

## Paper for Consideration by TSMAD and DIPWG

## The Use of Scale Independent and Scale Dependent Data in S-101

<i>Submitted by:</i>	S-101 Work Item
<i>Executive Summary:</i>	This is a discussion paper exploring the feasibility of Scale Independent and Scale Dependent data in S-101.
<i>Related Documents:</i>	N/A
<i>Related Projects:</i>	S-101

**Introduction / Background**

One of the early concepts introduced into S-101 was the utilization of scale independent and scale dependent datasets that would work in conjunction with each other in an ECDIS. One of the drivers was that more hydrographic offices were moving to production systems that utilized central databases and that overall updating would be easier. In moving to SI and SD datasets all aspects of updating will be improved. HO's will only have to edit the majority of their critical corrections a single time, the number of updates will be reduced, and the quality of data will be inherently better. In the original S-101 phased approach this concept was to be introduced in phase 4. However, at the S-101 Stakeholder's workshop held in March, it was requested that TSMAD investigate this concept at an earlier stage as there will be issues throughout the ENC supply chain to deal with.

**Analysis/Discussion**

As TSMAD is progressing with the development of S-101, one of the new concepts that was suggested was to utilize Scale Independent and Scale dependent datasets which when packaged and displayed together would form a complete navigational picture. However, it was suggested by industry stakeholders that TSMAD further investigate this concept to make sure that it is beneficial for the mariner.

In order to place this problem into context the following definitions apply for Scale Independent and Scale Dependent Data.

**Scale Independent Data:** Contains only those features that are designated as scale independent. These features cannot be duplicated in a scale dependent cell. Portrayal is controlled by the use of scale minimum and scale maximum.

**Scale Dependent Data:** Data in these cells traditionally have multiple generalizations based on either compilation scale or display scale. For example, shoreline is depicted with greater granularity at larger scales than at smaller scales. Features contained within this data set cannot be duplicated in scale independent datasets.

**Combined:** This is a traditional ENC cell that contains both scale dependent and independent data.

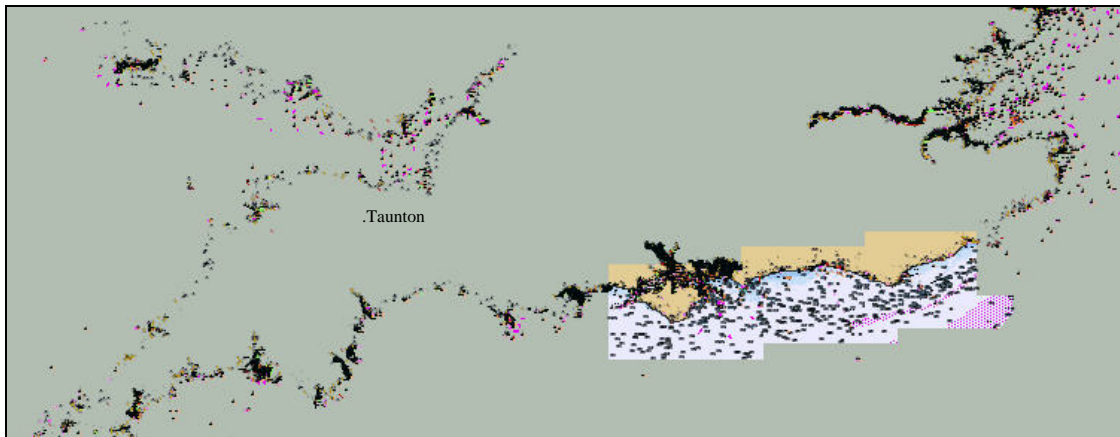
The issue is not whether implementing the scale independent and scale dependent concept is feasible, but rather is it beneficial for all users of S-101. This includes data producers, data production software companies, data distributors, equipment manufacturers and end users. In order to ensure that TSMAD is responding to the potential user base of S-101 data the following need to be considered.

- **Updates only need to go to one cell** - In theory the Scale Independent Cell would contain the aids to navigation, and these contain the bulk of the updates
- **Data Harmonization** - If a producer chooses to utilize SI and SD concepts then there should be a general improvement on data quality, eg. Piers depicted on Scale Dependent data will have to be harmonized to the correct position of the aid. However, this is also a natural evolution of data coming out of database centric production systems.
- **Data Loading and Portrayal** - There will need to be specific rules regarding how this data is loaded and portrayed.
- **Relating the various datasets to each other** - These datasets essentially need to be bundled together to work as a complete navigation picture
- **Data Distribution** - How will the distributors handle data distribution in order to make sure the mariner has a complete picture.

The following clauses are excerpts from an early draft of S-101 regarding the use of scale independent data.

### **Scale Independent and Scale Dependent**

ENC producers can make the decision to partition a set of navigational data into two separate cells based on the scale dependent and scale independent geometric properties of features. This concept splits a collection of data into two groups. The primary advantage of this structure is that receiving systems only hold the scale independent features once, instead of multiple occurrences at different display scales. This in turn effectively reduces the file size of an ENC exchange set and increases the speed at which updates can be applied to cells.



A scale independent cell overlaid with three scale dependant cells.

### **Scale Independent Cell**

There can be more than one scale independent cell contained within an exchange set. To view scale independent data in a receiving system there must be an accompanying cell containing the scale dependent data for that area. A scale independent cell will not contain any meta features. A nation responsible for the population of a scale independent data set will be obligated to produce scale dependent data sets of the same area. The display scale of the cell must be set to 0. All features within a scale independent cell must have the attribute, scale minimum and (scale max?) encoded.

### **Scale Dependent Cells**

Scale dependent cells will not contain any of the feature present in the scale independent list. Scale dependent cells with the same display scale may overlap. However, data within the cells must not overlap. Therefore, in the area of overlap only one cell may contain data.

### **Conclusions**

In conclusion there needs to be additional discussion to flesh out the feasibility and practicality of introducing Scale Independent and Scale Dependent datasets into S-101

### **Action Required of TSMAD/DIPWG**

The TSMAD/DIPWG is invited to:

- a. discuss the following questions:

How are the SI and SD datasets related?

How does one ensure that an SI feature doesn't exist in an SD dataset or vice versa?

How will portrayal work?

Portrayal of SI and SD data together

Portrayal of one area that has SI and SD data adjacent to an area that does not

How will distribution work?

How will updates work?

Sometimes an update will affect both SI and SD data – are they packaged together and released simultaneously. What happens if the end user only gets updates to the SI data and not the SD data?

Would TSMAD consider multiple SI cells by different themes?

Eg. An SI cell that contains only TSS information and a SI cell that contains Aids to Navigation. These would have to be related in some way. Can the same association cover two different datasets?

What features should be included from the table below for Scale Independent content?

Can the perceived benefits be achieved in another way?

### Scale Independent Cell Content

Listed in Table 2 are the allowable features and their geometric primitive types which make up the content of a scale independent cell.

ACROYNM	NAMES	GEOMETRIC TYPE	UKHO FODB	NOAA Scale Independent Features
BCNCAR	Beacon, cardinal	P	P	P
BCNISD	Beacon, isolated danger	P	P	P
BCNLAT	Beacon, lateral	P	P	P
BCNSAW	Beacon, safe water	P	P	P
BCNSPP	Beacon, special purpose/general	P	P	P
BUISGL	Building single	P, A	P	
BOYCAR	Buoy, cardinal	P	P	P
BOYISD	Buoy, isolated danger	P	P	P
BOYLAT	Buoy, lateral	P	P	P
BOYSAW	Buoy, safe water	P	P	P
BOYSPP	Buoy, special purpose	P	P	P
BOYINB	Buoy, installation	P	P	P
CGUSTA	Coastguard station	P	P	
CHKPNT	Check point	P		
CTRPNT	Control Point	P		
DAYMAR	Day mark	P	P	P
DISMAR	Distance mark	P		
FOGSIG	Fog signal	P	P	P
DWRTCL	Deep water route centreline	L		
DWRTPT	Deep water route part	A		
FORSTC	Fortified structure	P	P	
LNDMRK	Landmark	P	P	
LIGHTS	Light	P	P	P
LITFLT	Light Float	P	P	P
LITVES	Light vessel	P	P	P
MORFAC	Mooring/Warping facility	P	P	
PILPNT	Pile	P		
PILBOP	Pilot boarding place	P		
OBSTRN	Obstruction	P		
OFSPLF	Offshore platform	P	P	
OSPARE	Offshore production area	A		
PILBOP	Pilot boarding place	P, A		

PRCARE	Precautionary area	P, A		
PYLONS	Pylon/bridge support	P	P	
RADRFL	Radar reflector	P		P
RADSTA	Radar station	P	P	P
RTPBCN	Radar transponder beacon	P	P	P
RDOCAL	Radio calling-in point	P	P	
RDOSTA	Radio station	P	P	P
RECTRC	Recommended track	L		
RSCSTA	Rescue station	P	P	
SISTAT	Signal station, traffic	P	P	
SISTAW	Signal station, warning	P	P	
SILTNK	Silo/tank	P	P	
TOPMAR	Top mark	P	P	P
TSELNE	Traffic separation line	L		
TSEZNE	Traffic separation zone	A		
TSSBND	Traffic separation scheme boundary	L		
TSSCRS	Traffic separation scheme crossing	A		
TSSLPT	Traffic separation scheme lane part	A		
TSSRON	Traffic separation scheme roundabout	A		
TWRTPT	Two-way route part	A		
UWTROC	Underwater/awash rock	P		
WRECKS	Wreck	P, A		