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# Pilot Study:
# Application of SNPWG Object Model
# to BSH Sailing Directions

# Summary Report

**for the**

**Standardization of Nautical Publications Working Group**

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# 1. Background

This document summarizes a pilot study on the feasibility of converting restructured BSH sailing directions content into Jeppesen print and digital outputs that BSH would certify as preserving the BSH content, following the IHO Standardization of Nautical Publications Working Group object model for nautical publications. The pilot was conducted by Jeppesen Marine and Bundesamt für Seeschifffahrt und Hydrographie (BSH). This pilot study supports ongoing IHO work to develop new, integrated standards for nautical charts and publications information that can effectively be implemented in products and services for the maritime industry. The project converted parts of the BSH Baltic Sea Handbook, Part 3, BSH No. 20031, 17th edition, 3 August, 2007 into a Jeppesen XML database, yielding 3 Jeppesen encapsulations that preserve the BSH content:

1) Printed pages
2) A web (HTML) application
3) A CSV data extract

The International Maritime Organization (IMO) adopted an Amendment to the International Conventions for the Safety Of Life At Sea (SOLAS) in 2000 that defines the use of nautical information stored in databases. This covers both nautical charts and nautical publications. Working groups under the International Hydrographic Organization (IHO) Committee on Hydrographic Requirements for Information Systems (CHRIS) maintain data models and specifications for data transfer (S-57), presentation (S-52), and security (S-63). S-57 is specified in the IMO Performance Standards for Electronic Chart Display and Information Systems (ECDIS.) S-57 Edition 3.1 is the current version.

Today, the CHRIS working groups are cooperatively defining the next generation of nautical charts, publications, and ECDIS standards. Of primary interest here is the object modeling work of the Standardization of Nautical Publications Working Group (SNPWG).[1] The strategy of SNPWG and related CHRIS groups was to start with S-57 and revise or extend it to define S-100, aiming at a 2011 release. The goal is to integrate charts and publications data to the full extent feasible.

There is increasing pressure to ensure safe and efficient navigation at sea. IMO ECDIS requirements for high speed craft carrying cargo or more than 100 passengers begin implementation this year. ECDIS carriage requirement for other ship types is under discussion. The efforts of the maritime industry to improve nautical publications are a logical consequence. This pilot study is one example. It concludes that the work of SNPWG can produce the desired results.

[1] The model combines S-57 version 3.1 and extensions defined since then by SNPWG, TSMAD, and other CHRIS groups. This document refers to it as the SNPWG/S57 model for brevity.

# 2. Project Overview

## *2.1. Summary*

This project involved review of selected BSH publications, mapping selected sailing directions content to the SNPWG8.x object model, definition of a Jeppesen XML model, content conversion, and production of sample outputs. BSH had re-structured the content to support the SNPWG model. They translated the content to English, and provided background materials. The pilot team mapped the SNPWG/S57 object model to the sailing directions content. Jeppesen defined an XML model, XSL code, and steel-thread processes to convert the BSH source content from MS Word into an XML repository. Jeppesen defined print, web, and data extract output formats, and additional transforms and processes were developed to move data from the repository into the 3 outputs. BSH reviewed and approved version 1 outputs, then updates were applied in the XML model, and Jeppesen produced a version 2 print sample.

Groundwork for the pilot started in Hamburg, Germany in October 2007. Earnest preparation started in November. The first project outputs were reviewed in February, and the team drafted these findings in March.

The pilot concludes that it is feasible to apply the SNPWG/S57 model to the sailing directions sample and use the Jeppesen XML solution to produce print, web, and data extract encapsulations that preserve the BSH content. Caveats:

- This mapping of SNPWG/S57 object model to the BSH Handbook was defined by the pilot team, and has not been validated by SNPWG.
- We chose SNPWG/S57 objects that best fit the BSH SD text; we did not evaluate whether these also best fit the BSH implementation of ENCs.
- Some content in the sample text was unique to text document formats, and not a clear candidate for chart object attribution; the Jeppesen XML handles both, but this is beyond the SNPWG/S57 model.

The pilot study suggests that with diligent follow-through, publications products that begin to implement the SNPWG/S57 model could be introduced in advance of the 2011 milestone for S-100. This can make S-100 stronger and soften the impact of introducing S-100 for both the public and private sectors.

The three sample product outputs will be demonstrated at the April 2008 SNPWG meeting. All 3 outputs provide useful evidence on what is and is not possible at this stage of development of the SNPWG standard.

## *2.2. Scope*

The project involved English translation, modeling, markup, and generation of sample print, web, and data extract outputs for selected portions of the BSH

Baltic Sea Handbook, Volume 3, 17th Edition, August, 2007. The work centered on Section C2 - the passages, anchorages, and harbors of Mecklenburger Bucht.

BSH Handbooks are divided into

- o Front matter
- o Section A - General information and regulations for major sea areas
- o Section B – Natural Conditions (provided in a separate publication)
- o Section C - Local information and regulations for waterways, and harbors
- o Section D – Radio Service (provided in a separate publication)
- o Indexes

Section C2 used in the pilot was recently restructured by BSH, reducing it from prose to concise, formatted statements. The structure of the new German Sailing Directions is described in a BSH white paper and BSH internal working papers and manuals (see Section 6, items 1, 2 and 3.)

The relationship of the Baltic Handbook to other BSH nautical publications was reviewed. Aspects of Section A of the Handbook, Section D (Radio Services) the Bridge and Charthouse Handbook, and BSH Notices to Mariners were considered. However the bulk of the pilot project effort focused on Section C2.

Early in the pilot it was recognized that it was going to take more time and effort than anticipated to map the sailing directions content to the SNPWG/S57 model. The pilot team agreed to apply due effort to the mapping task and make concessions elsewhere, if needed. Consequently, we produced only an English version of the outputs; and although we found several instances where further restructuring of the sailing directions text or extension of the SNPWG/S57 model would be helpful, we treated only a few key examples.

## *2.3. Assumptions and Constraints*

Following are the primary assumptions and constraints in this Pilot:

- **The SNPWG/S57 object model for publications is developmental.**
  The SNPWG/S57 object catalog defines only extensions to S-57 specific to publications needs. The SNPWG extensions have changed since the pilot freeze, and the team’s mapping of the S-57 “core” was based on our knowledge of how it is generally used with marine charts. Further public and private sector collaboration would strengthen the SNPWG object model.

- **The BSH method for restructuring SD content is developmental.**
  To gain reasonable advantage from the very granular SNPWG/S-57 model, it is necessary to restructure SD content to a similar level of granularity, and the content must be authored in a way that conforms to the model.

- **Market research and use case modeling for ECDIS-integrated nautical publications is lacking.**
  The utility of paper sailing directions books is considerable. There is no guarantee that mariners would switch to digital publications, simply because they are digital. It's not enough to argue that digital publications could be automatically updated. Digital solutions must offer performance benefits.

- **Needs assessment and use case modeling for hydrographic office users of the SNPWG/S57 model is also lacking.**
  The goal of CHRIS is to integrate chart and publications data into a single database model, to the extent possible. Major benefits are possible with an integrated, but it means changes in system architecture and use cases.

- **The pilot solution assumes it is commonly understood that the need for text publications remains even with the advent of the new model.**
  The pilot focused on portions of sailing directions that are most clearly related to chart objects, but nevertheless we found content that cannot simply be converted to chart object attribution. Text publications are better suited to convey ideas such as sequential or conditional lists of instructions.

# 3. Method

## *3.1. Preparation*

BSH delivered:

- Reference material; see list of references in Section 6 of the Report
- SNPWG object model files (frozen at SNPWG 8.x, November 2007)
- English translation of Section C2 of the Baltic Handbook, Part 3
- Examples of corrections to sailing directions
- Photo images of landmarks in RGB and CMYK mode
- De-cluttered chart images and overlay geometry representing major divisions in the BSH sailing directions, for use in the Jeppesen web demo

Jeppesen reviewed the pilot concept with BSH and key Jeppesen stakeholders, drafted a statement of work, and the parties agreed on a plan and a team.

## *3.2. Review of Inputs*

The SNPWG 8.x object class catalogues were reviewed and reduced to a tabular format. The English-translation of Section C2 was reviewed with regard to structure, content, and meaning. Transliteration of German place names was not attempted. Related portions of Part A and the Radio Service Handbook were translated and reviewed for reference. Modeling of the related materials is being managed by SNPWG, and it appears that the existing SNPWG/S57 model can be applied to a significant portion of the related materials.

The map diagrams in the Baltic Sea Handbook that relate the sections of the book to the covered geography were also important inputs, as were the landmark photographs. BSH also provided originals of the source materials in German, which were used to some extent for cross-reference to the translated sections and for insight into certain information absent from section C2.

Further work on Sailing Directions updates happened in a later phase and is described later in this paper.

## *3.3. Mapping*

The pilot team developed a matrix for mapping the Section C2 text to SNPWG/S57 (Appendix A.) Diligent collaboration was required on how to apply S57, and additions and modifications were required to adequately map the text. These amendments for the pilot were communicated to SNPWG in the form of recommendations. For some topics, it was not possible to identify an SNPWG/S57 classification. The pilot method stored these as text items. Some examples of these text items are discussed in the report and appendices.

It was also discovered that further refinement and restructuring of the BSH Sailing Directions could make it easier to fully and consistently classify the SD information. The mapping, recommendations to SNPWG and ideas for refined restructuring of SD content are included with this report.

## *3.4. Conversion*

Conversion of the text was done solely by Jeppesen. Conversion for the pilot involved considerable manual work. The Jeppesen XML repository is governed by a schema that applies the SNPWG/S57 model, and a related schema that governs transfer of the content to intermediate product/service formats. To give some idea of this work, the two schemas amount to about 6000 lines and the repository for the translated sections is about 6400 lines of XML. The repository maintains all updates and changes, and is capable of rollback. This repository and related tools/structure are pre-production, but it is possible to trace items of content through the process end to end and the repository is well formed and validated.

## *3.5. Define Outputs and Processing*

**Print Samples**

The print document design and layout for the pilot basically follows the style of the original, translated BSH content, with a few exceptions. The Jeppesen print output does not have as many levels of indentation of nested content as the original, because Jeppesen used a standard XML model without customized extensions.

**Data Extract Sample**
The data extract was defined as a .CSV transform from the XML repository. The version presented in this report contains two columns. The first column contains the XML object or attribute type and the second column contains the data element. The data extract trims out the Jeppesen XML tag detail. Objects in the data extract are listed in order following the flow of section C2, and individual objects in the extract are separated by blank lines.

**Web Application Prototype**
The web application prototype was defined in a web flow document. BSH provided base images generated from de-cluttered ENC screen captures. The Jeppesen pilot team created XSL transforms to create XHTML and HTML pages at levels of complexity and functionality appropriate to the user's context in the web application. The prototype web allows the user to easily drill down to the harbor level but at that level the prototype reverts to a list of topics for that harbor. A limitation of the pilot is that we did not integrate the text content to existing ENC objects. The web demonstration also provides a text UI, a menu of topics that links to specific web pages. This web demonstrates that the normalized BSH content can be aggregated to suit unique application needs. SQL searches, etc. are not supported in the demo, but the data could support it.

## *3.6. Create Outputs, Version 1 and Version 2*

A combination of custom code and off-the-shelf toolsets was used to convert the XML markup into PDF and HTML output formats. For information which was expressed in terms of S57 and SNPWG objects, appropriate text was generated based on the contents of the relevant objects. The text was generated from XML representations of S57 objects included within the XML files in the repository. The approaches varied depending on the nature of the objects and the corresponding output text.

Updates to section C2 were supplied by BSH in the format normally used for "Nachrichten für Seefahrer" (Notices to Mariners) updates.

The changes were manually applied and an updated version of Sailing Directions produced with revision marks added in the form of change bars by the side of the changed sections. Change summaries as issued by BSH are currently in the form of replacements (or insertions, or deletions) of whole units of text (that is, all the text under a heading or sub-heading, or an entire table) rather than single lines of text or single rows in tables. The whole text unit is therefore marked in the output as a change. Changes are visible in the Version 2 print sample candidate in the Appendices.

## *3.7. Test and Certify Outputs*

BSH reviewed the content in the Jeppesen outputs and confirmed that the Jeppesen encapsulations preserve the BSH content.

# 4. Conclusions

## *4.1. It is feasible to apply the SNPWG/S-57 object model*

It was feasible to convert the BSH sample content to the Jeppesen XML model and generate print and digital output that preserves the BSH content.

**How much of the SNPWG/S57 model was used?**

As of SNPWG 8.x (November 2007) SNPWG had defined approximately 110 new attributes, 25 new geographic feature classes, and 10 new information object classes, in addition to updating approximately 25 existing S57 classes and 12 attributes. To these, the project team added about 20 geographic object classes and 75 feature object attributes already defined in S-57. (Since the team added all feature object attributes for the additional geographic feature object classes, significantly more attributes were added than were actually used.)

Of the feature classes and attributes identified by SNPWG and the project team, the pilot project uses approximately 50% of the total geographic object classes, 37% of the total number of attributes, and 8 out of 10 information object classes. The limited number of geographic object classes and attributes used was partly due to the lack of text pertaining to those objects and attributes in the sample text used in the pilot. The SNPWG/S-57 object model is derived from a tabular chart data model. Sailing Directions have historically been more of a summarized presentation of information than a detailed reduction of discrete data in tabular chart records.

It took time, but Jeppesen and BSH reached mindshare on a mapping of the SNPWG 8.x object model and S-57 to the sample material in three iterations.

It was then relatively straightforward to create the Jeppesen XML schema that ties the SNPWG/S57 objects to those portions of BSH Section C2 content that clearly relate to chart objects, such as landmarks, anchorages, etc. Additional XML schema was required to further classify the BSH content such that the tagged data in the XML repository could be used to generate both text presentations and discrete data objects that could be associated with ENC objects. The additional XML schema used by Jeppesen follows an accepted SGML standard for text publications. The two schemas work together, but the second schema goes well beyond the SNPWG object model.

It is important to understand that while it is possible to trace the flow of content through the Jeppesen conversion process to the outputs, it was not the scope of the pilot to create and test a final, production system. The pilot serves as a steel-thread prototype testing the possibility of converting content to the XML repository and outputs, maintaining data integrity through the process steps.

## *4.2. Suitable information architecture for publications is necessary*

Thorough, consistently applied publications information architecture is necessary if nautical publications are to be authored to fit the SNPWG/S-57 model and implemented it in automated solutions. There are several proven, standardized models for technical publications information architecture.

The BSH sailing directions content used in this pilot had been extensively restructured, reducing it from prose to nested collections of brief statements. The BSH approach follows the IHO M3 recommendations for sailing directions, but we encountered two broad types of anomalies with this content:

**1) Reauthored content remains more generalized than SNPWG/S57 model**

Often the sample content was not yet broken down to a level commensurate with the SNPWG/S57 model. Appendix F provides detailed examples related to Natural Conditions, Harbor Tables, VTS and Pilotage. A quick example related to the Shipping Restrictions section of C 2.1.1 is given here:

**Shipping restrictions**

Military exercises see Section A 1.6
Fishing see also Section A 1.4
trawlers
outside the 20-m-depth contour up to 1.5 nm distance from the coast during the winter period

As restructured, the Fishing paragraph becomes:

Fishing
See also Section A 1.4
Trawling operations: outside the 20 m. depth contour up to 1.5 nm distance from the coast; from 01 November to 30 April

**2) Inconsistent application of information architecture**

**Natural Conditions**

The BSH structure for Natural Conditions appears to follow this basic approach:
[natural phenomenon]
[sub-area]
[cause], [primary effect], [other information]

The following figure shows an example from the actual BSH sample on the left and a suggested re-authoring of this passage to apply this architecture to the passage consistently. To some extent, it can also be seen that the layout as implemented in either case below might benefit from additional formatting to clearly separate multiple instances of cause-effect-other information statements.

| BSH Version Supplied for Pilot | Restructured for Consistency |
|---|---|
| **C 2.1.1 Fehmarn to Neustaedter Bucht**<br>Current<br>during strong E winds<br>W to SW current<br>during strong N winds<br>in the inner part of Mecklenburger Bucht SW current maximum speed 1.5 kn<br>along the line Fehmarn-Darß E current maximum speed 1.5 kn<br>during strong W winds<br>along the coast E current maximum speed 1.5 kn<br>during strong S winds<br>in the central part of Mecklenburger Bucht and along the Holstein coast NE to NW current maximum speed 1 kn<br>during extremely strong storms maximum current speed 2 to 4 kn | **C 2.1.1 Fehmarn to Neustaedter Bucht**<br>Current<br>from Fehmarn to Neustaedter Bucht<br>during strong E winds, W to SW current<br>in the inner part of Mecklenburger Bucht<br>during strong N winds, SW current, maximum current speed 1.5 kn<br>along the line Fehmarn-Darß<br>during strong N winds, E current, maximum current speed 1.5 kn<br>along the coast<br>during strong W winds, E current, maximum current speed 1.5 kn<br>in the central part of Mecklenburger Bucht and along the Holstein coast<br>during strong S winds, NE to NW current, maximum current speed 1 kn<br>during extremely strong storms, maximum current speed 2 to 4 kn |

### *4.3. Some SD topics are better suited for text presentation*

Some content in the BSH sailing directions does not clearly fit the SNPWG/S-57 model's focus on geographic objects and attributes.

At the highest level, it is important to remember that the pilot focused on Section C, which contains the information that relates most clearly to S-57 chart objects. The Jeppesen web demo does include a simple treatment of some Section A content, where Section C specifically refers to Section A, but further refinement of Section A content was out of scope. SNPWG is looking into extending the object model to handle the general information in Sailing Directions, but in the current versions of BSH Handbooks they remain very prose.

## Section C Example: Conditional Information

Even within the highly restructured Section C2, examples of prose content which does not neatly fit the existing SNPWG/S-57 model remain. An example is the passage interdiction information in the Fairway subsection of Section C2.2 for Travemünde and Lübeck:

- passage interdiction
  - in Travemünder Enge between the lines connecting light buoys 3 and 4 and the beacons at km 25.5
    - for vessels of 6 m beam and more
      - at a range of visibility exceeding 1000 m and at winds up to force 6 Bft inclusive and the aggregate beams of the vessels that would be involved in such head-on situation would not exceed 42.00 m, whereas the draught of one of the vessels would not exceed 6.50 m
      - at a range of visibility below 1000 m or at winds exceeding force 6 Bft and the aggregate beams of the vessels that would be involved in such head-on situation would not exceed 35.00 m, whereas the draught of one of the vessels would not exceed 6.50 m
    - when no head-on situations are permitted to develop, the outbound vessel shall have the right of way
  - on Untertrave above Schlutup to Lübeck between Trave-km 15.3 (formerly Flender Werft) to Trave-km 8.6 (town piers)
    - for vessels of 6 m Beam
      - if the aggregate beams of the vessels that would be involved in such head-on situation would not exceed 35.00 m, whereas the draught of one of the vessels would not exceed 6.50 m
    - when no head-on situations are permitted to develop, the vessel with the broader beam shall have the right of way; in cases where both vessels have roughly the same beam, the inbound vessel shall have the right of way.
- passage and overtaking interdicted
  - in Herreninseldurchstich
    - information about reported vessels in opposite direction may be obtained from VTS Travemünde

Passage interdiction has a geographic component, but the instructions depend on location independent criteria: size of vessel, visibility, weather, and momentary information obtained from AIS, ship to ship communications, or VTS authorities.

## Example: Formatting and setup text information needed for text presentation

A considerable amount of the information in Sailing Directions has to do with the logic, flow, and formatting of the text publication presentation. To some extent it may be obvious that the SNPWG/S-57 model is not intended to define document formatting, but there is more to it than only formatting. The following two figures give an example of the treatment of a landmark photo in the BSH SD sample, followed by an example from the Jeppesen XML data extract showing how this content was handled:

**C 2.1.1 Fehmarn to Neustädter Bucht**

**Approaches**

Landmarks

See figure

(2006)

Figure C 2.1.1: Lighthouse Dahmeshöved from SE

| Object/Attribute | Description |
|---|---|
| SEAARE | |
| FOID | FOID-titular-SEAARE-C.2.1.1 |
| coordinates | |
| OBJNAM | Fehmarn to Neustädter Bucht |
| | |
| TextNote | See figure |
| | |
| LNDMRK | |
| FOID | LNDMRK-C_2_1_1 |
| coordinates | |
| CATLMK | 17 |
| OBJNAM | Lighthouse Dahmeshöved |
| PICREP | images/C_2_1_1_LNDMRK_01_CMYK.jpg |
| SORDAT | 2006 |
| | |
| TextNote | Figure C 2.1.1: |
| | |
| TextNote | from SE |

The user needs to know that this isn't just any landmark; it is a landmark in the Fehmarn to Neustädter Bucht waterway. The data extract table shows that Fehmarn to Neustädter Bucht is classified as a Sea Area. (It has been given an interim Feature Object ID as a placeholder.) It is not shown, but the Jeppesen model also classifies the text "Fehmarn to Neustädter Bucht" as the section title.

Now, consider the setup text and the caption for the landmark photo. The text "See figure" would be meaningless in an ENC pick report. Parts of the photo caption text, "Figure C 2.1.1:" would also not make sense as attribution to the tower chart object in an ENC.

The OBJNAM attribute of the tower object in the BSH ENC is simply “Dahmeshöved”, not “Lighthouse Dahmeshöved”. That makes sense in an ENC, because in ECDIS, one sees the context of the light and tower symbology when generating a pick report. The TextNote elements, shown in the data extract, are used to correctly capture the BSH setup text needed to produce the print document. For the pilot, we used the above approach. In practice, the XML design might be to store the “Lighthouse Dahmeshöved from SE” portion of the caption as a single TextNote element, and include a tower object in the XML repository, with the OBJNAM “Dahmeshöved”. If so, processing and presentation rules would need to exclude tower objects from text-oriented print (i.e., non-chart) outputs.

The main point here is that the Jeppesen XML pilot solution had to go beyond the SNPWG/S57 model to handle publication presentation. It combines a purely SNPWG/S-57 classification of SD content with a text presentation classification. The latter basically follows an established SGML standard for text manuals, but it is a Jeppesen implementation of it. There are multiple XML standards for technical publications.

Related points on this subject:

- The phrasing of NP text will need to be changed in several minor ways, e.g., by using standardized terminology for a category throughout the publication; see Appendix F for suggestions.

- Information will have to be added to the dataset in order to support nautical publications. For example, there is no photograph in the ENC.

- Information may also need to be reorganized in the dataset. For example, the value of PICREP in the example here deviates from the S-57 rule for PICREP values in using a sub-folder to store the photograph as well as in the name of the file. These differences were adopted for the sake of enhancing convenience and clarity during the pilot. If the new dataset results in a proliferation of data objects (data files, graphic files, TXTDSC/NTXTDS files, etc.) contained in the dataset, similar reorganization may be needed.

## *4.4. The standard must equally consider text and chart impacts*

Standards intended to reduce nautical publications content to chart-integrated data objects must equally consider both how much effort is required for Hydrographic Offices to adapt ENCs and how much effort is required to restructure and adapt publications to it.

This pilot study focused on applying the SNPWG/S-57 model to BSH sailing directions. Choices between multiple possible geographic object classes were resolved based on general knowledge of S-57, without intensive review of the related ENCs. There are consequences. Examples:

**<u>Sailing Directions objects having no corresponding ENC Geometry</u>**
Fairways are one of the most frequently recurring topics in BSH Handbooks. So, we used the FAIRWY object frequently in the XML conversion of Section C2. Later, we discovered that there is no Fairway object geometry in BSH ENCs for the waters covered by this pilot. How can the fairway information be linked to the chart? There are multiple options:

1. Coordinates of a centroid or bounding box for each fairway could be spelled out in the SD XML (only) as tagged data elements.
2. The XML FAIRWY text objects in the SD could be linked to instances of an existing geographic object class in the chart database
3. The XML FAIRWY text objects in the SD could be linked to spatial objects in the chart database.
4. New geographic and/or spatial objects could be created for all fairways.

These options each yield different consequences for ECDIS applications and for data management.

**<u>Sailing Directions and related ENC objects exist, but need harmonization</u>**
This example is the Section 2.2.1 Anchorage information for Travemünde and Trave. In the ENC it is encoded as an ACHARE point feature with both location and seabed information described by text in INFORM and NINFOM attributes:

| Object | Attribute | Value |
|---|---|---|
| **ACHARE** | | |
| | INFORM | The best anchorage can be found at about 2M from the northern outside moll in the bearing about 211 degree on 17m deepness above with sand mixed mud- and clayground. |
| | NINFOM | Den besten Ankerplatz findet man etwa 2sm von der Norderaussenmole in der Peilung etwa 211 Grad auf 17m Wassertiefe über mit Sand vermischtem Schlick- und Tongrund |
| | OBJNAM | Travemünde Roads |

As given in the translated version of Sailing Directions, the information for this anchorage is:

| Anchorage/ Position | Water depth/ Ground | Characteristics |
|---|---|---|
| Nordermole in approx. 211°, 2 nm | 17 m<br>Sand, Stiff mud, Clay | |

In order to allow a structured description (as in the second table) to be created by computer code, the text description in INFORM/NINFOM shown in the first table must be encoded into objects describing the seabed and depth, for example:

| Object | Attribute | Value |
|---|---|---|
| **ACHARE** | | |
| | INFORM | <empty> |
| | NINFOM | <empty> |
| | OBJNAM[2] | Nordermole in approx. 211°, 2 nm |
| **SBDARE** | | |
| | NATSUR | 4,1,2 |
| | NATQUA | ,7, |
| **DEPARE** | | |
| | DRVAL1 | 17 |
| | DRVAL2 | 17 |

Note that the Sailing Directions table does not mention the latitude and longitude of this anchorage.  It could promote better data integrity, more efficient data management, and more elegant ECDIS application functionality if the coordinates of the ENC ACHARE point were used as the position reference in the Sailing Directions table.

This example shows that multiple considerations may arise while synchronizing ENC data with information in sailing directions, including clarifying the geometry and associations of existing and new objects, consideration of implications for presentation (in this case, point and area geometries and their implications for ECDIS), and clarifying the data content of ENC and Sailing Directions, especially in comparison with each other.

Appendix H discusses this case in more detail.

## *4.5. Inputs/Outputs, Workflow, Business Rules are Important*

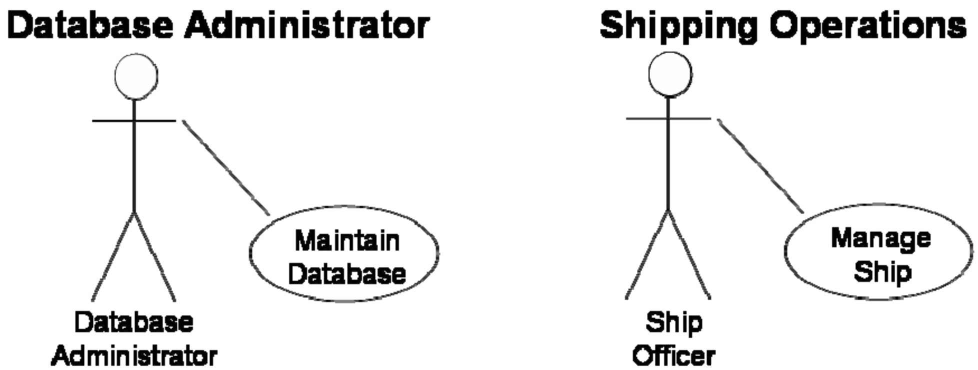
Inputs, workflow, business rules, desired outputs and application use cases are important considerations that impact the definition of data standards

During this pilot we learned that many HOs today process updates and other changes separately for charts vs. publications, which can lead to different treatments of the same information in charts vs. pubs.  The goal of CHRIS with S-100, including the SNPWG model, is to harmonize chart and publications information around a unified data model.  Both Hydrographic Offices and private sector firms will need to software enhancements, refined database designs, business rules and workflow to gain the advantages of the new model.

[2] The description of the location presents another difficulty. If encoded in the OBJNAM attribute, it must either be appended to the anchorage name “Travemünde Roads”, or replace it. Since Sailing Directions do not print the name of the area, we have chosen to replace it. Our proposal in Appendix B for defining a new attribute to hold location descriptions would allow the name and the location to be encoded as independent pieces of information, in different attributes of the ACHARE object.

### 4.6. The SNPWG/S-57 approach offers great potential for the private sector and HO-private sector collaboration

The primary result of transforming nautical publications to the SNPWG/S-57 model is the reduction of prose nautical publications to granular, normalized data that is highly integrated to nautical charts. There are two broad use cases for normalized nautical publications data:




Obviously, normalized, high-integrity NP databases are easier for Hydrographic Offices and other data managers to maintain with integrity. It enables Hydrographic Offices to be more effective, and to explore new data sources. Normalized, granular data is not immediately more useful to the ship officer by default, but it certainly enables data solutions providers and OEMs more flexibility to craft applications that provide ship officers just the information they need to suit any current situation. The marine industry will experience a paradigm shift with the implementation of these new standards.

It appears most likely that standards will need to be engineered to accommodate both tabular and XML solutions. The Jeppesen solution for the pilot study is an XML solution. Text content management has been the province of XML solutions, and Jeppesen has a sizeable investment in XML content management infrastructure. Charting and mapping have been the province of tabular database solutions. The project team has shown some of the advantage of XML for text content management, but even for this limited pilot, we also used tabular chart data. Within many Hydrographic Offices today, one finds a combination of GIS tools, desktop publishing tools (many of which use XML now) etc.

There are additional ideas on private sector opportunity in Appendix E.

## 5. Recommendations

This section contains a summary of general recommendations for SNPWG and the private sector. Detailed recommendations and extensions pertaining to the model can be found in the Appendices.

### 5.1. Recommendations to SNPWG

- Validate the model before final adoption. One way to validate it is by converting other actual publications (other Parts of BSH Sailing Directions, Sailing Directions produced by other Hydrographic Offices, and other nautical publications), as was done in this pilot.
- Consider processing efficiency when defining attributes, attribute types, and category enumerations for attribute values.
- Consider impacts on workflow in Hydrographic Offices, for data management after the new model comes into effect. Consider resource requirements for conversion of data to the new model and for maintenance of the new datasets.
- Consider making the model flexible wherever possible. (Appendix B has details on whatever we found while working on the subset of SNPWG and S-57 objects which were needed for this pilot project).

### 5.2. Recommendations to the Private Sector

- Use this pilot as a starting point for market research, needs assessment and development of use case models for both end-use applications and data management tools.
- Get involved with Hydrographic Offices and shipping companies, conduct and publish pilot research on the unanswered questions.
- Compete on product implementation, collaborate on standards.

## 6. List of Source Materials

1. Elektronische Segelanweisung, Prototyp eines Seehandbuch-Abschnitts erstellt in einen S57-Datenstuktur unter NAUTHIS, Jens Schröder-Fürstenberg, Jörg Hufenbach, Nautical Information Service, Nautical Publications, Working Paper. Hamburg, Rostock: BSH, 2001.
2. Structure of German Sailing Directions, Nautical Information Service, Nautical Publications, Working Paper. Hamburg, Rostock: BSH, 2004.
3. Development of a new structure of information presentation in German Sailing Directions, Jens Schröder-Fürstenberg, Nautical Information Service, Nautical Publications, Editors Manual. Hamburg, Rostock: BSH, 2004.
4. New Structure of Sailing Directions-Integration into Electronic Charts, Jens Schröder-Fürstenberg, WMU Journal of Maritime Affairs, 2005, Vol.4, No.1, 77–94. Malmö: World Maritime University, 2005.

## 7. Appendices

Appendix A: Mapping

The mapping provided below illustrates our approach to representing the content of BSH Sailing Directions in terms of objects and attributes from the S57 and SNPWG 8.x lists. It is a prototype mapping in the sense that it may use object-attribute bindings which are not currently part of either the S57 standard or the SNPWG 8.x proposals, and may use object combinations not currently envisaged in the S57 "Use of Object Catalogue" document. However, it is a workable mapping in the sense that the objects, attributes, and combinations thereof can be used to produce the outputs of this pilot project. Representative items from the mapping are enclosed below:

Division Titles:

**C 2 Mecklenburger Bucht**
**C 2.1 Fehmarn to Travemünde**
**C 2.1.1 Fehmarn to Neustädter Bucht**

| Object | Attribute | Value |
|---|---|---|
| SEAARE | OBJNAM | Mecklenburger Bucht |
| SEAARE | OBJNAM | Fehmarn to Travemünde |
| SEAARE | OBJNAM | Fehmarn to Neustädter Bucht |

**Topics:**

**Approaches**
Landmarks see Fig.

[Photograph]

*(2006)*

**Lighthouse Dahmeshöved from SE**
**Fig. C 2.1.1**

| Object | Attribute | Value |
|---|---|---|
| LNDMRK | OBJNAM | Lighthouse Dahmeshöved |
| | PICREP | <file name> |
| | CATLMK | 17 (tower) |
| | SORDAT | 2006 |

**Shipping restrictions**
Military exercises see Section A 1.6
Fishing see also Section A 1.4
trawlers
outside the 20-m-depth contour up to 1.5 nm distance from the coast during the winter period

| Object | Attribute | Value |
| --- | --- | --- |
| MIPARE | CATMPA | <empty> |
| SEAARE | OBJNAM | outside the 20 m, depth contour up to 1.5 nm distance from the coast |
| | INFORM | Trawling operations |
| | PERSTA | --1101 |
| | PEREND | --0430 |

**Natural conditions**

Current

during strong E winds

W to SW current

during strong N winds

in the inner part of Mecklenburger Bucht SW current maximum speed 1.5 kn

along the line Fehmarn-Darß E current maximum speed 1.5 kn

during strong W winds

along the coast E current maximum speed 1.5 kn

during strong S winds

in the central part of Mecklenburger Bucht and along the Holstein coast NE to NW current maximum speed 1 kn

during extremely strong storms maximum current speed 2 to 4 kn

Water level

increasing during NE winds

during storms up to 3 m

decreasing during SW winds

During storms up to 2 m

Ice

icing on open sea depends on wind and surface current

in the inner part of the bay risk of piling up of drifting ice during onshore winds

risk of barricades of pressure ice

[Not currently modeled as objects.]

**Fairway**

Restrictions

fairways subject to silting

Recommendations

local authorities provide information about the actual water depth

Entrance to Großenbroder Binnensee

restrictions

after silting correction of fairway and buoyage at short notice

Großenbroder Binnensee

dimensions of fairway

water depth 2.5 m

regulations
speed limit 5 kn

| Object | Attribute | Value |
|---|---|---|
| FAIRWY | siltat | Fairways subject to silting |
| Rcmdts | frmtxt | local authorities provide information about actual water depth |
| SEAARE | OBJNAM | Entrance to Großenbroder Binnensee |
| FAIRWY | siltat | after silting correction of fairways and buoyage at short notice |
| SEAARE | OBJNAM | Großenbroder Binnensee |
| FAIRWY | DRVAL1 | 2.5 |
| Reglts | frmtxt | Speed limit 5 kn |

**Port**

Berths

| **Port/ Berth Position** | **Quay length** | **Water depth** | **Maximum size of vessel** | | | | **Characteristics** |
|---|---|---|---|---|---|---|---|
| | | | Length | Beam | Draught | Tonnage | |
| **Großenbroder Binnensee** (54° 21’ N 011° 04’ E) | | | | | | | |
| Yachthafen Klemens | | to 4.5 m | | | | | Pleasure craft<br>180 Berths<br>visitors berths available |
| Großenbrode Yachthäfen | | 2.5 m | | | | | Pleasure craft<br>400 Berths<br>visitors berths available |
| Wassersport-zentrum | | to 2.5 m | | | | | Pleasure craft<br>visitors berths available |
| **Grömitz** (54° 08’ N 010° 57’ E) | | | | | | | |
| Yachthafen | | 2–3 m | | | | | Pleasure craft<br>780 Berths<br>(18 visitors berths)<br>open from 1.April to 31.October |

The table below contains the information for the spanned row with the port name (Großenbroder Binnensee) and the first detail row (for Yachthafen Klemens). The model is able to take the relevant information for the name from either of the hypothetical C_AGGR or prtare objects (for the name of the port) or from the C_ASSO or HRBFAC objects (for the detail row). The presence of the empty vstber attribute results in the phrase “visitor berths available” in the “characteristics” column. If this attribute is absent, nothing is printed about visitor berths; if it has a value, the value is printed as the number of available visitor berths. Coordinates in the spanned rows are taken from a separate additional attribute.

| Object | Attribute | Value |
|---|---|---|
| C_AGGR | OBJNAM | Großenbroder Binnensee |
| Prtare | OBJNAM | Großenbroder Binnensee |
| C_ASSO | OBJNAM | Yachthafen Klemens |
| HRBFAC | OBJNAM | Yachthafen Klemens |
| | CATHAF | 5 |
| | totber | 180 |
| | vstber | <empty> |
| DRGARE | DRVAL2 | 4.5 |

### C 2.1.2 Neustädter Bucht

[text deleted]

**Anchorage**

| Anchorage/ Position | Water depth/ Ground | Characteristics |
|---|---|---|
| W of dredged channel Neustadt Church bearing in centre of harbour entrance Neustadt | 5–7 m Sand with stones | |

| Object | Attribute | Value |
|---|---|---|
| ACHARE | OBJNAM | W of dredged channel Neustadt Church bearing in centre of harbour entrance Neustadt |
| DEPARE | DRVAL1 | 5 |
| | DRVAL2 | 7 |
| SBDARE | NATSUR | 4,5 |

**Port**

Berths

| Port/ Berth Position | Quay length | Water depth | Maximum size of vessel | | | | Characteristics |
|---|---|---|---|---|---|---|---|
| | | | Length | Beam | Draught | Tonnage | |
| **Neustadt** (54° 06’ N 010° 49’ E) | | | | | | | |
| Quay W part | 450 m | | | | | | commercial shipping |
| Quay E part | 200 m | | | | | | Fishery |
| **Neustadt-Wiek** (54° 06’ N 010° 48’ E) | | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Coast Guard Jetty | | | | | | | Naval Berth Coast Guard |
| Yacht harbour Fairway E part | | | | | | | Pleasure craft 250 Berths |
| Jetty N of yacht harbour | | | | | | | Pleasure craft visitors berths available |
| Ancora Marina | | 4 m | | | | | Pleasure craft 1 400 Berths |

Harbour services

waste disposal facilities

Oily residuals

Garbage

ships supplies and bunker facilities

repair facilities

| Object | Attribute | Value |
|---|---|---|
| ~~Wasdis~~ | ~~catwas~~ | ~~1~~ |
| ~~Wasdis~~ | ~~catwas~~ | ~~2~~ |
| ~~Wasdis~~ | ~~catwas~~ | ~~3~~ |
| ~~Wasdis~~ | ~~catwas~~ | ~~4~~ |
| ~~Wasdis~~ | ~~catwas~~ | ~~5~~ |
| ~~Wasdis~~ | ~~catwas~~ | ~~6~~ |
| Wasdis | catwas | 12 |
| Supply | catsup | 1 |
| Supply | catsup | 8 |
| Prtare | srvrep | <empty> |

The <empty> content of the prtare/srvrep attribute is printed as unspecified repair facilities. The stricken lines for wasdis/catwas correspond to the 6 MARPOL categories for oil wastes. Since the project team decided to print the original text of BSH Sailing Directions wherever possible, and we did not identify a category precisely corresponding to “oily wastes” or “oily residuals”, this specific text fragment was represented by a text entry in the XML instead of using the wasdis object.

[Remainder of text in Section C.2 deleted.]

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## Appendix B: Changes to SNPWG/S57 model

### B.1 Objects and Attributes

| Issue | Brief Description | Possible resolutions | Notes |
|---|---|---|---|
| designating locations | Some locations (areas, points, probably lines too) are designated by verbal descriptions, e.g., “between buoys 1 and 3” (on a specified fairway). | 1. Place verbal designation in OBJNAM attribute<br>2. add a new attribute for location designation | |
| shptyp categories | SNPWG 8.x defines about 50 categories for shptyp (E), not counting those reserved for future use. Objects with shytyp attributes might proliferate, complicating application programming and presentation. | Make shptyp of type L. Encoders must be directed to consider splitting an object with shptyp into 2 or more objects whenever any information in the object, or an object associated with it, is changed. Note that the category definitions are not mutually exclusive, e.g., there is a category for “tankers” and other categories for tankers carrying specified cargo. | Documentation for shptyp in SNPWG registry may need to be clarified and extended. |
| Nominal coordinates of harbors, cities, etc. | Several places in BSH SDs have lat/lon values given in the text. Pilot model uses a “coordinates” item for such information. | Use location designation to contain nominal lat/lon or add another attribute. | |
| HRBFAC (totber, vstber) | totber and vstber may be more appropriate in HRBFAC than SMCFAC. Mentioned in a note in our mapping document. HRBFAC is the primary object where totber and vstber should be encoded. | add to HRBFAC. | |
| Catwas | SD may use terms of intermediate meaning and detail, between “unspecified” or “unknown” and lists of specific MARPOL categories. BSH SDs uses “oily residuals”. | 1. Hydrographic offices or content providers must provide correct detailed information<br>2. Add or amend catwas categories to match terms commonly used in SDs. | |
| interpreta-tion of restvc | representing logical-AND and logical-OR of restrictions | Attributes of a single restvc object are logical-AND. logical-OR is represented with multiple restvc objects | |
| frmtxt<br><br>Q1 | There needs to be some agreement between producer and consumer of data on what kinds of formatting are allowed and how this will be made known | Require data producer to specify the semantics of formatting. E.g., such-and-such XML elements from such-and-such an XML model (e.g., XHTML 1.0 Strict, etc.) | See proposal below table. |

| | | | |
|---|---|---|---|
| frmtxt<br><br>Q2 | Even if the formatting method is known, the contents of a frmtxt attribute may need to be re-formatted for different presentation modes (e.g., handhelds, ECDIS, printing with different paper sizes). | See above; data consumer (e.g., ECDIS) must be able to re-format it as needed. | See proposal below table |
| VTS information in SD | VTS information in BSH SDs is structured like pilotage, and VTS is also associated with an area.<br>Given the number of objects involved in describing VTS, it may be worth considering defining it as a unique object, analogously to pltsrv. | 1. Consider defining new VTS service object, similar to pltsrv object.<br>2. Extend definition of mrnsrv<br>3. Retain current definitions and describe combinations in new “Use of Catalog”. | Additional considerations in next few rows. |
| VTS registration require-ments | Requirements for compulsory registration may be easier to describe if defined as objects or attributes.<br>Modeling registration requirements with reglts requires an implicit assumption that the reglts object here is always about compulsory reg. Using restvc requires some way of indicating the nature of the requirement (as restvc is currently defined, the only way to indicate the nature of the requirement is apparently by using INFORM, which makes processing complicated and less flexible). | 1. Define objects/attributes for registration requirements.<br>2. Add a category attribute to reglts with a value for “Compulsory VTS registration”.<br>3. Add an information object for “requirements” (see “requirement object” elsewhere in this list).<br>4. Extend or adapt restvc, | |
| VTS reports and Pilot requests | Need more structure than reglts and shprep provide (status/intention of vessel, location of vessel, time of movement or report/request, and miscellaneous conditions, e.g., when passing reporting points, after pilot boarding). | Define attributes for vessel status/intention, movement time or current time, and miscellaneous conditions. | Partial solution in latest (January 2008) proposal. |
| Service description in VTS, e.g. “traffic permission traffic information” | Service description in the “Vessel Traffic Service” section of BSH SDs is modeled in this project as literal text in a frmtxt attribute.<br>It may be simpler to model “traffic permission” and “traffic information” as category values of an attribute instead of using frmtxt or INFORM. | Consider defining an attribute for detailed service types which occur in many places in NPs.<br>(The categories in catmsv seem too broad for this kind of detail to fit there.) | See item mrnsrv (frmtxt) below. |
| mrnsrv (frmtxt) | Added attribute frmtxt to mrnsrv to hold detailed service descriptions. | Needed if details of service descriptions are not modeled with an attribute. | See item Service description in VTS above. |

| | | | |
|---|---|---|---|
| VTS or Pilot station name | The name of the VTS station may differ from the name or spatial designation of the service area. The same may be true of pilot stations and service areas.<br>For pilot stations, BUISGL/OBJNAM may be usable, if encoded in the ENC. VTS centers may not be encoded in the ENC.<br>RDOCAL/OBJNAM and PILBOP/OBJNAM are used for the call name, e.g.,"Trave Traffic" and "Lübeck Pilot". | Pilot project uses telcom/OBJNAM (which requires that a telcom object be linked with the pltsrv or mrnsrv object).<br>VTS:<br>mrnsrv/OBJNAM=area name/designation (may be empty)<br>RDOCAL/OBJNAM=call name<br>telcom/OBJNAM=VTS centre name<br>Pilotage:<br>pltsrv/OBJNAM=area name/designation (may be empty)<br>PILBOP/OBJNAM=call name<br>telcom/OBJNAM=pilot station name<br>or<br>BUISGL/OBJNAM=pilot station name | |
| category attributes for reglts, rcmdts, resdes | Category attributes for these information objects may be useful to state what the regulation is about (e.g., tug assistance, passage interdiction, traffic permission, speed limits). Attribute cataut just states who made (or is responsible for) the regulation, recommendation, or restriction. | | Speed limit can be captured by RESARE(CATREA). See also next row (suggested "requirement" object). |
| require-ment object (new)<br>or<br>redefinition of restvc | Distinguishing restriction from requirement. | 1. Add requirement object to encode a requirement for categorized vessels (as opposed to a restriction, modeled by restvc).<br>2. Add a category to restvc stating whether the encoding is for a restriction or a requirement (and rename restvc appropriately). | |
| passage width in fairway | currently no way to model width of fairway | Add HORWID to FAIRWY? | |
| Attribute value for "local traffic" in CATHAF | Term "local traffic" appears quite often in BSH harbour tables. | Consider adding category for "local traffic". | |
| Attribute value for rescue boat, pilot vessels | Terms rescue boats and pilot vessels appear often in "characteristics" rows of BSH harbour tables. Currently modeled as RSCSTA( ) and text notes (pilot vessels). | Consider adding category value or modeling using an existing object. | |

| | | | |
|---|---|---|---|
| forest products attribute | Appears often in BSH harbour tables. The “wood products” category in SNPWG 8.x may be an appropriate substitute. | Consider defining new category value or revising BSH Sailing Directions text. | |
| bridges with 2 passages | Currently modeled as two BRIDGE objects. | Open | |
| working hours | working hours may specified as “at 12:00h” or “after 12:00h” | Allow HHMM (at HH:MM), HHMM/ (from ...) and /HHMM (before ...) for working hours. | |
| autori (ssccrt, cataut) | Added attribute ssccrt<br>Added cataut=15 (government authorities)<br>Need rule saying that the authority may (must?) be named in an OBJNAM attribute? | | |
| DOCARE (totber, vstber) | Added. DOCARE is used to describe closed basins. DOCARE is a kind of harbour. | | |
| natural conditions | Proposal for modeling natural conditions pending with SNPWG. See Appendix F | | |
| DRYDOC (maxdpl, maxdwt) | Added attributes. | Hydrographic offices should clarify units used in data, and SNPWG should consider how to handle the use of different tonnage units in the same document. | |
| FAIRWAY (DRVAL2, HORWID, siltat) | Added. (HORWID mentioned elsewhere in this table). siltat, DRVAL2 and HORWID may be needed to capture statements in BSH SDs. | | |
| FLODOC (maxdpl, maxdwt) | Same argument as DRYDOC. | | |
| HRBARE (avlblg, totber, vstber) | Fallback, if capacity attributes are not associated with other object. | | |
| frmtxt attribute added to various objects | For information only. SNPWG 8.x adds frmtxt to various objects. | mrnsrv, gennti, shprep, rcmdts, reglts, resdes, srvhrs | See also mrnsrv(frmtxt) and “Service descriptions in VTS”. |
| prtare (totber, vstber) | Another fallback for totber and vstber data | | |
| SEAARE (PERSTA, PEREND) | Mentioned in our mapping document for modeling the “trawlers...” statement. (The concept of adding date information to SEAARE seems counterintuitive; it may or may not be useful.) | 1. Drop or discourage use.<br>2. Define criteria and process for adding appropriate ---ARE objects. | |

| | | | |
|---|---|---|---|
| SLCONS (avlblg) | For quay length in harbour tables. | This is the primary object where avlblg length should be encoded. | |
| slipways as repair facilities | Encoding length, beam, draft, tonnage for slipways (as repair facilities). Cannot use restvc, because that encodes vessel dimensions. | BSH-specific issue? | S57: Encode slipways as SLCONS with CATSLC=12 |
| Names and locations for graphic files.<br>In general, represen-tation of graphic information in files. | S57 specifies naming scheme, location, and default format for graphic files (TIF as standard, other formats by convention between producer and consumer).<br>Pilot used JPEG format for photographs and chapter index diagrams.<br>Allowing different formats implies using an attribute of an (S57) attribute.<br>S57 filename rules effectively allow no more than an alphanumeric identifier since there are only 6 characters available (CC is prod. code).<br>S57 conventions for PICREP use may need to be revised, or a new object defined.<br>Some photographs in Sailing Directions come from external sources (i.e., they are not in the ENC dataset.) | Consider defining a new "GRAFIC" information object with appropriate attributes? E.g., format=TIF, JPG,GIF, role=photograph, tidal current diagram, size=300/300, etc. | TSMAD question? Name format in S57 is CCXXXXXX.EEE (where CC = producer code). |
| Graphic file size and resolution | Print-quality output will probably need image resolution different from monitor or web output. Including multiple formats of the same image will bloat dataset size. | Define conventions for image resolutions, and conventions for producer and consumer to know resolutions and format. Perhaps define ways of specifying resolutions within the dataset. | TSMAD? See also the line item on names and locations for graphic files. |
| associating info objects with other objects | Allowed relationships for information objects:<br>Pilot assumes information objects do not have pointers to spatial objects, but may be have master/slave or collection relationships with geographic feature objects, collection objects, or other information objects. | Open | To be addressed by SNPWG |
| Additional objects | The pilot project identified objects which already exist in S57 and which may be needed for the model but were not mentioned in the SNPWG 8.X data dictionary files (as of November 2007). | LOCMAG, MAGVAR, RESARE, MIPARE, SEAARE, LNDMRK, FAIRWY, CURENT, DEPARE, HRBFAC, BUISGL, CTNARE, FSHFAC, FSHGRD, HRBARE, SLOTOP, MARCUL, DEPARE,COALNE, CBLSUB,CBLARE | Partial model |

| | | | |
|---|---|---|---|
| Expanded definition of dataset | The definition of dataset may need to be expanded beyond that given in S57, or a new concept defined. The issue is that we may want to include graphics in addition to those described by PICREP and also complete HTML or XML documents (like extracts from German Shipping Regulations, or Parts A and B of BSH sailing directions). | Expand definition of dataset, or define a new concept for a collection of data as described in the left. | |
| harmonize time description | Although not in Section C 2 the pilot project identified problems in coding time descriptions. Some possible simplifications are mentioned here.<br><br>'Use of Object Catalogue' document must describe use cases: e.g., a schedule in which working hours are different on 1 day of the week.<br><br>wkdywk and wkhrday could be correlated like NATSUR/NATQUA, but most weekdays have the same hours. (Both current and proposed definitions can represent differing hours on different weekdays).<br><br>National and local authorities sometimes publish their holidays annually. If calendars are mentioned, then better those issued by local authorities.<br>Some calendars are inherently variable, and holidays are declared at short notice (e.g., based on lunar sightings). | srvhrs(wkdywk, wkhrdy, fixhol, varhol, holcal)<br>wkdywk: as in SNWPG_9, but allow ranges too<br>wkhrdy:as in SNPWG_9, but type L instead of A<br>E.g.:<br>wkdywk=1-4,5<br>wkhrdy=0800/1900,0800/1700<br>for 8-7 Mon-Thu and 8-5 on Fridays.<br><br>fixhol: like fixdat in SNPWG_9, but of type L<br>varhol: like vardat in SNPWG_9, but make it L (and specify a separator character or format which cannot appear in the descriptive text, e.g. each such holiday must be in box brackets separated by commas: [holiday one],[holiday two]. (But there might be several such holidays.)<br>holcal: holiday calendars. Text describing (naming) the national and local holiday calendars and places (e.g., authorities) where the current year's list of holidays for a specific location can be obtained. One way to deal with variable holidays is to add a text attribute saying "consult such-and-such calendars for holiday information". | investigation on where to obtain authorized holiday calendars |

## B.2 Proposal for attribute frmtxt (formatted text)

Problem description:
The new attribute frmtxt is defined as any formatted text. The problem is that presentation software cannot guarantee that the precise format will be reproduced in the output. This is because output devices will vary in size, resolution, and other qualities and vendors may select different font types, font sizes, and space allocations for the content of frmtxt attributes. For example, the data producer might be tempted to use plain text with line breaks, 80-character lines, white space, numerals, and indentation to produce a suitably formatted list. The display may have a shorter line length due to hardware limitations or user interface considerations for ECDIS or other software, or the system may allow users to select larger font sizes, or a preparer of print output may use different paper sizes. Data consumers (vendors and software developers) will implement ad-hoc solutions for reformatting.

Suggestion:
The suggested solution is to require the data producer to specify the structuring used for the content of frmtxt attributes, as follows:

The value of the frmtxt attribute must be self-contained text that can be processed independently of any other part of the dataset and displayed integrated (i.e., seamlessly) with other content.

Data producers are required to use either plain text with line breaks, or well-known schemas or DTDs whose specifications are publicly available. Examples are HTML 4.01, XHTML 1.0 Strict, or XHTML 1.0 Transitional, or other well-known vocabularies such as those defined by OASIS (Organization for the Advancement of Structured Information Standards, http://www.oasis-open.org) standards.
Dependencies on another component of the dataset or external data are forbidden. The use of active content is forbidden. These rules mean that scripts, Java, and CSS are forbidden, as are external links (web site addresses may be included, but may not be coded as HTML links). Images may not be used.
The use of frames is forbidden.
The same format rules must apply to all frmtxt content in the dataset (i.e., the same schema or DTD should be used for all frmtxt elements).
Producers must specify the format in the dataset and in the accompanying documentation:

> For Web markup such as HTML, XML, etc., this requires specifying DTDs or schemas in the manner appropriate to the underlying specification (e.g., the appropriate DOCTYPE declaration).
> For plain text, the only descriptive information that may be provided is maximum line length, encoding, language, and style of line breaks/terminators (e.g., <CR><LF>, etc.).

Well-known and publicly available DTDs or schemas need not be included in the dataset. Producers are encouraged to state in their documentation the locations where the DTDs or schemas can be found (e.g., W3C sites for HTML).
Consumers (presentation software, ECDIS, etc.) may use any convenient display formatting, including ignoring the formatting of the content. Presentation software designers are responsible for producing reasonable displays of the content of frmtxt attributes.
Presentation software vendors should note that DTDs or schemas on Web sites may not be accessible at all times the software is executed, and are therefore encouraged to use known techniques such as catalogs and local caches to improve performance or deal with the absence of an Internet link.

The conformance of frmtxt content to the format specified by the producer of the dataset will be one of the validation checks for the dataset.

New dataset parameters are defined to describe the frmtxt format:
E.g., FRMTYP (Type of format): allowed values: “text”, “xml”, “html”, “xhtml”
& FRMPID (Descriptor) = formal public identifier of DTD or schema, if applicable, e.g.,

```
"-//W3C//DTD XHTML 1.0 Strict//EN"
```

for text content, FRMPID will be empty

## Appendix C: Sample Outputs

C.1 Jeppesen Print Sample Version 1
C.2 Jeppesen Version 2 Print Sample Candidate
C.3 Jeppesen Data Extract – V1 and V2 comparison
C.4 Jeppesen Web prototype – url to be provided

Insert Jeppesen Print Samples and Data Extract  here

## Appendix D: BSH Baltic Handbook Part III, C2 (Original)

Insert BSH original translated file here

## Appendix E: Proposals for Added Value and Data Re-Use

The content of NPs, especially of SDs is recommended in the IHO M3 standard. This standard limits the responsibility of Hydrographic Offices for shore based services which are under the responsibility of harbour authorities and local service providers. Those services which are a part of the marine infrastructure and service related information might be of some interest for Mariners.

The new S100 standard will no longer contain strong bindings between objects and attributes. Furthermore the SNPWG/S57 model contains information which is currently not being maintained or detailed by Hydrographic offices. This feature enables private companies to extend the content of ENC and add value. The following items were detected by the team when working with C2 chapter of Ostsee III.

**Detailed information**
For certain types of information Hydrographic Offices do not provide detailed information. More detailed information of waste disposal and supply facilities than is given in Sailing Directions might be convenient for mariners. The problem is here to obtain the relevant information from port authorities or from local providers.

Extended information
As has been said, the model contains much more information as needed. It is proposed to add value by providing contact details to services like disposal, supply, medical and repair service.

**Added value when using customized OBJ/ATT extensions**
Documents

> Port clearance is the main term of Governmental procedure when entering or leaving a port. The clearance requires a wide range of documents e.g. for custom, health, sanitary, immigration, declaration, cargo, dangerous goods as a specified type of cargo and crew. The templates for those documents may vary from port to port even within the same country. The documents are subject to maintenance requirements.
> Providing a printable and editable version of those documents might be a good added value.

**Different use of data**
Charted information following the data model is strongly geo-referenced and object referenced. With suitable file export facilities the data can be used for more than electronic chart applications. The group noted that existing software is able to export raw data into S57 as well as into ASCII, GML, KML, HOB, Shapefile and GeoTIFF.

The strong geo- and object referencing in the model offers the capability for a data modeler working with databases to work effectively when needing to select specified objects in a certain area and concentrate the work on them.
In addition the commonly used way of presenting data, the "pick report", can be replaced by a more convenient tool for users.

**Multiple output formats from the same XML markup**
As this project has demonstrated, it is possible to produce multiple formats from the same XML model and markup. This pilot project did this in producing CSV data extracts, HTML, and press-ready print outputs from the same XML. It is therefore theoretically possible to produce outputs in other formats, including XML, XHTML, text, database formats, or as data compiled in secure formats suitable for use in commercial applications, including ECDIS. An immediate consequence of this is that formats better suited than text (or HTML, or PDF) for search and indexing software can also be produced.

## Appendix F: List of Proposals for Restructuring SDs

### Natural Conditions

It is proposed to restructure the text using a simpler information typing architecture approach like

[natural phenomenon]
 [sub-area]
  [cause] [primary effect] [other information]

| Original format [minor manipulations] | Simple information typing architecture |
|---|---|
| C 2.1.1 Fehmarn to Neustaedter Bucht<br>Current<br>during strong E winds<br>W to SW current<br>during strong N winds<br>in the inner part of Mecklenburger Bucht SW current maximum speed 1.5 kn<br>along the line Fehmarn-Darß E current maximum speed 1.5 kn<br>during strong W winds<br>along the coast E current maximum speed 1.5 kn<br>during strong S winds<br>in the central part of Mecklenburger Bucht and along the Holstein coast NE to NW current maximum speed 1 kn<br>during extremely strong storms maximum current speed 2 to 4 kn | C 2.1.1 Fehmarn to Neustaedter Bucht<br>Current<br>from Fehmarn to Neustaedter Bucht<br>during strong E winds, W to SW current<br>in the inner part of Mecklenburger Bucht<br>during strong N winds, SW current, maximum current speed 1.5 kn<br>along the line Fehmarn-Darß<br>during strong N winds, E current, maximum current speed 1.5 kn<br>along the coast<br>during strong W winds, E current, maximum current speed 1.5 kn<br>in the central part of Mecklenburger Bucht and along the Holstein coast<br>during strong S winds, NE to NW current, maximum current speed 1 kn<br>during extremely strong storms, maximum current speed 2 to 4 kn |

| C 2.2.1 Travemuende and Trave | C 2.2.1 Travemuende and Trave |
|---|---|
| Current<br>during NNW to E winds<br>into Trave estuary<br>within the breakwater<br>river direction, minor N drift<br>maximum current speed 2 kn<br>near the coast eddies at half force of the main current<br>directly off the estuary in the middle and S part of the fairway in SW direction<br>in the N part directly before the northern breakwater in S direction<br>during S to W winds<br>out of Trave estuary<br>within the breakwater<br>river direction, minor N drift<br>maximum current speed 2 kn<br>near the coast eddies at half force of the main current<br>off the harbour area<br>one branch in fairway direction towards roadstead<br>one branch SE wards towards Mecklenburg coast | Current<br>off Trave estuary<br>into Trave estuary<br>between and upriver the breakwater<br>during NNW to E winds, (river direction) minor N drift, maximum current speed 2 kn<br>near the coast<br>during NNW to E winds, eddies at half force of the main current<br>directly off the estuary in the middle and S part of the fairway<br>during NNW to E winds, SW current<br>in the N part directly before the northern breakwater<br>during NNW to E winds, S current<br>off Trave estuary<br>out of Trave estuary<br>between and upriver the breakwater (river direction)<br>during S to W winds, minor N drift, maximum current speed 2 kn<br>near the coast<br>during S to W winds, eddies at half force of the main current<br>off the harbour area<br>during S to W winds, NE current<br>during S to W winds, SE current towards Mecklenburg coast |

**Fairways**

Following is an example of Fairway content in the BSH original, and as re-authored by the project team to more closely fit the SNPWG/S57 model.

BSH presentation order recommends that information which is valid for all sub-topics be presented at the beginning of a topic. In this example, readers may assume the res/rec information at the beginning of the topic applies to all fairways in the area, including any not specified, or one may assume the rec/res are only valid for the fairways described.

| **Fairway** |
|---|
| Restrictions |
| Fairways subject to silting |
| Recommendations |
| local authorities provide information about the actual water depth |
| Entrance to Großenbroder Binnensee |
| Restrictions |
| after silting correction of fairways and buoyage at short notice |
| Großenbroder Binnensee |
| Dimensions of Fairway |
| water depth 2.5 m |
| Regulations |
| Speed limit 5 kn |

In the example, there are no fairways in this stretch of coastline other than the two specified fairways. The project team proposes that the top information be moved to the relevant fairways to avoid misinterpretation. Here is the proposed presentation:

| **Fairway** |
|---|
| Entrance to Großenbroder Binnensee |
| Restrictions |
| Fairways subject to silting |
| after silting correction of fairways and buoyage at short notice |
| Recommendations |
| local authorities provide information about the actual water depth |
| Großenbroder Binnensee |
| Dimensions of fairway |
| water depth 2.5 m |
| Restrictions |
| fFairways subject to silting |
| Recommendations |
| local authorities provide information about the actual water depth |
| Regulations |
| Speed limit 5 kn |

**Table content**

Harbor tables contain one or more ports. The layout of the first line depends on whether the port is the only entry in this table, this applies to major ports, or if the port is one of several located at the described coastal part. The latter case works for minor ports.

The position of major ports is given in the sub-paragraph header. The BSH display strategy is to avoid data redundancies as much as possible. Thus the position of the port is not repeated in the harbour tables.

Minor ports, situated along the described coast, are not listed separately. They are collected in a harbour table each accompanied by a position.

For ports that deviate from the usual geographical hierarchy (see below) the entries corresponding to that port in the harbour table are laid out as for a major port. The location of the port is mentioned in the header of the corresponding section in the text, and not in the harbour table.

The team proposed handling all port entries uniformly.

**Harbour entries deviating from usual geographical hierarchy**
Geographic regions like inlets, harbors or rivers exist which are not important enough to fill their own sub-chapters. On the other hand those regions may be too extensive or important to be only a subchapter entry.
BSH instruction says that such regions have to be separated, highlighted in bold within a chapter. This exceptional position, out of the geographic hierarchy used for the rest of Part C, complicates the data model. As the print output shows, it is possible to model the current structure. However, it makes the model design more complicated. More importantly, it may make future processing by other programs for search, re-organization, presentation, integration with ECDIS, etc., more complex.
The team proposed to separate those regions into a separate subchapter.

**Restructuring of VTS reports and Pilot Requests text**
Requirements for pilot requests and VTS reports may be either general (e.g., "all vessels must report when passing reporting point") or dependent on vessel characteristics (size, cargo) and movement relative to a port (inbound, outbound, shifting or moving) and even time of day (e.g., sometimes requests for service after working hours must be made during the working hours or the relevant office). Also, there may be different pilot boarding places for different categories of vessels, and multiple radio calling-in points. It is relatively easy to capture these requirements in plain text, but writing code that produces reasonable text under all the theoretically possible combinations of objects and attributes pertaining to this information is more complex.

The current arrangement of pilotage and VTS sections is:

**Pilotage**
Pilot service
    pilotage compulsory
        (information)
    exemption from the pilotage compulsory
        (information)
    recommendation for accepting a pilot
        (information)
Pilot station (name)
    area of responsibility
        (information)
    service hours
        (information)
    services
        (information)
Pilot request
    time
        (information)

messages
(information)
Pilot boards
boarding time
(information)
boarding place
(information)
Pilot signals
pilot request from vessels
signals from the pilot boat or station

**Vessel traffic service/ Ships reporting system/ Traffic surveillance**
Surveillance area
(area of responsibility)
Station
(name)
Continuous listening watch
(communication method and the callsign (name) of the station)
Compulsory registration
(type of vessel)
Messages
approaching
(extract from the registration procedure)
during passage
(extract from the registration procedure)
departing
(extract from the registration procedure)
Service
(service provided by the station)

The question being addressed here is the structure of the VTS messages and pilot requests units. Descriptions of VTS reports and pilot requests can be formatted in terms of:

Condition/Status, Who, Where, When, to whom, What

Examples are provided below, combined in one table only for the convenience of the reader of this document. In Sailing Directions each would be under the proper “Vessel Traffic Service/Reports” or “Pilotage/Pilot request” heading.
The call name of the responsible “Vessel Traffic Service" is mentioned in the "Continuous listening watch" entry in the “Vessel Traffic Service" section and ensures the cross-reference to the associated List of Radio Signals entry.
The "to whom" section in Sailing Directions does not contain communication channel information. That information is stored and maintained in the appropriated List of Radio Signal publication, as required by BSH editorial

guidelines. Although the List of Radio Signals is separately published, maintained and sold, the structure of BSH Sailing Directions shows that it is a part of the book.
In the "What" section reporting data amongst other might be required. Those reporting data are collected in List of Radio Signal. Based on the kind of report, the nature and quantity of reporting details might differ from point to point and from report to report.

| Status | Who | When/Where | to whom | What |
|---|---|---|---|---|
| VTS , section 2.2.1 | | | | |
| Arrival | all vessels | when passing reporting point Calling-in point at (LAT/LON or verbal description from RDOCAL) | [Call Name] [Pointer to section in List of Radio Signals] | Sailing Plan |
| departure | all vessels | when passing reporting point Calling-in point at (LAT/LON or verbal description from RDOCAL) | | Sailing Plan |
| VTS, section 2.3.1 | | | | |
| Arrival | all vessels | 1 hour before passing Wismar fairway buoy or Offentief | [Call Name] [Pointer to section in List of Radio Signals] | Sailing Plan |
| all maneuvers within the VTS area | all vessels | after pilot boarding | | Position report |
| all maneuvers within the VTS area | all vessels | when passing the reporting points Calling-in point at (LAT/LON or verbal description from RDOCAL) | | Position report |
| all maneuvers within the VTS area | vessels navigating through Flaggtief | when passing light buoy 9 or 23 | | Position report |
| departure | all vessels | before departing the port or berth | | Sailing Plan |

| | | | | |
|---|---|---|---|---|
| VTS, section 2.4.1 | | | | |
| Arrival | all vessels | 30 min. before arrival Rostock fairway | [Call Name] [Pointer to section in List of Radio Signals] | Sailing Plan |
| all maneuvers within the VTS area | all vessels | when passing reporting points Calling-in point at (LAT/LON or verbal description from RDOCAL) | | Position report |
| all maneuvers within the VTS area | all vessels | after pilot boarding | | Position report |
| all maneuvers within the VTS area | all vessels | entering or leaving the fairway | | Position report |
| all maneuvers within the VTS area | all vessels | when alongside | | Position report |
| all maneuvers within the VTS area | all vessels | start and end of turning operations in turning basin | | Position report |
| departure | all vessels | before departing the port or berth | | Sailing Plan |
| Pilot request, 2.2.1 | | | | |
| Arrival | all vessels requiring pilotage | at least 12 hours before light-buoy 1 Lübeck-Gedser-Way | [Call Name] [Pointer to section in List of Radio Signals] | pilot request |
| Arrival | all vessels requiring pilotage with voyage time less than 3 h from previous port | immediately after leaving the previous port | | pilot request |
| Arrival | all vessels requiring pilotage | 2 h before light buoy 1 | | confirmation |
| shifting 08:00 to 19:00 | | at least 2 h before movement | | pilot request |

| | | | | |
|---|---|---|---|---|
| shifting, 19:00 to 08:00 | | before 17:00 | | pilot request |
| departure 08:00 to 19:00 | | at least 2 h before departure | | pilot request |
| departure, 19:00 to 08:00 | | before 17:00 | | pilot request |
| Pilot request 2.3.1 | | | | |
| Arrival | all vessels requiring pilotage | at least 4 hours before arrival at the outer boarding place | [Call Name] [Pointer to section in List of Radio Signals] | pilot request |
| shifting, short haul, 07:00 to 19:00 | | at least 3 h before movement | | pilot request |
| shifting, short haul, 19:00 to 07:00 | | at least 3 h before movement and before 17:00 | | pilot request |
| departure 07:00 to 19:00 | | at least 3 h before departure | | pilot request |
| departure, 19:00 to 07:00 | | at least 3 h before departure and before 17:00 | | pilot request |
| Pilot request, 2.4.1 | | | | |
| Arrival | all vessels requiring pilotage | at least 3 h before arriving outer pilot boarding place | [Call Name] [Pointer to section in List of Radio Signals] | pilot request |
| shifting, short haul, 07:00 to 19:00 | all vessels requiring pilotage | at least 3 h before movement | | pilot request |
| shifting, short haul, 19:00 to 07:00 | all vessels requiring pilotage | at least 3 h before movement and before 17:00 | | pilot request |
| departure 07:00 to 19:00 | all vessels requiring pilotage | at least 3 h before departure | | pilot request |

| | | | | |
|---|---|---|---|---|
| departure, 19:00 to 07:00 | all vessels requiring pilotage | at least 3 h before departure and before 17:00 | | pilot request |

Sailing plans may be combined with a passage plan or other required report.

The actual presentation could be any structured format which arranges the above content in a consistent manner, i.e., uses a standardized presentation structure for all the different combinations of information. The nature of the format, such as tables, bulleted or itemized lists, indented text, etc., could be determined by the documentation provider, e.g., the HO for their printed Sailing Directions. Since some information is repeated in consecutive rows, one obvious rule for a hypothetical tabular presentation might be to merge cells, or use the phrase “(as above)”, etc.

It may be possible to re-structure the compulsory requirements (compulsory VTS registration and compulsory, recommended, or exempted pilotage) in a similar way using the “Condition/Status, Who, Where, When, How/to whom, What” model, but doing that would make it a more complex table.

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## Appendix G: Recommendations to SNPWG

The following is an updated version of an NEG sub-group discussion paper which was drawn to SNPWG attention on Jan. 31, 2008.

Subject: SNPWG discussion items

**Summary of problems, ideas and proposals**

New objects referring to open items

SEAARE (sea area)
    rec/res/reg

RESARE (restricted area)
    rec/res/reg

FSHGRD (fishing ground)
    rec/res/reg

FSHFAC (Fishing facilities)
    rec/res/reg

CTNARE (caution area)
    rec/res/reg

There are 2 ways of describing speed limits, RESARE(RESTRN=27, INFORM) and reglts(cataut, frmtxt). Criteria for using one in preference to the other are to be determined. Uniform representation is preferable, if possible.

shptyp and catvsl
    both dealing with tanker  (shptyp is designed to replace catvsl)

Attribute types changed from L to E

quite often we changed attributes from type L to type E arguing that in cases where times or other limitation are involved a list is not allowed.  In my opinion the L type does not require that values have to be collected in a single instance/attribute binding; if possible this should be done, if not they have to split up.  According to S57 App. A Chapter 2, “Attributes”, the L type means: “The expected input is a list of one or more numbers selected from a list of pre-defined attribute values.[...].

Following the E approach too strictly may require the creation of unnecessary data object content in some places which can be handled more easily using the L type.

. Some attributes whose value sets use different adjectives may be considered for combination into a single attribute.  These attributes are:

- class of pilot boarding place
- status of transmission.

It was decided to pass this problem to the English speakers.

**Discussion on Natural condition problems**

**Natural conditions**

Wind

see my proposal below

Visibility

see my proposal below

Swell

see my proposal below

Current

| Area | Current | Direction/Force | Characteristics |
|---|---|---|---|
| | | | |

**CURENT**

**CURVEL; ORIENT;**

we see a problem here when trying to describe this feature more general probably INFORM will work, but it's better to establish a new attribute

Water level and tide

**WATLEV** which is related to land features and inter tidal water areas (CAUSWY (Causeway), GRIDRN (Gridiron), LNDRGN (Land region), MARCUL (Marine farm/culture), MORFAC (Mooring/warping facility), OBSTRN (Obstruction), PYLONS (Pylon/bridge support), SBDARE (Seabed area), SLCONS (Shoreline Construction), UWTROC (Underwater/awash rock) WRECKS (wrecks))

Seems to me that we need a new object/attribute construction dealing with non-charted water level information

Tidal streams

| Area | Current | Direction/Force | Time/ Characteristics |
|---|---|---|---|
| | in-going | | |
| | out-going | | |

**T_HMON**

**T_ACWL; T_MTOD; T_VAHC; STATUS;**

**T_NHMN**

**T_ACWL; T_MTOD; T_THDF; STATUS;**

**T_TIMS**

**T_ACWL; T_HWLW; T_TINT; T_TSVL; TIMEND; TIMSTA; STATUS;**

work is under further development by TIDAL WG (no SNPWG work)

Tidal stream atlas

will be portrayed by graphics

Magnetic variations

**MAGVAR**

**RYRMGV; VALACM; VALMAG**

**LOCMAG**

**VALLMA**

add an attribute dealing with non numeric information of magnetic anomalies

Ice

| Area | Nature of ice | Hindrance |
|---|---|---|
| | | |

**ICEARE**

various attributes and further object, to be defined by ICE WG (no SNPWG work)

not sure, whether they deal with hindrance stuff

Summary:

**wearsk** will, according o the current definition, work for “local weather and sea state which may impede ship operations”

It is proposed to define a weather object with following construction

weather and sea state

category of weather and sea state

wind

visibility

swell

current

water level and tide

(tidal streams)

**wearsk** (definition may but must not be improved)

basis of information (At the moment no better idea can be offered how to define this kind of sources)

long term (climatic)

forecast information

actual information

It is not sure whether the hindrance by ice is to address to ICE WG or is to settle by SNPWG using **wearsk**.  All other items can be modelled by relevant working groups.

The proposed approach will be able to handle both, open sea weather or weather in harbour, approach, anchorage area etc.  Separating weather information from other information offers greater variability.

## Appendix H: Examples of Changes to ENCs

While trying to express the content of Sailing Directions in terms of ENC objects and attributes, the project team discovered some instances where the content of ENCs was encoded in ways that are not convenient for the detailed object-based representation implied by the SNPWG approach.

### Example 1: Anchorage Area near Travemünde.

One example is the description of an anchorage area encoded in one of the BSH ENC cells. This particular anchorage area is encoded as an ACHARE point feature.

The table below shows the content of the relevant attributes of the ACHARE object in the pick report:

| Object | Attribute | Value |
|---|---|---|
| **ACHARE** | | |
| | CATACH | 1 (unrestricted anchorage) |
| | INFORM | The best anchorage can be found at about 2M from the northern outside moll in the bearing about 211 degree on 17m deepness above with sand mixed mud- and clayground. |
| | NINFOM | Den besten Ankerplatz findet man etwa 2sm von der Norderaussenmole in der Peilung etwa 211 Grad auf 17m Wassertiefe über mit Sand vermischtem Schlick- und Tongrund |
| | NOBJNM | Travemünde-Reede |
| | OBJNAM | Travemünde Roads |

Table I.1: Data from current ENC

As given in the translated version of Sailing Directions, the information for this anchorage is:

| Anchorage/ Position | Water depth/ Ground | Characteristics |
|---|---|---|
| Nordermole in approx. 211°, 2 nm | 17 m<br>Sand, Stiff mud, Clay | |

Table I.2: Description in translated version of sailing directions

As can be seen from Table I.1, the details about water depth and seabed are described in plain text in the INFORM (and NINFOM) attributes of the ACHARE. So is the verbal description of the location (i.e., “Nordermole in approx. 211°, 2 nm”), which is given in the first column of Table I.2 above.

The source of the depth information in column 2 of Table I.2 is unclear, because in the ENC, depths in the vicinity of this feature are given only in DEPARE objects (depth range 10-20 m., covering a much larger area along the coast than the anchorage) and a nearby (but not co-located) sounding (depth value 17.2 m.).

Clearly, the content of the Sailing Directions table for this anchorage feature can be encoded in object/attribute form instead of the text description in the INFORM/NINFOM attributes.

Table I.3 below shows the content of the updated ACHARE object and the new SBDARE and DEPARE objects:

| **Object** | **Attribute** | **Value** |
|---|---|---|
| **ACHARE** | | |
| | INFORM | <empty> |
| | NINFOM | <empty> |
| | NOBJNM | Travemünde-Reede |
| | OBJNAM | Travemünde Roads |
| | *new attribute* | *Nordermole in approx. 211°, 2 nm* |
| **SBDARE** | | |
| | NATSUR | 4,1,2 |
| | *NATQUA* | *,7,* |
| **DEPARE** | | |
| | DRVAL1 | 17 |
| | DRVAL2 | 17 |

Table I.3: Hypothetical data from updated ENC

The description of the location presents another difficulty. If encoded in the OBJNAM attribute (which is what the pilot does as an interim solution), it must either be appended to the anchorage name “Travemünde Roads”, or replace it. Since Sailing Directions do not print the name of the area, the project team chose to replace it. The proposal in Appendix B for defining a new attribute to hold location descriptions would allow the name and the location to be encoded as independent pieces of information, in different attributes of the ACHARE object. This unnamed new attribute is shown in italics in Table I.3.

The NATQUA attribute in Table I.3 represents values corresponding to the translated Sailing Directions (Table I.2).

All the above issues: data matching, spatial locations, and geometry, would need to be resolved.

**Example 2: Warnings about magnetic variations in the vicinity of a power cable**

A second case is when the ENC content may be somewhat different from the text of Sailing Directions. An example is the caution about magnetic variations in this area. In this case the text of Sailing Directions states:

**Approaches**

Route planning

Recommendation

crossing high-voltage DC cable Lübeck-Trelleborg

crossing the cable preferably at right angles

switch off the magnetic compass autopilot

**Natural Conditions**

Magnetic variations

in vicinity of the high-voltage DC cable Lübeck-Trelleborg (Arrie) up to 70°

Pick reports for the coastal and approach cells show this warning (in slightly different language from Sailing Directions) as text in INFORM/NINFOM attributes or files pointed to by TXTDSC/NTXTDS attributes, depending on whether a coastal or approach cell is queried.

The content is the same in both cases:

Cell: DE316002
Feature: CBLSUB
Attributes:
CATCBL=1
LNAM 00B43DF45CC1D463, 00B43DF45CC1D464
INFORM: MAGNETIC COMPASS DEFLECTIONS up to 70° can occur near the high-voltage direct-current cable. Switch off your magnetic compass autopilot before you sail across the cable. Whenever possible do so quickly and at right angle. See "Seehandbuch".

Cell: DE416041
Feature: CBLSUB
Attributes:
CATCBL=1
LNAM= 00B44329828FED8D
TXTDSC file contents:
MAGNETIC COMPASS DEFLECTIONS Magnetic compass deflections of up to 70° can occur near the high-voltage direct-current cable. Switch off your magnetic compass autopilot before you sail across the cable. Whenever possible, do so quickly and at a right angle. See "Seehandbuch"

There are three issues with using the above ENC objects to generate the text of Sailing Directions: (i) the difference in wording; (ii) the circular reference to the Handbook consequent on reproducing the text in INFORM/NINFOM or the text files; (iii) the need for knowing that the information about such magnetic variations is present in the INFORM/NINFOM and TXTDSC/NTXTDS attributes of a cable object (using a co-located LOCMAG feature object would simplify conversion and processing).

Another complication is that the ENC also stores navigational recommendations pertaining to this phenomenon in the INFORM/NINFOM or TXTDSC/NTXTDS attributes. The relevant Sailing Directions entry is placed under the **Approach**/ Route Planning headline. The Sailing Directions distinguish between the plain fact of magnetic variation in the vicinity of the cable (which is under Natural Conditions) and the recommendation when using magnetic compass in the area concerned.