20th NSHC Tidal Working Group meeting

The Hague, 27-28 January 2015

Contents:

Abbreviations used in this document

BLAST: Bringing Land and Sea Together
BSH: Federal Maritime and Hydrographic Agency of Germany (Bundesamt für Seeschifffahrt und Hydrographie)
BSHC: Baltic Sea Hydrographic Commission
DMI: Danish metrological institute (Danmarks Meteorologiske Institut)
FH: Flemish Hydrography (Vlaamse Hydrografie)
HSSC: Hydrographic Services and Standards Committee
IHB: International Hydrographic Bureau
IHO: International Hydrographic Organization
NHS: Norwegian Hydrographic Service (Kartverket sjødivisjonen)
NLHO: Royal Netherlands Navy Hydrographic Office (Dienst der Hydrografie)
NSHC: North Sea Hydrographic Commission
SHOM: French Naval Hydrographic and Oceanographic Service (Service hydrographique et océanographique de la marine)
SMA: Swedish maritime administration (Sjöfartsverket)
TSMAD: Transfer Standard Maintenance and Applications Development Working Group
TWG: Tidal Working Group
TWLWG: Tidal and Water Level Working Group
UKHO: United Kingdom Hydrographic Office
Other abbreviations are written out when first used.

Minutes of the meeting

Meeting location:

Netherlands Hydrographic Service, The Hague, Netherlands.

Participants:

Rogier Broekman	NLHS	Netherlands
Leendert Dorst	NLHS	Netherlands
Patrick Goffinet	BSH	Germany
Chris Jones	UKHO	United Kingdom
Ronald Kuilman	NLHS	Netherlands
Palle Bo Nielsen	DMI	Denmark
Hans Öiås	SMA	Sweden
Hans Poppe	FH	Belgium
Swen Roemer	NHS	Norway
Aksel Voldsund	NHS	Norway

Guests

Niels Kinneging	Rijkswaterstaat	NL
Cornelis Slobbe	Delft University of Technology (DUT)	NL
Firmijn Zijl	Deltares	NL

1. Opening remarks

Leendert Dorst from NLHO opens the meeting. The Hydrographer of the Netherlands Navy, Captain Marc van der Donck, gives a welcome speech to the participants. The new Norwegian delegates are especially welcomed. The group asks the new Norwegian delegates to thank Tor Tørresen for his valuable contributions during many years, and for his open and friendly spirit. After this a short introduction round is done. Apologies from France and Iceland.

2. Adoption of the agenda

The agenda was adopted with one additional presentation from UK (agenda item 13), one from Norway (agenda item 10), and one from DE (agenda item 9).
See Annex A.

3. Minutes of the 19th Meeting

proposed the following corrections:

- point 9: Tidal reduction methods. “In *Denmark* it is not DMI who does the survey anymore” should be changed into “In *Denmark* it is not DMI who does the survey.” Add a comment: “The hydrographic surveys are done by the Danish Geodata Authority.”

The minutes of the 19th meeting were adopted with the above changes.

4. Status of Action Items from 19th Meeting

WP (workplan) items are approved by the NSHC. A (action) items are internal within NSHC-TWG.

Workplan item	Status
16/01	Closed at 19th meeting. To be removed
16/02	Closed at 19th meeting. To be removed
16/03	Closed at 19th meeting. To be removed
16/04	To be discussed at agenda item 9
18/01	To be discussed at agenda item 9
18/02	Objective (WHY/priority) is missing. Agenda item 10

Action item	Status
18/01	To be discussed at agenda item 9
18/02	Closed – to be removed
18/03(a)	Closed – to be removed
18/03	At www.iho.int at >IRCC>RHC>NSHC is space reserved for documents of TWG. Chris Jones (UKHO) will put relevant documents of the TWG on this site. There is also a link to www.nshc.pro. This is a German site parallel to www.bshc.pro. A new action item is defined 20/03 to update the website.
18/04	Chris has no specific update on this. SHOM has made developments in structure of xml schema. UKHO has also a schema for xml. Chris will act as a link between NSHC-TWG and TWCWG (TWLWG+SCWG). Action 18/04 is on the list of TWCWG. Propose to close this action for NSHC-TWG. Agreed by members.
18/05	Closed – to be removed.
19/01	NLHO has send LAT surface to all members. Hans Poppe (Belgium) reports that data from France is missing next to the Belgium border. France had problems connecting the most Northern tide gauge. Propose to close this item. Agreed by members.
19/02	The letter has been sent by IHO. Propose to close this item. Agreed by members.
19/03	UKHO coordinates this item. Data from UK, NL and SE is available at UKHO. Other Member States are kindly requested to forward their data by 01 July 2015. Item remains open. TWG agrees that it concerns both separation models and hydrodynamic models.
19/04	Some member states use LAT as a reference level for their Chart Datum whilst others use a level close to EVRS2007 (Baltic Sea). First the differences need to be identified and qualified. Then the implications of smoothing can be investigated. TWG decides not to pursue a smoothing solution at this moment, as BLAST has already done that.
19/05	After brief discussion it is clear that this task can be done by NLHO within one week after receiving the required datasets. Propose to close this item and create item 20/01. Agreed by members.

5. Minutes of the 31st NSHC Conference

NSHC31-C2 Report from the Tidal WG

IHB expressed its concern that some WG are experiencing lack of resources. Use of academia may be a way to compensate for this. This however requires financial funding. UKHO has been historically very active in IHO-WGs. The amount of commitment is under discussion as an internal discussion within UKHO. DK, NL and UK have good relationships with their countries' universities on the subject of geoids, gravity and tide.

The following NSHC31 Conclusions were discussed:

number	Conclusion	Details
103	Disbanding the EU2MPWG	Disband the EU2MPWG
		Task the chair of the EU2MPWG to organize a meeting for winding up the activities and facilitating the transferring of duties to the IHO-EU Network WG (IENWG).
104	Joint European Coastal Mapping Program (JECMaP)	The EU2MPWG to ask the IHO-EU Network WG to coordinate the call for Tender for a study design of Joint European Coastal Mapping Program and keep the MS of the NSHC informed about the progress
105	The European Marine Observation and Data Network (EMODNET)	The IHO-EU Network WG is approached to draft a concept for the composition of a Consortium to respond to the announced tender by the EU Commission.
		the IHO-EU-Network-WG is expected to succeed to designate a Member State of one of the most active European RHCs as [Co-]leader of the Consortium to coordinate its establishment in cooperation with the commercial project management provider and to draft the response to the tender assisted by the regional coordinators if this necessity arises.
113	NSHC website	Accept the offer from DE and create a website for NSHC, based on the available solution from BSHC.

6. Report from IHO TWLWG 6, 25-28 March in Wollongong (Australia)

Chris Jones gives a presentation on the IHO TWLWG meeting in Wollongong, Australia. The structure of some IHO WGs have changed. The TWLWG and Surface Current Working Group (SCWG) are merged into the Tides, Water Level and Current Working Group (TWCWG). The TWLWG has its last meeting in US on 21-24 April 2015. The major items on the agenda are:

- S-100 product specification (specification for dynamic tides)
- standard for digital tide table
- IMO e-navigation initiative
- 1st draft of dynamic water level data transfer product specifications released
- Security issues with data transfer of digital tide
- S-100 ENCWG will distribute its preliminary specifications for stakeholder review

The Chair thanks Chris for his contribution. There is a remaining question on how to express uncertainty level of digital tidal information. This question is dealt with in cooperation with IHO's Data Quality Working Group.

7. Presentations from the participants

Presentation by Firmin Zijl of Deltares. Deltares is an semi-government institution. It develops models used for real time flooding forecasting in the Netherlands. The current model in use in Dutch Continental Shelf version 5 (DCSMv5). It has a 48h lead time with a 6h update frequency. In November 2006 there was a storm and the forecasted values did not meet the expectations. This lead to the development of an improved model, DCSMv6. Meteorological input was added to the model. Sea surface roughness is calculated using Charnock relation. Calibration approach using tide gauge data at > 120 stations. The achieved quality improvement is 60% on tide, 25% on surge and 47% in total. The new model uses a Kalman Filter steady state. 32 stations are now used in the KF observation model. It has a 1/40 by 1/60 degree resolution.
Questions:
(UKHO) Will this system work with UK forecasting service? UK uses a separate model?
(VH) If there are open boundaries, is it possible surge is introduced twice? How good is the bathymetry in the model? Answers: Surge is generated internally. The bathymetry and grain size is not known for the entire North Sea. It was adjusted to the model.

Presentation by Cornelis Slobbe of Technical University of Delft.
Cornelis is working on a project called NEVREF (Vertical Reference Frame for the Netherlands Mainland, Wadden Islands and Continental Shelf). The aim is to create a geoid for land and sea with an accuracy of 1 cm and to establish its relationship to LAT with 1 dm accuracy. There are 5 work packages:

1) Iterative computation of quasi geoid
2) Iterative computation Dynamic Topography
3) LAT relative to quasi geoid
4) Height connection Wadden Islands and platforms
5) water level reduction

Work package 1 uses a hydrodynamic model, radar altimetry data, satellite gravimetry data, and terrestrial/shipboard/airborne gravity data. Satellite gravimetry provides the long-wavelength gravity field, while the other data sets provide the short-wavelengths. The hydrodynamic model is required to reduce the altimetric sea surface heights to the geoid.
Work package 2 uses the hydrodynamic model and the quasi-geoid to compute the dynamic topography corrections for the radar altimeter data set.
Work package 3 determines how often water levels drop below LAT. The computation of the harmonic constituents can be done over different time spans, e.g., 20 years, 100 years, or per year. The most appropriate method is still to be chosen.
Work package 4 is using GNSS leveling methods and hydrodynamic model leveling to transfer the NAP height system to the Wadden islands.
Work package 5 is addressing whether we can combine tidal reduction with GNSS with tidal reduction based on a properly referenced hydrodynamic model, and whether the latter can be used for the vertical positioning of an ROV.

Questions:
SE. RTK derived heights of water level. Squad of vessel? NLHO has spent time developing a good squad model. Depth dependent squad model?
NO correct instantaneous water level? From the model. Global gravity field modeling.
DE. Computation of LAT. Number of constituents. 95 used. Process how to calculate LAT is discussed.
LAT is minimum of tide over period of 19 years based on astronomical effect only.
NO: whole dataset in every case. Minimum of minimum. Long term drift disappear.

18.6 cycle is difficult to define. Biggest signal is changes of bathymetry, temperature, climate change.

Presentation of Niels Kinneging of Rijkswaterstaat

Rijkswaterstaat is the executive part of the Ministry of Infrastructure and Environment. Niels is speaking on Coastal Zone mapping, call4tender by DGMARE. There is a Consortium formed by HO's. The aim is support economic activities in coastal zone. The coasting mapping call is on availability, dissemination, share experience, develop standards of best practice, proposals for future strategy. There are 3 work packages:

WP1: digital mapping

WP2: share experiences, standards & best practices

- Vertical datums issue
- Survey experiences
- Platforms sharing

WP3: future program

Rijkswaterstaat took the responsibility for a Europe-wide overview on existing vertical datums for land and sea (first item of WP2). He calls upon the group to assist him. TWG agrees to be available for information requests, if the project is awarded.

Questions: rely on this WG how to handle different vertical reference systems. Resolution of coastal area minimum is 25m.

8. Discussions (topics proposed by the participants)

8.a: Lowest Astronomical Tide as Chart Datum:
definition and safety aspects of IHO resolution 3 / 1919.

The source of this discussion is the TWLWG6-8-Final Report, paragraph 4.14, determining ellipsoidal height of MSL at the coast which was taken with item 5.1: Lowest Astronomical Tides in the North Sea derived from a Vertical Referenced Shallow Water Model and an assessment of its suggested sense of safety.

LAT is now defined as the minimum of tide under astronomical conditions under average meteorological conditions. The way LAT is computed is done under responsibility of each Member State. Some countries apply the SA constituent[1] and others don't. If "average meteorological conditions" are interpreted as an average per season, SA should be included and if it is interpreted as a yearly average, the meteorological part of SA should be excluded. Some countries only use constituents which have a value of 1cm of more due to the accuracy of the tide gauge. In the end it is concluded that SA should be implemented in computing LAT in the North Sea.
There is a discussion on the length of period that should be used to compute LAT. Is this 18.6 years or can it for example be 100 years?
Conclusion is that NLHO will no longer pursue the corresponding TWLWG-6 action item 4.14 and leave it to resolve this matter not on a global but on a regional level. The above discussion has solved this for the North Sea region.
N.b.: On 28 January 2015, NL has communicated this with David Wyatt of IHO.

8.b.Awareness EU-DGMARE of vertical reference frames

NL has represented NSHC-TWG at the quarterly meetings of the EU Marine and Maritime Policy Working Group (EU2MPWG), to follow up on the IHB representation on the topic of the creation of a single set of reference surfaces for all European seas (ref. our Action 19/02). NL holds a presentation, which reflects the work of the TWG over the past few years. This is the information that has been shared with DG Mare of the European Commission, within the framework of the EU2MPWG. Cornelis Slobbe remarks that a large model is needed to include the Baltic, North Sea and Mediterranean. One open question is if it is productive to currently remain represented in the follow-up IENWG. This will be discussed with the NSHC-representative to the IENWG (Matthias Jonas, DE).
N.b.: On 29 January, NL and the NSHC representative reached the conclusion that it is currently not productive to remain represented in the IENWG.

9. Explain and reduce differences in reference surfaces at the international boundaries (WP16-04, WP18-01)

Assessment of the Lowest Astronomical Tide surface derived from DCSMv5 at the Delft University of Technology - Clement Roussel of ENSTA Bretagne

Leendert Dorst reports on the efforts of Clement Roussel of ENSTA Bretagne to validate the LAT2013 surface of DUT. This is the final result of the North Sea Geoid project, which preceded the current NEVREF project. Clement made comparisons with other realizations, which adds to our internal action items 20/01 and 20/02. An important result is that is nearly impossible to create an a priori estimation of the uncertainty of the results, and that DUT's a posteriori results to assess the uncertainty at the tide gauges do not show useful patterns to allow for interpolation. Due to the preliminary character of the results, NL decided not to use LAT2013 for operational use, nor to distribute it for that purpose.

[1] SA: Solar Annual, which includes all yearly effects, astronomical and meteorological

Norway is interested in the mean dynamic topography. What is its behaviour over time? Cornelis reports that one should take the hydrodynamic model and compute the time period one is interested in.

Establishment of IHO-EU Network WG (IENWG)
The new IHO-EU Network Working Group has a new member structure, with respect to its predecessor EU2MPWG (see agenda item 8b). Instead of each HO delivering a member, now one region is represented by one member. For NSHC this is Germany, by person Matthias Jonas. This group has been established to deal with EU/EC matters and manage the IHO/EC MOU. Its members are now ARHC, BSHC, EatHC, MBSHC, NHC, NIOHC, NSHC, SAIHC, SWPHC. The Chair is France (Michiel Even).

EVRS
NL gives a short presentation on how EVRF2000 and EVRF2007 were established. This is a European levelling network on cm accuracy connecting tide gauges across Europe. The connection between EVRS and LAT is important within the INSPIRE program: datasets can be presented on either reference height, depending if the data is land or sea based. After some discussion a new action item is defined (20/04) to gain insight in the difference between EVRS and LAT.

General discussion
On WP 16/04 (Enable GNSS based tidal reduction and the connection with the vertical datum on land), Sweden reports there is EU funding for improving the geoid in the Baltic region. Gravity measurements on water are now carried out. Germany holds a presentation on its advancements on using GNSS for tidal reduction. A Separation Model (including LAT) has been achieved for the entire German Exclusive Economic Zone of the North Sea and is now operational. LAT-ellipsoidal differences decrease from 42 meters (North West side) to 37 meters (South East side). For normal hydrographic surveying Germany is not still performing post processing of GNSS data. However, new methods are tested to expand GNSS RTK positioning further away from the coast using satellite communication and to derive GNSS data from the reference stations.

Two new work items are identified after the discussions:

Item number	Objective	Task description	HO involved	Status
WP 20/01	Improve North Sea wide realization of reference surfaces	Redo the work done in 2010 using the latest references from the Member States	NL, All	November 2015
WP 20/02	Show insight in the status of bordering countries	Create a matrix showing the status of adjacent borders wrt Chart Datum, LAT, MSL wrt ellipsoidal boundaries	NL, All	March 2015

At WP 20/02 the following options are identified:
1. no common boundary
2. differences on a common boundary but not checked
3. differences on a common boundary checked to be not significant
4. differences on a common boundary checked to need to be reduced

10 Exchange between HO's on operational methodologies for GNSS based surveys (WP18/02)

Netherlands hold a presentation on their findings using Fugro's Marinestar system.
FIG publication #62 is briefly discussed, in particular paragraph 6.8 (North Sea Development). UKHO have in the past followed FIG developments but no longer are able to. NL also reports that connection to FIG is sometimes difficult. Norway holds a presentation on a test in the Stavanger fjord to compute GNSS height with respect to two tidal gauges in the fjord.

11 Report from IHO SCWG2 28-30 May 2014 Quebec City, Canada

NL reports on the forming of the TWCWG which has been formed by merging TWLWG and SCWG. The SCWG has sent a questionnaire to users. 1400 replies with 43% professionals. Surface current is mostly used in route planning and manouvring. Current values are computed in a grid points system but visualization is preferred by vector. There is the remaining question if a world wide data centre for surface currents is feasible. The next SCWG is meeting in Japan on 13-15 May 2015.

12 Developments in modern tide gauges

NO: A new tidegauge is installed between the Norwegian mainland and Spitzbergen. Norway has little experience with radar as tide measurement. For temporal measurements, pressure sensors are used with one falling dry and one submerged. There is yet no replacement strategy for radar instruments.

NL: Rijkswaterstaat is responsible for tide gauges. They use combination of floating gauges and radar. The Navy vessels use pressure gauges SAIV when needed. These were used in NL Caribbean area for 1 year with good results

SE: In *Sweden* the Swedish Metrological and Hydrological institute (SMHI) has a network of stations. These are floating gauges in stilling wells, most with paper recorders (to be modernised). Hourly observations are available online (smhi.se). SMA has a network of permanent stations observing water level, wind, salinity and current. At each station, three pressure gauges send observations to the head office where all are stored and the shallowest is presented online. Approximated water density is used. There is now an app available to access the data from mobile phone or internet (in Swedish language only).

DK: has installed 8 radar tidegauges in 2014 and will increase this number. Operation is accessible via website in real-time. DK is responsible for 33 gauges in its waters.

UK. UKHO is not installing or driving the tide gauges. They advise on where new gauges are required. Presently there are 44 tidegauges around UK. South coast has its own system. Survey contractors have a range of equipment.

DE: reports no change from last year.

13 Developments in digital tide tables and website predictions/apps for tides.

NO: Norway reports on api.sehavniva.no/apitest.html. It can generate different URL's. to get answers from the database. Faster than an ordinary website. Question from website is changed to this and request is sent to database. In time it will be usable in mobile phones.

NL: tidal information is available at www.getij.nl (Rijkswaterstaat site). There is at present no development towards mobile phone access.

SE: app from meteorological institute, for all platforms available. Frequently used in last storm in Sweden.

DK: on website tide tables in pdf form/text format. Predictions on website. 2-5 days ahead..

UK: The series of tide tables are now in 6 volumes instead of 5 volumes. One volume has been split into two parts.

DE: only printed tide table. Home page can display prediction for 1 week.

UK holds a short presentation on ports with complex tides (double high and/or double low waters) within TotalTide. In the classical way per day 2 highs and 2 lows are reported. With this complexity, a stand is introduced. This is a period in which the water level does not change significantly (<10cm). The gradient is 0.1m per 30 min. Pairs of high water are grouped together to show the beginning and end of a stand. The Total Tide program will be updated in 2015.

14 Tidal reduction methods

NO: uses temporal tide gauges in relation to fixed stations. In future possibly GNSS method. Offshore Danish mean model surface is used.

NL: Dutch Continental Shelf Model (DCSM) version 5 in combination with Premo version 3. In future DCSM version 6 will be used in Premo. GNSS usage for online surveying was tested in 2013 (see NL presentation under agenda item 10).

SE: mostly GNSS+RTK directly referenced to national system. Check against traditional water level measurements. Can switch between the methods. No predictions are used.

UK: VORF reduction to GNSS survey is now standard. Recording tide gauges are redundant. Royal Navy uses VORF. There is a mix between classical method and GNSS. Co-tidal method is phased out.

DK: RTK in use for Danish waters. Land based stations located nearby the survey area. There are now fixed land base stations. When out of reach then usage of tide gauges. Greenland is done the old fashion way with tide gauge nearby. DTU develops new surface and calibrating/comparing for Greenland.

DE: LAT Separation Model (LAT2010) is used as standard for GNSS surveying in the German Bight. Tidal reduction is carried out close to EVRS using GNSS and the GCG2011 quasi geoid model. Whenever nautical products have to be delivered, geoid related depth are transformed to LAT using a difference model (LAT2010-GCG2011). In tidal rivers some fixed CD values close to LAT are used. Tide gauges derived data are only used for checking GNSS heights (loss of ambiguities), and in some cases where high accuracy GNSS heights are not available.

BE has left the meeting

15 Draft report of the NSHC-TWG for the 32nd NSHC conference

The next NSHC meeting will be in June 2016 in Ireland. There will be a TWG meeting before so at present no report to NSHC is needed. Report will be drafted after the next TWG meeting.

16 Any other business

The Terms of Reference need to be addressed. For example, the reference to TWLWG needs to be changed. See the current and proposed version in Annex B.
The minutes of this meeting are currently not formally approved until the start of the next meeting. Suggested to sent out the concept minutes and request feedback by email within one month. The final minutes can then be approved well before the next meeting.

17 Review of action items

18/01 remains open.
18/03 Is closed and replaced by WP 20/03
18/04 is closed but remains on the list.
19/01 is closed but remains on the list.
19/02 is closed but remains on the list.
19/03 date is set to July 2015
19/04 is closed but remains on the list.
19/05 is closed but remains on the list.
20/01 new
20/02 new
20/03 new
20/04 new

See Annex D for actions for internal coordination within TWG.

18 Date and venue of the 21st NSHC TWG meeting

The next NSHC meeting will be held in Ireland. NL will contact Ireland if they can arrange facilities for the TWG meeting as well. The meeting will be held at least 6 weeks in advance of the NSHC meeting. We aim at March/April 2016. As Ireland is not a member of the NSHC-TWG, another MS will need to coordinate.
N.b.: As no other volunteers were found after the TWG meeting, NL offered on 19 February 2015 to continue to play this role, and to chair the next meeting. The NSHC chair circle identifies the following TWG chairs/organizers for further meetings: NL->(IE)->BE->IS->SE->UK->DE->DK->FR->NO->NL->etc.

The Chairman thanks all for their effort and time and closes the meeting.

ANNEX A: Agenda

20th NSHC Tidal Working Group Meeting

27-28 January 2015, The Hague, the Netherlands

1. Opening remarks……..Chairman
2. Adoption of the agenda……..Chairman
3. Minutes of the 19th Meeting……..All
4. Status of Action Items from 19th Meeting.……All
5. Minutes of the 31st NSHC Conference……..Chairman
6. Report from IHO TWLWG 6 25-28 March 2014 in Wollongong, Australia...UK
7. Presentations from the participants
   - DCSMv6 (Firmin Zijl – Deltares)
   - NEVREF (Cornelis Slobbe – TUDelft)
   - Coastal Zone Mapping (Niels Kinnegin – Rijkswaterstaat)
8. Discussions (topics proposed by the participants
   - Lowest Astronomical Tide as Chart Datum: definition and safety aspects of IHO resolution 3/1919 (Discussion item TWLWG) ……..NL
   - Awareness EU-DGMARE of vertical reference frames ……NL
9. Explain and reduce differences in reference surfaces at the international boundaries (WP16/04, WP 18/01) ……All
   - Assessment of the Lowest Astronomical Tide surface derived from DCSMv5 at the Delft University of Technology - Clement Roussel of ENSTA Bretagne …NL
   - Establishment of IHO-EU Network WG (IENWG) ……NL
   - EVRS connection ……NL
10. Exchange between HO's on operational methodologies for GNSS based surveys
    - GNSS (Thijs Ligteringen) ……...NL
    - FIG 62 publication ……All
11. Report from IHO SCWG2 28-30 May 2014 Quebec City, Canada ……NL
12. Developments in modern tide gauges ……..All
13. Developments in digital tide tables and website predictions ……..All
    - apps for tides ……..All
14. Tidal reduction methods ……All
15. Draft report of the NSHC-TWG for the 32nd NSHC conference ……..NL
16. Any other business……..All
17. Review of action items……..NL
18. Date and venue of the 21st NSHC TWG meeting……All
19. Closing remarks……Chairman

ANNEX B:

Proposed version:

Terms of Reference for the North Sea Hydrographic Commission Tidal Working Group

As amended by NSHC 28th conference and commented on by TWG 18th

1. Objective

To provide technical advice and promote co-ordination on tidal issues especially within the North Sea Hydrographic Commission (NSHC).

2. Authority

The Tidal Working Group (TWG) is a subsidiary of the NSHC and its work plan is subject to NSHC approval. The TWG acknowledges the IHO Tidal, Water Level and Current Working Group (TWCWG) as a subsidiary of the Transfer Standard Maintenance and Applications Development Working Group(TSMAD) of the Hydrographic Services and Standards Committee (HSCC). Subject to approval by NSHC the TWG is especially involved with the regional interpretation and implementation of tidal issues as identified by TSMAD/TWCWG. If applicable the TWG can also give advice to TSMAD and NSHC for further consideration.

3. Procedures

a. The TWG should:

1. work according to the agreed NSHC work plan;
2. monitor and report the progress of the work plan;
3. propose new work plan items for consideration by the NSHC.

To support the identification of new work plan items deemed relevant for the NSHC, the TWG should:

4. liaise with especially TSMAD/TWCWG for any emerging development;
5. Exchange views and experiences concerning tidal issues like unifying vertical datums, analysis, modelling and related issues like sea level rise and surge.

b. The TWG will conduct its business mainly by correspondence. Meetings and workshops should be scheduled as deemed necessary for the accomplishment of the work plan.

4. Composition and Chairmanship

1. The TWG shall comprise representatives of the NSHC Member State and expert contributors if applicable.
2. Decisions should generally be made by consensus, if a majority is required each Member State has one vote.

3. External contributors can contribute to the work plan but are not entitled to vote.
4. The Chair and secretarial support will be from the Member State hosting the meeting.
5. The Chair should monitor and report on the work plan to the NSHC.

Current version:

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ANNEX C: WORK PLAN TWG to be approved by NSHC

Workplan NSHC Tidal Working Group: ([Feb 2012] - to be confirmed by NSHC)				
Item number (TWG/item)	**objective (WHY/priority)**	**task description (WHAT/HOW)**	**HO involved**	**Status**
WP 16 / 04	Enable GNSS-based tidal reduction and the connection with the vertical datum on land	Follow developments on geoid, MSL and LAT computations for the North Sea area	All	Permanent, see also WP18/01
WP18/01	Improve North Sea wide realization of reference surfaces	Explain and reduce differences in reference surfaces at the international boundaries	All	Permanent
WP 18/02	Improve methodologies for GNSS surveys	Exchange between HO's on operational methodologies for GNSS based surveys	All	Permanent

ANNEX D: Actions for internal coordination within TWG

Item number (TWG/item)	objective (WHY/priority)	task description (WHAT/HOW)	HO involved	status	corresponding work plan item
A18/01	Explain differences in realizations of LAT	Exchange on bilateral basis between involved HO's to investigate further the origin of observed differences at the boundaries between national reference surfaces	All	Permanent	WP 18/01
A18/03	Better capitalize the work done by the NSHC TWG	Study the feasibility for setting up a web portal for NSHC TWG on the IHO website	UKHO	Closed. See 20/03	None
A18/04	Facilitate exchanges of tide data by developing a standard XML format for tide data exchanges	Publish harmonic constituents and tide prediction for use within IHO community; UKHO acts as coordinator and links with TWLWG	All, UKHO	Closed	None
Action 18/05	Towards a common language both for tide constituents and tide predictions.	Automation of tide table production	All TWLWG	Closed	None
Action 19/01	Compare LAT surfaces	NLHO send a copy of the LAT surface from TU Delft to the TWG to be compared to the national models	NLHO, All	Closed	None
Action 19/02	Prepare an answer to IHO	UKHO distributes an answer to the letter from IHO for comments	UKHO, All	Closed	None
Action 19/03	Make an overview over existing separation and hydrodynamic models, including metadata	Each member state sends the information to UKHO	All, UKHO	July 2015	WP 18/01
Action 19/04	Investigate implications of eventual smoothing at the open sea boundaries between countries	Depends on the differences observed in the reference levels at the boundary layers.	All	Closed	None
Action 19/05	Maintenance of the common reference surfaces	Investigate what is required to update the existing LAT surface	NLHO	Closed	None
Action 20/01	Improve North Sea wide realization of reference surfaces	Redo the work done in 2010 using the latest references from the Member States	NL, All	September 2015	WP 18/01
Action 20/02	Show insight in the status at all bilateral boundaries	Create a matrix showing the status at all boundaries wrt Chart Datum, LAT, MSL and ellipsoidal boundaries	NL, All	March 2015	WP 18/01

Action 20/03	Better capitalize the work done by the NSHC TWG	Use the web portal for NSHC TWG on the IHO website	UK, All	Permanent	None
Action 20/04	Gain insight the connection between EVRS and chart datum	Create overview of connection between EVRS and Chart Datum	NL, All	Dec 2015.	WP 16/04

Table 1 Action items NSHC Tidal Working Group

ANNEX E: 6th IHO-TWLWG meeting

https://www.iho.int/mtg_docs/com_wg/IHOTC/TWLWG%206/TWLWG%206-8-Final%20Report.pdf