

9th Meeting of the Hydrographic Services and Standards Committee
6-10 November 2017, Ottawa, Canada

Report of the Nautical Cartography Working Group (NCWG)

Submitted by:	Chairman, NCWG
Related Documents:	List of Actions HSSC9-03B
Related Projects:	Not applicable

Chair:	Mr Mikko Hovi, Finland
Vice-Chair:	Ms Jacqueline Barone, USA
Secretary:	Mr Andrew Heath-Coleman, UK
Member States:	Australia, Brazil, Canada, Denmark, Finland, France, Germany, Greece, India, Indonesia, Iran, Italy, Japan, Korea (Rep of), Latvia, Netherlands, New Zealand, Norway, Pakistan, Russia, South Africa, Spain, Sweden, Turkey, Ukraine, UK, USA (=27)
Expert Contributor Organizations:	IHO Secreteriat, IBSC/ICA, C-MAP, Esri
<i>see Annex A for full details</i>	

1 Meetings Held During the Reporting Period and Planned

- 1.1 NCWG3 – 16-19 May 2017, Redlands, CA, USA. The full record of this meeting can be found on the NCWG page of the IHO web site.
- 1.2 NCWG4 is planned to be held between September 2018 and February 2019.
- 1.3 No meeting of the INT1 Sub-Working Group has been held during the reporting period. No meeting of the INT1 Sub-Working Group is planned before NCWG4.

2 NCWG Executive

- 2.1 In accordance with its term of reference, NCWG appointed its chair and vice-chair at its first meeting (NCWG3) after IHO Assembly.
- 2.2 As at HSSC9, the executive of the NCWG is:

Chair:	Mikko Hovi
Vice Chair:	Jacqueline Barone
Secretary:	Andrew Heath-Coleman

3 NCWG Terms of Reference

- 3.1 The NCWG Terms of Reference as approved at HSSC8 were adopted by the Working Group at NCWG3. The Terms of Reference for the NCWG are included at Annex B. Changes required by implementation of the revised IHO Convention and the amended title of IHO Publication S-11A are shown in red.

4 Work Programme

The programme is based on the priorities assigned within the detailed Work Plan (Annex C refers). Since HSSC8, the principal activities have been:

4.1 S-4 Chart Specifications of the IHO and Regulations for International (INT) Charts

4.1.1 Edition 4.7.0, July 2017, has been approved by MS and published. IHO CL 17/2017 and 42/2017 refer. This edition includes among other amendments

- guidance on the use of seals of non-IHO members on INT charts and charting sub-surface pipelines,
- guidance on charting sub-surface pipelines,
- new symbology for user activated AtoNs,
- revised symbology for seagrass,
- new symbology for bubble curtains, and
- changes related to removal of vacant entries from INT1.

4.1.2 Additional revisions and clarifications to S-4 are currently being discussed by the Working Group. The record of discussions, related actions and items in the NCWG Work Plan can be found in the NCWG3 Record on the NCWG page of the IHO web site. Items currently being discussed by the Working Group include (but are not restricted to):

- impacts of the amendments to IHO Resolution 3/1919,
- guidance on digital repromats.

4.1.3 Future of paper chart is currently under consideration of a small drafting group set up by NCWG3. This group is led by US-NOAA and NCWG vice-chair with Australia, Canada, Finland, Italy, UK, and Esri as members. An excerpt, that includes the purpose, background, scope and the table of contents, from the working draft is included at Annex D.

4.2 S-4 supplementary publications INT 1, INT 2 & INT 3

4.2.1 INT1 *Symbols, Abbreviations and Terms used on Charts*. There are three official language versions of INT1. No new revisions of the English, Spanish and French language versions have been published within the reporting period. Their current status is:

- Spanish language version published by ES/IHM: Edition 5, November 2015.
- French language version published by FR/SHOM: Edition 6, 2016.
- English language version published by DE/BSH: Edition 8, July 2015.

The efforts of IHM, SHOM and BSH and their collaboration through the NCWG INT1 Sub-Working Group (under the coordination of Mr Andrew Heath-Coleman) are acknowledged in developing these revisions.

4.2.2 Development of new Section V on data quality was reassessed at NCWG3. Several member states either have or are planning to have such information in their INT1 publications. The NCWG concluded that the need to develop an INT1 section for data quality still exists and tasked UK to prepare a preliminary draft for the WG.

4.2.3 INT2 *Borders, Graduations, Grids and Linear Scales*. There are no current plans for a revision of Edition 4, 2007, published by NL.

4.2.4 INT3 *Use of Symbols and Abbreviations*. There are no current plans for a revision of Edition 5, 2011, published by UK.

4.3 S-11 Part A Guidance for the Preparation and Maintenance of International Chart Schemes

- 4.3.1 Edition 3.0.0, June 2017, has been approved by MS and published. IHO CL 19/2017 and 41/2017 refer. This edition introduces a new document structure and guidance on ENC scheming.
- 4.3.2 Edition 3.1.0 has been approved by HSSC (HSSC Letter 2/2017) and submitted to IHO Council for endorsement and subsequent adoption by the MS. This edition adds new procedures on monitoring of INT Charts into Section 100 and introduces the related 'Basic quality assurance check-list for review of INT charts' as an Annex.
- 4.4 Liaison with other IHO working groups and S-100 implementation support
 - 4.4.1 NCWG has continued to liaise with other HSSC WGs by keeping them informed about its current activities and by considering their reports and submissions in its meetings.
- 4.5 Lessons learned from Marine Incidents
 - 4.5.1 There were no marine incidents brought to the attention of the Working Group during the reporting period, however it was agreed that this would remain a standing agenda item for NCWG meetings.

5 Progress on HSSC Action Items

- 5.1 Action HSSC8/03: *NCWG to compile portrayal requirements relating to product specifications in general as part of its programme of work*: Discussed at NCWG3 under agenda item 7.3. NCWG will setup a protocol to provide assistance to other WGs on their request. According to the protocol NCWG Portrayal Support subWG will be the first point of contact for all such requests. The NCWG will also introduce a simple template for enquiring groups to format requests to NCWG Portrayal Support subWG.
- 5.2 Action HSSC8/28: *NCWG and ENCWG to draft a single educative IHO authoritative document addressing the issue of "equivalent" T&Ps for ENCs, in view of its distribution to HOs, Port State Control authorities and mariners after approval*: Discussed at NCWG3 under agenda item 7.7. The final version is not yet ready for distribution.
- 5.3 Action HSSC8/39: *NCWG to consider the paper on the "visualization of bathymetric uncertainties data in S-101" and develop appropriate recommendations on the way forward*: Discussed at NCWG3 under agenda item 8.4. The method presented in the paper was considered as a viable starting point for further development, depending on progress in agreeing the data model by S-100WG. Concerns were expressed about the density of poorer quality (i.e. denser) grid obscuring detail, some commenting only usable for planning purposes. These concerns should be noted in the further development case by case.
- 5.4 Action HSSC8/68: *ICPC Focus Group to submit a proposal to NCWG for adapting S-4 charting specifications for submarine cables taking into account deep sea mining*: Paper NCWG3-08.3A submitted by ICPC was discussed at NCWG3 under agenda item 8.3. NCWG considered that there is no further action on S-4 needed, except to check possible impact of IHO Resolution 4/1967 as amended by IHO A-1.

6 Problems Encountered

- 6.1 Ongoing resource stretch at participating HOs.
- 6.2 Retirement during 2016 of both the Chair and Vice-Chair of the Working Group has impacted continuity of outstanding actions and the composition of Sub-Working/Correspondence Groups. This has resulted to delays on certain work plan items.

7 Any Other Items of Note for Consideration of HSSC

- 7.1 Rule-based cartography
 - 7.1.1 Following the various discussions on, for example, the future of the paper chart, print-on-demand approaches of MSs and development of chart production software, the NCWG has

discussed the role of rule-based cartography in nautical charting. At NCWG3, after discussion on the topic and a demo given by Esri, the WG considered that stronger emphasis should be given in future to the ability to automate chart production. This will be done on an on-going basis when developing new and revised guidance.

8 Any Other Items of Note for Information of HSSC

8.1 The activity of NCWG continues at a high level:

- The volume of detailed input to NCWG's work is extensive and thanks are recorded to all contributor MS' representatives.
- NCWG has the highest MS participation of any HSSC WG and this is matched by a very high level of active participation in its meetings and deliberations. (The latest two meetings of the WG have been attended by 18 and 13 MS, plus industry representatives. WG correspondence routinely receives considered responses from more than 20 participants.) I interpret this to be a continuing indicator of the relevance and value to each participating MS.

8.2 NCWG discussions are progressing regarding greater 'cross-format' engagement and maintaining and supporting the continued relevance of nautical cartography.

8.3 The NCWG Executive continues to provide responses to a variety of miscellaneous enquirers. This includes providing advice to ICCWG/RCG coordinators and to individual MS on charting matters and the application of IHO specifications and standards.

9 Conclusions and Recommended Actions

9.1 HSSC9 is invited to endorse the continued activity of the WG under its Terms of Reference at Annex B.

9.2 HSSC8 is invited to approve the Work Plan as submitted at Annex C. This Work Plan was formally reviewed in detail at NCWG3, April 2017 and has been updated in the version at Annex C. Note particularly new Item A31. Following any direction or guidance from HSSC9, this will be subject to further review and revision at NCWG4.

10 Justifications and Impacts

10.1 Justification for the continued activity of the WG is to fulfil the remit of its Terms of Reference which includes:

- Improving the standardization and currency of nautical charts (in accordance with SOLAS V (2002, regulation 9));
- Improving the guidance provided to nautical chart compilers, whatever the product's format, including support for 'Capacity Building';
- Improving the interface and, where feasible, commonality of presentation between physical and digital chart products, whilst acknowledging their inherent differences.

10.2 The principal impact is the resource commitments of participating HOs.

11 Action Required of HSSC

The HSSC is invited to:

- **Note** this report;
- **Endorse** the continued activity of the WG;
- **Endorse** the changes to NCWG TOR at Annex B; and
- **Approve** the Work Plan at Annex C.

Annexes

- A. Membership of NCWG (at 14 September 2017)
- B. NCWG Terms of Reference
- C. NCWG Work Plan
- D. The Future of the Paper Nautical Chart - Introduction and Table of Contents

MEMBERSHIP OF NCWG

(at 14 September 2017)

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NCWG Terms of Reference
NAUTICAL CARTOGRAPHY WORKING GROUP (NCWG)

- Ref:*
- 1) 1st HSSC Meeting (Singapore, October 2009)
 - 2) 4th HSSC Meeting (Taunton, United Kingdom, September 2012)
 - 3) 6th HSSC Meeting (Viña del Mar, Chile, November 2014) (name change only)
 - 3) 6th HSSC Meeting (Viña del Mar, Chile, November 2014) (name change only)
 - 4) 7th HSSC Meeting (Busan, Republic of Korea, November 2015)
 - 5) 8th HSSC Meeting (Monaco, November 2016) (clarification in section 4c only)
 - 6) 9th HSSC Meeting...

1. **Objectives**

- a) To provide expert and authoritative advice and guidance to relevant IHO bodies and non-IHO entities on the concepts of nautical cartography, including
 - (i) Its application to nautical charts existing in any physical or digital form;
 - (ii) The development of specifications for symbolization of any data required to be displayed on nautical charts;
 - (iii) The integration of the nautical chart and other cartographic products for e-Navigation. This includes resolving portrayal issues related to the simultaneous display of a nautical chart in combination with navigational information and non-navigational information within an integrated navigation system.
- b) To provide expertise to the International Board on Standards of Competence for Hydrographic Surveyors and Nautical Cartographers (IBSC) on the standards of competence for cartographers when deemed necessary.
- c) To monitor the development of other relevant international standards.

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 Chair**

- a) The WG shall comprise representatives of IHO Member States (MS), Expert Contributors (EC), observers from accredited Non-Governmental International Organizations (NGIO), and a representative of the **IHO Secretariat**. A membership list shall be maintained and posted on the IHO website.
- b) The Chair will monitor membership to ensure that each Regional Hydrographic Commission is invited to be represented on the WG.
- c) EC membership is open to entities and organizations that can provide a relevant and constructive contribution to the work of the WG.
- d) The Chair and Vice-Chair shall each 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 **IHO Assembly** and shall be determined by vote of the MS present and voting.
- e) A Secretary should be appointed to ensure the smooth running of WG business; to administer consultation and collation of members' views; and may act as Editor of the WG's publications. The position is normally filled by a member of the WG.
- f) 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. If the position of Chair or Vice-Chair

becomes vacant during the period between two ordinary sessions of the **Assembly** an election should be conducted at the next meeting of the Working Group or by correspondence.

- g) ECs shall seek approval of membership from the Chair.
- h) EC membership may be withdrawn if 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.
- i) All members shall inform the Chair in advance of their intention to attend meetings of the WG.
- j) 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's main tasks are listed at (1) above and are amplified here:
 - (i) Keep under continuous review the IHO publication S-4 'Regulations of the IHO for International (INT) Charts and Chart Specifications of the IHO', in order to advise the HSSC on their updating, design and format and the portrayal of symbols. Note: S-4 is supplemented by:
 - INT 1 'Symbols, Abbreviations and Terms used on Charts'
 - INT 2 'Borders, Graduation, Grids and Linear Scales'
 - INT 3 'Use of Symbols and Abbreviations'These supplementary documents are maintained by individual MS, under the supervision of NCWG.
 - (ii) Advise the HSSC on suggestions put forward by MS to update S-4, in accordance with IHO Specification B-160, with the goal of achieving the maximum possible adherence by MS to the Regulations and Specifications.
 - (iii) Keep under continuous review S-11 Part A 'Guidance for the Preparation and Maintenance of International (INT) Chart Schemes and ENC Schemes' in order to advise the HSSC on its updating.
 - (iv) Advise the **IHO Secretariat** and Regional Hydrographic Commissions, as appropriate, on the work of International Charting Coordination Working Groups (ICCWG) or Regional Charting Groups (RCG) in order to promote the production of international (INT) charts.
 - (v) Offer advice based on the WG experience to ICCWG/RCG and individual MS, on chart schemes and cartographic work, in order to strongly encourage adherence to IHO charting specifications.
- 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 shall 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 **responding** MS represented in the WG.

- d) The date and venue of WG 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 will maintain close liaison with other HSSC WGs, particularly the ENCWG, NIPWG and S-100WG, and other groups developing and maintaining S-100 based products. The WG should liaise also with other IHO bodies, international organizations and industry, as appropriate and as instructed by HSSC.
- h) The WG should prepare annually a report on its activities and a rolling two-year work plan, including expected time frame.

NCWG Work Plan
September 2017
(Updated following NCWG3)

- *Objectives, Tasks and Work Items are pursued in accordance with IHO Work Programme 2017, Programme 2: Services and Standards (as proposed in CL54/2016 and approved by CL65/2016):*
 - *Element 2.2 Hydrographic Data Transfer Standards*
 - *Task 2.2.5 Provide outreach and technical assistance regarding transfer standards*
 - *Element 2.3. Nautical Cartography:*
 - *Task 2.3.1 Conduct meetings of Nautical Cartography Working Group (NCWG).*
 - *Task 2.3.2 Maintain and extend the relevant IHO standards, specifications and publications.*
- *The focus is on maintaining and enhancing cartographic standards and specifications for nautical charts to suit the needs of the modern mariner in support of safe navigation and protection of the marine environment.*
- *As a Plan it will and should evolve; accordingly, contributions from WG members and others are welcomed at any time.*
- *NCWG Tasks*
 - A *Maintain and extend Publication S-4 'Chart Specifications of the IHO & Regulations of the IHO for INT Charts' (IHO Task 2.3.2.1)*
 - B *Maintain and extend Publication S-11 Part A 'Guidance for the Preparation and Maintenance of INT Chart schemes' (IHO Task 2.3.2.5)*
 - D *Development of new (and revised) symbology (IHO Task 2.3.2)*
 - E *Maintenance of S-4 supplementary publications INT 1, 2 & 3 (IHO Task 2.3.2.2-4)*
 - G *Conduct meetings of NCWG (IHO Task 2.3.1)*
 - H *Provide technical assistance to other IHO working groups and support regarding the implementation of S-100 (IHO Task 2.2.5)*

No	Work item	Priority H-high M-medium L-low	Next Milestone	Start Date	End Date	Status P-Planned O-Ongoing C-Completed	Contact Person(s)	Affected Pubs/Standard	Remarks
A16	Consideration of the 'future of the paper chart'	H	Circulate draft table of contents of the report on the "future of the paper chart" to WG Then, allocate tasks to Future of Paper Chart sub-group Members	2014	2018	O	Colby Harmon		CSPCWG10 Action 36 NCWG1 Action 54 Meeting following NCWG2 NCWG3 Action 12 Report at HSSC9
A24	Provide guidance on the use of seals of non- IHO members on INT charts. Clarification required to prevent non- HO seals and logos being included on INT charts	M	Report to HSSC9 and remove	2014	2017	C	Sec NCWG	S-4	HSSC6-05.5C & F refer NCWG1 Action 46 WG Ltrs 02 & 08/2015 Included in S-4 4.6.0 NCWG2 Action 36, further clarification needed Included in S-4 4.7.0
A26	Portrayal subWG	H	Agree protocol for seeking advice from NCWG	2016	2017	O	Chair NCWG		HSSC7 Action 18 NCWG2 Actions 5, 22, 30-32 Attendance at NIPWG Visualization workshop May 2017. Report to HSSC9 for approval by other WGs.
A27	Provide guidance on charting Sub-surface floating pipelines	M	Report to HSSC9 and remove	2016	2017	C	Sec NCWG	S-4	NCWG2 Action 15 Endorsed by HSSC8. Included in S-4 4.7.0
A28	Future of S-4		Progress with A16			P	Chair NCWG	S-4	NCWG3 Agenda 7.4: waiting on progress with A16

A29	Consider ICPC submission on charting submarine cables taking into account deep sea mining	L	Chair to communicate with ICPC. Sec to confirm nothing in S-4 contradictory to Res.4/1967 as amended.			P	Chair NCWG	S-4	HSSC8/68 (pending submission from ICPC). ICPC unavailable for discussion at NCWG3. NCWG3 Action 19
A30	Check the impact of the IHO Resolution 3/1919 as amended on S-4 when it is approved	L	Submit change to HSSC9 for approval if appropriate	2016	2018	O	Sec NCWG	S-4, INT1	Ref. IHO CL 27/2016 and CL 10/2017 NCWG3 Action 27
A31	Revise S-4 A-500 for digital reformat	M	Circulate draft revised A-500 for WG members comment	2017	2018	P	Sec NCWG	S-4	NCWG3 Action 31
B3	Develop guidelines for preparation & maintenance of small / medium scale ENC schemes.	H	Report to HSSC9 and remove	2009	2017	C	Sec/Chair NCWG IHB	S-11A	HSSC7 Action 22 NCWG2 Action 37 Included in S-11A 3.0.0
B4	Prepare a "basic quality assurance check-list template" for use by INT Chart Coordinators/ICCWG in support of the review of new INT charts.	M	IRCC decision to include in S-11 Part A (3.1.0)	2016	2017	C	IHO(Sec) Chair/Sec NCWG	S-11A	IHO CL 64/2015 NCWG2 Actions 38, 39 Feedback from coordinators due 31/03/2017. Refer to IRCC9. NCWG3 Agenda 7.5 – NCWG action completed
D36	User activated AtoN	M	Report to HSSC9 and remove	2015	2017	C	Sec NCWG	S-4, INT1	NCWG2 Action 10 Endorsed by HSSC8. Included in S-4 4.7.0
D37	Seagrass	M	Report to HSSC9 and remove	2016	2017	C	Sec NCWG	S-4, INT1	NCWG2 Action 23, 24 Endorsed by HSSC8. Included in S-4 4.7.0
D38	Bubbler	M	Report to HSSC9 and remove	2016	2017	C	Sec NCWG	S-4, INT1	NCWG2 Action 43, 44 Endorsed by HSSC8. Included in S-4 4.7.0

E1	Maintain official INT 1s		Planning for next editions by INT1 sub-WG			O	DE: S Spohn FR: S Guillou ES: F. Yanguas	INT 1	English version 2015 (Ed 8) French version 2016 (Ed 6) Spanish version 2015(Ed 5)
E4	Symbols for vacant entries in INT 1	L	Remove agreed vacant entries and populate B48 & F29.2 next editions INT1. Report to HSSC9 and remove	2016	2017	C	Sec NCWG INT1subWG	INT 1, S-4 part B	NCWG1 Action 14 NCWG2 Actions 41-44 Included in S-4 4.7.0 INT1 changes now part of E1.
E9	Develop new section V for INT1 for 'data quality'	M	Draft to WG	2014	2018	O	Chair NCWG UK	INT1	CSPCWG10 Action 35 NCWG3 Agenda 11.2: Transferred to UK
E10	Symbol library	L	Report to HSSC9 and remove	2016	?	O	UK (J Carey) US (C Harmon)	S-4, INT1	NCWG Actions 45, 46 NCWG3 Agenda 3: Not required to progress at this time.
H1	Liaise with IHO subsidiary bodies and subordinate organs, e.g. WNWNS-SC, NIPWG, ENCWG, SCUFN, etc.	L	Business as usual, report to HSSC9 and remove	2016	?	O	Chair and Sec NCWG	S-4, INT1, S-32	Support the UFN Project Team, see Doc. HSSC8-07.1C INF3 NCWG Agenda 7.6: J Barone appointed as POC for UFN PT.
H2	Prepare a single educative IHO authoritative document addressing the issue of "equivalent" T&Ps for ENCs, in view of its distribution to HOs, Port State Control authorities and mariners after approval.	M	Chair to circulate revised draft to WG members for comment	2016	2017	O	NCWG Chair and ENCWG Chair	S-66 Stage 2?	HSSC8/28 NCWG3 Action 15
H3	Consider the paper on the "visualization of bathymetric uncertainties data in S-101" (Doc. HSSC8-05.6B INF6) and develop appropriate recommendations on the way forward.	M	Chair to report to DE and HSSC9.	2016	2017	P	NCWG Chair	S-101	HSSC8/39 NCWG Action 20

G. CSPCWG Meetings (IHO T2.3.1 refers)

Date	Meeting	Location	Meeting	Date	Meeting	Location
03-05 Nov 04	CSPCWG 1	IHB, Monaco	CSPCWG 1	28-30 April 2015	CSPCWG 11/NCWG1	Rostock, Germany
19-21 Oct 05	CSPCWG 2	IHB, Monaco	CSPCWG 2	26-29 April 2016	NCWG2	IHB, Monaco
22-24 Nov 06	CSPCWG 3	IHB, Monaco	CSPCWG 3	16-19 May 2017	NCWG3	ESRI HQ, Redlands, CA, USA
13-15 Nov 07	CSPCWG 4	IHB, Monaco	CSPCWG 4	Sept 2018 or later	NCWG4	tbd
18-21 Nov 08	CSPCWG 5	Sydney, Australia	CSPCWG 5			
01-03 Dec 09	CSPCWG 6	IHB, Monaco	CSPCWG 6			
23-26 Nov 10	CSPCWG 7	Simon's Town, S Africa	CSPCWG 7			
29 Nov–02 Dec 11	CSPCWG 8	Turku, Finland	CSPCWG 8			
13-16 Nov 12	CSPGWG 9	Seoul, Rep of Korea	CSPGWG 9			
21-24 Jan 2014	CSPCWG 10	Wellington, New Zealand	CSPCWG 10			

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The Future of the Paper Nautical Chart

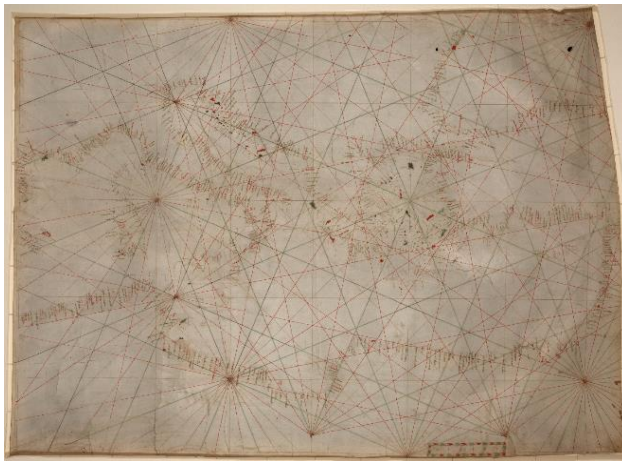
An Overview of Issues and Recommendations Regarding
Paper Nautical Charts in the Current and Future Marine Environment
by the International Hydrographic Organization – Nautical Cartography Working
Group

– – Working Draft – Front Section and Table of Contents – 12 Oct 2017 –

Executive Summary

<<< This section is to be written after the paper is completed >>>

1. Introduction



Portolans¹, nautical charts covered with a rhumbline network, started to appear in Europe in the late 13th century. This new innovation took advantage of the recent practical use of the magnetic compass for marine navigation. Portolans exemplify how the form of one navigational tool can be heavily influenced by the advent of another. The invention of radio direction finding in the 1930s, which eventually led to the addition of LORAN lattices on nautical charts, is

another example. The creation of the Global Positioning System (GPS) and development of Electronic Chart Display and Information Systems (ECDIS) in the 1990s changed the form of nautical charts in a radical way; most notably, moving from paper media to the digital form of Electronic Navigational Charts (ENC).

1.1 Purpose

While paper and raster nautical charts have coexisted with the vector ENC for nearly three decades, the advent of GPS, ENCs and ECDIS is now having an increasing influence on the way raster charts are made and used. The content, format, distribution, and even the

Figure 1 - Portolan chart of the Mediterranean Sea ca. 1320 to 1350

continued existence of the paper chart, are topics that are now commonly discussed by professional

mariners, recreational boaters, regulatory authorities, national hydrographic offices, and other stakeholders. To adequately prepare for the future, the International Hydrographic Organization - Nautical Cartography Working Group has prepared this overview of the most significant issues related to the “Future of the Paper Nautical Chart”, and offers some recommendations to be considered by the IHO. It is hoped that further exploration and discussion of these issues will help official chart producers, paper chart makers, and chart users better prepare for what may lie ahead.

¹ Figure 1. Portolan chart of the Mediterranean Sea ca. 1320 to 1350: manuscript chart of the Mediterranean and Black seas on vellum. [Map] Retrieved from the U.S. Library of Congress, <https://www.loc.gov/item/2003630429/>.

1.2 Background

The idea for writing this paper originated at the 9th meeting of the Chart Standardization and Paper Chart Working Group (CSPCWG) in 2012 (see Annex A for an account of subsequent discussions about the paper). During the meeting, a discussion about the relevance of the INT chart concept expanded to consider the future of the paper chart generally. It was opined that, while ENC's are particularly useful for navigation at larger scales, paper charts at smaller scales are still very useful for planning and overview and it was suggested that a paper could be drafted on this subject.

Over the span of five years, three working group chairs, and several working group members volunteering to help write a paper, less than complete success has been achieved in finishing this task. It remains in the work plan of the Nautical Cartography Working Group (NCWG) (the former CSPCWG) as high-priority Item A16, "Consideration of the 'future of the paper chart.'"

1.3 Scope

With the goal of finally completing the task of writing a paper on the "Future of the Paper Nautical Chart" in mind, the scope of this study has intentionally been designed to be wide, but shallow with the understanding that digging deeper into some topics may be desired in the future. That is, to identify issues that may affect the future production and use of paper national and international (INT) nautical charts and to discuss the most important aspects of those topics in a timely manner. The information presented is intended to stimulate additional discussion and ultimately prompt a desire to delve deeper into the ramifications of specific topics that are introduced here. This paper is not an exhaustive study of global paper nautical chart production, distribution and usage practices. It is meant only to introduce important paper chart related issues that may require the IHO, individual hydrographic offices, regulatory organizations, mariners, and other stakeholders to think about paper charts differently and to take appropriate actions to prepare for the future of the paper chart. Some preliminary recommendations are provided for further consideration and the possible development of more practical IHO guidelines.

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