

S-100

NSHC32 Dublin 22 June 2016

Niels Nijhuis



TELEDYNE CARIS
Everywhere you look™



Teledyne CARIS

- HQ staying in Fredericton, and regional offices to operate the same way
- Employees will be retained (much of our IP is with the CARIS personnel)
- Opportunities for employees to interact in the larger Teledyne group
- Doug Lockhart from Teledyne RDI brought on as interim General Manager
- Dr. Masry will act as advisor to Doug, and Mark Masry will continue as CTO
- Continued commitment to customer service and individual approach with our customers



CARIS Solutions

- Our focus will be on our full product line
 - Evolve the Ping-to-Chart workflow
- Opportunity to interface very well to Teledyne sensors
 - e.g. Sonar, LiDAR, Laser Scanners, AUVs and USVs
- CARIS software will continue to be vendor agnostic
 - Our customers need to interface to multiple types of sonars
- CARIS is the only software company in the Teledyne group
 - Teledyne was very interested in our downstream GIS and cartographic software
 - The sensors make data and our solutions turn it into information
 - Teledyne gives CARIS the opportunity to grow

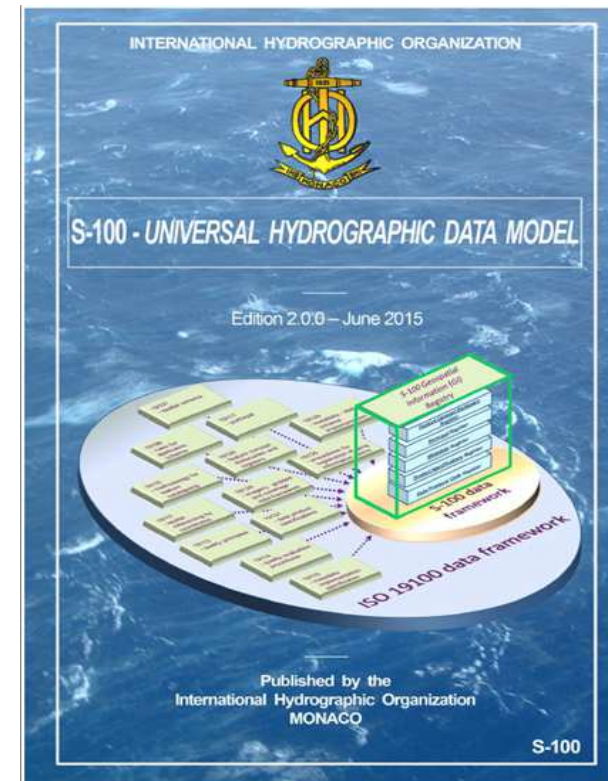


S-100

International Hydrographic Organization (IHO)

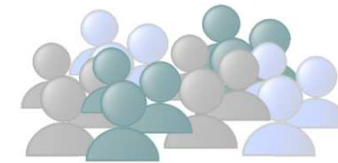
S-100

Universal Hydrographic Data Model



S-100

Aims to support a greater range of hydrographic related digital data sources, products and customers



A framework for development of the next generation products

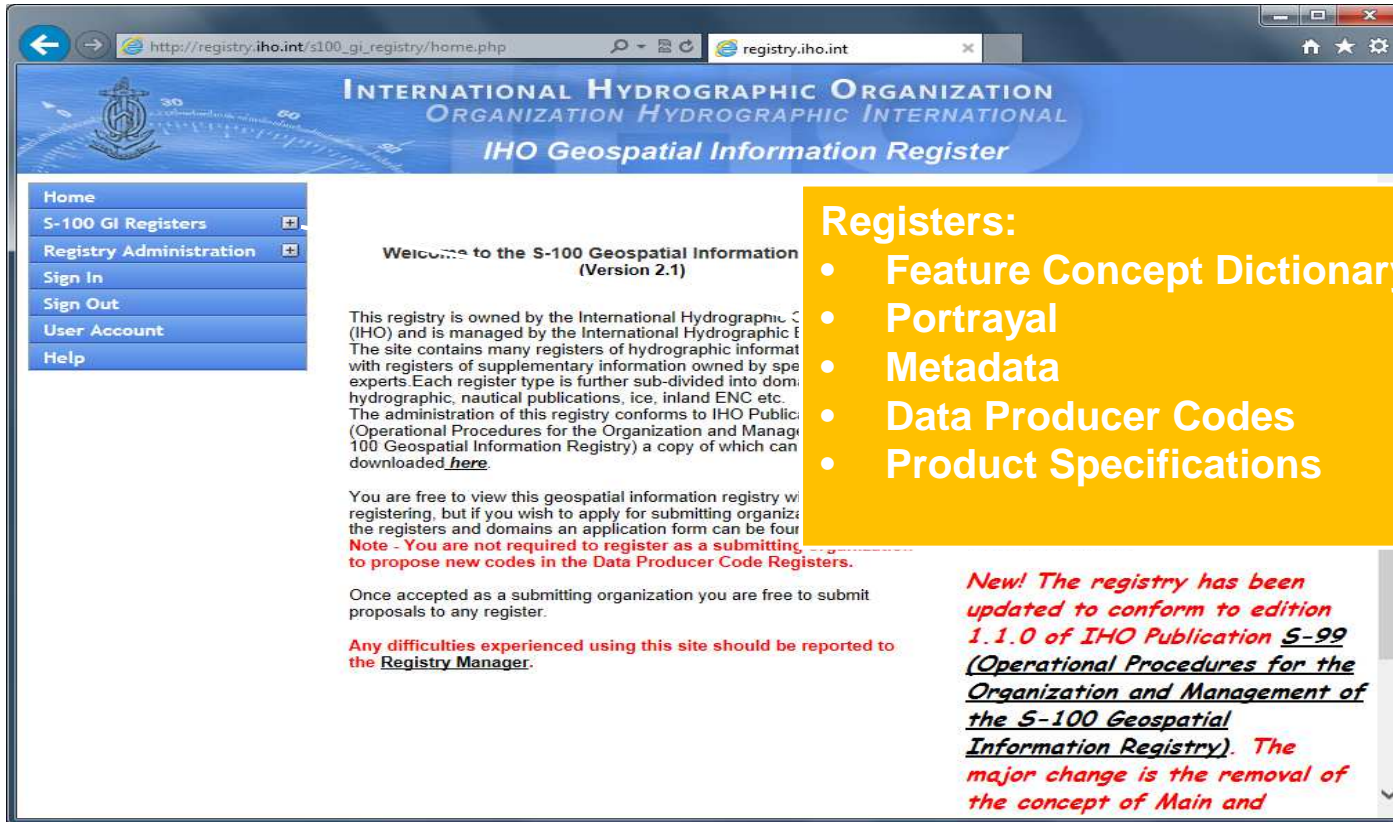
Not a product specification

1. Conceptual Schema Language
2. Management of IHO Geospatial Information Registers
3. General Feature Model
4. Metadata
5. Feature Catalogue
6. Coordinate Reference Systems
7. Spatial Schema
8. Imagery and Gridded Data
9. Portrayal
10. Encoding Formats
11. Product Specifications
12. Maintenance

“...does *not* mandate particular encoding formats...”

“...structure for any data *product specification to be written ...*”

“...defines the *methodology* for classification of the feature types...”
(does not define actual classes)



The screenshot shows a web browser window displaying the IHO Geospatial Information Registry homepage. The browser address bar shows the URL http://registry.iho.int/s100_gi_registry/home.php. The page header features the IHO logo and the text "INTERNATIONAL HYDROGRAPHIC ORGANIZATION ORGANIZATION HYDROGRAPHIC INTERNATIONALE IHO Geospatial Information Register". A navigation menu on the left includes links for Home, S-100 GI Registers, Registry Administration, Sign In, Sign Out, User Account, and Help. The main content area is titled "Welcome to the S-100 Geospatial Information (Version 2.1)" and contains introductory text about the registry's ownership and management. A yellow callout box on the right lists the registers available: Feature Concept Dictionary, Portrayal, Metadata, Data Producer Codes, and Product Specifications. A red callout box at the bottom right provides an update notice regarding the registry's conformity with IHO Publication S-99.

Registers:

- Feature Concept Dictionary
- Portrayal
- Metadata
- Data Producer Codes
- Product Specifications

New! The registry has been updated to conform to edition 1.1.0 of IHO Publication S-99 (Operational Procedures for the Organization and Management of the S-100 Geospatial Information Registry). The major change is the removal of the concept of Main and

IHO: S-101 to S-199

IHO S-101 ENC
IHO S-102 Bathymetric Surface
IHO S-103 Sub-surface Navigation
IHO S-111 Surface currents
IHO S-112 Dynamic Water Level Data
IHO S-121 Maritime limits and boundaries
IHO S-122 Marine Protected Areas
IHO S-123 Radio Services
IHO S-124 Navigational warnings
IHO S-125 Navigational services
IHO S-126 Physical Environment
IHO S-127 Traffic Management
IHO S-128 Catalogues of Nautical Products
IHO S-1xx Marine Services
IHO S-1xx Digital Mariner Routeing Guide
IHO S-1xx Harbour Infrastructure
IHO S-1xx (Social/Political)

IALA: S-201 to S-299

IALA S-201 Aids to Navigation Information
IALA S-210 Inter-VTS Exchange Format
IALA S-230 Application Specific Messages
IALA S-240 DGNSS Station Almanac
IALA S-245 eLoran ASF Data
IALA S-246 eLoran Station Almanac

IOC: S-301 to S-399

Various: S-401 to ...

IEHG S-401 Inland ENC
JCOMM S-411 Ice Information
JCOMM S-412 Weather Overlay

IHO: S-101 to S-199

IHO S-101 ENC

IHO S-102 Bathymetric Surface

IHO S-103 Sub-surface Navigation

IHO S-111 Surface currents

IHO S-112 Dynamic Water Level Data

IHO S-121 Maritime limits and boundaries

IHO S-122 Marine Protected Areas

IHO S-123 Radio Services

IHO S-124 Navigational warnings

IHO S-125 Navigational services

IHO S-126 Physical Environment

IHO S-127 Traffic Management

IHO S-128 Catalogues of Nautical Products

IHO S-1xx Marine Services

IHO S-1xx Digital Mariner Routeing Guide

IHO S-1xx Harbour Infrastructure

IHO S-1xx (Social/Political)

S-102 ed. 1.0 (Published 2012)

Work on ed. 2 is ongoing

IALA S-230 Application Specific Messages

IALA S-240 DGNSS Station Almanac

IALA S-245 eLoran ASF Data

IALA S-246 eLoran Station Almanac

IOC: S-301 to S-399

Various: S-401 to ...

IEHG S-401 Inland ENC

JCOMM S-411 Ice Information

JCOMM S-412 Weather Overlay

IHO: S-101 to S-199

IHO S-101 ENC

IHO S-102 Bathymetric Surface

IHO S-103 Sub-surface Navigation

IHO S-111 Surface currents

IHO S-112 Dynamic Water Level Data

IHO S-121 Maritime limits and boundaries

IHO S-122 Marine Protected Areas

IHO S-123 Radio Services

IHO S-124 Navigational warnings

IHO S-125 Navigational services

IHO S-126 Physical Environment

IHO S-127 Traffic Management

IHO S-128 Catalogues of Nautical Products

IHO S-1xx Marine Services

IHO S-1xx Digital Mariner Routeing Guide

IHO S-1xx Harbour Infrastructure

IHO S-1xx (Social/Political)

S-102 ed. 1.0 (Published 2012)

Work on ed. 2 is ongoing

IALA S-201 Aids to Navigation Information

IALA S-210 Inter-VTS Exchange Format

IALA S-230 Application Specific Messages

IALA S-240 DGNSS

IALA S-245 eLoran

IALA S-246 eLoran

Draft versions exists

IOC: S-301 to S-399

Various: S-401 to ...

IEHG S-401 Inland ENC

JCOMM S-411 Ice Information

JCOMM S-412 Weather Overlay



S-101

Chapters

- Introduction
- 1. Overview
- 2. Specification Scope
- 3. Dataset Identification
- 4. Data Content and Structure
- 5. Coordinate Reference System
- 6. Data Quality
- 7. Data Capture and Classification
- 8. Maintenance
- 9. Portrayal
- 10. Data Product Format (encoding)
- 11. Data Product Delivery

Annexes

- A. Data Classification and Encoding Guide
- B. Data Product format (encoding)
- C. Normative
- D. Feature Catalogue

S-57 ENC specs completely rewritten following S-100

- For instance “cleaning up” the S-57 ENC product specification and encoding guides

Using new S-100 possibilities

- New feature & attribute encoding
- Allows exchange of updated feature catalogue and portrayal
- ...

Should allow display systems to receive and use/display newly defined features

- New terminology
 - Edge/Curve, Area/Surface, ...
- New relation types
 - Expanding slightly on existing S-57 feature relations
- Larger files allowed
 - 10MB for base cells and 200kb for update cell
- New file naming (CCXXXXXXXXX.EEE)
 - Plus more external/support files (TXT, HTM, XML or TIF)
 - Exchange Catalogue (XML)
- New skin-of-the-earth features
 - Depth Area, Dredged Area, Land Area, Unsurveyed Area, Dock Area, Lock Basin
- Cartographic text placement *allowed*
- ...

‘specificUsage’ replaces S-57 Usage

- Intended for data discovery (only)
- No longer in filename
- 3 usages:
 - Port Entry
 - Transit
 - Overview

Only 3 usages in S-101
(and not indicated in filename)

Minimum and maximum display scale for ENC Data Sets may overlap

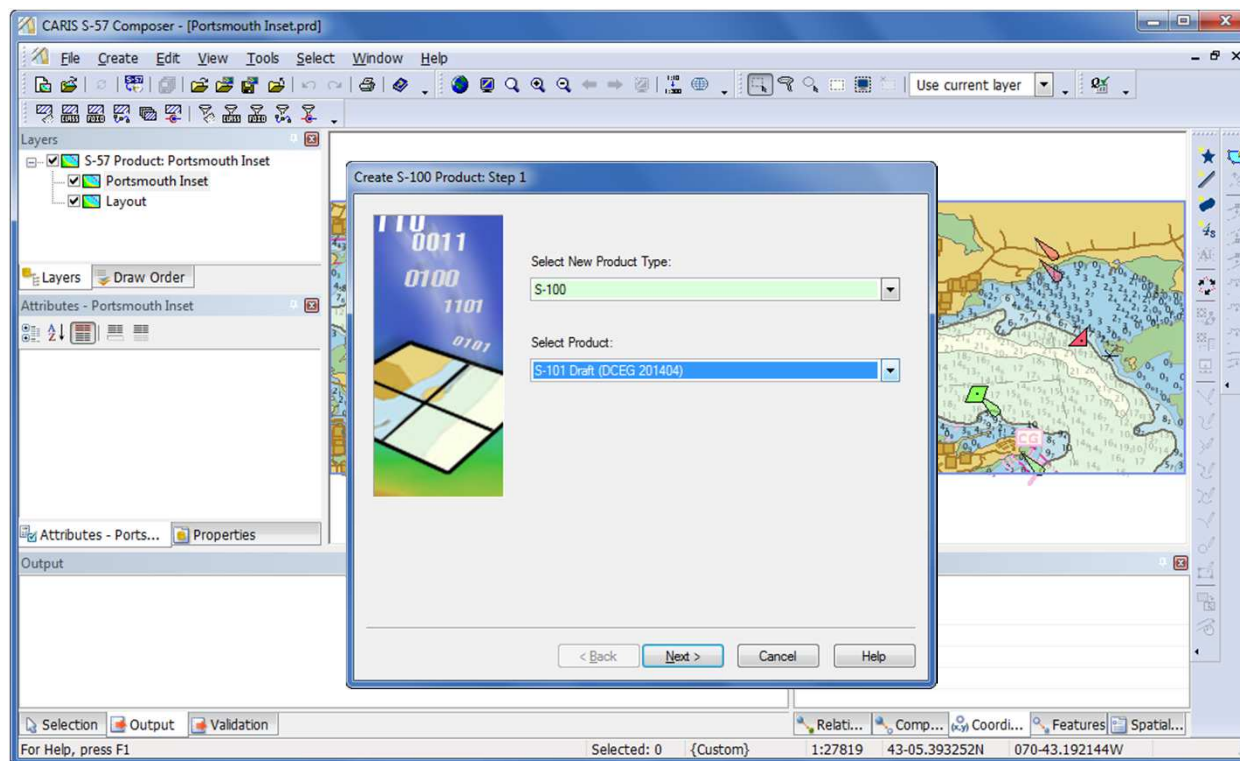
- however 'DataCoverage' features within these datasets must not overlap

Scale
1:10,000,000
1:3,500,000
1:1,500,000
1:700,000
1:350,000
1:180,000
1:90,000
1:45,000
1:22,000
1:12,000
1:8,000
1:4,000
1:3,000
1:2,000
1:1,000

- Create various S-100 vector products
 - From scratch, or
 - Convert e.g. S-57 to S-101 data

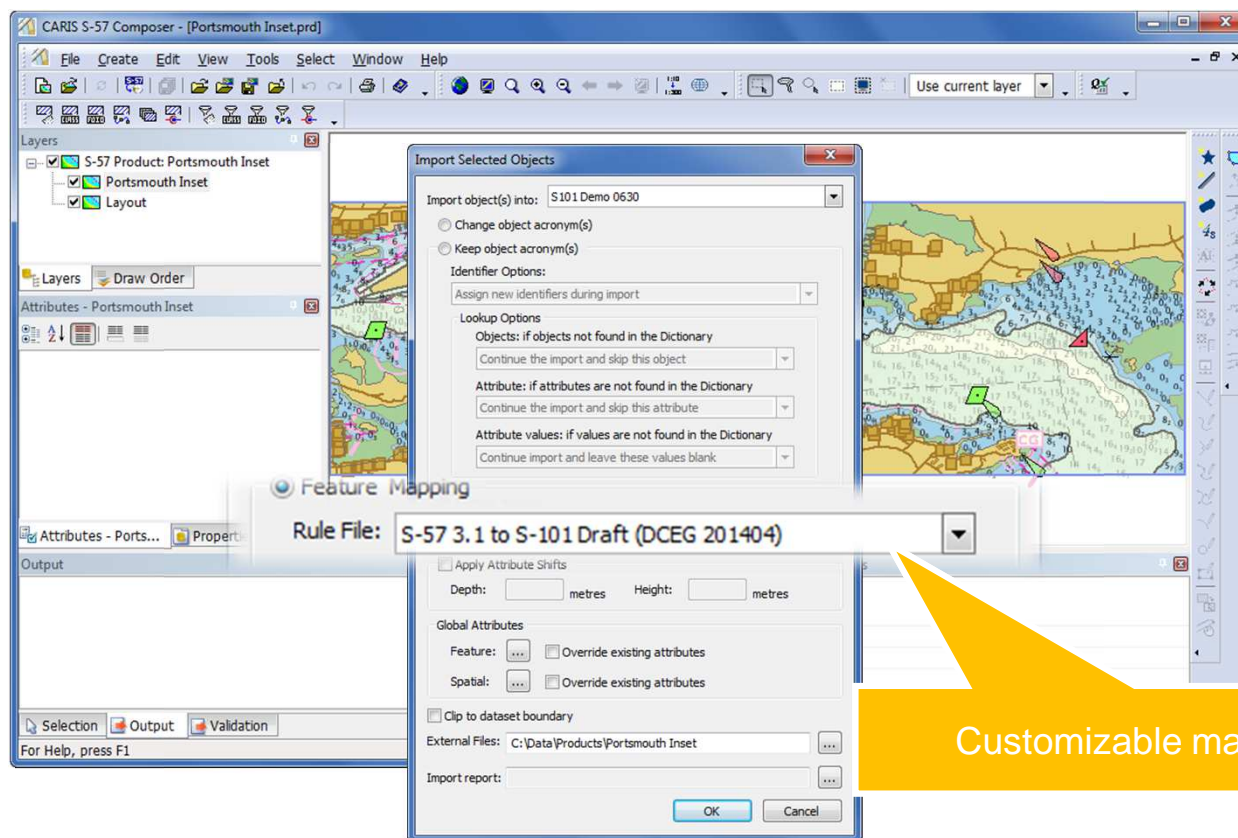
S-100 capabilities made available through Teledyne CARIS' regular update and maintenance program to existing S-57 Composer and HPD users.

Create new S-100 product



IHO S-101 is currently (2016) having draft status

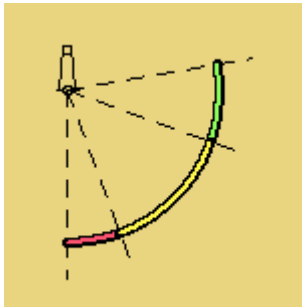
Convert S-57 features to S-101 features



IHO S-101 is currently (2016) having draft status

Each light sector is a feature in S-57 ENC

S-57 ENC



Attributes repeated for each feature

Feature ID	Acronym
1C 000000...	LIGHTS
1C 000000...	LIGHTS
1C 000000...	LIGHTS

Sector limit one	290
Sector limit two	340
Signal group	(1)
Signal period	3
Signal sequence	
Status	
Value of nominal range	6
Vertical datum	

CARIS S-57 Composer 3.0

S-101 ENC

One "complex" feature in S-101

Feature ID	Acronym
1C 000000...	LightSectored

Light characteristic	7 (isophased)
Light sector 1	1 (white),290.00000000
Light sector 2	3 (red),340.00000000
Light sector 3	4 (green),260.00000000
(New Light sector 4)	
Signal group 1	(1)
(New Signal group)	

Light sectors attributes

CARIS S-57 Composer 3.0 supports creation and maintenance of ENCs (including S-101 draft), IENCs, AMLs, MIOs and other specialty and custom products.

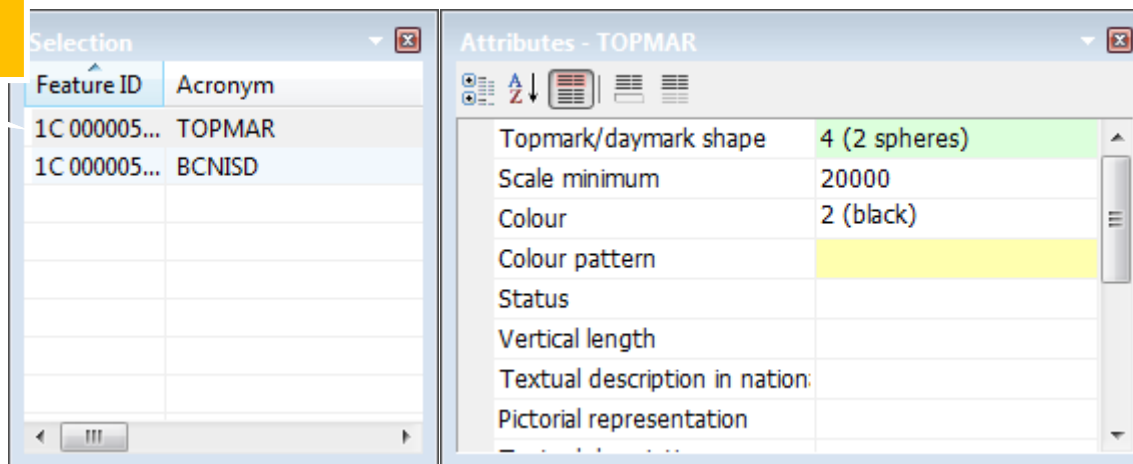
Topmark is a separate feature in S-57 ENC

S-57 ENC



S-101 ENC

One "complex" feature in S-101



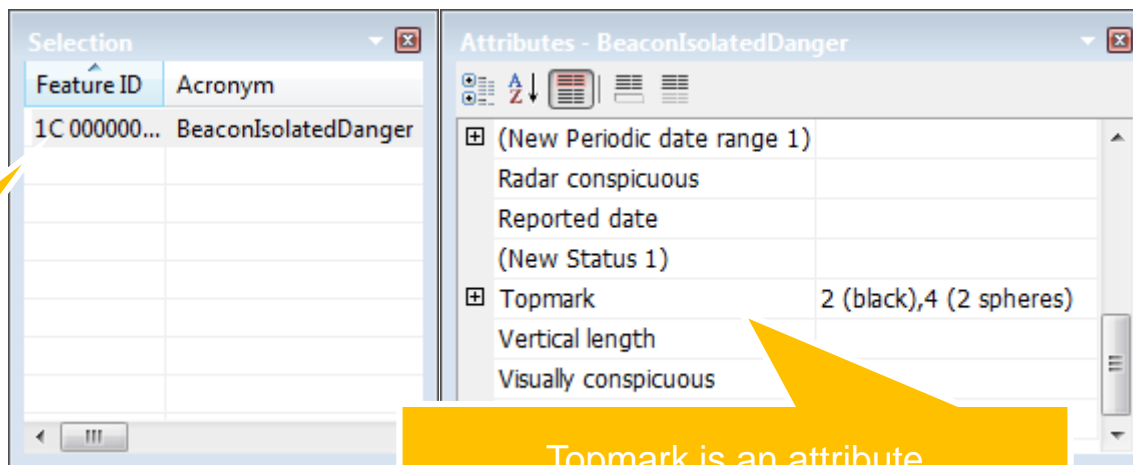
The screenshot shows two windows: 'Selection' and 'Attributes - TOPMAR'. The 'Selection' window has a table with the following data:

Feature ID	Acronym
1C 000005...	TOPMAR
1C 000005...	BCNISD

The 'Attributes - TOPMAR' window shows the following attributes:

Topmark/daymark shape	4 (2 spheres)
Scale minimum	20000
Colour	2 (black)
Colour pattern	
Status	
Vertical length	
Textual description in nation:	
Pictorial representation	

CARIS S-57 Composer 3.0



The screenshot shows two windows: 'Selection' and 'Attributes - BeaconIsolatedDanger'. The 'Selection' window has a table with the following data:

Feature ID	Acronym
1C 000000...	BeaconIsolatedDanger

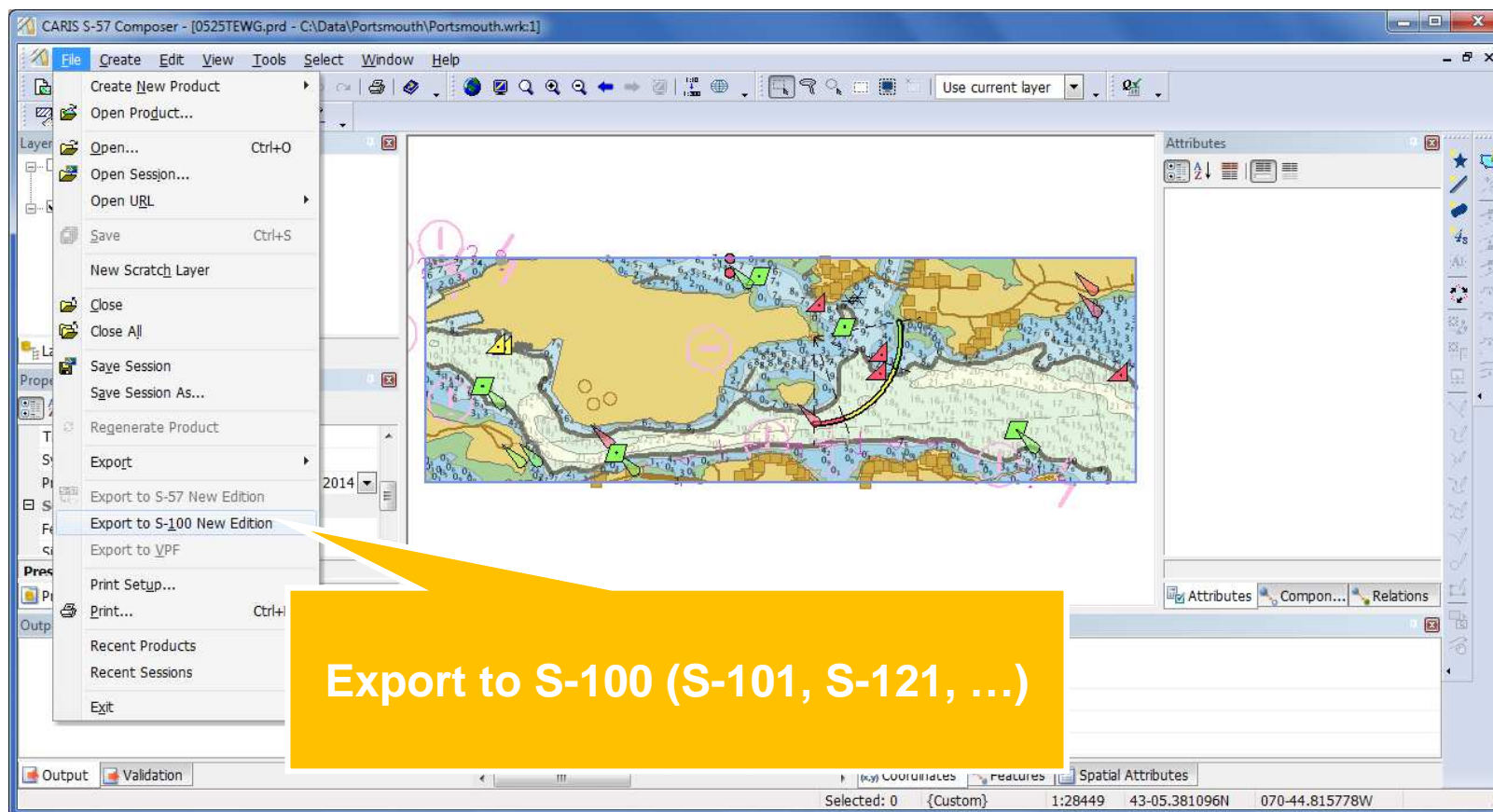
The 'Attributes - BeaconIsolatedDanger' window shows the following attributes:

(New Periodic date range 1)	
Radar conspicuous	
Reported date	
(New Status 1)	
Topmark	2 (black),4 (2 spheres)
Vertical length	
Visually conspicuous	

Topmark is an attribute

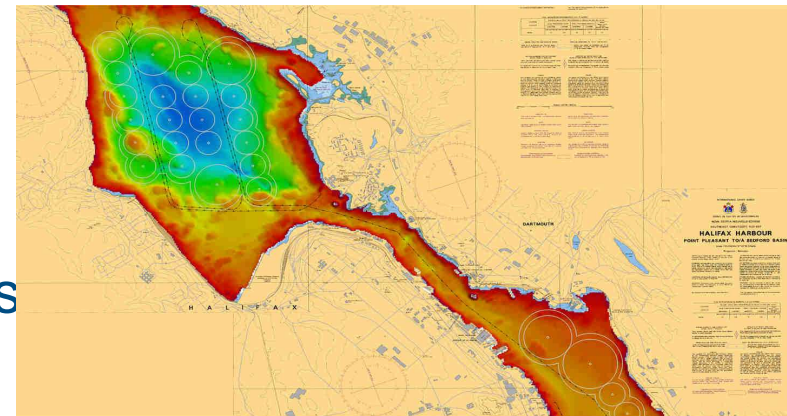
CARIS S-57 Composer 3.0 supports creation and maintenance of ENCs (including S-101 draft), IENCs, AMLs, MIOs and other specialty and custom products.

Export to S-101 ENC Product



S-102

- Growing interest in products to support enhanced navigation in areas that are:
 - High risk
 - Environmentally sensitive
 - High traffic
- Includes raster bathymetric overlays
 - S-102 Bathymetric Surfaces
 - BAG surfaces
 - Informal products



Need for high resolution bathymetric data

- in the form of a bathymetric model

Enables fusion of temporal data

- E.g. tidal heights

Overlay for S-101 ENC's

- To compliment/enhance ENC information

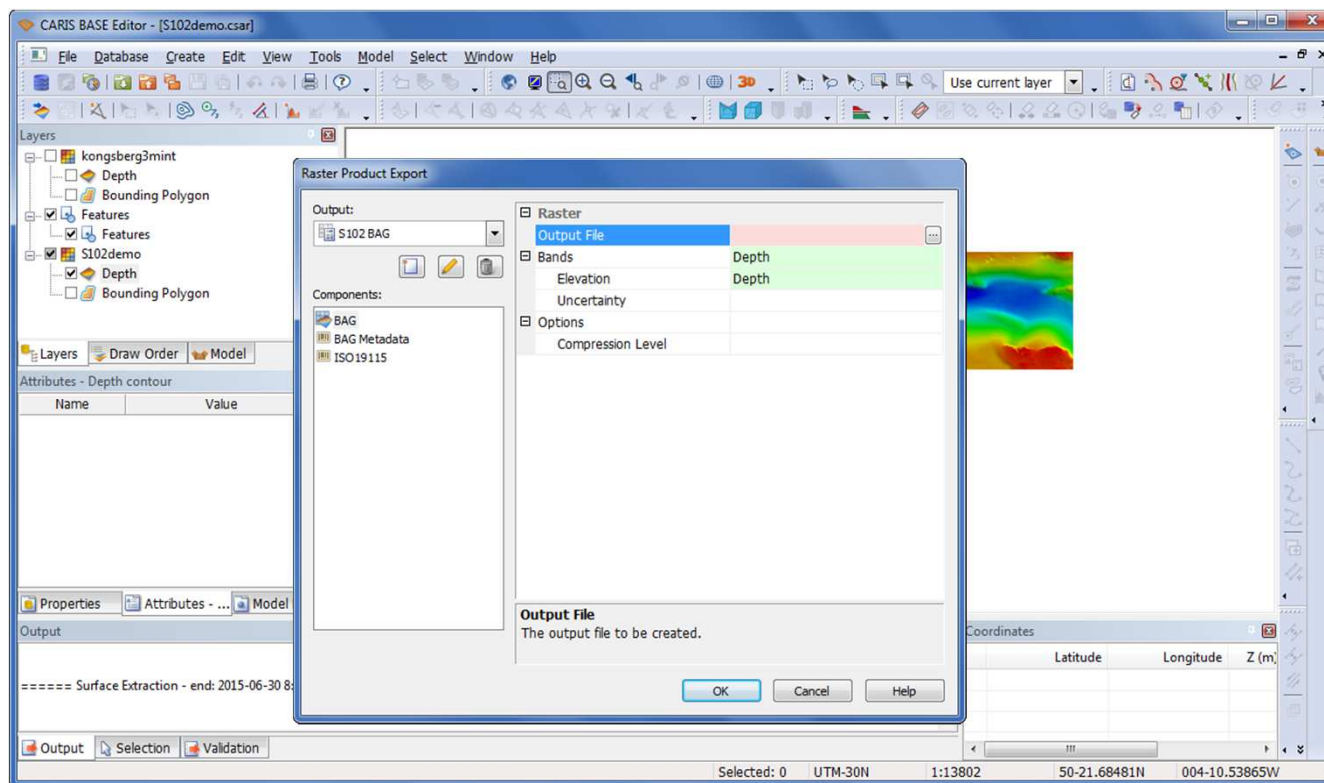
Potentially allows dynamic contouring

- Maybe even in ECS and future ECDIS

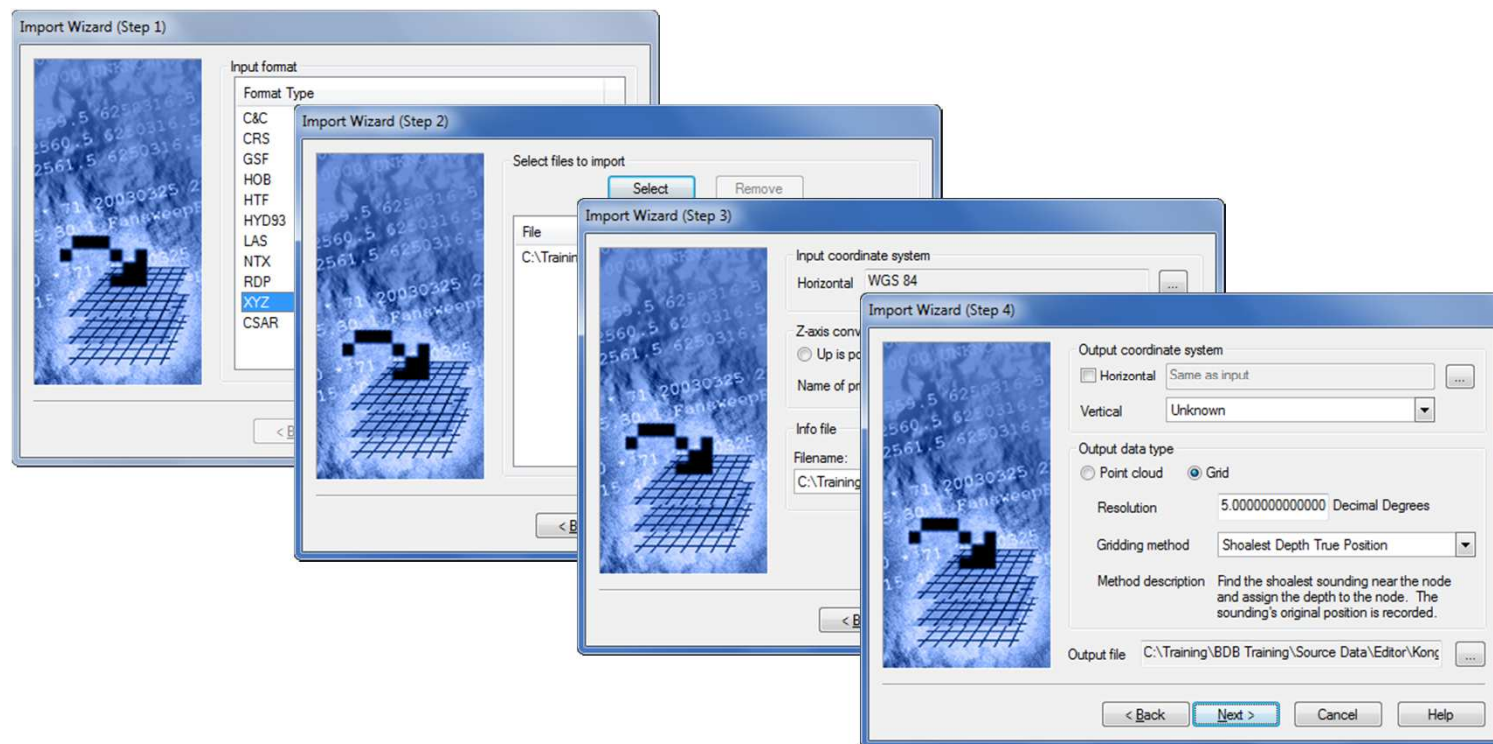
S-102 products

- Quickly created
 - Directly from bathymetric coverage data
 - In only 2-3 simple steps (see following slides)
 - Wizard to create surface when no surface exists
 - From one source, or multiple combined sources

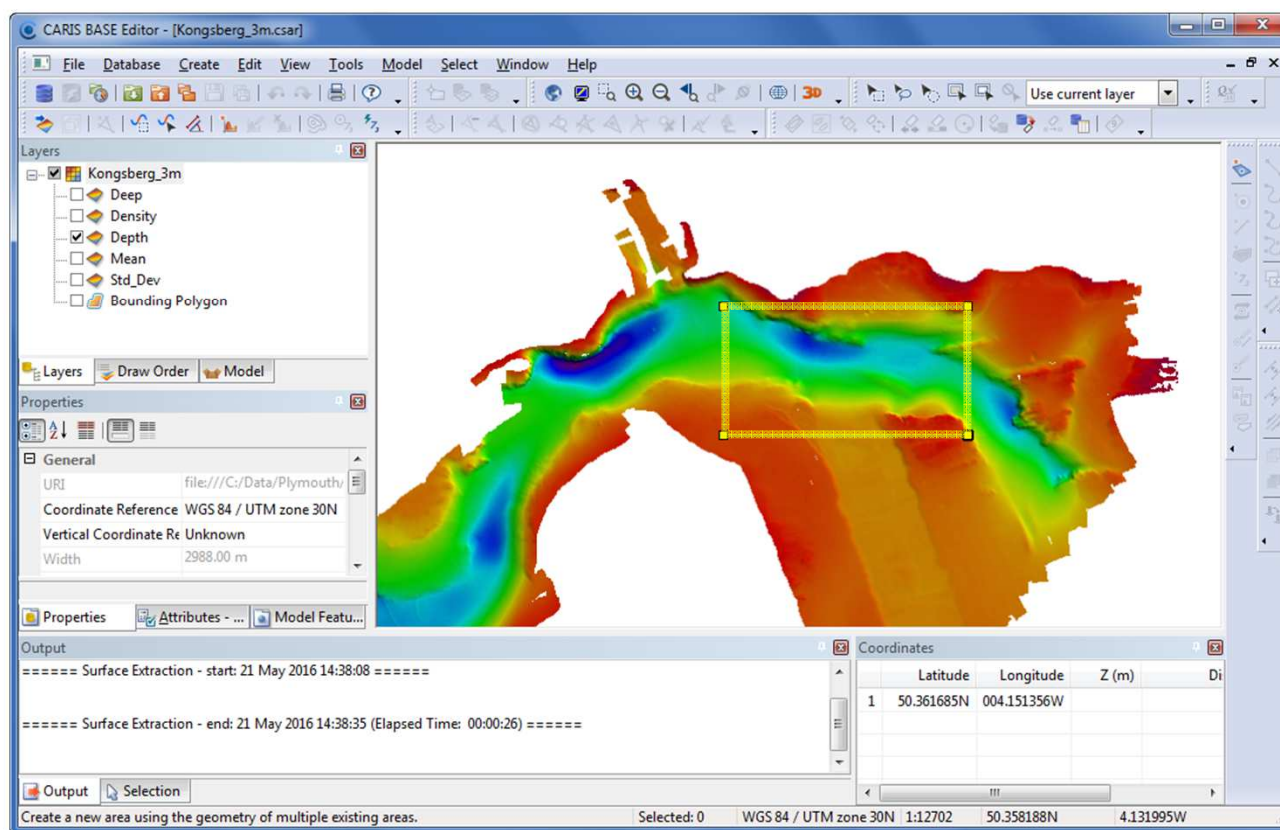
S-102 Bathymetric Surface Product creation



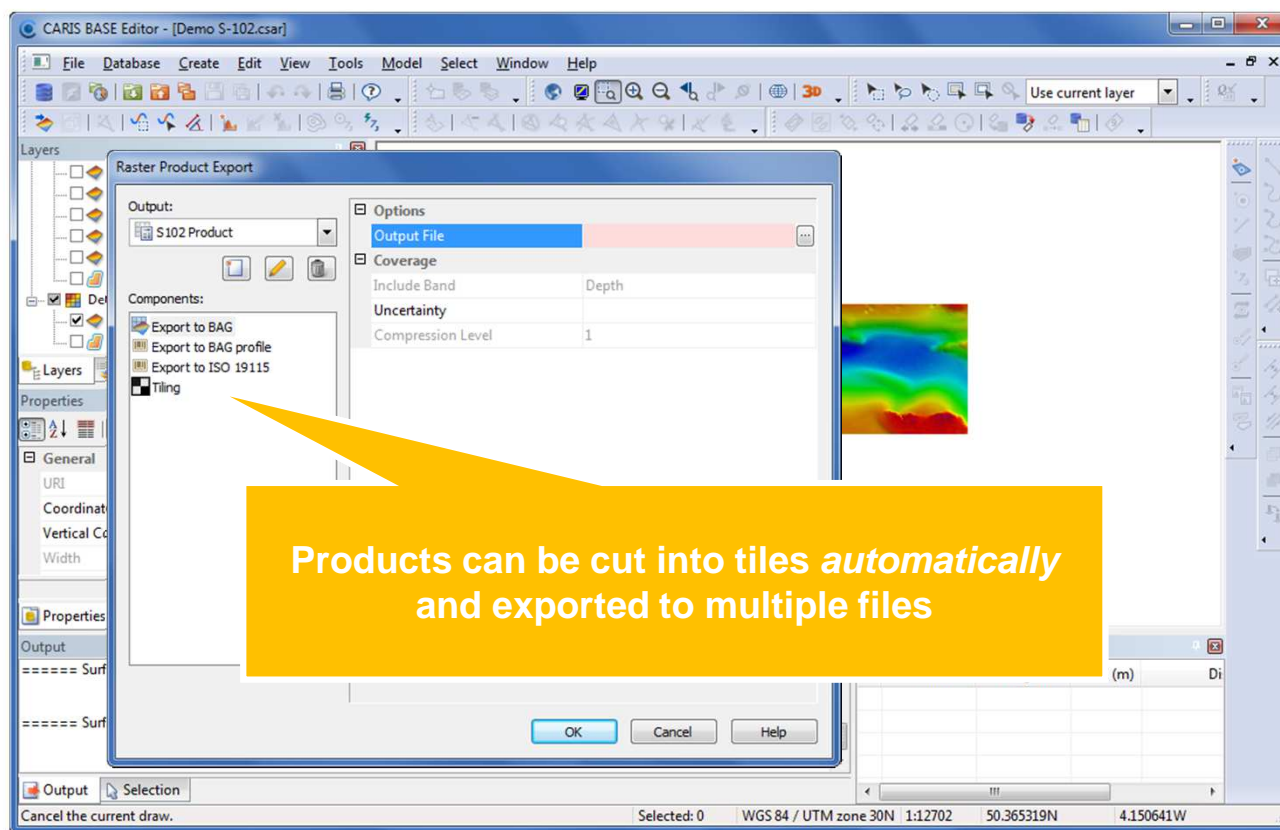
Create surface is (from XYZ and many other formats)



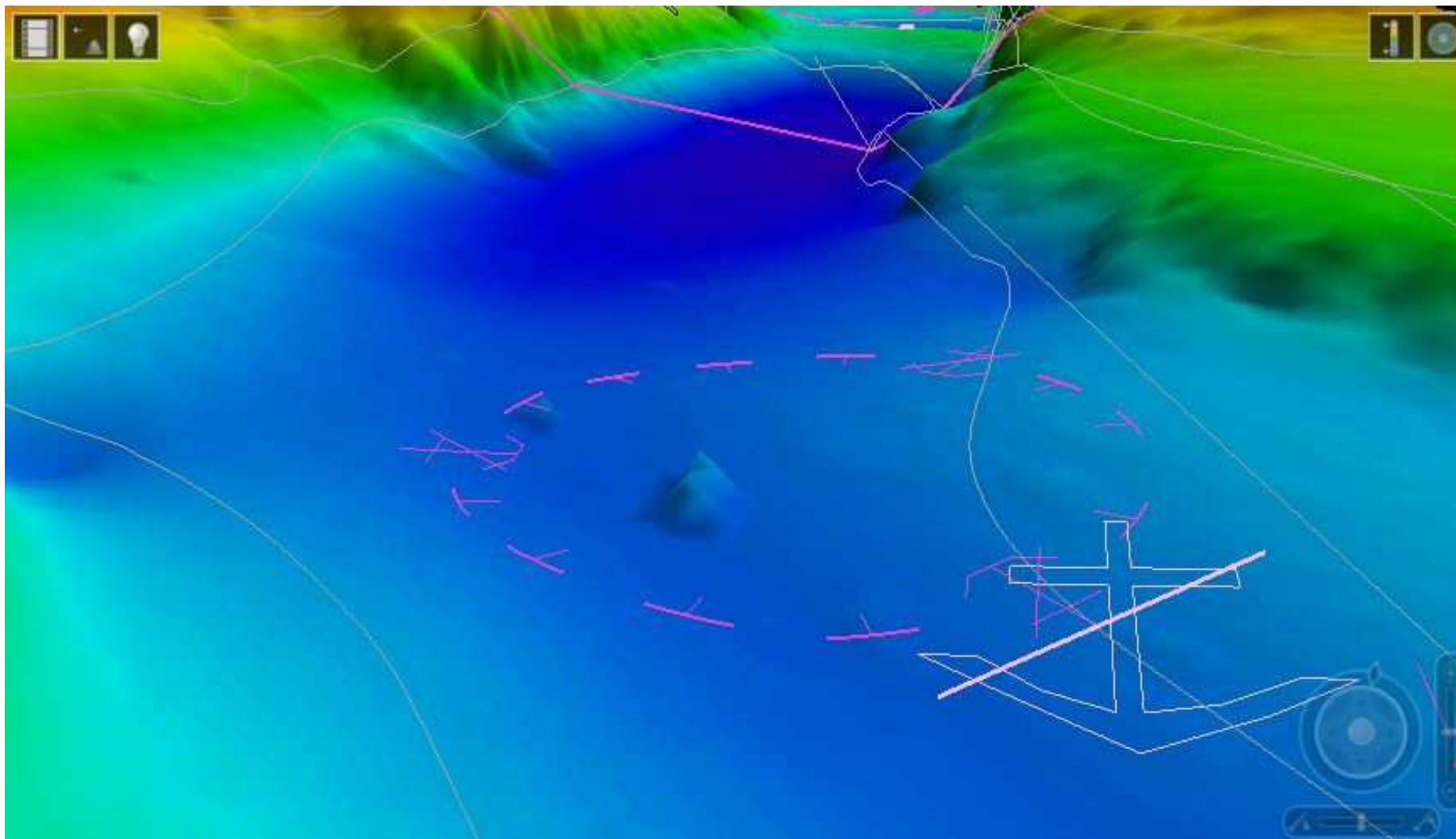
Define coverage (from one or more sources)



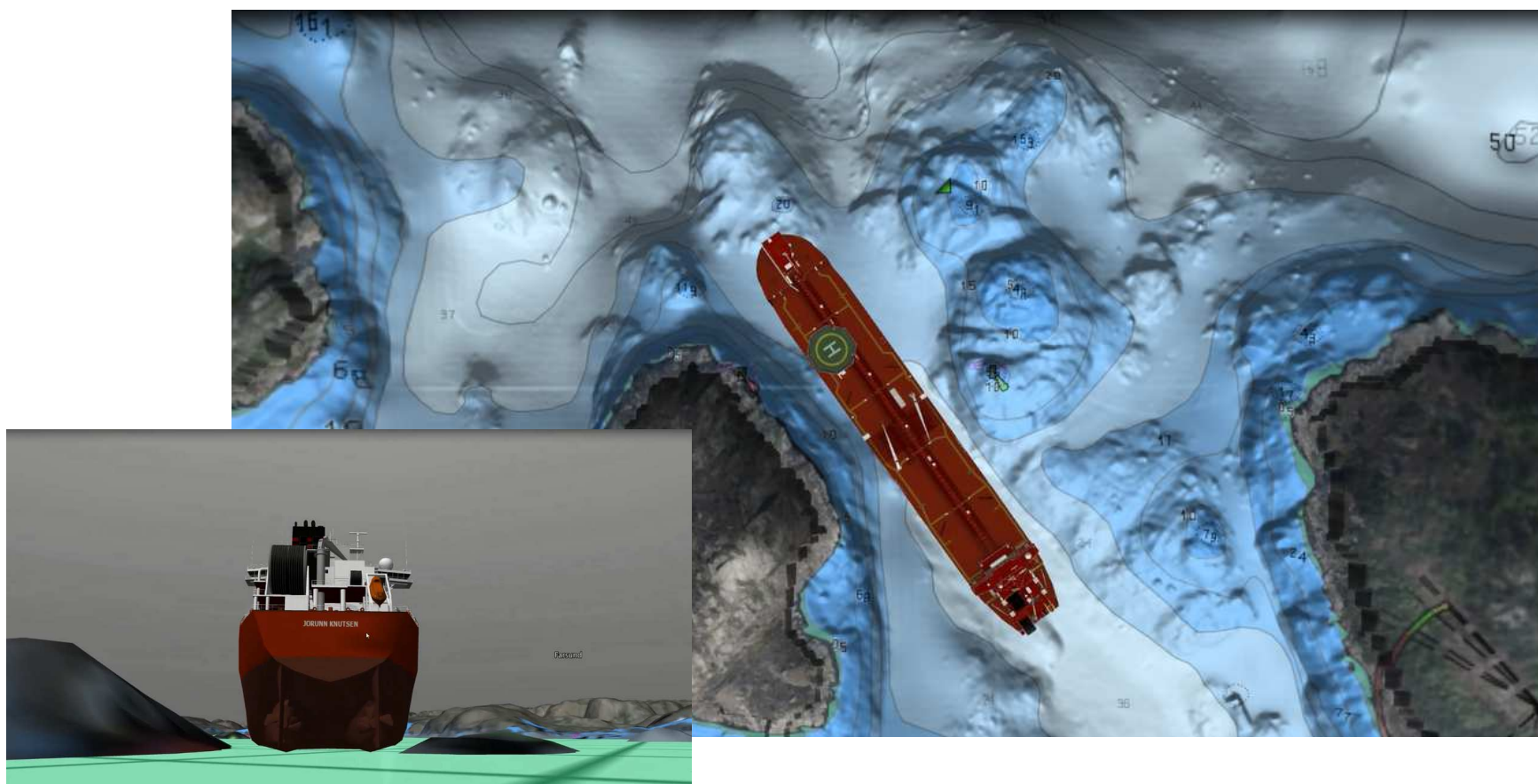
Export product - Done



Result: Navigational Surface

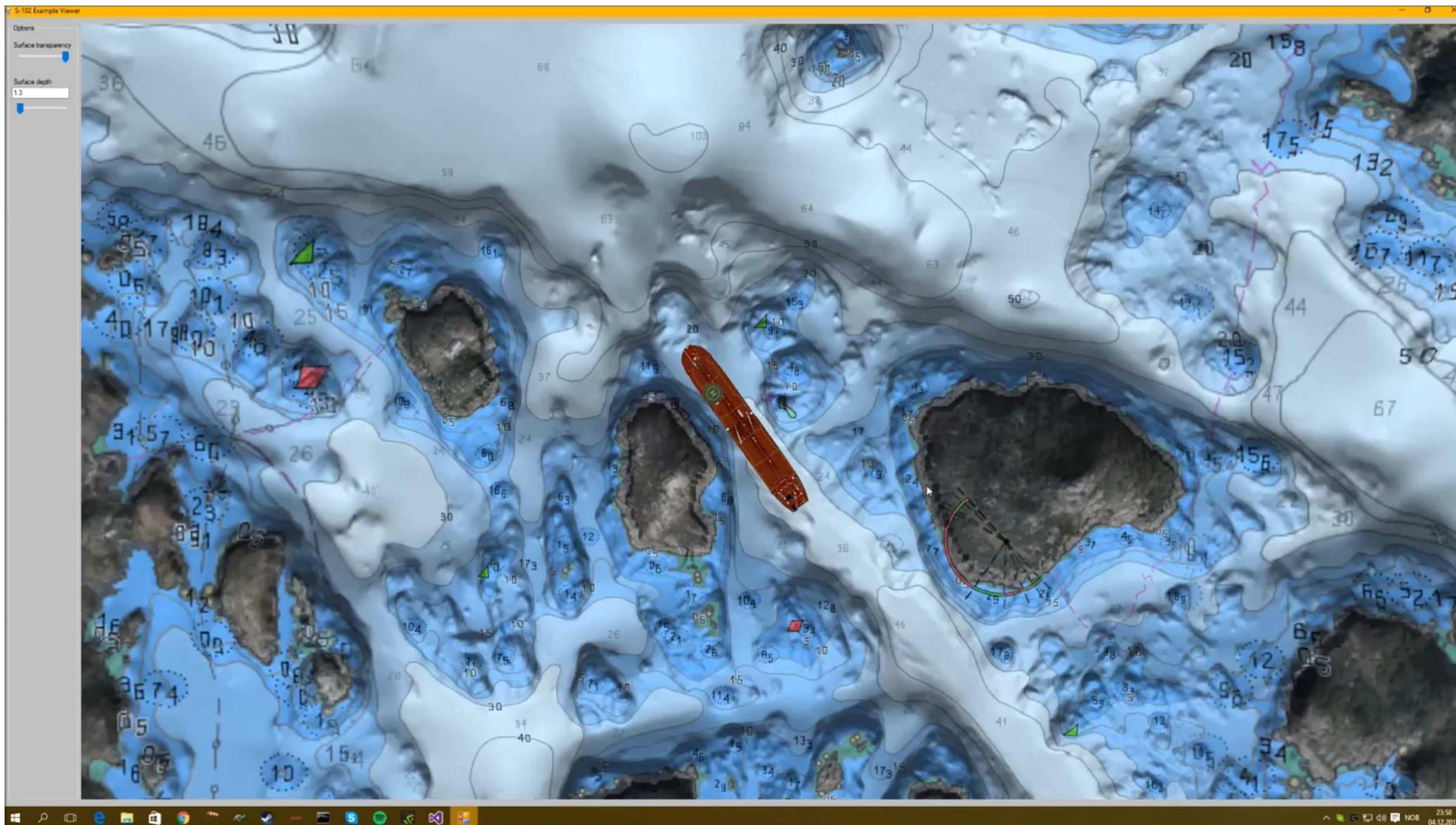


ENC data is created using CARIS' S-57 production tool. The bathymetric surface is created using [CARIS BASE Editor](#).



Movie is provided by PRIMAR. Demo by Kongsberg. Data from Norwegian Hydrographic Service (S-102 and ENC).
Land data and aerial photos from the Norwegian Mapping Authority.
S-102 data has been produced using CARIS BASE Editor.

PRIMAR example for use of S-102





Summary

CARIS

- Actively participating in the IHO development
- Assisting organizations on S-100 product development
- Have released multiple S-100 supporting applications
- Provides workshops and training on S-100

GALWAY · BUSAN · WASHINGTON · BOLOGNA · PANAMA · WELLINGTON · KUALA LUMPUR · WORLD TOUR 2016 ·
 SHANGHAI · WORLD TOUR 2016 · SEATTLE · RIO DE JANEIRO · WORLD TOUR 2016 ·
CARIS · WORLD TOUR 2016



15-17 November Galway, Ireland

CARIS WORLD TOUR 2016

Topic	Description
Trends in the hydrographic industry, and CARIS software vision	Introduction and discussion on trends in the hydrographic industry, and the applicability to CARIS solution; including data centric workflows, future hydrographic products and standards, and autonomous surveys. The direction of CARIS solutions for the coming years will be described in detail.
CARIS Onboard and near real-time processing	Introduction to CARIS Onboard and near real-time processing to reduce the product creation timeline for hydrographic data acquired with survey launches, autonomous underwater vehicles, or unmanned surface vehicles.
Elevation data modelling	Introduction to Variable Resolution surfaces and the benefits of modelling elevation data of varying density in a single seamless surface; includes familiarization with Variable Resolution surfaces, and other elevation modelling improvements.
IHO S-100 and product specifications	Gain familiarity with the IHO S-100 Universal Hydrographic Data Model and related product specifications, which will be used to support modern navigation and other future geospatial applications.
MSDI and data discovery	Explore the importance of interoperability standards and Marine Spatial Data Infrastructure (MSDI) to increase access to information sources; includes discussion on MSDI and standards defined by IHO, OGC and other standards organizations to support sustainable use of the marine environment.
New CARIS technology deployment	A detailed look at CARIS' future product line and associated benefits, such as improved workflows, interoperability and user experience; includes review of the new license deployment model and how existing client investments in CARIS solutions will be retained under the new CARIS architecture.

Topic	Description
Sensor processing	Update on the latest improvements for sonar data processing; including bathymetry processing workflows and tools for integrating post-processed data sources for improved results, and CARIS' new SIPS backscatter processing engine to robustly correct seafloor imagery.
Marine spatial data storage	Learn about the latest techniques to efficiently store and manage extensive elevation data holdings in a database environment, and become familiar with new tools to improve data access, security, and exchange.
Marine spatial data analysis	An in-depth look at CARIS tools to analyze various spatial data sources; includes deformation analysis of vertical/near-vertical structures to monitor changes.
Product composition	Introduction to the Seabed Survey Data Model and SeabedML format to facilitate the exchange of data between oil and gas companies and hydrographic agencies; includes review of capabilities to open and export data in the SeabedML open exchange format.
CARIS HPD and database production	Receive an update on the functionality offered by the latest version of CARIS HPD to realize efficiencies in the production and maintenance of various nautical product types; includes the latest tools for user management, object creation, and quality control.
Nautical publications	Learn how to create nautical publications, such as Notices to Mariners, List of Lights, etc. as part of the HPD database environment to obtain operational efficiencies, and ensure essential information makes it to the mariner in a timely manner.

Participate for 1, 2 or 3 days



niels.nijhuis@caris.nl