

INTERNATIONAL HYDROGRAPHIC ORGANIZATION



S-100 NIWC Test Bed Report for S-100WG5

March 2020

**Template Published by the
IHO Secretariat
MONACO**

**Report Published by
NIWC Atlantic
Virginia Beach, VA USA**

Contents

1	Contents of the Reporting Template.....	4
1.1	General Information.....	4
1.2	Executive Summary.....	4
1.3	Testbed Information	4
1.4	Testbed Methodology	6
1.5	Testbed Results.....	7
1.5.1	Presentation of data (e.g. statistics)	7
1.5.2	Users assessment and experience.....	8
1.5.3	Other comments.....	8
1.6	Conclusions and Recommendations.....	11
1.6.1	Lessons learnt.....	11
1.6.2	Own plans.....	11
1.6.3	Suggested further studies	11
1.7	Publications.....	11
1.7.1	Peer-reviewed publications	11
1.7.2	Technical papers	11
1.7.3	Reports.....	11
1.7.4	Communication material	11
1.8	Reference Material.....	11

1 Contents of the Reporting Template

1.1 General Information

Name of testbed	NIWC S100 Testbed Program
Location of testbed	Virginia Beach, Virginia USA
Time and duration of testbed	Ongoing
Contact person(s)	Karen Lehman, karen.lehman@navy.mil (Acting Project Manager) Mikan Stamenkovich, mikan.stamenkovich@navy.mil (Technical Lead)
Testbed website	N/A
Organisation(s) involved	NIWC Atlantic (Formerly known as SPAWAR)
Funding programme and budget	Ongoing

1.2 Executive Summary

The NIWC S-100 Testbed Project aims to provide empirical proof of the S-100 design through phased implementation of an ECDIS. The testbed will implement data import and validation, data loading and portrayal of S-100 based products in the context of a Simple Viewer (Phase 3) and Shore Based ECDIS (Phase 6).

In order to support development through Phase 6 various elements of the S-100 Testbed initiative are exercised by the NIWC testbed project. Testing areas include Phase 1 (Feature and Portrayal Catalogue use), Phase 2 (validation of S-101 converted data and S-100 based portrayal). After Phase 3 completes, additional testing during Phases 4 and 5 will be used to support the Shore Based ECDIS development of Phase 6.

1.3 Testbed Information

The type of user group(s) involved in the test:

- Shipboard users
- Shore-based users
- SAR users

Details of e-navigation gap/s considered for the testbed (some examples are given below. For a complete list, please refer to the IMO MSC 91 report)

- Information/data management
- Effective and robust voice communication and data transfer

- Systems and equipment
- Ship reporting
- Traffic monitoring; and/or
- Training and familiarization

The category of e-navigation gap/s considered in the testbed

- Technical
- Regulatory
- Operational: and/or
- Training

Details of e-navigation solution/s considered in the testbed (solutions prioritised by IMO are listed below. For a complete list, please refer to the IMO MSC 91 report)

- S1: Improved, harmonized and user-friendly bridge design
- S2: Means for standardized and automated reporting
- S3: Improved reliability, resilience and integrity of bridge equipment and navigation information
- S4: Integration and presentation of available information received via communication equipment
- S9: Improved Communication of VTS Service Portfolio

Compliance to SOLAS navigation – if the product or testbed will be used as part of SOLAS navigation the system should be able to meet the following:

1.3.1 Expected Functionality per Product (i.e. S-101)

- Is the functionality limited for “just display”?
- Even “just display” requires selectors controlling what is displayed or how items are displayed
- Warnings and indications with time limits associated with the up-to-dateness of the data
- If required, alerts or indications based on the content of the product
- If required, requirements for pick reports
- If required, rules for interoperability (to be displayed together, how to display together, etc.)

Details of service

- File name and folder conventions
- Up-to-dateness information
- Authentication method, including method of pre-sharing of related key(s)
- If used, method of encryption and method of managing of decryption keys

Format of S-10X product

- Machine readable feature catalogue
- Machine readable portrayal catalogue
- Machine readable schema
- If required, machine readable alerts and indications catalogue
- If required, machine readable interoperation catalogue

Test data and expected results

- Test datasets and test cases

1.3.2 Expected Functionality per Product (insert as needed)

The primary users are S-100 Working Group members and other interested IHO parties. The testbed aims to identify gaps in utilization of the S-100 family of product specifications with initial focus on S-101. Support for S-100 products based on GML and HDF-5 encodings are in development.

The S-100 testbed phases implemented to date are:

- Build Catalogues (Phase 1)
- Produce data (Phase 2)
- Ingest and Display Data on ECDIS (Phase 3 Simple Viewer)

The S-100 testbed phases currently in development are:

- Multiple Datasets / Interoperability (Phase 6 Shore ECDIS)

The category of S-100 Testbed solutions considered in the NIWC testbed project were both technical validation of the specifications and operational considerations in the context of ECDIS.

1.4 Testbed Methodology

Methodology used for data collection:

Method	S100Viewer user experience feedback
Validity	
Reliability	

Summary information on testbed respondents / participants:

Number	None, no direct user feedback during reporting period
Background	
Experience	
Demographics	

Procedure used in the testbed:

Testbed setup	Windows 7 or 10 via Basecamp distribution
Technical solutions used	C# application, XML, XSLT, Lua scripting

Standards	IHO S100WG standards support. Application specific information and limitations are available in the release notes of the S100Viewer application.
-----------	--

1.5 Testbed Results

The contents of this report are the result of using NIWC S100Viewer version 1.8.0.0, released to coincide with S-100WG5. NIWC S100Viewer version 1.8.0.0:

- Available on Basecamp
- Supports continued assessment of Lua scripting (S-100 Part 13) and portrayal (S-100 Part 9a)
- Miscellaneous bug fixes and improvements.

Summary of findings:

1.5.1 Presentation of data (e.g. statistics)

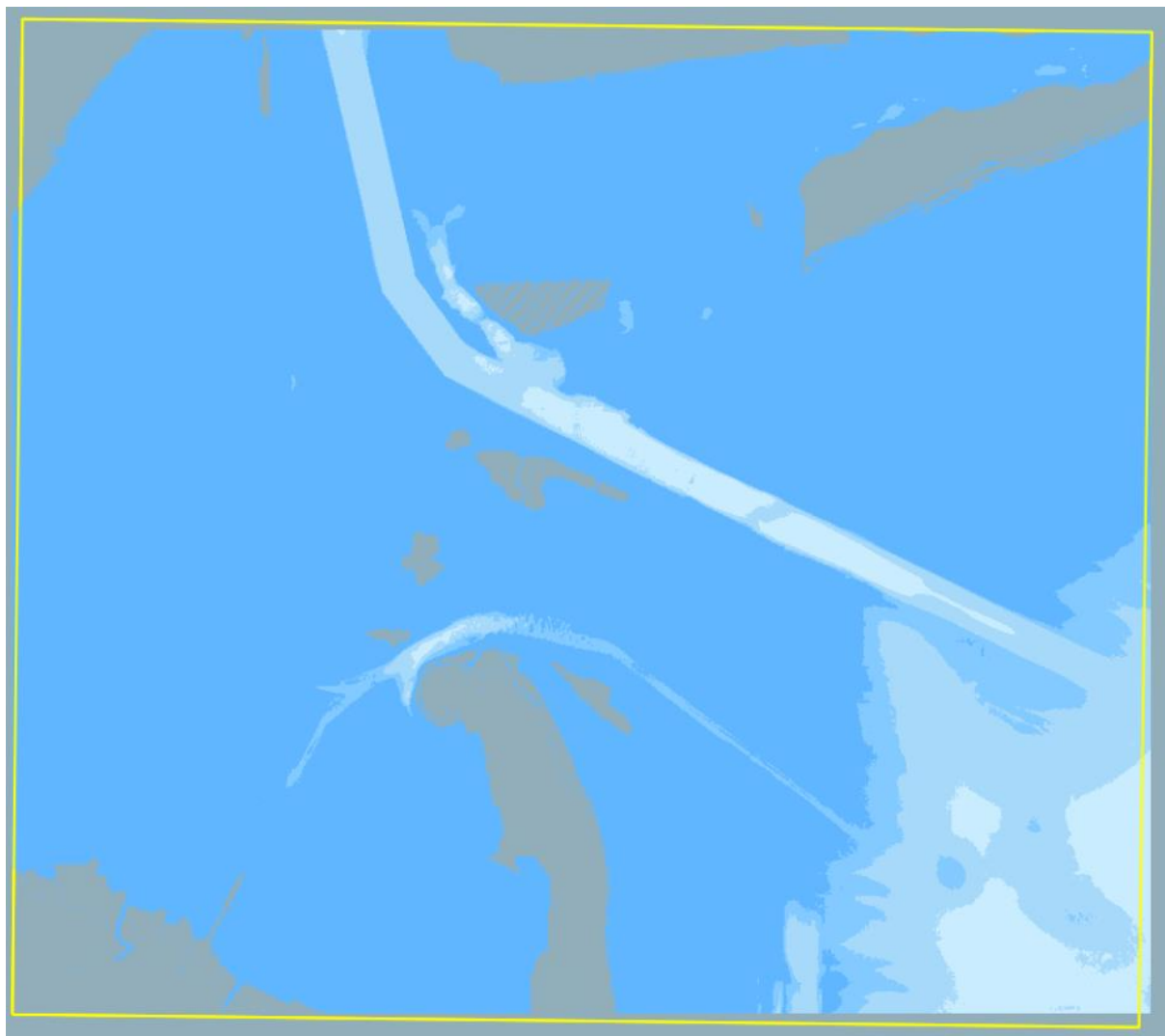
1.5.1.1 BAG to S-102 Converter

We experimented with the NOAA provided BAG_to_S102.exe converter. For the sample data tested, one post conversion issue was corrected. horizontalDatumValue = 4326 (World Geodetic System 1984, used in GPS) was changed to 32618 (WGS 84 / UTM zone 18N). Additionally, after conversion, the S-102 output should change "productSpecification" to "S102" instead of leaving it as "BAG". NAVO is in the process of correcting these minor issues.

No other issues with the converter were encountered. Furthermore, we have added support to S100Viewer v1.8.0.0 to handle S102 datasets delivered in UTM format.

1.5.1.2 BAG Converted Data from UTM

We noticed skew when portraying UTM data and are concerned about this effect if S-102 data is to be distributed in projected form. In the following image, the skew is most noticeable in the lower right corner. Discussions with NAVO indicate that this level of skew is expected when re-projecting from UTM to geodetic. The question remains if this type of skew is deemed acceptable with overlay on S-101 data or other data.



1.5.2 Users assessment and experience

We have had some inquiries regarding implementation of Lua scripting. Notably, we assisted the Norwegian Electronic Chart Centre in the implementation of Lua scripting support using the Java programming language.

1.5.3 Other comments

1.5.3.1 S100Viewer v1.8.0.0

Ongoing refinement of S100Viewer in support of various S-100 based products. Note, our viewer is a single S-100 product validation tool. See separate section regarding our multiple product software tool, Shore-Based ECDIS.

1.5.3.1.1 S100Viewer v.1.8.0.0 Release Notes

Contains miscellaneous bug fixes and improvements (implemented support for S-102 UTM datasets). Enhancements to support changes to individual portrayal catalogues are listed below:

S-101 Portrayal Catalogue:

- The provided portrayal catalogue is updated to version 1.0.3. This fixes a bug in the RadioCallingInPoint rules file.

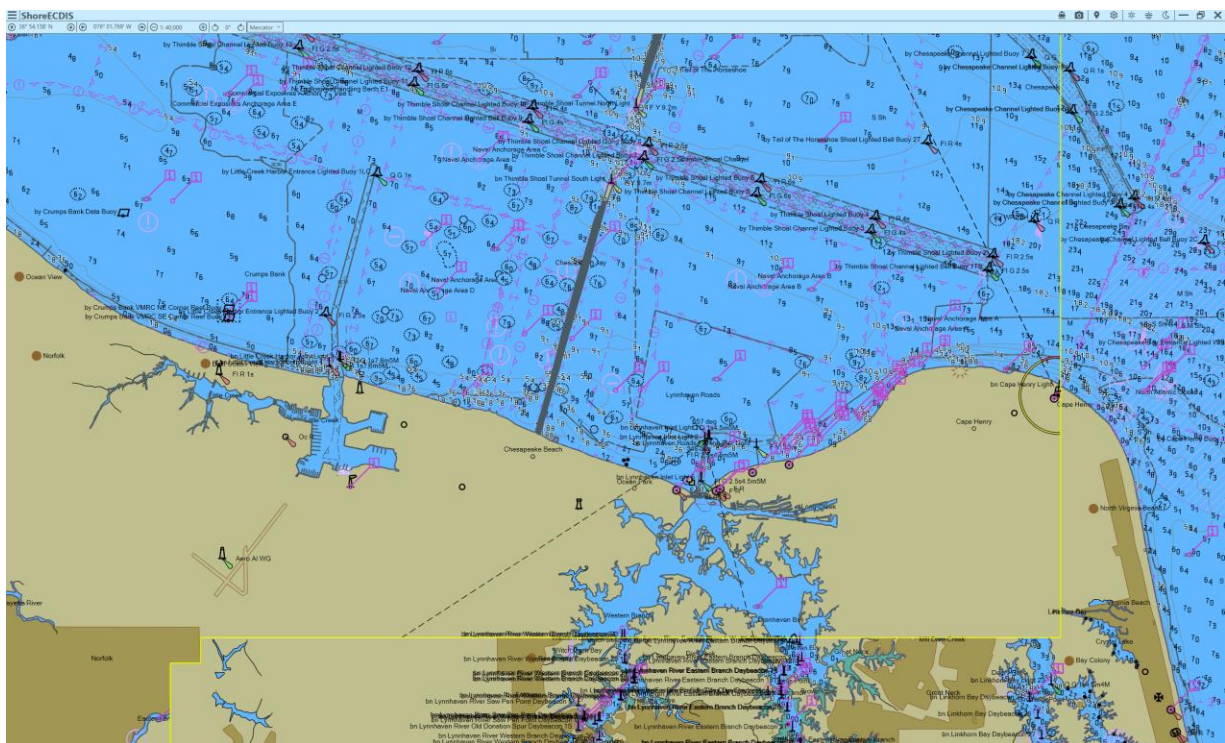
S-102 Portrayal Catalogue:

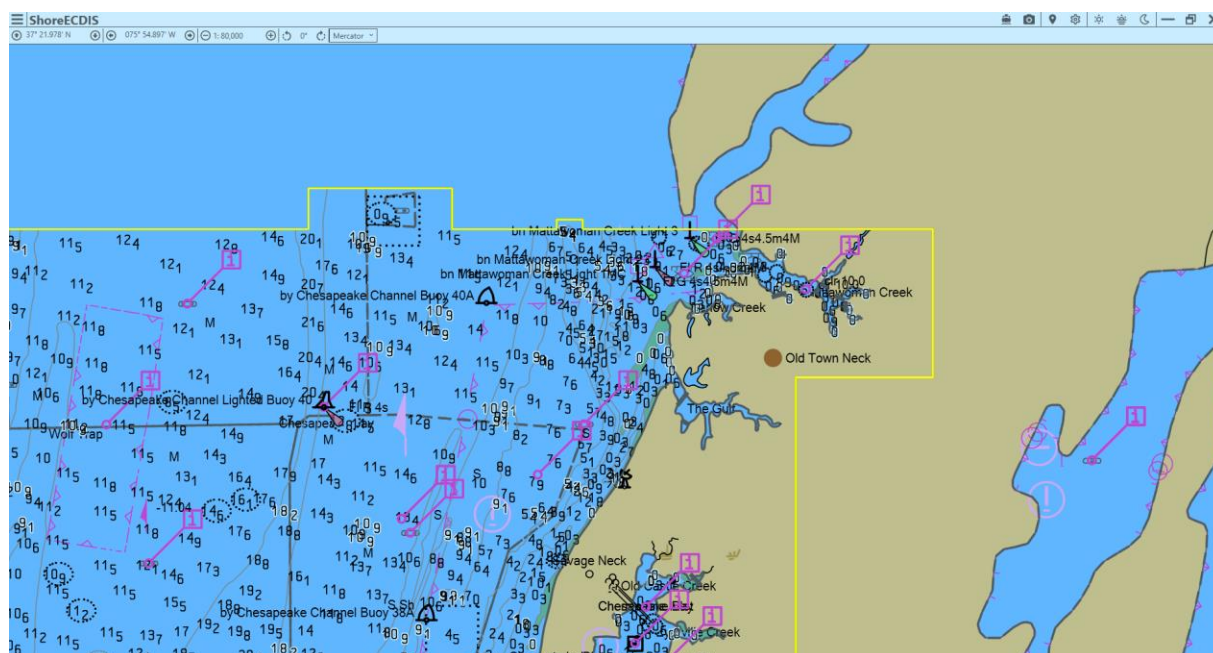
- Fixed IDs to be compliant with S-100 standard.

1.5.3.1.2 Shore-Based ECDIS (SBE)

We have continued the design of multiple product support within our SBE demonstration software. We have focused on the S-101 data loading/unloading algorithm implementation and testing while also implementing a basic visualization framework.

Support for ownship simulation is under development to support shore based testing of S-100 products intended for use by ECDIS. See below for sample images of S-101 datasets. The yellow lines signify dataCoverage boundaries.





1.5.3.2 Lua Portrayal Catalogue Updates

Rules for simple line styles updated based on user feedback.

Now correctly handles byte order marks on Lua files.

1.5.3.3 Lua Support for KHOA and Others

Lua scripting support provide to Tore Halset, of Electronic Chart Centre, Norway.

1.5.3.4 Lua Reference Implementation

We are in the finalizing the Lua reference implementation. Notable enhancements in the 1.0 release include:

- Provides a separate tool to generate portrayal input from an ISO-8211 file and feature catalogue. This tool is useful for easily exercising the reference implementation using arbitrary datasets.
- Implementations of all host functions except *HostSpatialRelate* are provided.
- Provides validation checks and scripts which can be used by manufacturers when implementing Lua support
 - o Verifies that a given host implementation correctly generates portrayal instructions.
 - o Evaluates host behaviour at a highly granular level, testing each entry point separately.

1.5.3.5 MISC Items

- Provided comments to 5.7 NIPWG Proposal regarding Military Practice Area (MIPARE).
- There are many language tags in the portrayal catalogue that only use 2 characters. We believe the requirement is that three character codes be used.

For example, should be: `<language>eng</language>`

1.6 Conclusions and Recommendations

We recommend the user community use and provide feedback on the S-101 Lua portrayal catalogue as soon as possible so that the S100WG and S101PT can fully mature the S-101 standard.

1.6.1 Lessons learnt

1.6.2 Own plans

We invite feedback on the testbed, S-101 Portrayal Catalogue, and Lua scripting reference implementation to advance the maturation of the S-101 standard.

1. Continue S-101 portrayal refinement based on community input.
2. Continue the design of Shore Based ECDIS in support of interoperability.

Suggested further studies: NONE

1.7 Publications

Not applicable for this reporting period.

Peer-reviewed publications

Technical papers

Reports

Communication material

1.8 Reference Material

S-100 Edition 4.0.0 Final

S-101 ENC Product Specification Baseline 1.0.0

S-101 Feature Catalogue S-101FC_1.0.0_20190409.xml

NWC S-100 Viewer v1.8.0.0

NWC S-101 Portrayal Catalogue Version 1.0.3