S-104 Edition 2

TWCWG 8

20-22 February 2024

IHO

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OVERVIEW

- S-100 WG8 discussions of S-104
- S-104 in S-100 Phase 1 implementation plan and time line
- Project team meeting outcomes
- S-104 Ed. 2.0.0
- Validation checks
- Next steps

S-104 DISCUSSION AT S-100 WG8

- Validation checks being discussed in the S-100 WG limit the water level information accepted on ECDIS to regular grid coverages and forecasts or predictions.
- TWCWG support the concept of water level adjustment on S-100 ECDIS, but not the exclusion of all other uses of water level information on ECDIS.
- TWCWG: It is important not to over-restrict the types of water level information accepted on ECDIS, which should accept the S-104 types:

dataCodingFormat	Type of Data
1	Time series data at one or more fixed stations
2	Regularly-gridded data at one or more times
3	Ungeorectified gridded data or point set data at one or more times
7	TIN data
8	Stationwise time series at one or more fixed stations

- S-128 (Catalogue of Nautical Products) may need to be extended to support designations for different types of water level information.

S-104 DISCUSSION AT S-100 WG8 - 2

- Information about compatibility for S-98 Annex C water level adjustment should be encoded in exchange catalogue so applications can discover whether a particular S-104 dataset is compatible with the WLA algorithm in S-98 Annex C.
- Paper and presentation: S100WG8-42 Water Level Information on S-100 ECDIS (Rev) available at https://iho.int/en/s-100wg8-2023
- Accompanying S-100 Proposals:
  - S100WG8-40; WLA-compatibility – Clarification to Discovery Metadata – Indicate S-98 WLA compatibility with specific string in discovery metadata attribute specificUsage
  - S100WG8-41: WLA-compatibility – Extension to Discovery Metadata – Add new metadata attribute to discovery metadata to indicate S-98 WLA compatibility

S100WG8 - COMPLETENESS OF INFORMATION ON ECDIS

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- MSC.530(06) requirements:

  1.3 *ECDIS should be capable of displaying all nautical information necessary for safe and efficient navigation, originated and distributed by or on the authority of a government, authorized hydrographic office or other relevant government institution, as required by SOLAS regulations V/19 and V/27.*

- MSC.530(106) defines “ENDS” as:

  3.3 *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, which 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).*

S100WG8 - COMPLETENESS OF INFORMATION ON ECDIS

- The validation checks as formulated would block the following kinds of water level information (largely because it is not in regular grid form):
  - Tide tables on ECDIS – point-based data, with the geographic coordinates being the location of the tide station.
  - Data generated by some hydrodynamic models, including forecast information, using grids whose cells are not rectangles. This can be encoded and distributed as georeferenced grids or TIN (Triangulated Irregular Network) data.
  - Hydrodynamic models whose cells are rectangles or not can also be encoded and distributed as point-based data, i.e., sampling of the model at a tide station location for model evaluation comparison to astronomical tidal predictions and/or total water level observations (which would also be point-based data).
  - Water level information distributed via AIS Application Specific Messages is unlikely to be gridded data.
- Such information is necessary for safe and efficient navigation and should be available to the mariner on ECDIS – even if it is not used for water-level adjustment functionality as described in S-98.

S100WG8 - PRODUCTION READINESS

- Conversion of existing water level information from tide gauge stations to regular grid format requires a substantial investment of time, effort and know-how.
  - Smaller hydrographic offices in particular may not have the resources and expertise to complete this by 2026 or shortly after.
- Hydrographic Offices need to validate their water level models and be confident of the reported accuracy of the data they distribute.
  - This requires significant development even for well-resourced Hydrographic Offices.
- The matter of distribution, including technical, infrastructure, licensing, and management aspects, needs to be addressed, especially since some Hydrographic Offices plan to distribute S-104 datasets multiple times a day.
- TWCWG expect that only a few hydrographic offices will be ready to distribute S-104 datasets in the regular grid format at the time S-100 ECDIS become operational.
  - Tide tables on the other hand are relatively easy to convert to S-104 digital datasets.
- Too-strict restrictions on “what is allowed on ECDIS” mean tide and water level data will be absent from ECDIS for many ports and marine waterways.
  - This means important nautical publications (i.e., tide tables or a substitute) will be missing from the “ENDS” defined in MSC.530(106).

TWCWG RECOMMENDATIONS, S-100 WG ACTION

1) S-100 level validation should be such that S-100 ECDIS accepts S-104 data formats in addition to regular grids complying with the proposed requirements for water level adjustment.

2) S-104 Edition 2.0 should define portrayal and pick report formats compatible with S-100 Edition 5.1.0 or the interim solution for complex pick reports described above and in NIPWG papers.

3) The following checks should be in S-98 as compatibility checks for WLA purposes instead of S-100-level validation checks:
   1) Any checks pertaining to compatibility between S-101, S-102, and S-104 for the purposes of water level adjustment, including the proposed validation checks described in the Background section above.
   2) A check corresponding to whichever option (new compliancy category or specificUsage content) is selected for detection of WLA-compatible information.

4) Appropriate amendments should be made in one or both of S-100 and S-98 pertaining to the new compliancy category code or the restriction on specific usage.

5) The S-100 Validation Checks subgroup should be tasked with developing a set of checks for S-101/S-102/S-104 compatibility for WLA purposes, in conjunction with the S-102 Project Team, the S-104 Project Team (TWCWG), and the S-164/S-98 subgroup.
   1) The scope of these checks (“WLA compatibility checks”). should be limited to inter-product compatibility for the purposes of WLA.
   2) “Ordinary” S-100-level checks for compliance to S-100 (format consistency with Part 10c, etc.) should be a separate set of checks (“validation checks”).

- [Decision 8/27] S-100WG8 recommended that the S-104 PS should focus on the initial scope of S-104, which is for water level adjustment to be applied in conjunction with S-102.
- [Action 8/39] S-100WG Chair to communicate this S-100WG8 recommendation to the TWCWG Chair.

ROADMAP FOR S-100 IMPLEMENTATION

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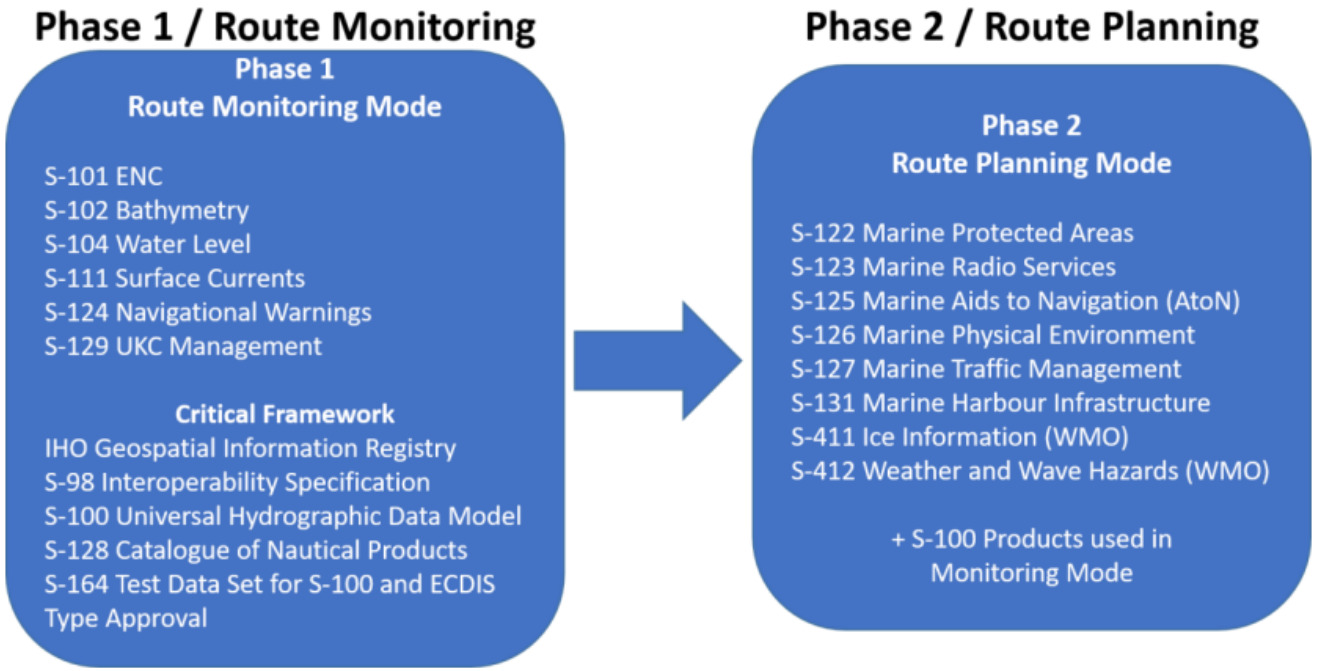
Table A – IHO list of S-100 products with special focus	
Phase 1 / Route monitoring	
S-101	Electronic Navigational Chart (ENC)
S-102	Bathymetric Surface
S-104	Water Level Information for Surface Navigation
S-111	Surface Currents
S-124	Navigational Warnings
S-129	Under Keel Clearance Management
Critical 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
Phase 2 / Route planning	
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
S-411 (WMO)	Ice Information
S-412 (WMO)	Weather and Wave Hazards



Roadmap for the S-100 Implementation Decade v. 3.0.0

RECOMMENDED COURSE OF ACTION FOR S-104 - 1

- The outcome of S-100 WG8 was discussed with the S104 project team and TWCWG Chair team.
- Work on S-104 Edition 2.0 will focus on S-100 Phase 1 implementation. This means S-104 Edition 2.0 will be limited to water level adjustment as described in S-98.
  - The only spatial type will be “regular grid’.
  - Types of information: only predictions, forecasts, analysis/hybrid values (for the future) and real-time observations. "Historical observations" and "Hindcast" will be removed.
  - Gridded spatially variable "uncertainty" has been provisionally added to the value record as an optional attribute to allow spatially variably defined uncertainty over a grid.
  - Hydrographic Offices' priority plans for S-100 water level information production may be achievable by producing RG datasets for relatively small extents (for example, one or more harbours in one HDF5 dataset, areas where S-129 underkeel clearance datasets will be produced, etc.).
- S-104 Edition 2.0 has been revised and a draft circulated to the S-104 Project Team for review.
- Consideration needed for how gridded (spatially variable) uncertainty would be used or portrayed in S-98 or elsewhere. For example, how is the uncertainty calculated (method)?
  - New (optional) embedded metadata attribute(s) with more information about gridded uncertainty?

RECOMMENDED COURSE OF ACTION FOR S-104 - 2

- The S-104 project team recommends that TWCWG endorse a new product (or products) containing some or all of the spatial and data types being removed from S-104.
  - HSSC approval of a new S1XX product and a new number (“S-105”?) will be needed..
- Allowing ECDIS to support the adaptive generation or adjustment of safety contours (to replace ENC safety contours) from S-104 and S-101/S-102 is TBD.

S-100 ACTIVITY

- S-100 WG8 revised S-100 Edition 5.1.0. Edition 5.2.0 is now going through the approval process.
  - Change of digital signature algorithm from DSA to ECDSA. [Part 15]
    - All Phase 1 products must use the ECDSA algorithm. Product specifications must therefore be aligned to Ed. 5.2.0.
  - Updated Feature Catalogue model to indicate attributes to be suppressed in pick reports. [Part 5]
  - Prescribes use of new attribute “interoperabilityIdentifier” to identify instances of the same thing in different data products (e.g., the same Restricted Area in ENC and Marine Protected Area datasets). [Parts 3 and 11]
  - Part 4a revised to say product specifications cannot extend the S-100 exchange catalogue model
    - Cannot define new metadata attributes in dataset discovery metadata blocks (or elsewhere in the exchange catalogue).
  - Revised schema for SVG symbols (Part 9 - Portrayal); minor corrections and clarifications in Part 9 and 9a (Lua portrayal).
  - Approved residual corrections and clarifications to Part 8 (imagery and gridded data conceptual model)
  - Minor corrections and clarifications to Part 10a (ISO 8211 encoding), Part 10c (HDF5 encoding).
  - Specification of requirements for fileless cancellation; restriction for bounding polygon for data coverage in discovery metadata. [Part 17]

S-104 TRANSITION FROM EDITION 1.1.0 TO 2.0.0

- Removal of coverage types other than regular grids.
- Removal of historical observations and hindcasts from kinds of water level information.
- Added “uncertainty” as an optional real attribute in the data values record.
  - Re-used existing concept in IHO GI Registry
    - *Definition*: Estimate characterising the range of values within which the true value of a measurement is expected to lie as defined within a particular confidence level. It is expressed as a positive value.
    - *Unit*: Metre; *Resolution*: 0.01
- Alignment with draft of S-100 5.2.0:
  - Digital signatures are now mandatory. Clarifications have been added about use of digital signatures in discovery blocks in the exchange catalogue.
  - Updated metadata from S-100 Edition 5.0.0 to 5.2.0.
  - Adoption of requirements for fileless cancellation; restriction for bounding polygon for data coverage in discovery metadata.

S-104 1.1.0/2.0.0 TRANSITION – OTHER REVISIONS

- Added new EPSG codes to list of allowed codes for horizontal CRS
  - Recent realizations of WGS 84
  - Added EPSG codes for UTM zones - S-102 (Bathymetry) 2.2.0 uses them.
- Added material regarding requirements for compatibility with S-102 / S-101 in several places.
  - Same vertical and horizontal datums as underlying S-102
- Updated data quality checks to indicate checks that do not apply to regular grids
- Removed old Annex B (Additional terms), moving selected terms to Clause 1.4.1
- Updated validation checks
  - Removed checks not applying to regular grids.
  - Added known checks for cross-product compatibility with S-102/S-101 for WLA purposes.
  - Check ID format is now as decided by the S-100 validation checks sub-group.
  - Clarifications relating to dataset production (clause 7) including requirements pertaining to metadata and S-102/S-101 compatibility for S-198 WLA purposes.
- All portrayal removed – S-104 Ed. 2 data will be used only for WLA and portrayal will therefore be according to S-102 or S-101.
- ISO metadata files are no longer allowed. (S-100 WG recommends not using them for Phase 1 products).
- UML diagrams have been updated or removed as appropriate.

OPEN ISSUES

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- Finalization of validation checks depends on developments in the S-100 Validation Checks and S-98 sub-groups.
  - “S-100 level” checks
  - Cross-product checks to verify compatibility for the purpose of water level adjustment as described in S-98
  - “Product-specific” checks cannot be finalized until “S-100 level” and “interoperability” checks are finalized
    - Redundancies, Conflicts, Gaps?

NEXT STEPS

- Review by S-104 project team and TWCWG and resolution of issues identified during review.
  - Dataset cancellation – fileless by preference
    - Requires resolution of security issue identified by PRIMAR
  - Finalization of “product-specific” validation checks?
- Check by DQWG
- HSSC approval
- Member State vote
- Sample datasets
- Validation
- Clarify production and distribution requirements and issues
- Test datasets for ECDIS
- Others?