Paper for Consideration by S-101PT

Proposal of Alternate Options for Display Scale

Submitted by:	USA (NOAA)
Executive Summary:	The USA (NOAA) is currently in the implementation phase of re-scheming its Electronic Navigation Chart (ENC) suite. This letter provides information about NOAA's implementation of a binary scale system to support web services and marine display systems, which currently does not conform to the proposed IHO S-101 standards.
Related Documents:	IHO S-101 ENC Product Specification 1.0.0, S-101 Annex A Data Classification and Encoding Guide 1.0.0, and NOAA's National Charting Plan
Related Projects:	The 42nd US / Canada Hydrographic Commission (USCHC) Annual Meeting

Introduction / Background

NOAA's re-schemed ENC product suite provides seamless electronic chart coverage, provided as a series of tiles with consistent size and scale. This regular gridded ENC coverage approach reduces the number of chart scales from over one hundred unique scales to twelve scales. NOAA's new re-schemed ENC product suite endeavours to align with IHO S-101 ENC format specifications, (i.e., units, contour intervals, etc.). However, the product scheme deviates from the proposed specifications concerning display scale.

Analysis/Discussion

When NOAA started designing a new scheme of its electronic chart suite, use of the IHO's recommended scales for each usage band based on radar ranges was considered. Ultimately, NOAA decided to adopt a binary scale system in which each successively smaller scale is half of the preceding scale.
The current use of one hundred and thirty-one scales will be reduced to the twelve shown in Table 1, column (c).

Usage of binary scales will simplify the display of charts in different systems and web-services. In addition, generalization rules are simpler when the scales are linearly aligned with each other. After evaluation of four common binary scale schemas that included typical charts and maps, NOAA selected the NOAA Display Scale Schema shown in Table 1, column (c). The display scales selected for use by NOAA are based on the most common chart scales in the NOAA ENC© suite (i.e., 1:10,000, 1:20,000, 1:40,000 and 1:80,000). As a result, fewer charts will need to be recompiled and rescaled to the new standard display scales.

In IHO Publications S-101 ENC Product Specification and S-101 Annex A Data Classification and Encoding Guide, Versions 1.0.0, published in December 2018 reference IHO scale ranges in terms of minimum and maximum scales. Currently the S-101 documentation provides only one option for the minimum and maximum display scale scheme.

- S-101 ENC Product Specification: Section 3 - Dataset Identification, Spatial Resolution (p 12)
- S-101 ENC Product Specification: Section 12.1.2. – S100_DatasetDiscoveryMetadata (p 45)
- S-101 ENC Product Specification: Section 12.1.2. – S100_DataCoverage (p 47)
- S-101 Annex A Data Classification and Encoding Guide: Section 2.5.1 – ENC data coverage (pp 19-22)
- S-101 Annex A Data Classification and Encoding Guide: Section 3.4 – Data coverage (pp 42-43)

Recommendations

Adopt NOAA's binary scale range schema, Table 1, column (c) as an alternative to the IHO mandated scale range schema, Table 1, column (a). Consider other binary scale range schemas as additional options (see Table 1, column (b), (d), and (e)).

Justification and Impacts

Allowing flexibility with chart scales would permit re-schemed ENC products to leverage the benefits of using binary scales, without contradicting IHO specifications.

Action Required of S-101PT

The S-101PT is invited to:

a. note this paper;
b. consider the above;
c. take any necessary action.

Table 1. Scale Range Schema Options

IHO Maximum – Minimum Display Scale Schema (a)	Google Map - Rounded Display Scale Schema (b)	NOAA Display Scale Schema (c)	US Foot Based Display Scale Schema (d)	Metric EU Based Display Scale Schema (e)
1:10,000,000				
1:3,500,000 - 1:10,000,000			1:6,144,000	1: 6,400,000
	1:4,608,000	1:5,120,000	1:3,072,000 – 1:6,144,000	1:3,200,000 – 1:6,400,000
1:1,500,000 - 1:3,500,000	1:2,304,000 – 1:4,608,000	1:2,560,000 – 1:5,120,000	1:1,536,000 – 1:3,072,000	1:1,600,000 – 1:3,200,000
1:700,000 - 1:1,500,000	1:1,152,000 – 1:2,304,000	1:1,280,000 – 1:2,560,000	1:768,000 – 1:1,536,000	1:800,000 – 1: 1,600,000
1:1:350,000 – 1:700,000	1:576,000 – 1:1,152,000	1:640,000 – 1:1,280,000	1:384,000 – 1:768,000	1:400,000 – 1:800,000
1:180,000 – 1:350,000	1:288,000 – 1:576,000	1:320,000 – 1:640,000	1:192,000 – 1:384,000	1:200,000 – 1:400,000
1:90,000 – 1:180,000	1:144,000 – 288,000	1:160,000 – 1:320,000	1:96,000 – 1:192,000	1:100,000 – 1:200,000
1:45,000 – 1:90,000	1:72,000 – 1:144,000	1:80,000 – 1:160,000	1:48,000 – 1:96,000	1:50,000 – 1:100,000
1:22,000 – 1:45,000	1:36,000 – 1:72,000	1:40,000 – 1:80,000	1:24,000 – 1:48,000	1:25,000 – 1:50,000
1:12,000 – 1:22,000	1:18,000 – 1:36,000	1:20,000 – 1:40,000	1:12,000 – 1:24,000	1:12,500 – 1:25,000
1:8,000 – 1:12,000	1:9,000 – 1:18,000	1:10,000 – 1:20,000	1:6,000 – 1:12,000	1:6,250 – 1:12,500
1:4,000 – 1:8,000	1:4,500 – 1:9,000	1:5,000 – 1:10,000	1:3,000 – 1:6,000	1:3,125 – 1:6,250
1:3,000 – 1:4,000	1:2,250 – 1:4,500	1:2,500 – 1:5,000		
1:2,000 – 1:3,000				
1:1,000 – 1:2,000				

Note: FOR REASONS OF ECONOMY, DELEGATES ARE KINDLY REQUESTED TO BRING THEIR OWN COPIES OF THE DOCUMENTS TO THE MEETING