



# 6th Meeting of the IHO Council

## Report and Proposals from HSSC

### Agenda Item C6-04.1A

C-6, Monaco, 18 – 20 October 2022



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## ITEMS TO BE REPORTED

International  
Hydrographic  
Organization

- Difficulties and challenges
- Implementation of the IHO Strategic Plan
- The implementation of the Roadmap for the S-100 Implementation Decade (2020 – 2030)
  - Proposed New IHO Resolution xx/2023 on the S-100 Implementation
  - Proposed amendments to the S-100 Roadmap Annex 2 – **Session 2**
  - Proposed Annex 4, Dual Fuel Concept for S-100 ECDIS – **Session 2**
  - IMO endorsement on S-100 in ECDIS Performance Standards
- Progress in the development of the S-1xx Product Specifications
- Update on the implementation of the recommendations on the Future of the Paper Nautical Chart
- Other highlights in the ongoing HSSC Work Plan



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## DIFFICULTIES AND CHALLENGES

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- Covid-19 challenges. Face-to-face meetings again is most welcomed and is expected to speed up the progress. All Working Groups are expected to have one face-to-face meeting before next HSSC15 2023.
- At the IMO NCSR9 Meeting in June 2022 the proposal, initiated by IHO, to include S-100 as a valid format in ECDIS was endorsed. The proposal was based on the IHO S-100 timeline and it is now of outermost importance to keep the timeline for S-101 and associated S-100 product specifications.
- Critical to encourage IHO Member States and wider stakeholders to actively support the development of S-101, followed by the HSSC ISO 9001 cell, and other related product specifications. Possibly accelerate delivery of operational versions of S-128, S-164 and S-98.
- HSSC has a critical vacancy at the position of Data Quality WG Chair and Secretary and there is a risk that DQWG activities are put on hold. An inactive DQWG will hamper the S-100 development and it is critical that IHO MS nominate officer's bearers to this important WG.

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Goal 1 : Evolving the hydrographic support for safety and efficiency of maritime navigation				Goal 2 : Increasing the use of hydrographic data for the benefit of society
1.1 DELIVER STANDARDS FOR HYDROGRAPHIC DATA AND SPECIFICATIONS OF HYDROGRAPHIC PRODUCTS		1.2 DEVELOP STANDARDS & SPECIFICATIONS		2.2 PROMOTE NEW TOOLS AND METHODS
	1.1.1 Member States produce & deliver products based on S-100	1.1.2 Number of hydrographic data products and services based on S-100	1.2.1 Percentage of Hydrographic data product and services based on S-100	2.2.2 Number of new applications of the new version of Standards for Hydrographic Survey (S-44)
Target	2026 : 60% of MS distribute at least 1 product*	2026 : 10** S1xx Product Specifications are operational (Edition 2.0.0)	2026 : 100% of PS** includes cyber security and data quality assessment	Number of downloads of S-44 Edition 6.0.0 and following ones
Value 31/12/2021	0% of MS distribute official products <i>Several MS distribute S-102 &amp; S-111 compliant with current editions of PS</i>	0/10 <i>S-100 Edition 5.0.0 endorsed at HSSC 14</i>	0% <i>No PS in Edition 2.0.0</i>	59
<p>* Based on that 62 of 94 IHO MS produce S-57 ENCs (March 2021)</p> <p>** S-101, S-102, S-104, S-111, S-122, S-124, S-127, S-128, S-129, S-131</p>				

Dashboard on SPIs allocated to HSSC. The dashboard format was presented at HSSC14 as good example on how the SPIs could be reported. Figures updated 31<sup>st</sup> December 2021.

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# NEW IHO RESOLUTION ON THE S-100 IMPLEMENTATION

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- As a consequence of the introduction of S-100 and following an A-2 proposal (PRO 2.3) by the ROK. HSSC14 endorsed the amendment of four IHO resolutions.
- IHO MS subsequently adopted these amended resolutions. See IHO CL 20 and 38/2022.
- In addition HSSC propose an overarching IHO Resolution on S-100, embracing concepts and pathways depicted in the S-100 Roadmap.
- The proposed new Resolution will also reference the IMO Resolution on ECDIS Performance Standards and the in force dates agreed upon. See Annex A to the C-6 HSSC report.

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# IHO RESOLUTION XX/2023 – S-100 IMPLEMENTATION

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It is resolved that S-100 implementation be monitored by the Council through the Roadmap for the S-100 Implementation Decade (2020 – 2030 and guided by its Annexes.

- a) Collaboration with IMO and other liaising Organizations.
- b) S-100 Timelines
- c) WEND-100 Principles
- d) Dual Fuel Concept for S-100 ECDIS

The IHO Member States should respect the IMO Resolution on Performance Standards for ECDIS and the in force dates agreed upon, understanding that adequate S-101 ENC coverage and appropriate complementary S-100 data/products services are expected when S-100 ECDIS becomes operational.

- **HSSC invites the Council to endorse the new Resolution on S-100 and if endorsed for the Council Chair to submit the proposal to be adopted by A-3.**

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# IMO ENDORSEMENT ON S-100 IN ECDIS PERFORMANCE STANDARDS

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- The IHO organized drafting group consisted of relevant parts of the HSSC Chair group, CIRM, IEC, INTERTANKO and a few other relevant stakeholders.
- The drafting group was chaired by the IHO Technical Director and a draft redline version was submitted by IHO, cosponsored by CIRM and Intertanko, to the IMO NCSR9 meeting, held in June 2022.
- With the exception of the withdrawal of functionalities for route exchange all other proposed changes were endorsed by NCSR9. To be approved by IMO MSC106 in November 2022.
- A transition period was agreed upon, meaning that S-100 ECDIS will be legal to use after **1 January 2026** and from **1 January 2029** new systems must comply with the new IMO Resolution on ECDIS Performance Standards.



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# S-100 IN THE IMO REGULATIONS AND CONSEQUENCES FOR IHO AND IHO MS

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- Inclusion of S-100 in the IMO regulatory framework is a major success for IHO.
  - IHO has now commitments towards IMO and other stakeholders to achieve operational status on the prioritized S-100 product specifications.
  - Member States to achieve substantial coverage of S-101 until 2026.
  - Active contribution in S-100 related WGs and PTs must be increased.
  - The first into force date, 1 January 2026, at the end of the coming IHO work programme 2023 – 2026.
- 
- **HSSC invites the Council to recommend to A-3 that Goal 1 and its Targets in the IHO Strategic Plan should have the highest priority in the 2023 – 2026 Work Programme**

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# PROGRESSES IN THE DEVELOPMENT OF THE S-1XX PRODUCT SPECIFICATIONS

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- The development of the S-1xx product specifications is progressing more or less as expected. Detailed timeline is available in S-100 Roadmap, Annex 2
- HSSC14 approved the first editions (1.0.0) of the following Product Specifications, for experimentation and testing:
  - Interoperability, S-98
  - Water Level, S-104
  - Catalogue of Nautical Products, S-128
- HSSC14 also endorsed new editions of:
  - Management of the S-100 GI Registry, S-99, edition 1.1.0
  - S-100, edition 5.0.0
  - Bathymetry, S-102, edition 2.1.0
  - IHO CL 21 and 24/2022 are issue for MS approval.

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# FUNDAMENTAL CHANGES IN S-100 ECDIS

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- The single layer official S-57 ENC's will be replaced by multiple, interacting layers of navigational data
- The S-101 ENC will always be the navigational base layer
- In the draft IMO ECDIS Performance Standards the term *Electronic Navigational Data Service (ENDS)* is used for the multiple layers to be used in S-100 ECDIS
- ***Electronic Navigational Data Service (ENDS)*** means a special-purpose database compiled from nautical chart and nautical publication data, standardized as to content, structure and format, **issued for use with ECDIS by or on the authority of a Government, authorized Hydrographic Office or other relevant government institution**, and conforming to IHO standards; and, is designed to meet the requirement of marine navigation and the nautical charts and nautical publications carriage requirements in SOLAS regulations V/19 and V/27. **The navigational base layer of ENDS is the Electronic Navigational Chart (ENC).**
- S-98 is the product specification which will handle how multiple layers are portrayed and how alarms are triggered

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## S-98 : A CORE COMPONENT OF S-100

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Example 1: High density bathymetry (S-102) replaces soundings in the ENC. Depth contours are re-computed based on S-102.

S-102 contains a grid of depth values with no predefined contours

S-98 defines how to draw a safety contour on a grid of S-102 depths

These generated depth contours with associated depth areas supresses the S-101 depth contours areas





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# Example 2 : S-98 defines how to apply Water Level Adjustment using S-104

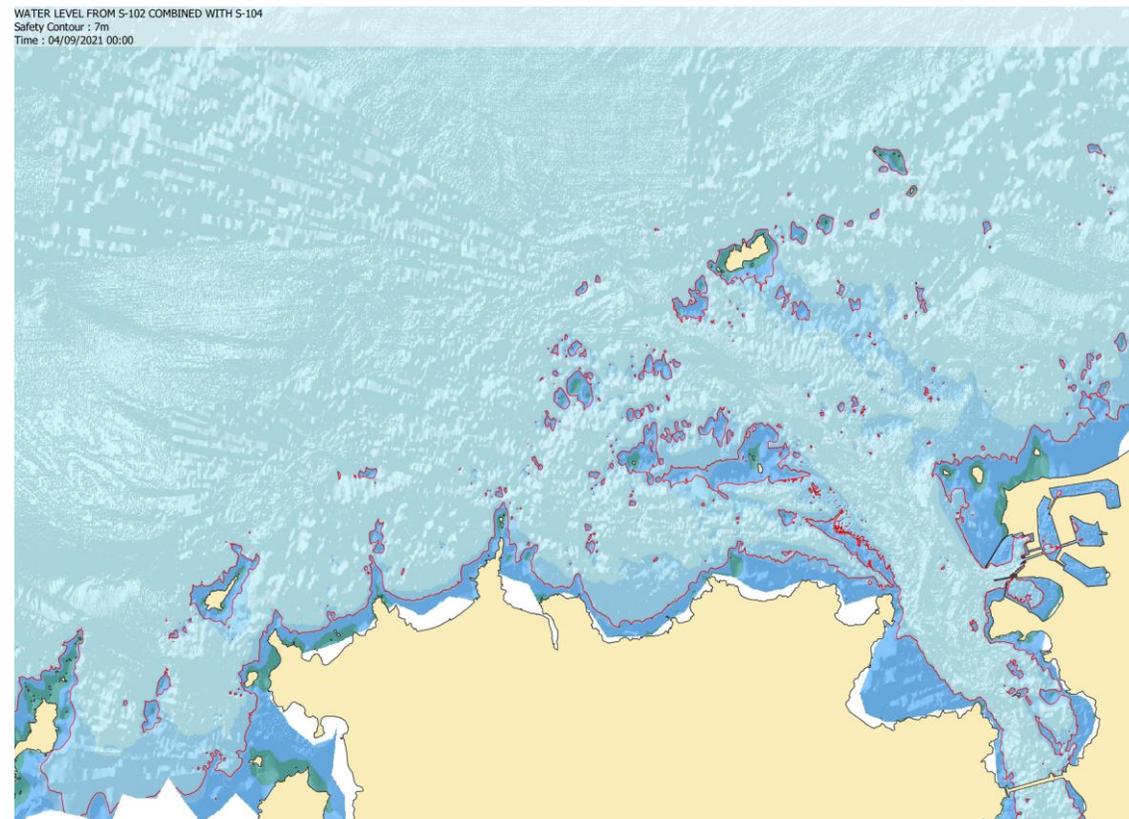
International Hydrographic Organization

S-104 Depth Value = 0.1m

11.31	11.46	11.43	11.43	
11.35	11.35	11.15	11.45	
9999	11.31	11.32	11.0	11.0
	9999	11.43	11.42	10.9

S-102 No Data Value

Safety Contour 7m. The safety contour changes are based on S-102 bathymetry and Water Level Adjustment (WLA), using S-104, over a period of 21 hours.



S-102 Data (Safety Contour 7m) / S-104 Data (Corrected Depths)

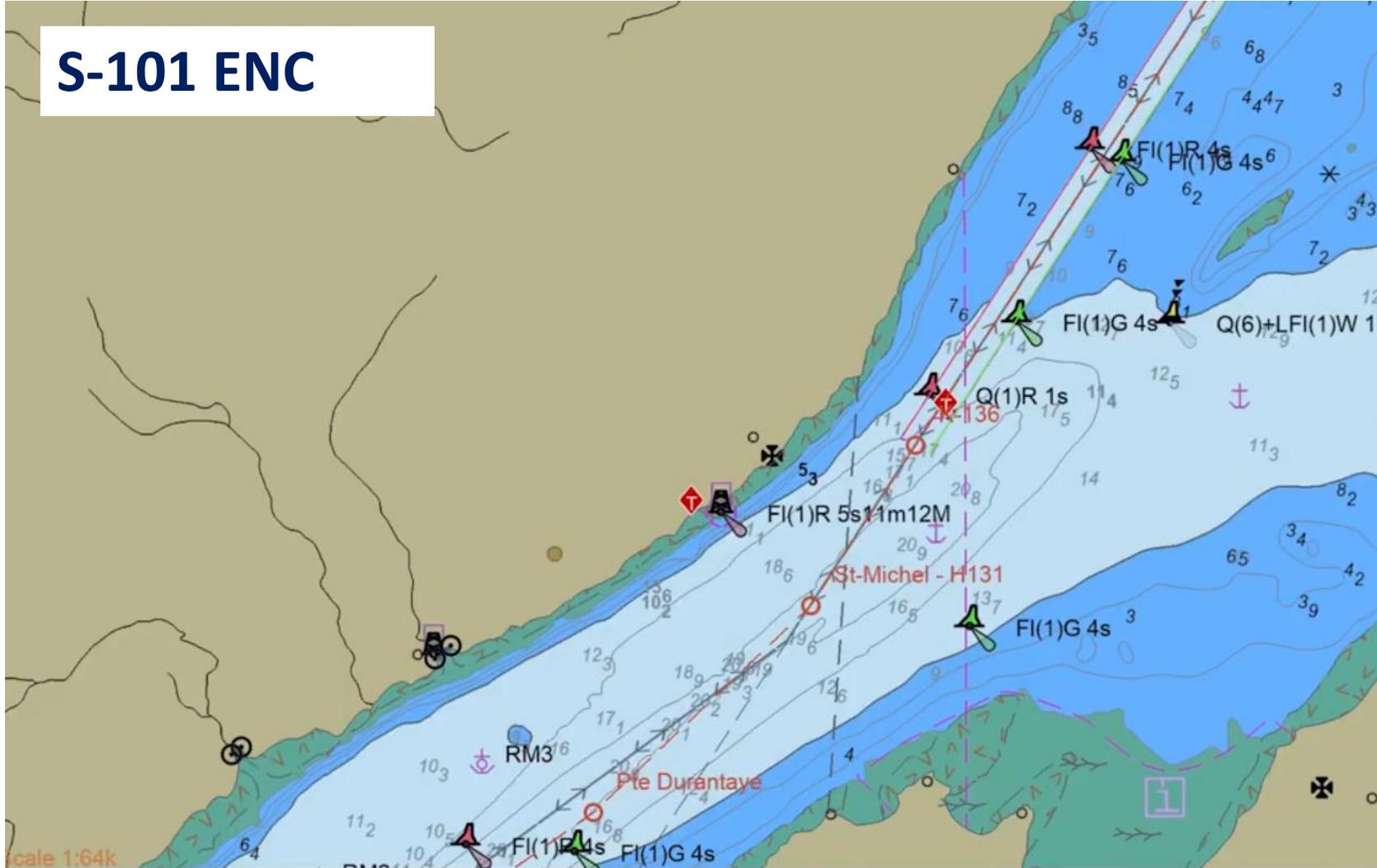


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# SUPPRESSION OF S-101 ENC DEPTH INFORMATION

International  
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S-101 ENC



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With permission from the  
Canadian Hydrographic Service



Reference: C5/07

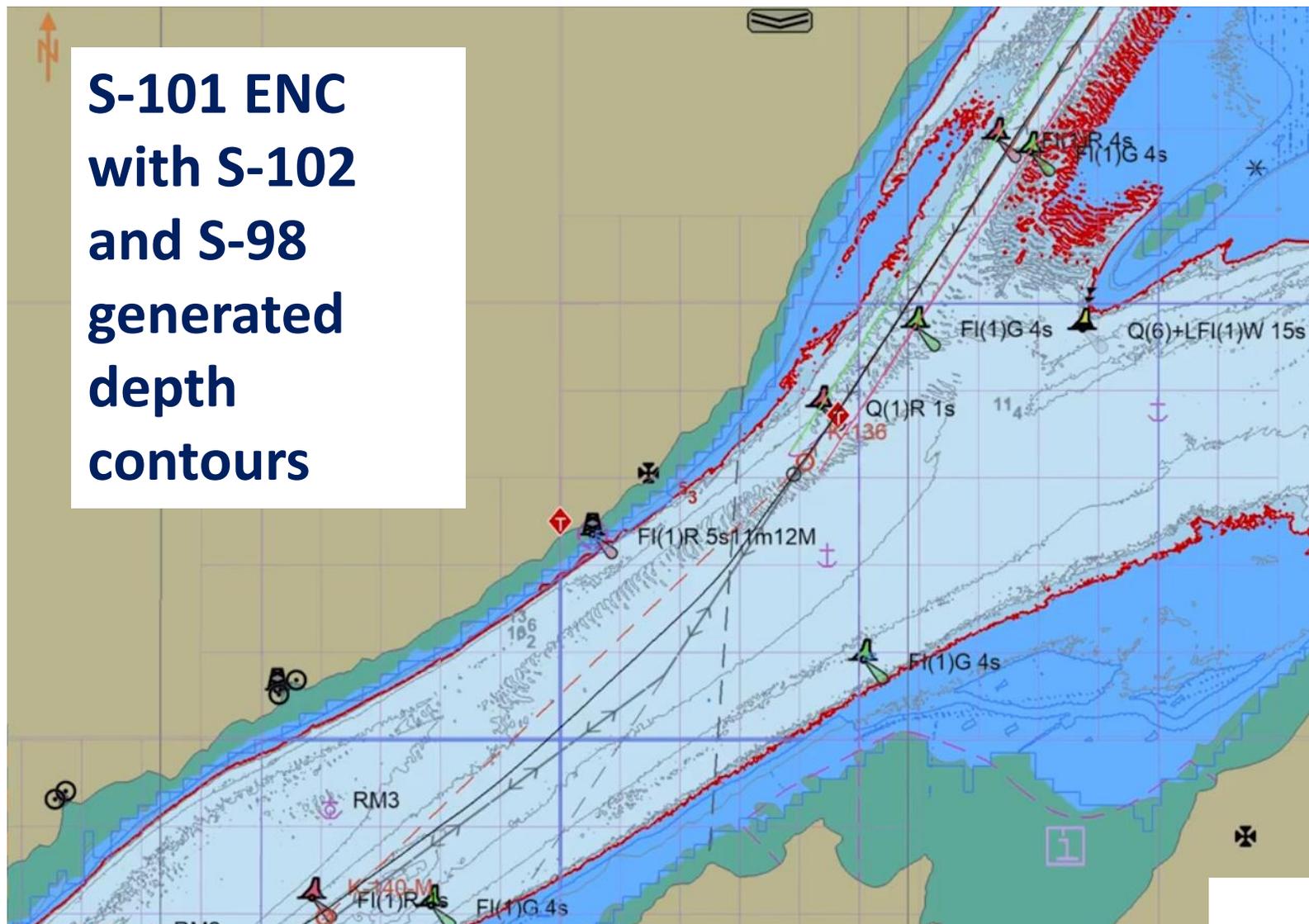


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# SUPPRESSION OF S-101 ENC DEPTH INFORMATION WITH S-102 AND S-98

International Hydrographic Organization

S-101 ENC with S-102 and S-98 generated depth contours



With permission from the Canadian Hydrographic Service



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# S-98 ENABLED FUNCTIONALITIES

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- S-98 enables, with interleaving, suppression and replacement of the ENC content, a change from the existing S-57 ENC regime where the ENC content is untouchable.
- The approved S-98 edition 1.0.0 is for experimentation and testing and it should be noted that the criteria and process for determining what data is superior are yet to be determined.
- Note that it is critical to handle combined quality parameters correctly. Thus a well functioned DQWG is necessary.
- **HSSC invites the Council to note the strategic change in S-100 ECDIS with interacting navigational data layers, enabled by the Interoperability Specification S-98**

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# CATALOGUE OF NAUTICAL PRODUCTS, S-128

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- The scope of S-128 has changed from a pure catalogue of products to both a catalogue of products and a service to provide a machine readable way to verify the up-to-dateness of the data in ECDIS
- This comes with an extended responsibility placed on data producers and may move the production of S-128 from optional to mandatory to fully provide the end users an accurate report of up-to-dateness of the onboard data
- NIPWG in liaison with S-100WG will provide an input paper to WENDWG13 regarding responsibility of stakeholders in producing and dissemination of S-128 data
- The role of the RENCs must be considered in regards to S-128

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# THE IMPLEMENTATION OF THE RECOMMENDATIONS ON THE FUTURE OF THE PAPER NAUTICAL CHART

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- The NCWG has established a sub-WG (Baseline Portrayal Project Team, BSPT) to develop a Baseline Symbology aiming to support the automated production of paper charts from S-101 data.
  - BSPT had a slight delay initially, but is in progress since December 2021.
  - There are no other status changes on the other recommendations since C-5.
  - Some MS argued at HSSC14 that a varied approach might be needed to achieve better guidance on the future of the paper chart.
  - HSSC and NCWG is of the opinion that the Chart Specification S-4 gives enough flexibility (“Must”, “Should” and “May” is stated) and that the general approach agreed upon at A-2 2020, regarding paper charts, is reasonable.
  - Higher priority on the BSPT, to be aligned with the operational version of S-101, could be considered (depending MS contribution).
- **HSSC invites the Council to discuss if an alternative approach is needed for the future of the paper chart, to be approved by A-3. See also agenda item C-6 4.1B.**

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# OTHER HIGHLIGHTS IN THE ONGOING HSSC WORK PLAN

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- The ENCWG has finalized a revision of the Use of the Object catalogue (S-57 Annex A) and the new edition of the ENC Validation Checks (S-58 edition 7.0.0). CL 24/2022 has been published in June for Member States approval.
- The new Hydrographic Survey WG is progressing well. HSSC14 endorsed the Hydrographic Survey Standard S-44 Edition 6.1.0 and CL 25/2022 has been published in June for Member States approval.
- The MASSPT and the S-130 PT have been established and delivered their first respective status reports at HSSC14.
- HSSC15 will take place in Helsinki Finland 5 - 9 June 2023, with one day reserved for a Stakeholder session.



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## ACTIONS REQUESTED FROM C-6

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- Note the Report
- To endorse the new Resolution on S-100 and if endorsed for the Council Chair to submit the proposal to be adopted by A-3
- Recognizing the commitments made towards IMO, IEC and other stakeholders on the S-100 implementation, that the Council recommend to A-3 that Goal 1 and its Targets in the IHO Strategic Plan should have the highest priority in the 2023 – 2026 Work Programme
- To note the strategic change in S-100 ECDIS with interacting navigational data layers, enabled by the Interoperability Specification S-98
- Note the critical vacancy at the position of Data Quality WG Chair and Secretary and there is a risk that DQWG activities are put on hold and encourage MS to nominate officers bearers.
- To discuss if an alternative approach is needed for the future of the paper chart, to be approved by A-3. See also agenda item C-6 4.1B
- Take any other action as it may consider appropriate

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# **HSSC SLIDES FOR SESSION 2**

International  
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- Proposed amendments to the S-100 Roadmap Annex 2.
- Dual Fuel Concept for S-100 ECDIS. Executive Summary and Report.



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# THE S-100 CRITICAL FRAMEWORK

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Hydrographic  
Organization

- Since C5 it has become evident that increasing support is needed to develop the framework in accordance with the S-100 timeline and even in some cases to speed up this development.
- The critical S-100 framework consist of:
  - IHO Geospatial Information Registry
  - S-98 Interoperability Specification
  - S-100 Universal Hydrographic Data Model
  - S-128 Catalogue of Nautical Products
  - S-164 Test Data Set for S-100 and ECDIS Type Approval
- IEC has made clear that the development of these product specifications are especially important for them in order to revise their ECDIS Test Standard (IEC 61174) to include support for S-100.

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# S-100 IMPLEMENTATION PRIORITIES

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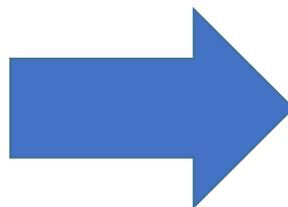
## First step

### Navigational Route Monitoring Mode

- S-101 ENC
- S-102 Bathymetry
- S-104 Water Level
- S-111 Surface Currents
- S-124 Navigational Warnings
- S-129 UKC Management

#### Critical Framework

- IHO Geospatial Information Registry
- S-98 Interoperability Specification
- S-100 Universal Hydrographic Data Model
- S-128 Catalogue of Nautical Products
- S-164 Test Data Set for S-100 and ECDIS
- Type Approval



## Next step

### Navigational Route Planning Mode

- S-122 Marine Protected Areas
- S-123 Marine Radio Services
- S-125 Marine Aids to Navigation (AtoN)
- S-126 Marine Physical Environment
- S-127 Marine Traffic Management
- S-131 Marine Harbour Infrastructure

+ S-100 Products used in  
Monitoring Mode

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# PROPOSED AMENDMENTS TO THE ROADMAP FOR THE S-100 IMPLEMENTATION DECADE (2020 – 2030), 1(2)

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Table A – IHO list of S-100 products with special focus	
First step – Route monitoring mode	
S-101	Electronic Navigational Chart (ENC)
S-102	Bathymetric Surface
S-104	Water Level Information for Surface Navigation
S-111	Surface Currents
S-124	Navigational Warnings
S-129	Under Keel Clearance Management
Critical Framework	
	IHO Geospatial Information Registry
S-98	Interoperability Specification
S-100	Universal Hydrographic Data Model
S-128	Catalogue of Nautical Products
S-164	Test Data Set for S-100 and ECDIS Type Approval
Second step – Route planning mode	
S-122	Marine Protected Areas
S-123	Marine Radio Services
S-125	Marine Aids to Navigational (AtoN)
S-126	Marine Physical Environment
S-127	Marine Traffic Management
S-131	Marine Harbour Infrastructure

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## ACTIONS REQUESTED FROM C-6

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- HSSC invites the Council to approve the revised version of S-100 Roadmap, Annex 2, including the priority of the Critical S-100 Framework and an updated S-100 timeline. Minor adjustments in the S-100 timeline.



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# DUEL FUEL CONCEPT FOR S-100 ECDIS

International  
Hydrographic  
Organization

- S-100WG has developed a governance document to support the duel fuel S-57 and S-101 support in S-100 ECDIS. HSSC14 endorsed the first edition of the document named *Duel Fuel Concept for S-100 ECDIS*.
- HSSC14 also tasked S-100WG to prepare an Executive Summary of the full report. S-100WG was also tasked to maintain the duel fuel concept and provide updates for endorsement as appropriate.
- The Executive Summary and the full report is presented in Annex B to the C6 HSSC Report.
- It is suggested that the Executive Summary will be included as an Annex 4 to the S-100 Roadmap and the full report as an appendix to annex 4.

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## EXECUTIVE SUMMARY - FINDINGS

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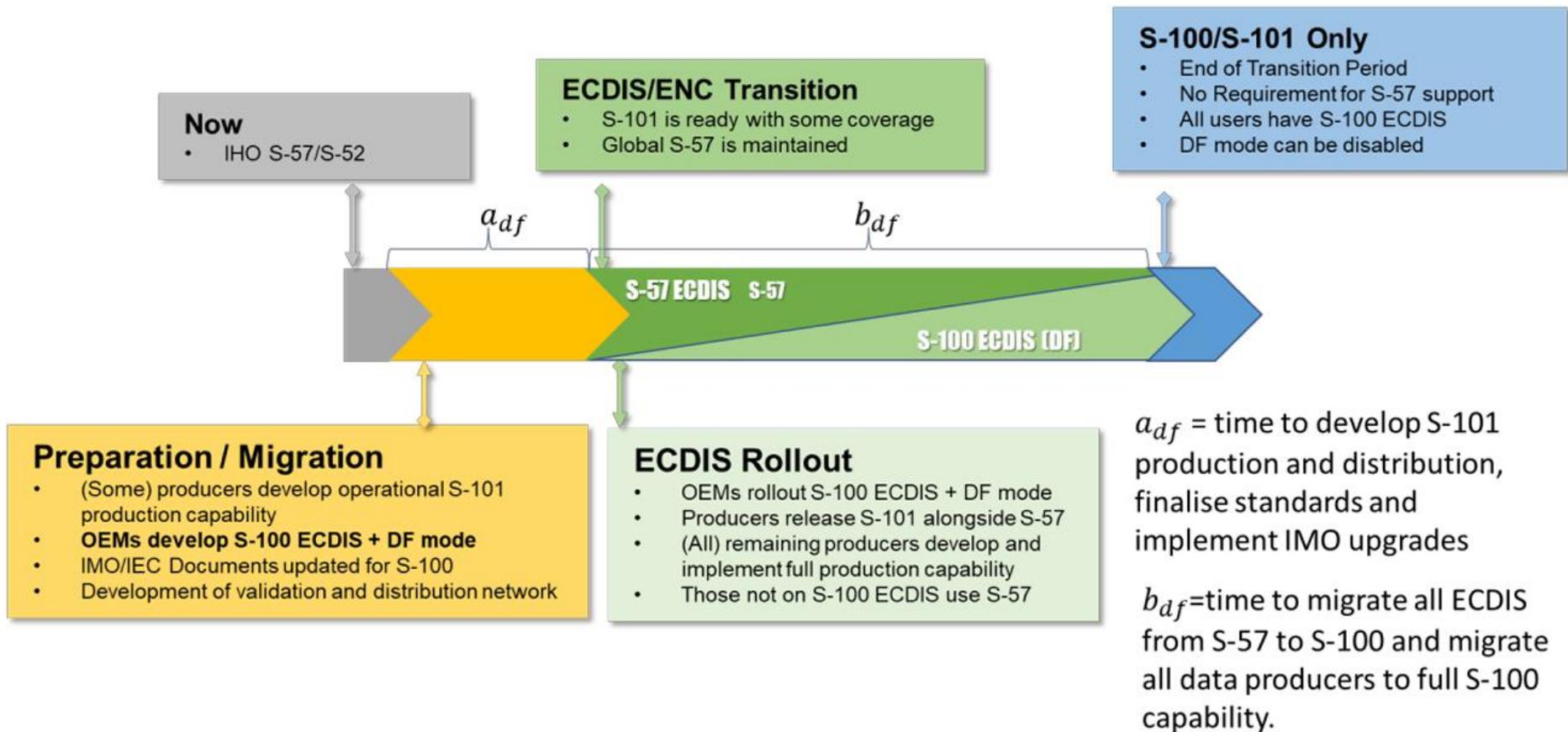
1. No substantial technical objections to Dual Fuel mode within S-100 ECDIS.
2. Clarification of the rationale for Dual Fuel mode and its relationship to the migration by IHO member states from S-57 to S-101 and to assist stakeholder understanding the transition plan to S-100 ECDIS.
3. Some gaps are still noted, but from a data producer and industry perspective there are no compelling technical issues preventing the introduction of the Dual Fuel Concept for S-100 ECDIS.
4. Strong dependency on the process at IMO level by various stakeholders in adding S-100 to the existing documentation regime under SOLAS. The entire Dual Fuel and S-100 ECDIS effort is dependent on a successful transition at this level and consequent support for the parties involved in drafting, reviewing and supporting these efforts.



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# S-100 ECDIS DUAL FUEL TIMELINE

International Hydrographic Organization



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# ADDITIONAL SUPPORT OF THE DUAL FUEL CONCEPT

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- ENCWG has developed a S-57 ENC to S-101 Conversion Guidance which was approved in its first edition at HSSC14. For implementation and testing. The outstanding achievement of the TSSC at the IHO Secretariat, Jeff Wootton should be noted.
- HSSC14 also tasked the ENCWG to develop an encoding guidance for the backward conversion from S-101 to S-57.
- All these initiatives are aimed to support the transition from S-57 ENCs to S-101 ENCs, so IHO MS can achieve substantial coverage of S-101 ENC in advance of the new IMO ECDIS Performance Standards in force dates.

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## **ACTIONS REQUESTED FROM C-6**

International  
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- HSSC invites the Council to endorse the Dual Fuel Concept for S-100 ECDIS Executive Summary and the full report as an Annex 4 to the S-100 Roadmap.
- HSSC also propose that the Council submit the Executive Summary and the report to IHO Assembly-3 for approval by Member States.