	5.4	165		1540	5.7	174		1718	5.2	158		1719	5.9	180		1617	5.5	168		1610	6.2	189
	2341	−0.3	−9	●	2331	−0.4	−12									○	2319	0.3	9	●	2326	0.1	3
6 Tu	0454	4.9	149	21 W	0430	4.9	149	6 F	0029	0.0	0	21 Sa	0040	−0.3	−9	6 F	0444	5.6	171	21 Sa	0435	6.3	192
	1136	0.1	3		1136	−0.4	−12		0553	5.0	152		0549	5.6	171		1130	0.4	12		1154	−0.1	−3
	1702	5.3	162		1639	5.7	174		1231	0.3	9		1303	−0.3	−9		1654	5.4	165		1702	6.1	186
									1754	5.1	155		1815	5.8	177		2354	0.4	12				
7 W	0022	−0.2	−6	22 Th	0018	−0.5	−15	7 Sa	0104	0.2	6	22 Su	0128	−0.2	−6	7 Sa	0520	5.6	171	22 Su	0013	0.2	6
	0540	4.8	146		0520	5.0	152		0632	5.0	152		0642	5.6	171		1209	0.5	15		0523	6.3	192
	1216	0.2	6		1227	−0.4	−12		1310	0.5	15		1356	−0.2	−6		1728	5.3	162		1245	0.0	0
	1742	5.1	155		1733	5.7	174		1826	5.0	152		1913	5.6	171						1756	6.0	183
8 Th	0103	0.0	0	23 F	0106	−0.5	−15	8 Su	0137	0.3	9	23 M	0216	−0.1	−3	8 Su	0027	0.5	15	23 M	0100	0.3	9
	0625	4.7	143		0612	5.1	155		0706	5.0	152		0739	5.6	171		0550	5.6	171		0615	6.2	189
	1255	0.4	12		1320	−0.4	−12		1350	0.6	18		1452	−0.1	−3		1249	0.6	18		1337	0.1	3
	1822	5.0	152		1830	5.6	171		1851	4.9	149		2012	5.5	168		1757	5.2	158		1853	5.8	177
9 F	0141	0.1	3	24 Sa	0154	−0.5	−15	9 M	0208	0.4	12	24 Tu	0307	0.1	3	9 M	0058	0.6	18	24 Tu	0148	0.5	15
	0710	4.6	140		0708	5.2	158		0730	5.0	152		0837	5.6	171		0607	5.7	174		0710	6.1	186
	1334	0.5	15		1414	−0.4	−12		1434	0.7	21		1549	0.1	3		1330	0.7	21		1431	0.3	9
	1901	4.9	149		1931	5.5	168		1924	4.8	146		2111	5.4	165		1821	5.2	158		1951	5.7	174
10 Sa	0219	0.2	6	25 Su	0244	−0.4	−12	10 Tu	0240	0.5	15	25 W	0400	0.2	6	10 Tu	0129	0.7	21	25 W	0238	0.7	21
	0755	4.6	140		0806	5.2	158		0752	5.1	155		0935	5.5	168		0627	5.8	177		0807	5.9	180
	1416	0.6	18		1511	−0.3	−9		1526	0.8	24		1647	0.2	6		1414	0.8	24		1526	0.5	15
	1940	4.8	146		2032	5.4	165		2009	4.6	140	◐	2210	5.3	162		1855	5.1	155		2049	5.6	171
11 Su	0256	0.3	9	26 M	0336	−0.3	−9	11 W	0320	0.5	15	26 Th	0455	0.4	12	11 W	0202	0.8	24	26 Th	0331	0.9	27
	0839	4.6	140		0904	5.3	162		0832	5.2	158		1034	5.4	165		0704	5.8	177		0906	5.8	177
	1503	0.7	21		1610	−0.2	−6		1627	0.9	27		1746	0.3	9		1504	1.0	30		1622	0.6	18
	2021	4.6	140	◐	2132	5.2	158	◑	2109	4.5	137		2309	5.2	158		1942	5.0	152		2147	5.5	168
12 M	0334	0.4	12	27 Tu	0429	−0.3	−9	12 Th	0413	0.7	21	27 F	0552	0.5	15	12 Th	0245	0.9	27	27 F	0426	1.0	30
	0922	4.7	143		1002	5.3	162		0923	5.2	158		1153	5.4	165		0751	5.8	177		1005	5.6	171
	1559	0.8	24		1710	−0.1	−3		1733	0.9	27		1843	0.3	9		1602	1.1	34		1718	0.7	21
	2115	4.4	134		2231	5.1	155		2234	4.4	134						2041	4.9	149	◐	2245	5.5	168
13 Tu	0416	0.4	12	28 W	0524	−0.2	−6	13 F	0520	0.7	21	28 Sa	0007	5.3	162	13 F	0341	1.0	30	28 Sa	0522	1.1	34
	1006	4.7	143		1101	5.3	162		1028	5.2	158		0648	0.5	15		0844	5.8	177		1104	5.6	171
	1701	0.8	24		1810	−0.1	−3		1837	0.8	24		1231	5.4	165		1705	1.1	34		1814	0.8	24
◑	2220	4.3	131		2330	5.0	152		2348	4.4	134		1938	0.2	6	◑	2201	4.9	149		2342	5.6	171
14 W	0507	0.5	15	29 Th	0620	−0.1	−3	14 Sa	0631	0.7	21					14 Sa	0453	1.1	34	29 Su	0619	1.2	37
	1055	4.8	146		1159	5.3	162		1149	5.2	158						0947	5.6	171		1202	5.6	171
	1806	0.8	24		1908	−0.1	−3		1938	0.6	18						1808	1.1	34		1907	0.7	21
	2325	4.2	128														2318	4.9	149				
15 Th	0605	0.5	15	30 F	0028	5.0	152	15 Su	0050	4.5	137					15 Su	0607	1.1	34	30 M	0037	5.7	174
	1148	4.9	149		0715	−0.1	−3		0736	0.5	15						1110	5.6	171		0714	1.1	34
	1908	0.7	21		1255	5.3	162		1256	5.4	165						1909	0.9	27		1256	5.6	171
					2004	−0.2	−6		2034	0.4	12										1957	0.6	18
				31 Sa	0123	5.1	155													31 Tu	0128	5.9	180
					0808	−0.1	−3														0806	1.0	30
					1347	5.4	165														1346	5.7	174
					2057	−0.3	−9														2043	0.6	18

Time meridian 75° W. 0000 is midnight. 1200 is noon. Times are not adjusted for Daylight Saving Time.
Heights are referred to mean low water during lowest river stages which is the chart datum of soundings.

UKHO Example



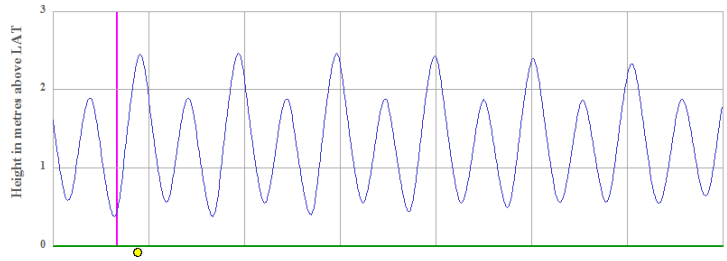
Australian Example



BRISBANE BAR

Local Standard Time Zone: -10:00 U.T. | **27° 22' S 153° 10' E** | **Year 2016**

PREDICTION DATUM below MSL: 1.31 (m) | **Port 59980**



16:00 0.4m

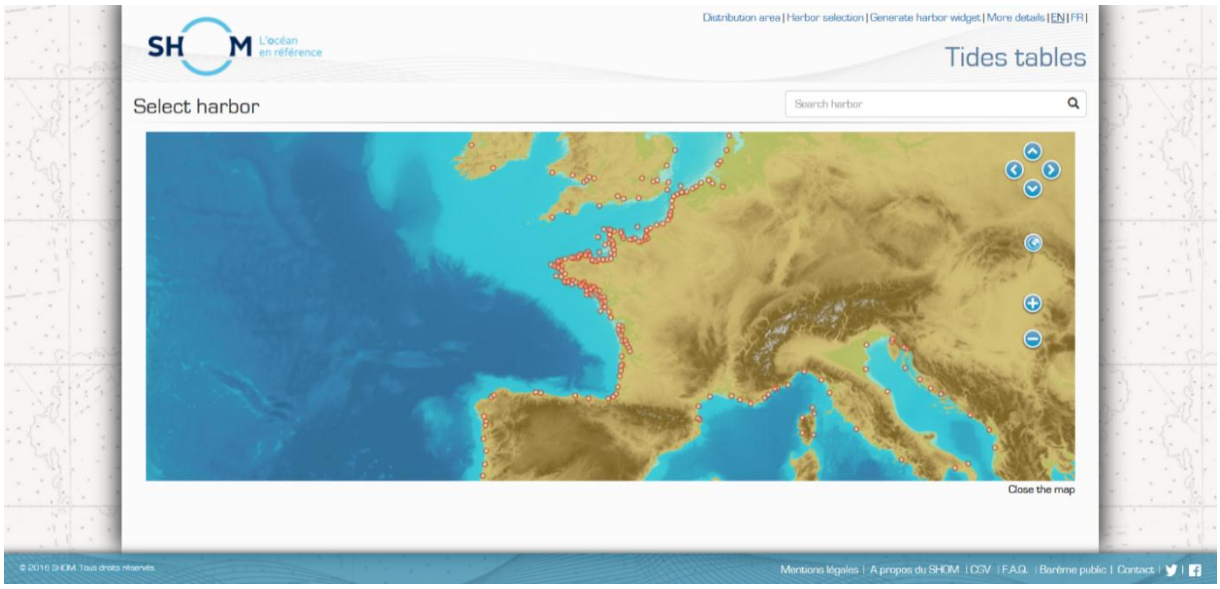
Jun 20 Mo		21 Tu		22 We		23 Th		24 Fr		25 Sa		26 Su	
Time	m	Time	m	Time	m	Time	m	Time	m	Time	m	Time	m
0343	0.6	0423	0.6	0503	0.5	0543	0.5	0624	0.5	0024	2.4	0109	2.3
0911	1.9	0951	1.9	1032	1.9	1115	1.9	1200	1.9	0707	0.5	0755	0.5
1520	0.4	1557	0.4	1635	0.4	1713	0.4	1755	0.5	1250	1.9	1347	1.9
2150	2.4	2227	2.5	2304	2.5	2343	2.4			1843	0.6	1939	0.6

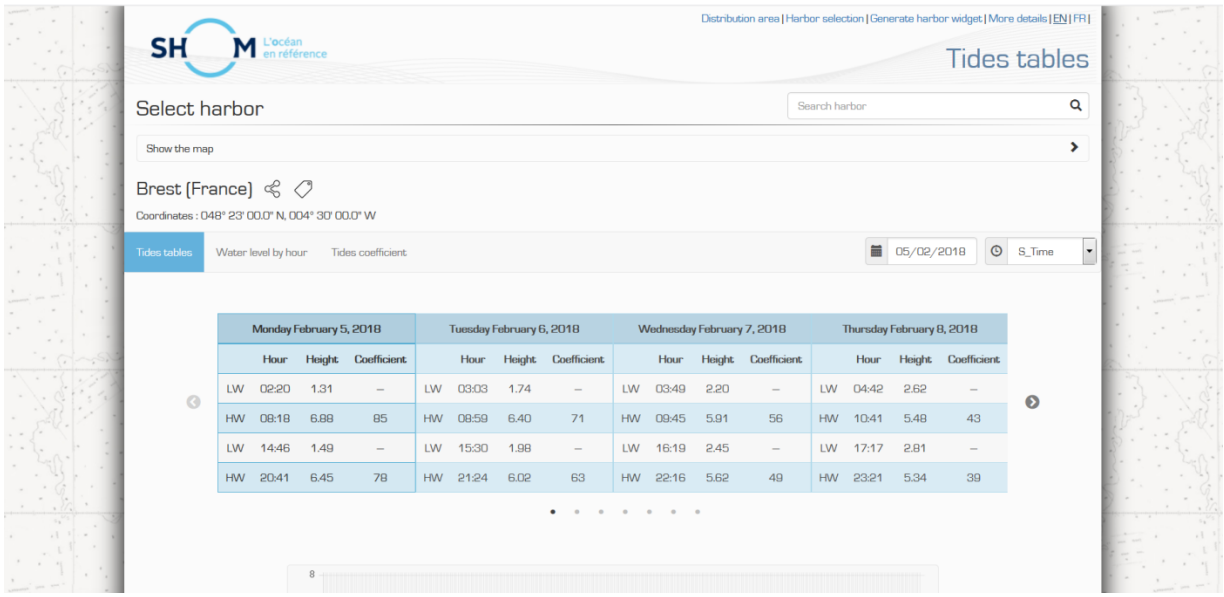
Moon phases supplied by Sydney Observatory

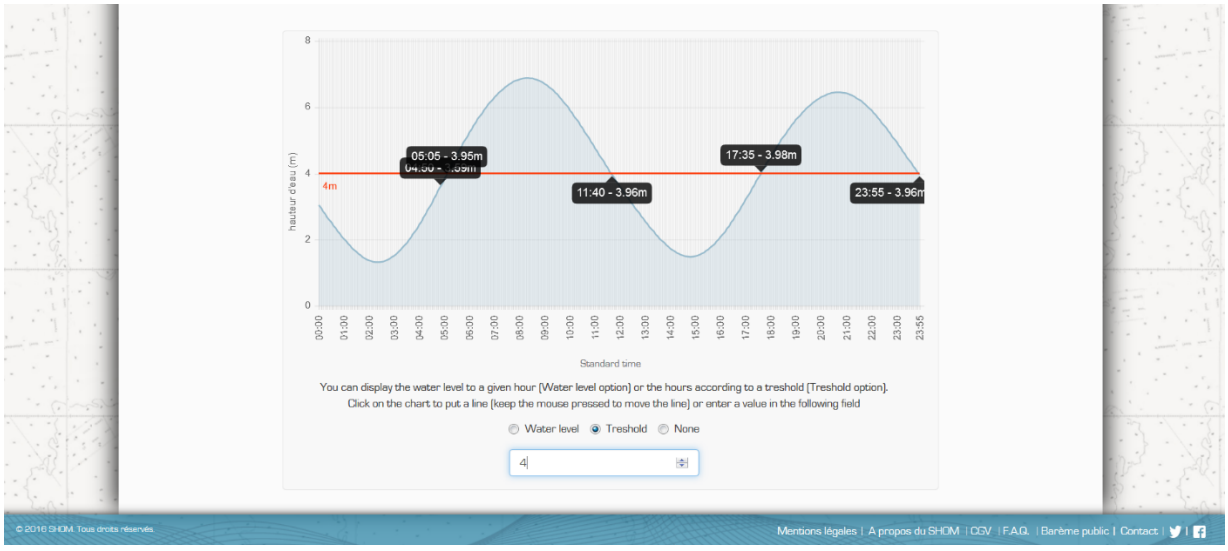
No account is taken of Daylight Saving Time

These predictions are identical to those published in ANTT and can thus be used as an official navigational publication.
Prediction Datum is LAT, which may not be Chart Datum. Correction to Chart Datum can be found at:
Level / To Chart Datum Corrections and Zero of Predictions Window.

Example from SHOM (France)







IHO File No. S3/8151 & S3/6004

Comments by Member States with Chair TWCWG and IHO Secretariat replies

Belgium

The Flemish Hydrography can only approve the Resolution 01/2019 when changing the wording of Section 8.i back to the previous version, i.e.:

"It is recommended that the HO provide and display tidal sea level amplitude prediction with a minimum of either centimetre (for metric systems) or tenths of foot (for imperial systems) precision"

Reply: Considering the need to produce tidal prediction with an uncertainty of the order of centimetre and the I.T context, exploiting to the full the computing power will provide a greater precision than the one displayed today on digital tide tables. In this context, increasing the precision more than the current 2 digits, could help to better minimize the centimetric uncertainty in the final water level prediction provided and help to minimize the truncation effect.
In some cases, the current digital tide tables are displayed with a 0.01 m precision, but the computation are done with a precision better than 0.01m (0.001m).
The idea is to fit a centimetre precision on tide table, using and provide data with more than 2 digits, the WG suggested 3 digits.

Additional comment by the Flemish Hydrography:

In paragraph 8 i. the intention to 'provide and display tidal sea level amplitude prediction with a minimum of 4 decimals precision (for metric system)' is not clear.
If it signifies a fraction of 4 decimals, it leads to values that are nog longer suitable for tidal publications. In the metric system this leads to a precision of 0,1 mm which is a too small increment to have a practical significance in tidal publications.
It should also be noted that none of the examples provided as attachment to the current CL provides the minimum 4 decimals precision, either as a fraction or otherwise.

Reply:

Considering the need to produce tidal predictions with an uncertainty of the order of centimetre and the computing environment, exploiting to the full the computing power will provide a greater precision than the one displayed today on digital tide tables. In this context, increasing the precision more than the current 2 digits in the international system units, could help to better minimize the centimetric uncertainty in the final water level prediction provided and helps to minimize the truncation effect.
In some cases, the current digital tide tables are displayed with a 0.01 m precision, but the computation are done with a higher precision.
For tide table, the objective is to fit a centimetre precision, using and providing data with more than 2 digits, it is suggested even 3 digits.
It should be kept in mind that resolution 01/2019 provides recommendations and is written to ease the future use of electronic tide information. These values could be used after by the tide table producer to apply harmonic analysis and produce tidal constituents.

However revised wording for 8i to accommodate the comments from the Flemish Hydrography are:

"It is recommended that the HO provide and display tidal sea level amplitude prediction with a minimum of either centimetre (for metric systems) or tenths of foot (for imperial systems) precision"

Brazil

Brazil suggests the following writing for the proposed new IHO Resolution 01/2019:
TITLE: DIGITAL TIDE AND TIDAL CURRENT TABLES

1 Hydrographic Offices (HOs) may authorize to publish their Tide and Tidal Current Tables in either paper format or digitally. If digitally, they can be distributed either through the HO's website, or representative complement or via portable media such as a DVD.

General Guidelines for Digital Tide and Tidal Current Tables

2 Digital Tide and Tidal Current Tables should adhere to all the same requirements as existing paper Tide and Tidal Current Tables as specified in IHO Work Programme 2 "Hydrographic Services and Standards".

3 The issuing office should provide documentation on how to install or read the electronic tables, minimum computer specifications how to obtain product support and general information on the Digital Tide and Tidal Current Tables. This information should be provided in either hardcopy written form (for example, on a separate sheet of paper or on the cover of the disk or other media), or electronically in a plain ASCII text 'readme.txt' type of file. This file should also include user license and/or condition of use information.

4 The issuing office should provide its formal name, mailing address; web url and point of contact information on the cover of the media. It should also provide information on the production of the tables (including both address and website), information on how to obtain annual updates, and how to obtain interim updates or errata information.

5 The Digital Tide and Tidal Current Tables should include a statement concerning the standing of the digital tables as meeting the applicable maritime regulations, either SOLAS and/or local country carriage requirements.

Formats for Digital Tide and Tidal Current Tables

6 There shall be two allowable formats for Digital Tide and Tidal Current Tables:
a. Scanned Images of Tide and Tidal Current Tables: scanned images of the paper Tables.
b. Electronically Generated Tide and Tidal Current Predictions: software and user interface that calculates tide and tidal current predictions from stored Harmonic Constituents or time and range offsets.

Detailed Specifications for Digital Tide Tables - Scanned Images of Tide Tables

7 Scanned Images of Tide Tables should have the following specifications:
a. faithful reproduction of all the pages of printed Tide Tables,

b. images formatted in a widely available, common format. Examples formats include, but not limited to PDF, TIFF, JPEG, GIF. If PDF files are provided, then information on how to download the Adobe Acrobat Reader software must be provided,
c. if multiple books are published, then each book be located within its own folder and clearly identified, and
d. no modification of the scanned images permitted by users.

Detailed Specifications for Digital Tide Tables - Electronically Generated Tide Predictions

8 Electronically Generated Tide Predictions should have the following specifications:
a. Station Selection: can either be map based or list based, and organized by water body,
b. Station Information:
- Station Name and Number (or ID) as appropriate,
- Body of Water Descriptor (if appropriate),
- Latitude and Longitude (following ISO 6709 convention, stated in degrees and 6 decimals),
- Horizontal and Vertical Datum convention,
- Location Map with nearby prediction stations identified,
- URL to station or data portal.
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. default reference datum is the Chart Datum used by the country. Furthermore, the capability for the user to reference predictions to other tidal datums supported by the HO (such as LAT, HAT, MHW, MSL) and the user identify datums such as a national geodetic or ellipsoidal datum or other coastal engineering or threshold datums that are pertinent,
f. data displays and tables can be toggled both in Metric or English units, with default depending upon country,
g. time displayed is the legal local time as default, with user selected option for UTC/GMT, daylight savings time, etc. Legal time includes daylight savings time if applicable. Furthermore, when time zone information is displayed it follows the convention that negative time zone offsets are used for east longitude and positive offsets for west longitude,
h. the following tide prediction source metadata information:
- Harmonic Constituents or Time and Range Correction to Reference Station,
- Dates of Harmonic Analyses time series used to create the set of Harmonic Constituents used in the prediction,
- Dates of the observations used to create time and height corrections (for nonharmonic based predictions) to a Reference Station,
- Links to the list of the Harmonic Constituents used in the Prediction. Furthermore, the display of the Harmonic Constituents should adhere to the IHO Resolution 2/1977 (NATIONAL TIDAL CONSTITUENT BANKS), and
- The name of the Harmonic Analysis program used to generate the Harmonic Constituents.
i. tidal sea level amplitude prediction provided and displayed with a minimum of 2 decimals precision (for metric system),
j. capability for the users to obtain output in common formats such as PDF, TXT, XML, CSV, S-112 single point formats,
k. special warning explaining areas of anomalous tidal conditions, special datums, or tidal based hazards to navigations (dual high or low waters, tidal bores, river flow dependencies and river datums, frequent non-tidal conditions, etc..), and

l. when applicable, estimates of uncertainty in the predicted times and heights of high and low waters.

Detailed Specifications for Graphical Display of Electronic Tide Predictions

9 Predictions must have the ability to obtain graphical and tabular output for desired time period (either historical and into the future) and should contain the following attributes with the objective not to prescribe a specific graphical view but rather to identify common elements that transcend all types of graphs:
a. predictions displayed as discrete points or a continuous curve using a curve fit routine to times and heights of high and low waters or to the time series values,
b. all axes clearly labelled,
c. time series data with a minimum, 1-hour increments,
d. times and heights of predicted high and low tides,
e. default datum is the same as Chart Datum for the location of the prediction,
f. default tidal height units are the same as the HO's printed tables,
g. the display includes station information (as defined above),
h. the display includes the name and/or the insignia of the source authority organization,
i. the display has the option to view the tide prediction numerical values used to create the graphic, and
j. the display of the graphical data is able to be adjusted to suit daytime, twilight, and night time viewing.

Detailed Specifications for Digital Tidal Current Tables

10 Digital Tidal Current Tables can be in the same two formats as Digital Tide Tables and the same requirements that apply to Digital Tide Tables pertain to Tidal Current Tables.

11 Electronically Generated Tidal Current Predictions should have the following additional specifications:
a. depth of prediction and descriptor that the depth is either from the surface down or from the bottom up included in the metadata,
b. if applicable, flood and ebb current direction (referenced to True North),
c. default speed units in knots for graphical display of tidal currents, and
d. default direction units in degrees (referenced to True North) for graphical display of tidal currents.

Reply: The Chair and Secretariat thank Brazil for their comprehensive comments, which have been taken into consideration when finalizing the text of the resolution.

China

Section 6 A that reads:
Scanned Images of Tide and Tidal Current Tables: This format consists of scanned images of the paper tide tables. This format should have the following attributes.

Should read:
Scanned Images of Tide and Tidal Current Tables:
images of the paper tide tables.

Reply: The proposed simplification is supported with the revision of paragraph 6a as presented.

Colombia

Taking into consideration the common approval and benefit of using GNSS technology in the tidal measurement during the hydrographic surveying, as well as the developments of some Offices to establish the vertical separation between the tidal datum and the ellipsoid of reference in territorial waters, Colombia proposes to include the following item:

12. It has been resolved that the models of separation Ellipsoid - Tidal datum can be included in a global database for general consultations according to the following details:
- Coverage polygon in digital format (SHP, KMZ, KML);
- Metadata in TXT format (They must include the creation data, the spatial resolution; the available tidal data).

Reply: The Chair and the Secretariat thank Colombia for this suggested addition, however as the topic was not addressed by the TWCWG during the original drafting, it is felt that further discussion on the detail is necessary before inclusion as an amendment to the resolution.

India

National Hydrographic Office, India is not producing digital tide and tidal current table in either paper format or digitally.

Reply: The Secretariat thanks India for this information.

Saudi Arabia

Whilst Saudi Arabia approves the proposed new IHO Resolution 01/2019 some aspects of the content impacts on the National Security Policy with regards to the release of sensitive data, e.g. tide and stream constituents.

Hence Saudi Arabia will endeavour to present fullest data sets for Digital Tide and Tidal Current Tables where-ever possible to align with the proposal.

Reply: The resolution recommends the most common practices and the most common formats for officially delivered tidal products. The respect of national security policies is a concern shared within HO framework. The current IHO recommendation is providing best practices guidelines for a set of data that promote the hydrographic international knowledge and exchanges. This impacts tidal information systems interoperability and eventually the international tidal products for navigation. The resolution is a recommendation specifically dedicated to the data sets that are delivered or made public.

Sweden

Comments to the proposed IHO Resolution 01/2019:

Section 2: The reference should preferably refer to M-3 IHO Programme 2 "Hydrographic services and Standards" Section 2.2 - Tides and Water Levels

Section 8 h: The reference should preferably refer to M-3 IHO National Tidal Constituent Banks Resolution 2/1977 as amended 42/2000 A6:8. The web-link Points to an unofficial external website directory and should link to the IHO Website or be removed.

Reply: Agreed, both references have been amended.