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| **NAUTICAL CARTOGRAPHY WORKING GROUP** |

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# NCWG Letter 05/2024

To NCWG Members

23 April 2024

**NCWG Base Symbology Project Team recommendation of  
Standard Colours for the automated creation of ENC derived paper charts**

Dear Colleagues,

This letter presents the NCWG's Baseline Symbology Project Team (BSPT) recommendations for baseline colours to be used for the automated creation of ENC derived paper charts. Feedback on the recommended colours is requested.

Please reply, using the response form at Annex B, **no later than 17 June 2024**. I ask you to use the ‘Reply to all’ option for responses, to ensure the full Working Group membership is aware of developing discussions.

Yours sincerely,

A close-up of a signature

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Mikko Hovi

Chair NCWG

**Paper for Consideration by NCWG**

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| ***Submitted by:*** | Baseline Symbology Project Team |
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|  |  |
| ***Related Projects:*** | HSSC 12/36 |

# Background

*Formation of the Project Team*

In October 2020, the IHO Hydrographic Services and Standards Committee (HSSC) tasked NCWG to, "add a work item in its workplan to develop ways to enable or enhance HOs’ ability to produce paper charts or raster chart images directly from S-101. [The goal is to create a ‘Common IHO Baseline Symbology’ including basic symbol sets and rules.]" ([Action HSSC12/36](https://iho.int/uploads/user/Services%20and%20Standards/HSSC/HSSC13/LIST%20OF%20ACTIONS%20FROM%20HSSC12_27Nov2020.pdf)).

NCWG formally established the BSPT in March 2021 at a special NCWG meeting to discuss [Baseline Symbology](https://iho.int/uploads/user/Services%20and%20Standards/NCWG/NCWG_VTC_2021/NCWG_Baseline_Symbology_Meeting_VTC_minutes.docx). Subsequentially, the project team refined the BSPT's terms of reference (TOR), defining its mandate to:

Establish a common IHO symbology, based on S-4, which can be used to support the automated creation of paper chart products directly from S-101 data. A common symbology library will help hydrographic offices, private industry, developers and others, to view ENC data and facilitate direct creation of ENC derived products more efficiently and quickly.

The TOR goes on to state the project team's primary objective as focusing on, "Development of a symbol library comprising a common set of symbols (in SVG format) and related portrayal rules. This will support efforts toward the automated or semi-automated creation of paper charts."

*IHO Colour "Specifications"*

The [S-4, Regulations of the IHO for International (INT) Charts and Chart Specifications of the IHO](https://iho.int/uploads/user/pubs/standards/s-4/S4_V4-9-0_March_2021.pdf) describes the symbols and colours to be used on paper and raster nautical charts. Section B-140 specifies that, "All charts should pe printed in a minimum of four colours" black, magenta, buff (or grey) and blue." S-4 names six basic colours in the sections indicted below.

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| B-141 Black | B-143 Buff (Yellow) or Grey | B-145 Green |
| B-142 Magenta | B-144 Blue | B-146 Cautionary Notes |

Although S-4 notes the hue (the name of the colour) to be used for various purposes, it does not describe the chroma (saturation) or value (lightness) of the colours. Nor does S-4 describe the attributes of the additional colours of red, green, and yellow that are used on Scandinavian "multicoloured" charts. S-4 also states that, "The use of alternative colours, for example red instead of magenta, and of screened colours, tends to reduce the level of possible standardization," but then concludes that, "such colour variations can, if desired, produce an element of national individuality without affecting the comprehensibility of a chart as much as, for example, a non-standard symbol."

Current paper nautical chart production reflects this general adherence to the colour hues specified in S-4, while still exhibiting the individuality of each country. Variation is possible, because each chart producer has their own production system and standard (to them) set of symbols and colours. However, a principal goal of the BSPT has been to provide ONE standard set of SVG chart symbols and portrayal rules that can be used to automate (or nearly automate) the creation of paper charts directly from ENC data. Use of BSPT colours and symbols will yield complete uniformity in chart portrayal, regardless of the source of ENC data.

# Methodology

The BSPT recognized that a single standard set of colours would be needed to encode each baseline chart symbol in SVG format. Thus, the team focused on defining baseline colours before it started working on specifying a standard lineweight, size, etc., for each symbol that S-4 only generally describes.

Samples of chart colour palettes were collected for analysis from Canada, Finland, New Zealand, the United Kingdom, and the United States (NOAA). Colour data from these five hydrographic offices was readily available from members of the BSPT. Recognizing that these palettes – and similar palettes from other HOs – have evolved over decades into the familiar and functional chart colours used around the world, the team did not believe it was necessary to conduct human factors engineering or an ergonomic study to refine these colours further. The immediate goal was to agree upon a set of colours, not too different from the "tried and true" colours in current use, that would be acceptable to a broad group of chart makers and chart users. Most HOs provided their colour definitions with RGB (Red Green Blue) values. One HO provided CMYK (Cyan Magenta Yellow Black) values and these were converted to the RGB colour model for ease of comparison using an online converter, such as [www.rapidtables.com/convert/color/cmyk-to-rgb.html](http://www.rapidtables.com/convert/color/cmyk-to-rgb.html)

As expected, the five sample colour palettes were similar, but not identical. Some HOs also used more colours than others. The BSPT ultimately focused its efforts on 17 colours which the five HOs used for similar purposes (land, urban areas, depth contours, etc.). As a first step, the team decided to see what the "average" of each colour from the five sets of samples would look like. For each colour, each of their respective RGB values were summed and divided by the number of HOs for which a colour sample was provided (usually four or five, but sometimes fewer).

Although the BSPT originally viewed this colour averaging exercise as just a first step in a longer analysis, the team was quite pleased with most of the average colours and – with a few exceptions – is recommending that these be adopted as the baseline colour palette. These colours will be used in the baseline symbols that the BSPT will start working on next.

Some of the recommended baseline colours were not derived from averaging HO sample colours. Instead of averaging across the HOs' Medium Blue values (of which there were only two samples), the RGB values for the recommended Medium Blue are the respective averages of the Dark Blue and Light Blue RGB averages. This placed Medium Blue equidistant from the other two recommended depth area hues and makes it easier to differentiate the three shades.

The other exception to using average colours is the selection of the Red, Orange, Yellow and Green colours used for aids to navigation. The Canadian RGB values for these colours were chosen, because the resulting average colours were believed to be too dull and in the case of Red, too close to magenta. The brighter Canadian colours, developed as a set, were thought to work well together.

The BSPT Recommended Baseline Chart Colours are show in Annex A, along with the sample colours provided by the five hydrographic offices that were used to calculate the average colours. As the BSPT proceeds, it may determine that some of these colours will need to be tweaked as they start to be used in creating baseline symbols or as the symbols begin to be shown in context within chart mock-ups. However, the recommended palette provides a good starting point, which generally agrees with chart colours already in use.

**Action required of NCWG**

Please use form **Annex B** to provide any comments or suggestions regarding the recommended baseline colours shown in **Annex A**.

# Annex A – BSPT Recommended Baseline Chart Colours



X Hydrographic office does not use or did not provide a sample of this colour.

\* Medium blue is the average of the average dark blue and average light blue RGB values.

\*\* Canadian RGB values for red, orange, yellow, and green were adopted rather than the average colours.

**Annex B**

**NCWG Letter 05/2024**

**Response Form** **BSPT Recommended Baseline Colours**

[mikko.hovi@traficom.fi](mailto:mikko.hovi@traficom.fi), [psheatsley@esri.com](mailto:psheatsley@esri.com) and

[Daniel.Brousseau@dfo-mpo.gc.ca](mailto:Daniel.Brousseau@dfo-mpo.gc.ca) no later than **17 June 2024**

Further comments:

Date:

Name:

Organisation: