Chart On Demand (COD) & Certified Printed ENC (CPENC)

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MAR 2022

Certified Printed ENCs (CPENCs) Produced by Chart On Demand (COD) Capability

Overview

- The Chart On Demand (COD) capability is a technology that symbolizes S-57 ***Electronic Navigational Charts (ENC)*** with a S-52 ***Presentation Library*** of S-4 ***INT1 Symbols and Abbreviations used on Paper Charts*** in order to automatically generate **georeferenced PDFs** of a nautical chart-like hardcopy product known as **Certified Printed ENC (CPENC)**, for hydrographic office-maintained **Fixed Areas of Interest** (AOIs) (i.e. chart catalog/footprints)

Technology Infrastructure

- Esri-developed application
  - Requires: **ArcGIS Server -- Maritime Chart Service** & **Custom Chart Builder**, **ArcGIS Pro** (.pagx templates, Fixed AOI extents), **ENCs**
  - Associated configuration files require administration to apply: customized color schemes, customized symbols, grid/graticule changes, templates (i.e. marginalia/surrounds), Fixed AOI generation/maintenance, etc.

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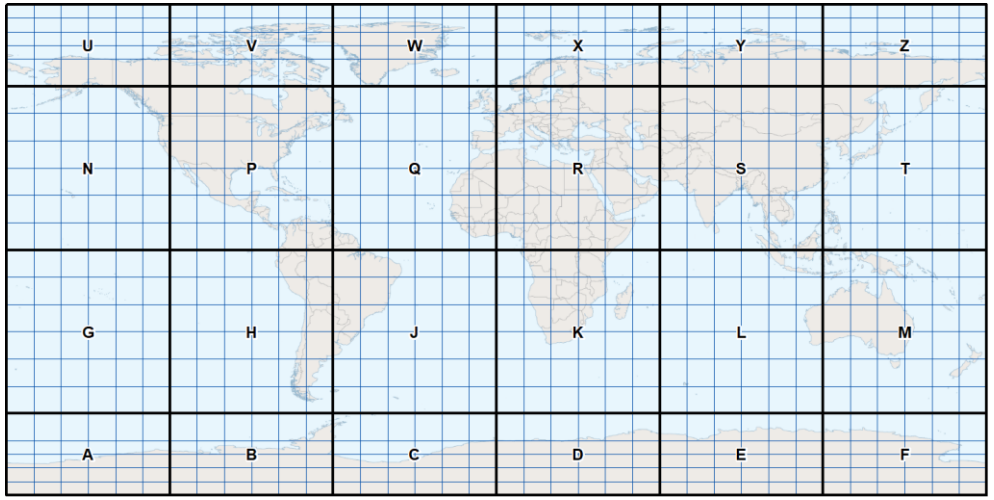
Chart Numbering

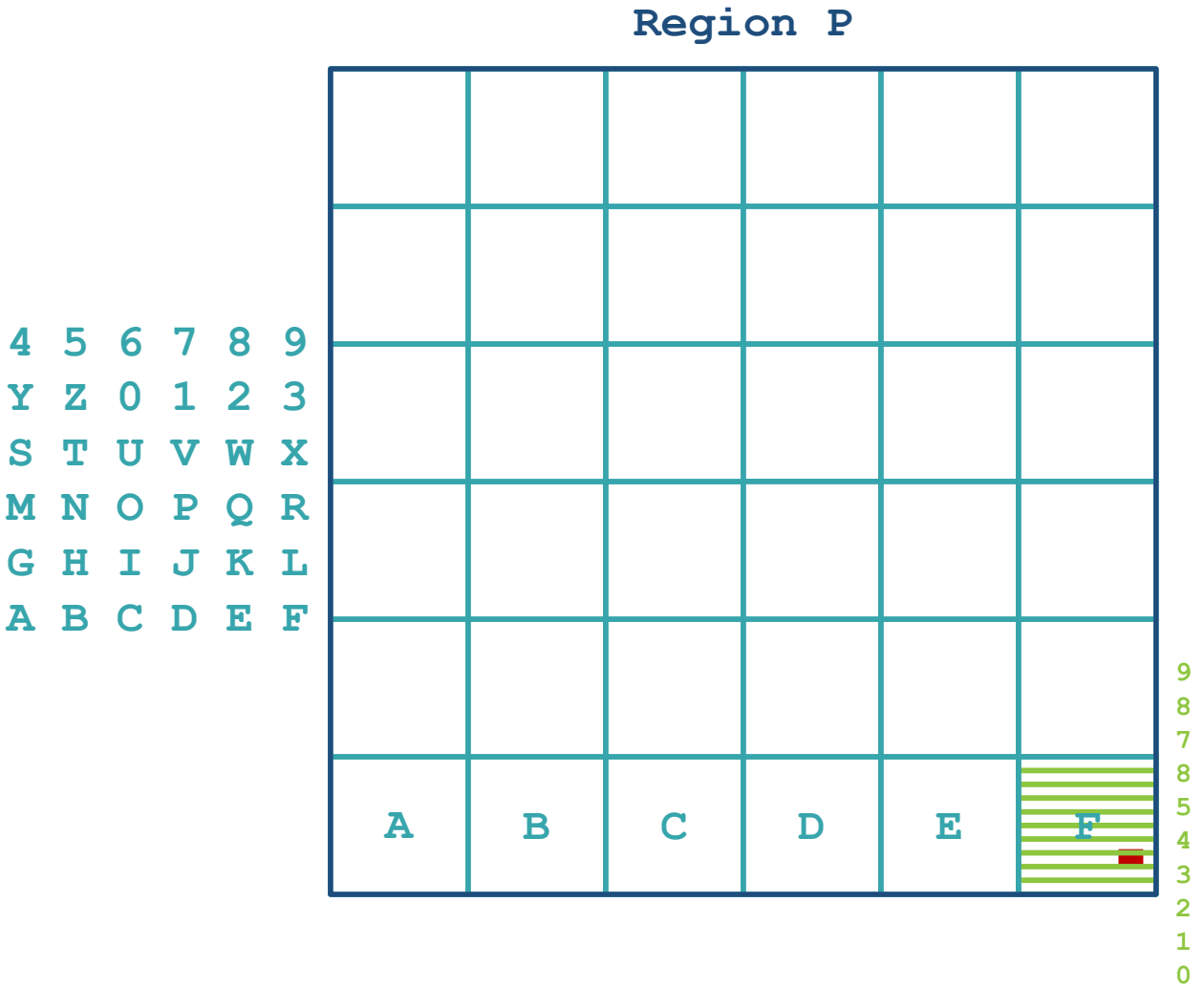


CPENC numbering aligns to NGA global ENC Grid:

PFA200

- **P**: NGA ENC Grid region
  - (A to Z, no I or O)
- **F**: 10° subdivision of region
  - (A to Z; 0 to 9)
- **A**: value for chart scale band
  - (B = Berthing, H = Harbor, A = Approach, C = Coastal, G = General, O=Overview)
- **200**: sequential 3-digit number
  - Based on region/subdivision/scale and its LAT determining sequence of 3 digits.

Numbering System Example



Approach scale chart:

PFA200

00 = first chart in series created in Region/Subregion **PF** LAT Zone **2**

Charts series increments within a LAT Zone from 00 through 99. Allows for 100 Fixed AOIs to be created for each scale, within a single LAT Zone.

- **24 Regions** (A-Z, excluding I and O)
  - **24-36 Subregions** per Region (A-Z + 0-5 or 0-9)
    - **8-10 Lat Zones** (0-9 or 0-7 at poles) per Subregion

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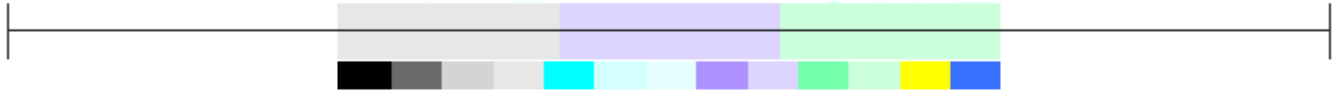
CPENC Enhancement: Scale, Alignment and Color Verification

CPENCs will have an enhanced 6 inch scale reference to verify correct printing alignment and color beyond the correct scaling of the chart.

Overprinting not applied ✗

To ensure this chart was printed at the proper scale, alignment, and color: (1) the line below should be straight and measure six inches (152.4 millimeters), (2) the line should strikethrough three equally-sized boxes of distinct color containing the word "OVERPRINT", and (3) a separate group of 13 equally-sized boxes of distinct color should be aligned and completely visible under red light. If any part of the three checks listed above fail to be confirmed, this copy is not certified safe for navigation.



Overprinting applied ✓

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Automation Caveat

A new note will be added to every CPENC, explaining their automated rendering from ENC and cartographic anomalies that may exist on the furnished chart given its static representation of a digital product.

AUTOMATION CAVEAT

This chart has been automatically rendered from Electronic Navigational Charts (ENCs) that are produced by the National Geospatial-Intelligence Agency (NGA) and/or received from NGA's trusted-partners. While significant technological development efforts have been made in this automation process, cartographic anomalies could nonetheless exist. Mariners using this chart must understand this is a static reproduction of the ENC and has not been individually quality checked or adjusted for optimal navigation usage in the area covered by this chart. Navigational users are reminded of the affirmative duty of the prudent mariner to "use all available means to assure safe navigation of their vessels" and to not rely solely on any single aid to navigation.

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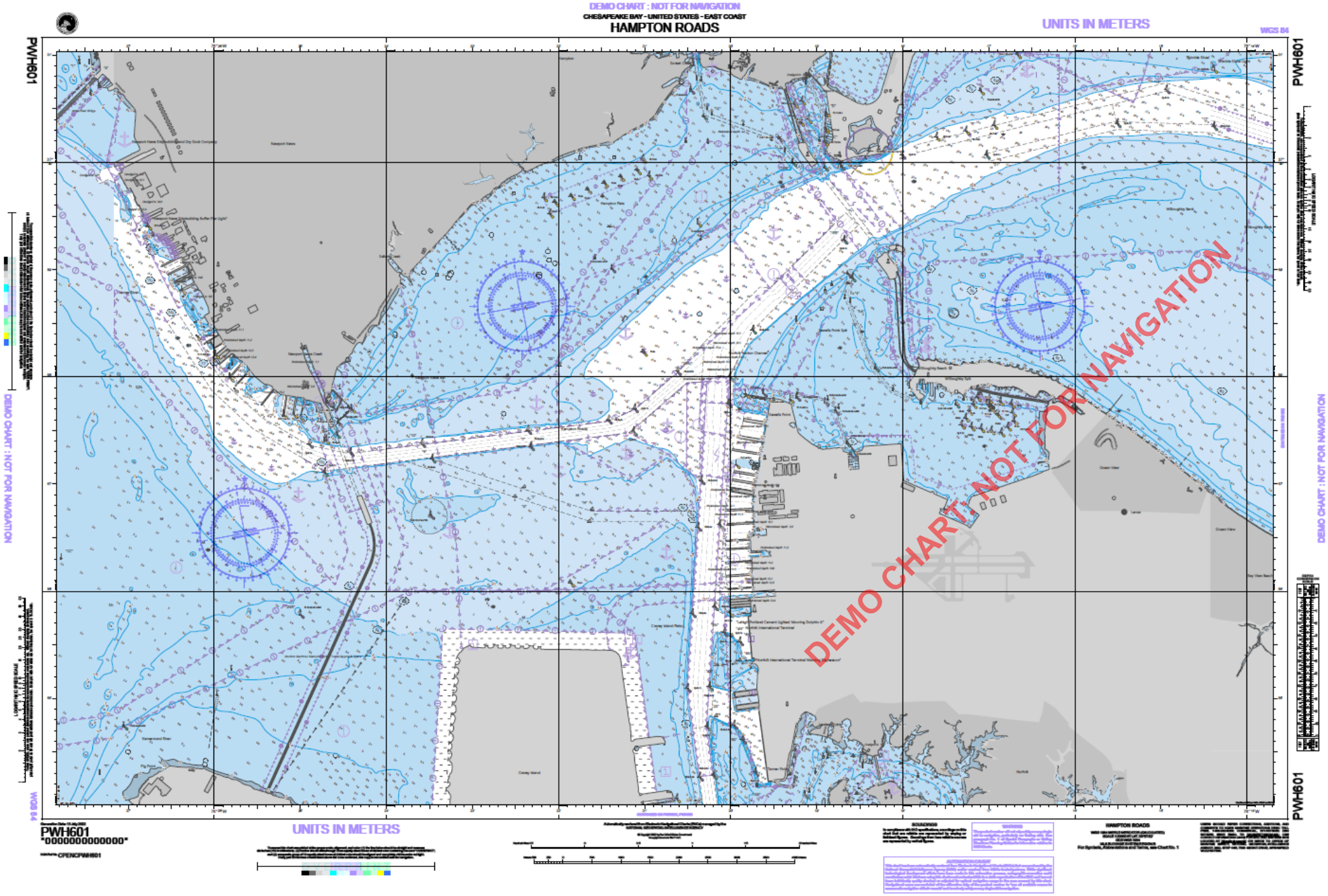


***Note**: CPENCs are generated from the latest ENC, in the MCS, in about 1-2 minutes of processing per CPENC.*

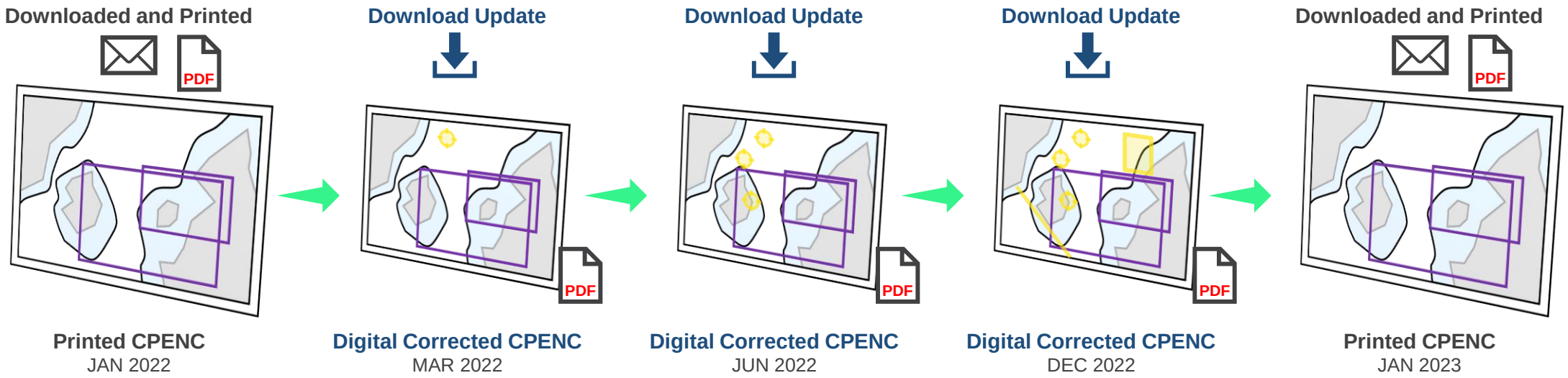
CPENC Symbolic Corrections Concept

Rather than receive a list of traditional, textual corrections, that need to be converted from GHUB's current output to a human-readable (textual), NtM format, and interpreted and plotted by a mariner—

NGA Maritime Safety Office will provide digital Corrected CPENCs with symbolically highlighted changes directly on the most up-to-date view of the ENC between printed CPENC versions.

Chart Timeline and Distribution with Graphical/Symbolic Corrections

- Printed versions of CPENCs will be available on NGA websites.
- U.S. Military customers can use any version of the CPENC PDF in order to exchange for latest printed or corrected version of the CPENC via synchronization software.
- All the latest versions (printed or corrected) of public-available CPENCs could be made available on the future distribution website for download.
- Update Example:

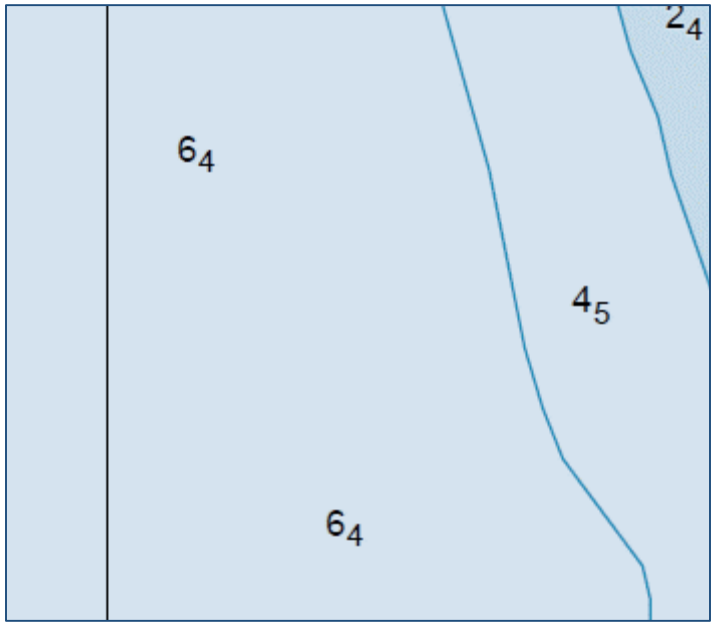


Operational Ease of Use

- Mariners would not need to read/interpret text or plot based on coordinates.
- Mariners would be able to update their chart to exactly how it appears in the digital corrected CPENC.
- **The Digital Correction CPENC file *is* the latest view of ENC.**
  - It merely highlights how it has CRITICALLY changed from the last printed version. Non-critical changes are on the Digital Correction CPENC, because it uses the latest ENC, but those changes are not highlighted.

Graphical/Symbolic Corrections Example: Point Correction

Printed CPENC

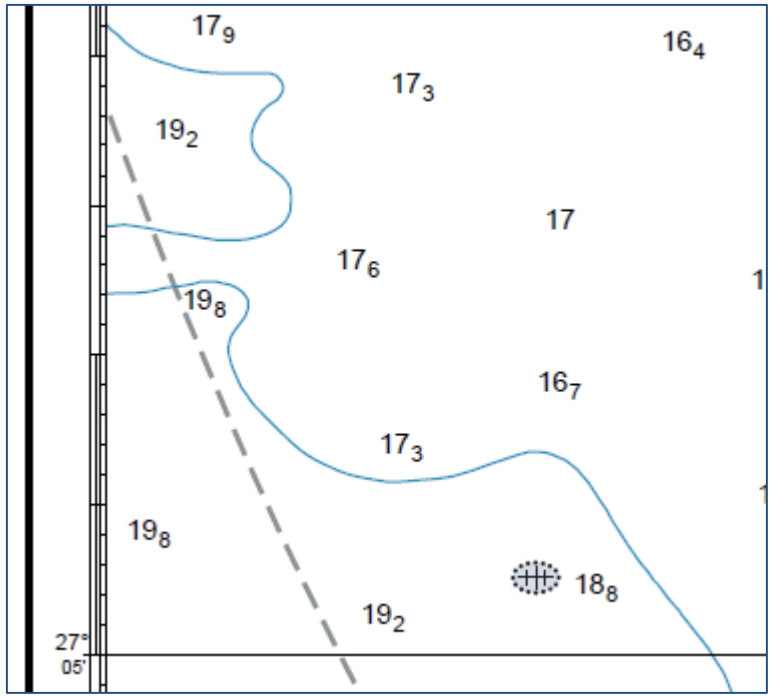


Digital Corrected CPENC

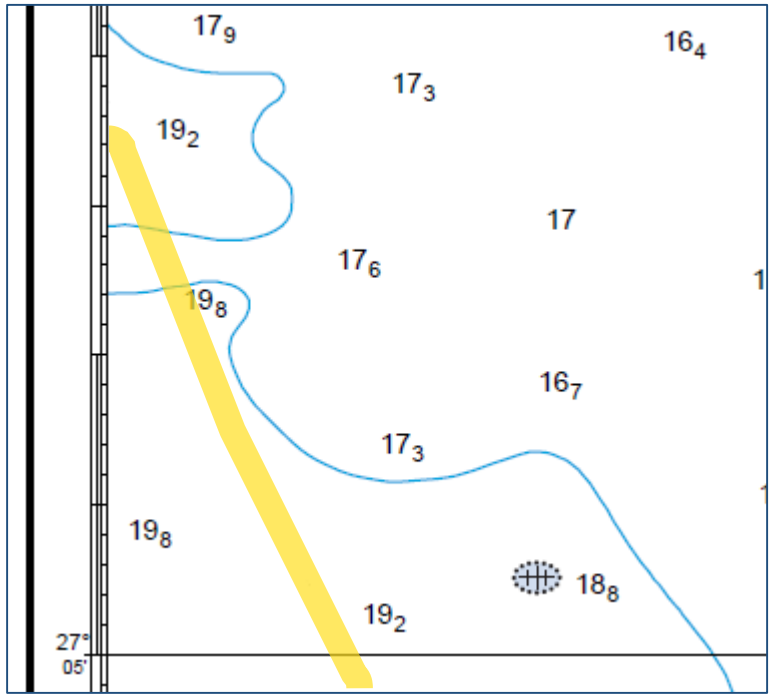
*Printed CPENC shows sounding of 6.4; **CHANGE** to 6 is highlighted on Digital Corrected CPENC.*

Graphical/Symbolic Corrections Example: Line Correction

Printed CPENC



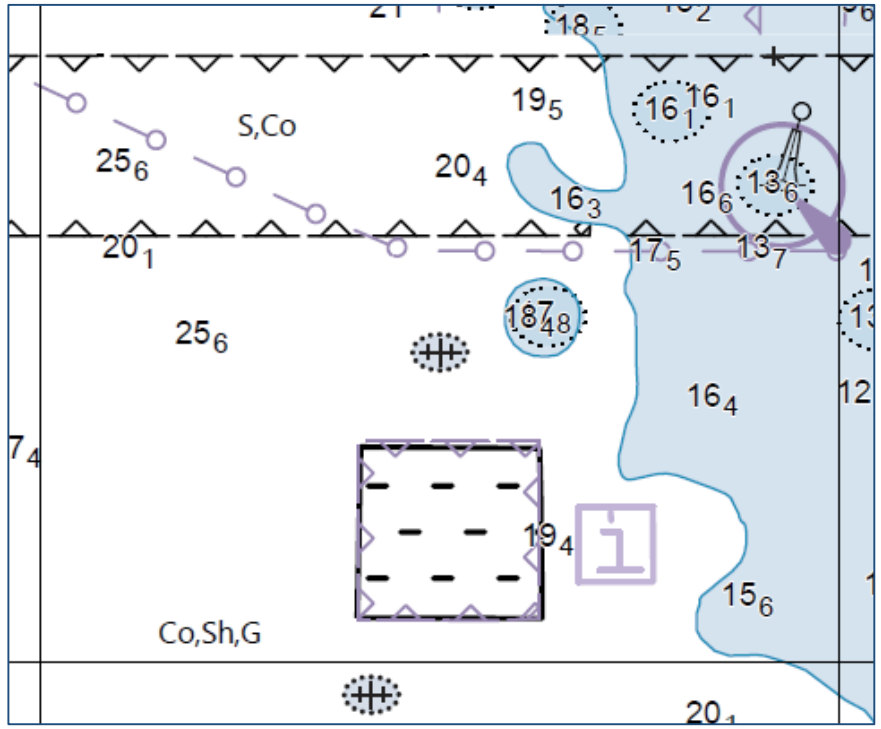
Digital Corrected CPENC



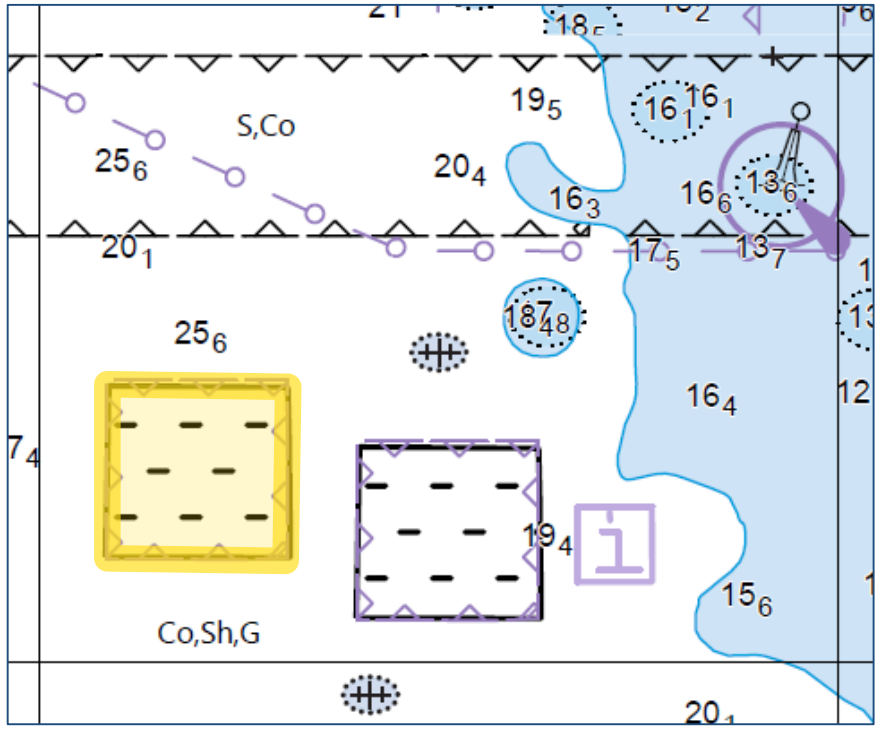
*Printed CPENC shows limit line; **DELETE** of limit line highlighted on Digital Corrected CPENC.*

Graphical/Symbolic Corrections Example: Area Correction

Printed CPENC



Digital Corrected CPENC



*Printed CPENC shows restricted area; **ADD** of restricted area highlighted on Digital Corrected CPENC.*

Safer, Smarter, and Faster Information for the Mariner

- Because the Mariner has the latest view of the ENC in the digital correction CPENC, they always have the latest data for decision making, both critical or non-critical.
- Drastically decreases human error from both the provider and the Mariner. Provider will need to:
  - Maintain change detection results cumulatively until another print version is released (controlled by date definition queries);
  - Smartly generate new CPENCs only where changes occur (easily automated with geospatial overlay between critical change and Fixed AOIs);
- No guesswork for the Mariner.
  - Exchange/replace outdated digital CPENC file (printed or corrected version) with the latest CPENC file:

Both a digital Corrected CPENC and a printed version could easily be made distinguishable to the mariner with a chart surround in the margins, for example:

IN-PRINT

vs.

CORRECTED