



NIOHC19  
26-28 Mar 2019  
Muscat, Oman

# ENC Solutions for S-100 and beyond

SevenCs Software

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## Agenda

- Introduction of SevenCs
- ENC Production Life Cycle
- 7Cs Analyzer
- ENC Bathymetric Plotter



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Founded in **1992**

**100+** Employees

**4** Office locations

Hamburg



Limassol

Tokyo

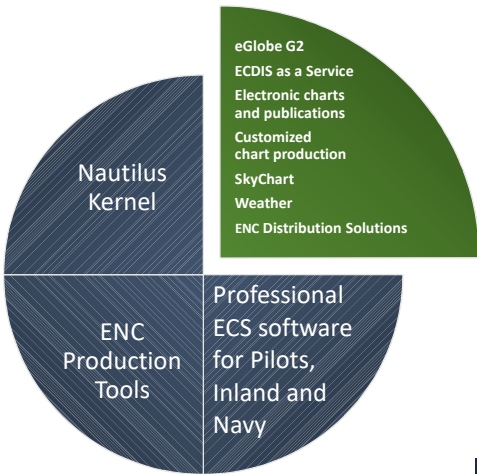
Singapore



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**CORE ACTIVITIES**




**Nautilus Kernel**

**ENC Production Tools**

**Professional ECS software for Pilots, Inland and Navy**

**eGlobe G2**  
 ECDIS as a Service  
 Electronic charts and publications  
 Customized chart production  
 SkyChart  
 Weather  
 ENC Distribution Solutions

We provide 24/7 emergency support to all of our customers.



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## SevenCs - Products and Services

- ECDIS Kernel software
- Web based solutions for electronic charts
- Chart Production/Validation Software
- Navigation Software (ECS, PPU)
- Software Development (e.g. ECDIS for ChartWorld )
- Training and Consulting



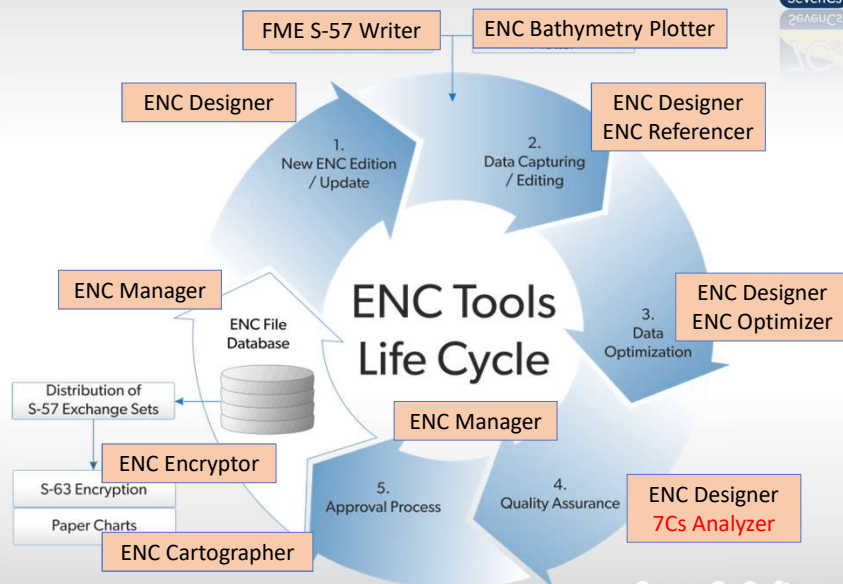
```
// Check for 'noShow'
for (int i = 0; i <
{
    QString arg(my_arg);
    if (arg == "noShow")
```

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## ENC Life Cycle



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## Current S-100/S-101 activities



- Member of IHO **S-100 working group** and of S-100 technical **expert team**
- SevenCs **S-100 ECDIS Kernel** Nautilus
  - basis for large variety of S-100 applications (S-101,S-102, ...)
- **S-101 Validation Software**
  - provided to S-100/S-101 IHO expert groups to assist in development and testing of S-101 validation checks
- **S-101 Reader** Plugin for FME
  - include S-101 data in geo-data processing procedures

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## New 7Cs Analyzer



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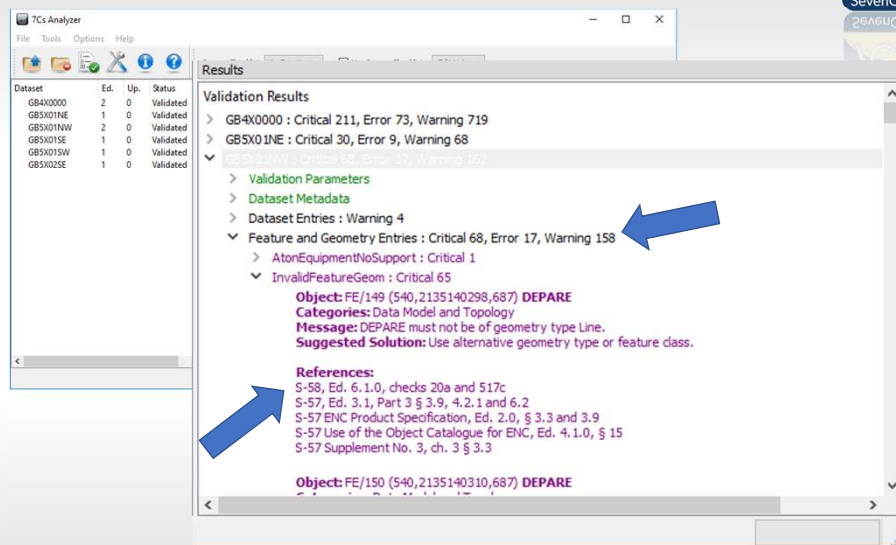
# 7Cs Analyzer Version 4.0.0

- Based on Nautilus S-100 ECDIS Kernel
- Validates S-57 ENC, IENC, AML
- Includes **S-58 6.1.0**. and IENC Validation Checks
- Integrates into ENC Designer
- Additional module for S-101
- S-100 testbed version known as “Validator”



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# New Analyzer Version 4.0.0



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## Validation Standards



- IHO S-100 Universal Hydrographic Data Model (Dec 18)
- S-101 Edition 1.0.0 (Dec 18)
- S-57 Transfer Standard for Digital Hydrographic Data Edition 3.1
- S-57 ENC Product Specification 2.0
- S-57 Appendix B.1 Annex A – Use of the Object Catalogue for ENC Edition 4.1.0
- IHO S-58 ENC Validation Checks Edition 6.1 (Sep 18) \*
- Product Specifications for Inland ENC Editions 2.1, 2.2, 2.3, 2.4
- Recommended Inland ENC Validation Checks 2.4

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## High Density Contours



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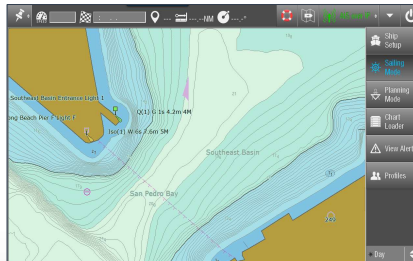
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## Depth information in ENC's and ECDIS



- Hardly any Official ENC's with high density contours
- To be set by the operator of the navigation system

- Reflect the ships' draught plus extra safety margin
- Areas safe for navigation are shown in the display



- Safe areas can be distinguished from shallow areas

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## Depth Contours in ENC's

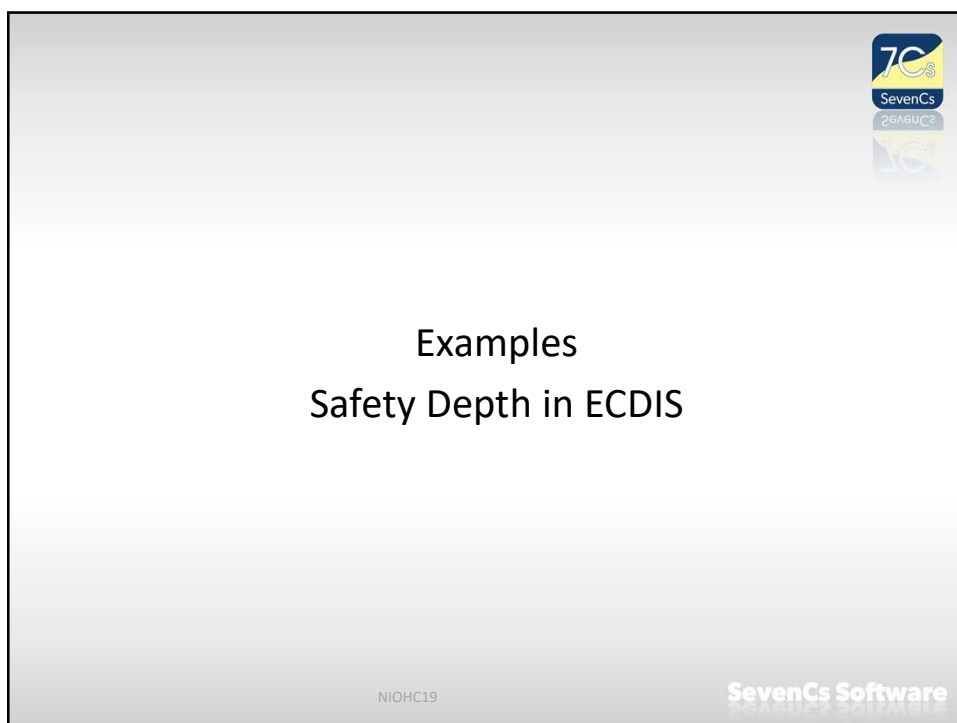


- ENC's use same contour levels as paper charts
- -2m, -1m, 0m, 2m, **5m, 10m, 20m**, 30m, 50m, ...
- ECDIS safety contour display is bound to the same schema
- Hence ECDIS safety contour setting cannot always be reflected in ECDIS chart display
- This results in unused potentially navigable areas
- => ENC's should have much denser contours

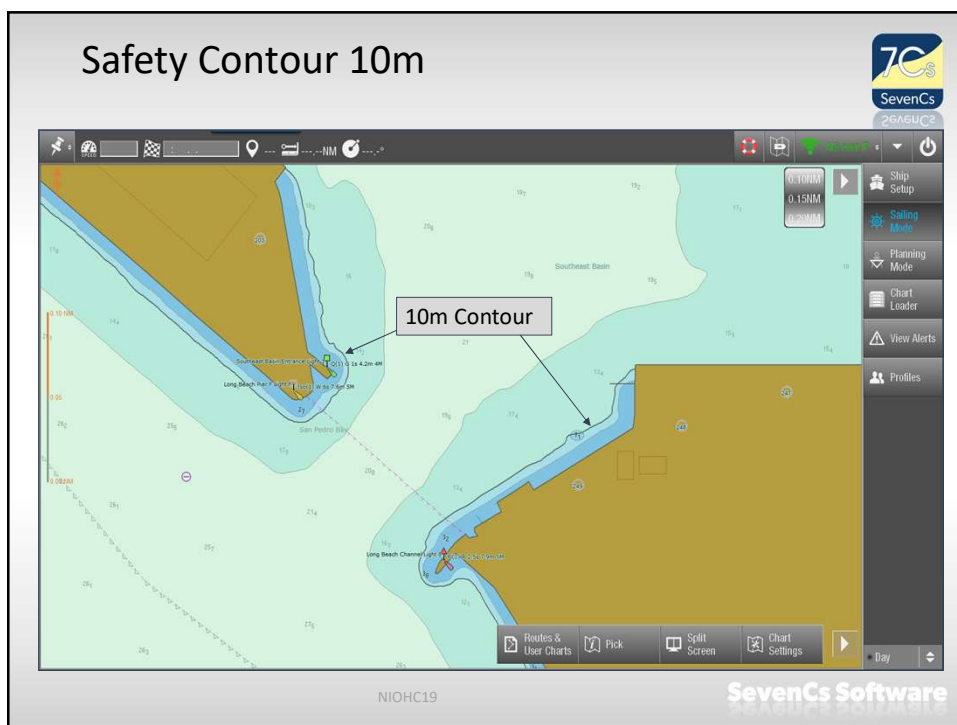
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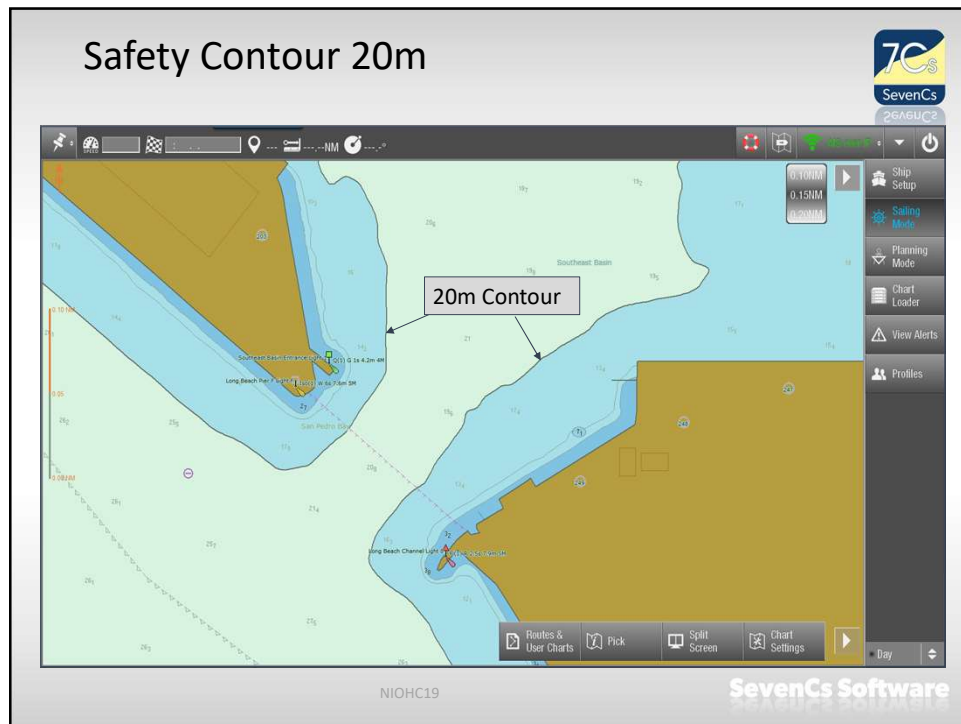


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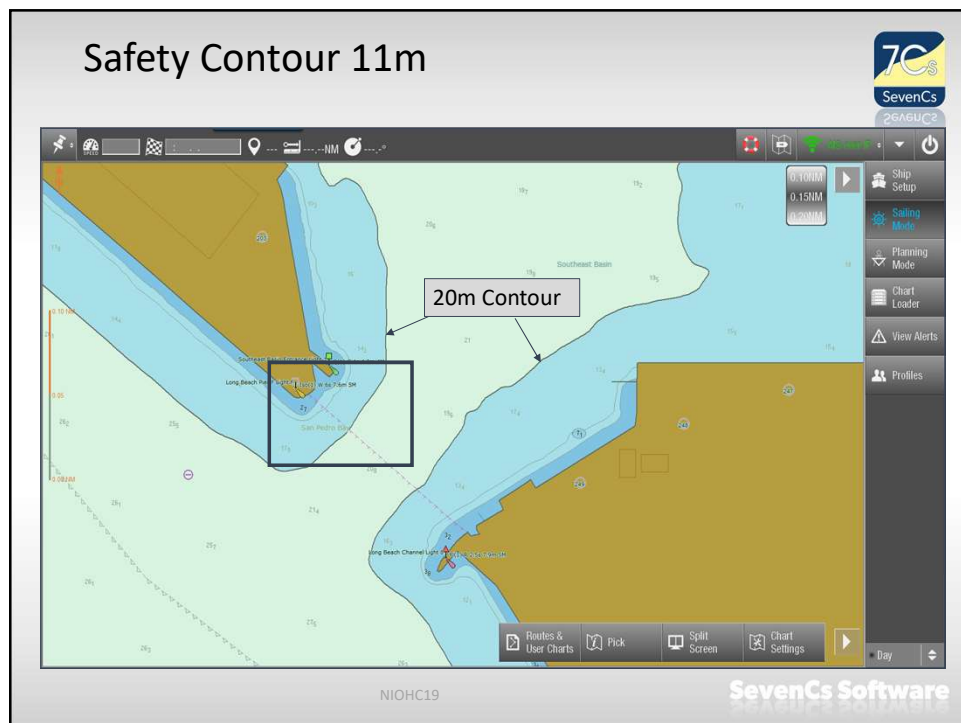


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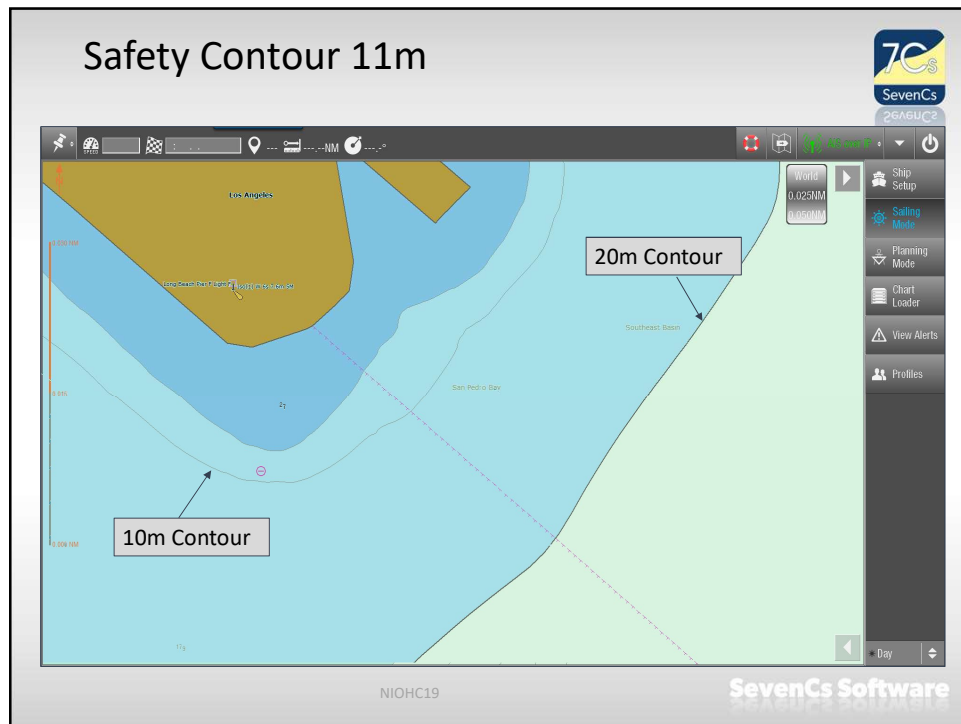




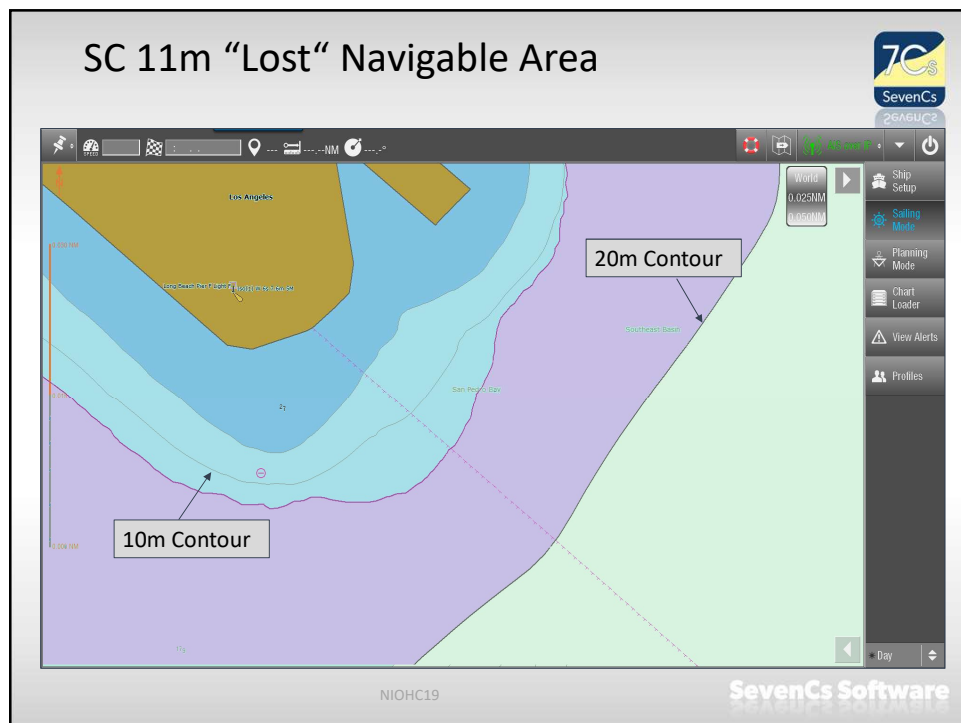
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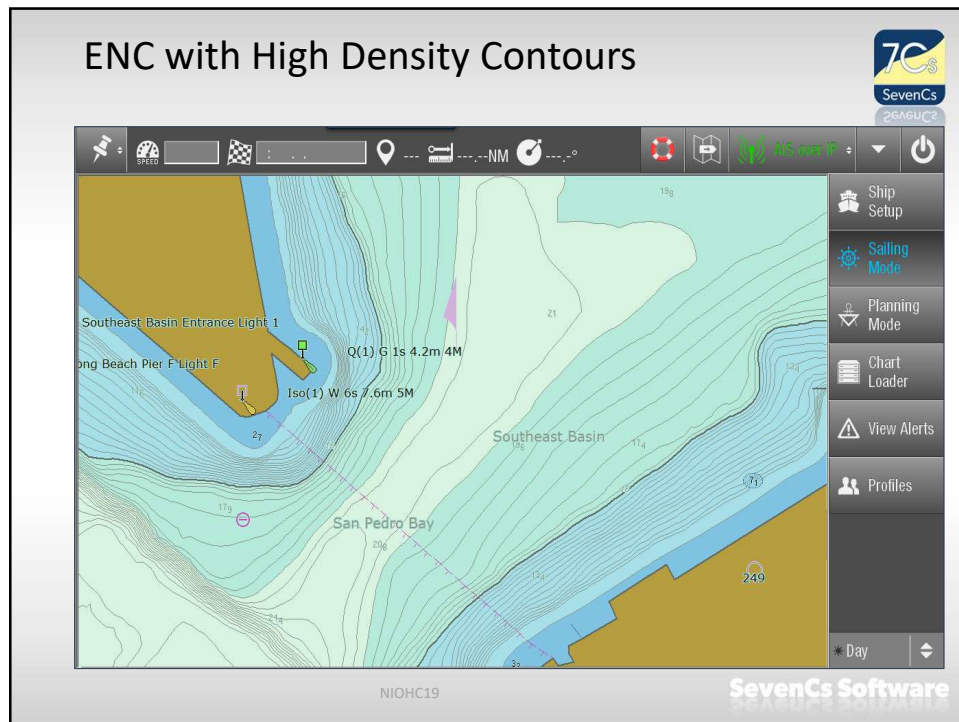
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### Problems with denser contours in ENC's (?)

What data producers say:

- Still a lot manual work involved in contour generation
- Contour creation at small intervals can result in topological issues (line overlaps, degenerated edges)
- Potential issue with 5MB cell size limit

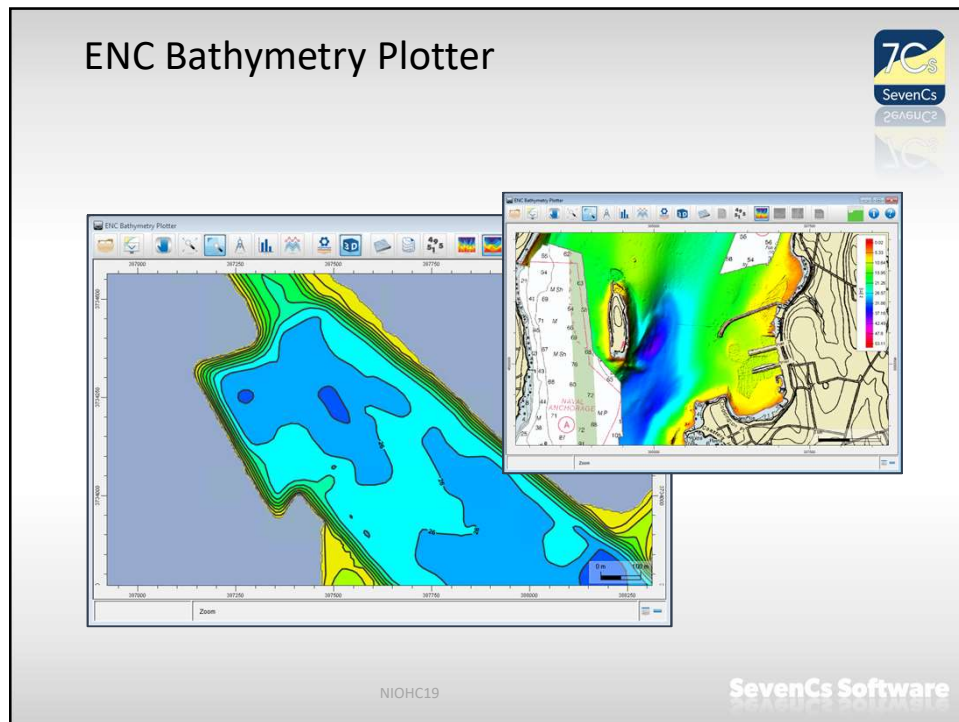
What SevenCs thinks:

- If issues can be solved navigation with ECDIS will become **significantly** more effective than today
- **Ready solution – ENC Bathymetry Plotter**

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## ENC Bathymetry Plotter



- Create contour lines and selected soundings
- for incorporation into nautical chart products
- Reads gridded bathymetry files (e.g. BAG, S-102) or xyz point clouds
- S-57 export
- First version released in July 2016

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## ENC Bathymetry Plotter



- Simple workflow - data import, modelling, contouring, export
- Shoal biased smoothing and generalization process
- Contours are derived from Nautical Elevation Model
- Sounding selection function
- Export to S-57 (DEPCNT, DEPARE, SOUNDG, M\_COVR, M\_QUAL)
- Detailed pdf summary report

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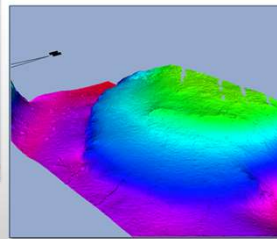
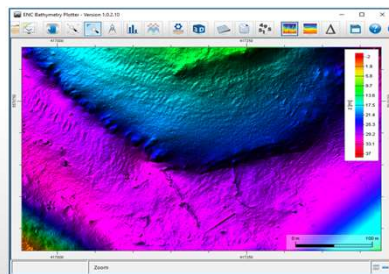
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## Nautical Elevation Model



- Based on shoal biased Nautical Elevation Model
- Structured as gridded bathymetry (BAG, S-102)
- Rough source model => Nautical Elevation Model
- Analogy: draping a sheet over a rough bottom
- To some extent similar to Navigation Surface approach developed by Shep M. Smith in 2003



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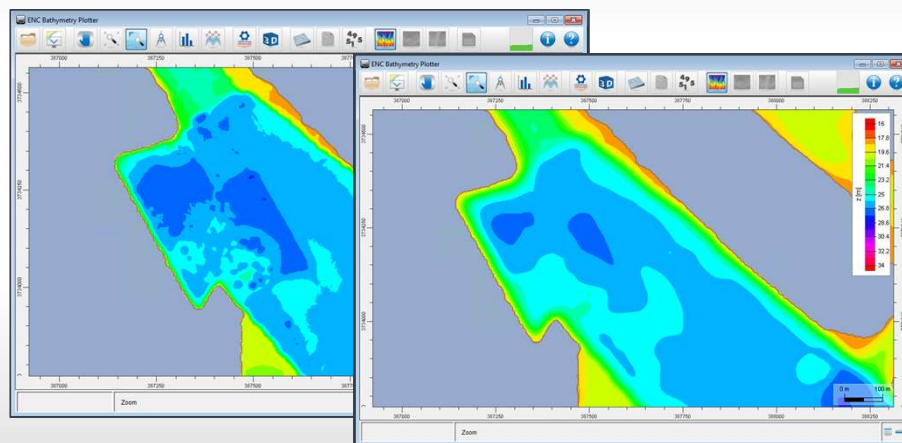
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## ENC Bathymetry Plotter – Nautical Model



- Input Model vs. Nautical Elevation Model



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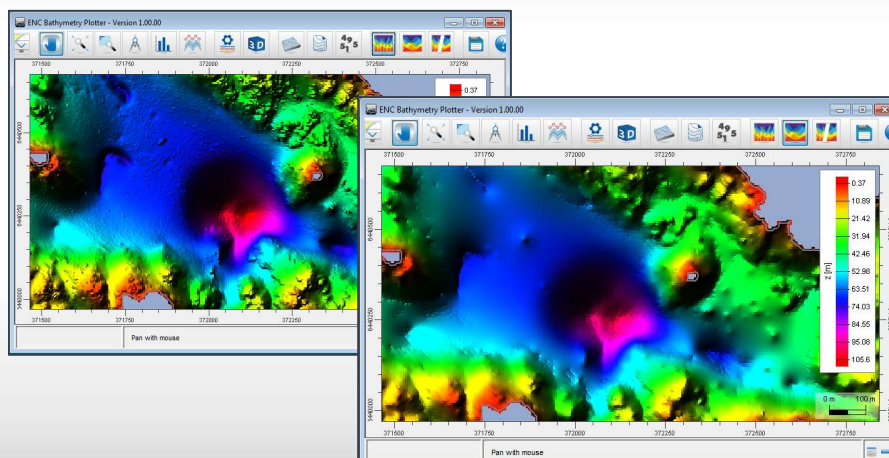
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## ENC Bathymetry Plotter – Nautical Model



- Input Model vs. Nautical Elevation Model



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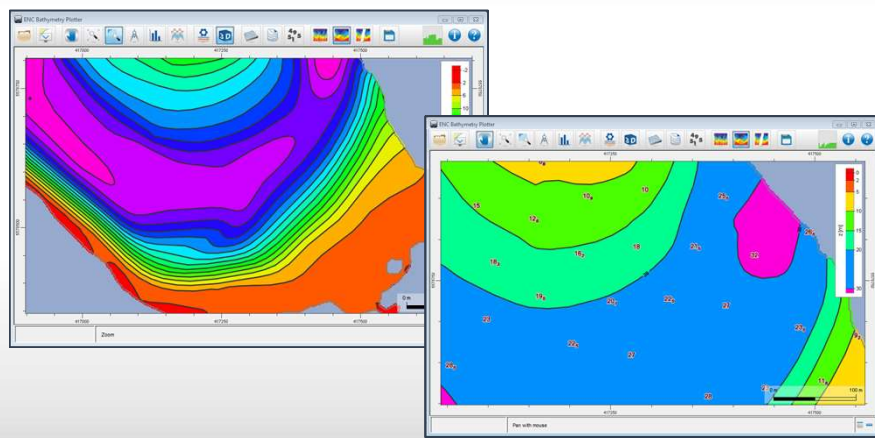
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## ENC Bathymetry Plotter



- Creation of contours and selected soundings



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## ENC Bathymetry Plotter – S-57 Export



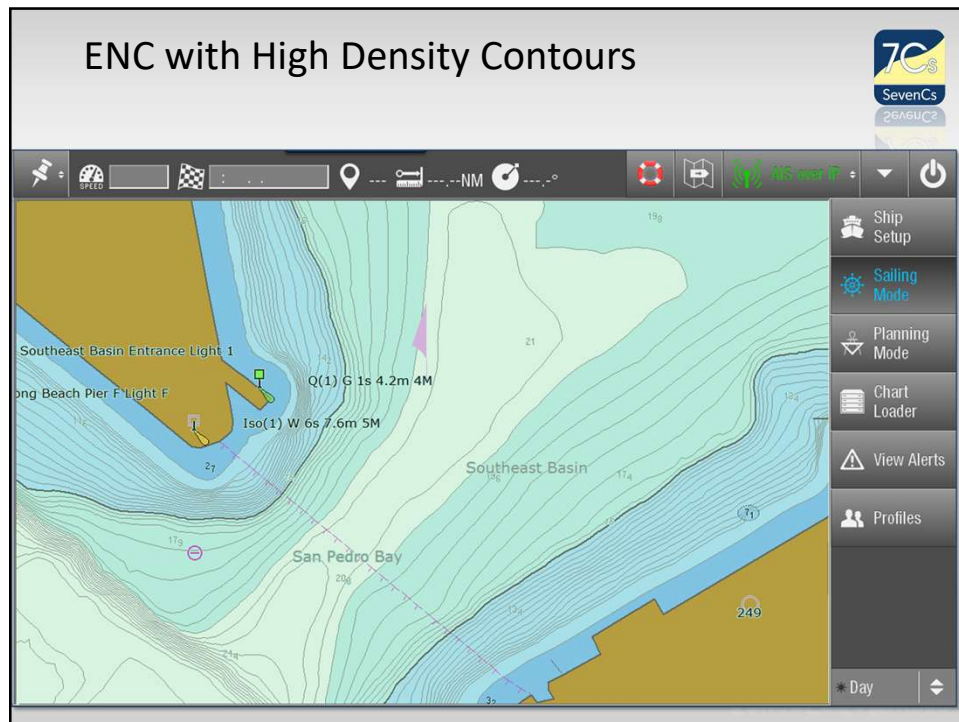
- S-57 Export of bathymetric features



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### Challenges moving forward

- HO's will be facing new challenges if they decide to take the step into regular production of High Density Bathymetry ENC's and also the upcoming S-100 products and standards
- Advanced technical solutions are available and will have to be implemented to cope with the new challenges.
- The introduction of S-100 based digital products will provide additional options, which SevenCs will support.

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Thank you very much  
for your attention

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