

## Paper for Consideration by ENCWG

### Some perspectives for Additional Bathymetry Layer standard

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<b>Executive Summary:</b>	This paper is provided as food for thinking about the use of Additional Bathymetry data to address community centric issues related to safety of navigation purpose.
<b>Related Documents:</b>	HSSC8-05.3C Rev1 (Development of an Additional Bathymetry Layer standard based on S-57/S-52 ); S-102 specification; ENCWG2-6.6 (Presentation of High Resolution Bathymetry in S-57 ENC's)
<b>Related Projects:</b>	B-ENC ; S-102 products usage (Ref paper S-100WG2-10.11); Under Keel Clearance Management Information Product Specification (ref paper HSSC7-05.1D)

### Introduction / Background

Traditionally, bathymetry has been populated through soundings and depth contours charted in respect of cartographic rules (S-4 included). Once the security issue addressed, readability of the information is the cornerstone. Consequently very high resolution bathymetric surveys, as undertaken these days, are rendered in quite a smooth bathymetry: cartographers are doing their best to keep consistent the morphology but they cannot put on too many details due to the space of the chart.

As reminded by HSSC8-05.3C, we are now facing usages able to use and even urgently requiring very high resolution data for computation as decision aids for the mariners, the pilots, and the port managers. As quoted in HSSC8-05.3C " Specific navigational tasks like pilotage and vessel traffic services at seaward harbor approaches and port areas request the provision of more detailed seabed topography based on the most recent survey available. Such specific bathymetric layer should ideally allow the combination with regular ENC's and facilitate the application of tidal information to depth soundings and dense contour lines to aid precision navigation for pilots."

Additionally other usages in deeper water (fishery activities, sea bottom research, AUV navigation ...) request the provision of more detailed seabed topography based on the most recent survey available as well.

Indeed all these usages request provision of bathymetric data in complement of ENC in a suitable form. Even though ENC data is compiled for a variety of navigational purposes, it cannot cover all the needs.

It makes sense today to start addressing their request. Anyway, we still have to think about another legacy system, the mariner, who may need to read the sea bottom through the chart and for whom the "traditional" chart paradigm still appears effective to make him easy read the bathymetry.

### Analysis/Discussion

The following paper is providing food for thinking about various existing options for including additional bathymetry within ENC's as assigned to the ENCWG by HSSC8. It completes the UKHO very profitable explanation of the methodology used to fulfil the high resolution bathymetry (ref paper ENCWG02-6.6), and echoing HSSC8-05.3c submitted for consideration by CIRM, Germany and USA (NOAA).

Yes, an ENC can describe high resolution bathymetry. UKHO is welcome to have shared the Hummer river proof of concept with the ENCWG. Within the scope of S-57/ENC product specification (PS) and the Use of the Object Catalogue (UOC), indeed, it is up to each HO to choose the relevant ranges of the depth contours and the degree of generalization to adopt. As presented by the UKHO, the utmost advantage is that ECDIS is able to use such data without any slight changes, just because it is an ENC. That means as well that it is the sole ENC available in the dedicated area at the selected usage band, to be compliant with the standard. This constraint may be fully suitable or not depending on the idea a unique product can fulfil the requirements of many usages or not.

But what about additional bathymetry data within ENC's as addressed by the HSSC8 to the ENCWG?

HSSC8-05.3C Rev1 has pointed out a proof of concept coming from the IENC concept: B-ENC and ABL. The paper highlights the gap to fulfil before a common use of S-102 products as well. Truly, S-102 is providing another additional bathymetry concept, as quoted the PS “Concurrent with the advent of electronic navigation, the need for high resolution bathymetric data in the form of a bathymetric model, has become a requirement to better enable the systematic fusion of temporal data such as tidal heights and also to enable the same data to be used for other applications where a shoal-biased model may not be optimal. Furthermore, having such a model allows an ECDIS or ECS to make other intelligent adjustments such as contour intervals.

[...]Bathymetric Surface data may be used alone or it may be combined with ENC [as an auxiliary layer of data with an ENC] or other S-100 compatible data. As such this Bathymetric Surface product specification describes one of a number of additional layers that could be integrated with other S-100 products for use with ENC.

[...]The Bathymetric Surface data product described here incorporates the Navigation Surface concept. [...]The term Navigation Surface (NS) is reserved for a final product BAG certified specifically for safety of navigation purposes.”

The question is how to make that offer consistent and relevant for the different communities of users, not all content with a unique shoal-biases representation of the bathymetry, but still a part of them. The point is not so much to find the good product specification but how to deal with different specifications about bathymetry while addressing different communities of interest. The other piece of the cake is about the user system, basically the ECDIS, and how it will be handling the data properly. And for this reason, industrials would be more than welcome to embark with HOs to think globally about it.

Based on Inland navigation feedbacks, B-ENC appears as effective and likely quite straight forward to specify. One major point about the specification may be to agree on the terms. ENC means a S-57 ENC PS compliant product which is assumed by an official HO. The fact to use B-ENC term in a different meaning is confusing for the ENC baseline. In addition, HSSC8-05.3C Rev1 presents the B-ENC as the results of the ECDIS/ECS fusion of ENC data and the additional bathymetry layer (ABL), meaning that B-ENC is a user system process output and not a certified product (ABL may be).

Then, such an IHO endorsed product specification would match community requests like pilotage and vessel traffic services. IHO would play a key role as standardization authority in the maritime domain and it would cast a concrete bridge between the maritime and inland navigation domains where the seaward harbor approaches and port areas are settled around. It seems to be a quick win effort.

Moreover, B-ENC would be an opportunity to expand the concept in the maritime domain for other communities (e.g. fishery, AUV navigation). The major point to consider then is the use of such a concept within certified ECDIS and the change of IMO and IEC documents. But it does not seem so different to the use of S-102 products, which are certified specifically for safety of navigation purposes and for which it is deemed that some changes about the ECDIS has to be carried out. The point would be more to consider both in the same analysis and see what the consequences on the ECDIS are.

## **Conclusions**

The term “B-ENC” should be clarified in regards of “ENC”, and then B-ENC PS elaborated by the IHO with expert contributors (ENCWG responsibility) appears as a quick win. The use of B-ENC will then get close to the use of S-102 product, both being one of a number of additional layers that could be integrated with other S-100 products for use with ENC in a safety of navigation prospective. The major part is how it is managed within the ECDIS? What should be specified for ECDIS? This is a cornerstone of e-navigation and should be addressed in one way or another, the sooner the better (see PRIMAR submission S-100WG2-10.11).

## **Recommendations**

- Follow up the principles supported by HSSC8-05.3C Rev1., with a PT endorsed by S-100WG as the issue is wider than S-57 ENC.
- Consider the interest of B-ENC specification in e-navigation prospective, to vet how to use additional bathymetry data for safety navigation purposes as for S-102 products.

**Justification and Impacts**

The provision of a standard for detailed bathymetric information to complement the information of sea bed bathymetry embedded in ENCs is a core issue of IHO as an international standardization body, and as a major actor of the development of e-navigation services.

**Action Required of ENCWG**

The ENCWG is invited to:

- a. note this paper
- b. agree with HSSC8-05.3C Rev1 recommendations and course of actions
- c. set up a B-ENC project team, with S-101 / /S-102 considerations