1st IHO-HSSC Meeting
The Regent Hotel, Singapore, 22-24 October 2009

Report of the TSMADWG to HSSC 1

Transfer Standard Maintenance and Application Development Working Group

Submitted by:	Chairman, TSMADWG
Related Documents:	List of Actions from CHRIS20, CL 36/2009
Related Projects:	NA

Chair:	Barrie Greenslade, UK
Vice Chair:	Jean-Luc Deniel,
Secretary:	Anthony Pharaoh, IHB
Member States:	Australia, Belgium, Brazil, Canada, Denmark, Estonia, Finland, France, Germany, Italy, Japan, Republic of Korea, Netherlands, New Zealand, Norway, Republic of South Africa, Singapore, Spain, Sweden, United Kingdom, United States of America and Venezuela.
Expert Contributors:	The International Centre for ENCs (IC-ENC), PRIMAR Stavanger, Caris (Canada and Netherlands), ESRI (USA), Furuno (Finland), GEOMOD (France), Jeppesen, HAS Systems (Australia), IDON Technologies (Canada), IIC Technologies (Canada), Joint Geospatial Support Facility (New Zealand), MITRE (USA), SevenCs (Germany), TKartor (Sweden), and Transas (Russia).

1 Meetings Held During Reporting Period

a. TSMAD 18 4-8 May, 2009, Ottawa
b. TSMAD S-100 Sub-WG Meeting 8 1-3 May, 2009, Taunton

2 Work Program

Progress continues on the work items assigned by CHRIS as follows:

2.1 S-100

A final draft version was published in June 2009. Comments were invited (CL 36/2009) from stakeholders and these were reviewed at TSMAD FG 6.

Due to the closing date for comments being the 31.08.09 and the S-100 FG not meeting until 2nd – 4th September, the results of the review and any TSMAD

recommendations for S-100 will be delayed. They will be added to this report ASAP.

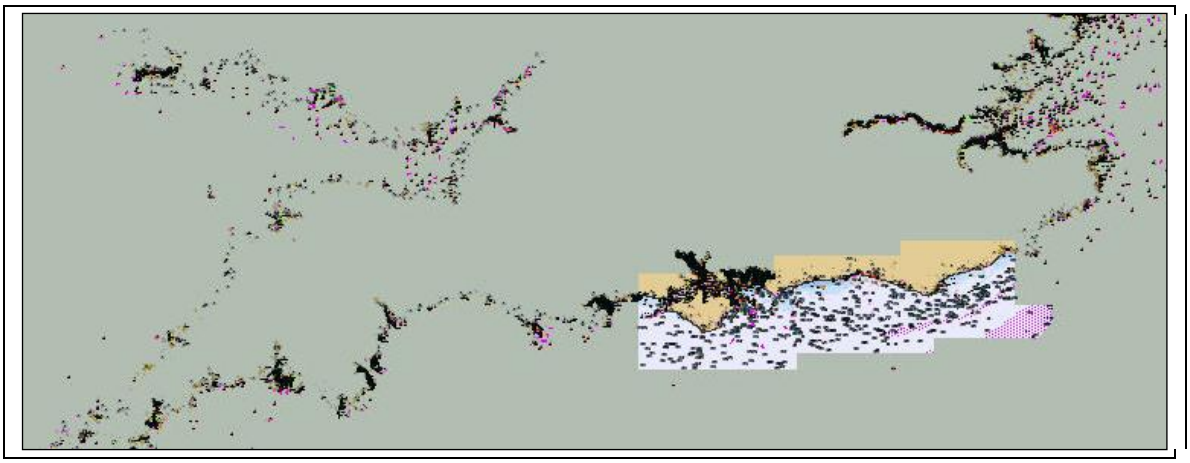
2.2 S-101 ENC Product Specification

S-101 is the new Electronic Navigational Chart product specification that is based on S-100. The intent of S-101 is to utilize the flexibility of S-100 to allow the IHO and Member States to respond to the changing needs of the mariner. S-101 will include machine readable feature catalogues and portrayal catalogues that will facilitate updating of changes to shipboard systems.

2.2.1 S-101 Progress

TSMAD has made steady progress on the development of S-101. An initial draft of S-101 was completed in late 2008. Key aspects of this draft were reviewed at the joint TSMAD/DIPWG meeting in May 2009, these decisions will be incorporated into a revised draft for further review at the next TSMAD meeting in October 2009.

Currently, S-101 introduces new functionality and tightens up loopholes in S-57. These include establishing a fixed set of display scales to facilitate cell loading on ECDIS and introducing the concept of scale independent and scale dependent cells.



A scale independent cell overlaid with three scale dependant cells.

2.2.2 S-101 next steps:

The goal for the next year is finalize S-101, including a preliminary feature catalogue and portrayal catalogue. TSMAD would like to then utilize this to begin creating test datasets for use by both ENC software manufactures and ECDIS manufacturers.

TSMAD needs involvement and commitment from industry partners to help develop test datasets, enhance production systems, and develop mechanisms for use of this data within ECDIS that can support S-101. This will enable TSMAD to use an iterative

approach to continuously fine tune S-101 prior to official approval by the IHO member states and publication by the IHO.

2.3 S-10X Hydrographic Survey Product Specifications

As predicted at CHRIS20 a draft version of S-102 has been completed and posted on the TSMAD wiki using a newly created S-102 group. The response to this has been less than enthusiastic and without proper support the work item leader will struggle to pursue this further.

2.4 Marine Environment Protection Product Specification (MEPPS)

The MPAARE (Marine Protected Area) feature has been proposed and accepted to the IHO GI Hydro register and is now available for use. Little progress has been made to the development of the product specification. The MEPWG chair attend the last SNPWG meeting where it was agreed to develop a test scenario base on marine environment protection areas.
Whilst TSMAD originally agreed to this project as part of their work programme it has become increasingly apparent that apart from the MPAARE itself (which was agreed that this was a feature for use in ENCs) the product specification is more aligned to the domain of SNPWG. Therefore TSMAD recommends that HSSC approve the transfer of this project to the SNPWG work programme.

3 TSMAD Outreach

3.1 ISO TC211

3.1.1 Attendees to TC211 Plenary and Working Group Meetings

Barrie Greenslade (UKHO) and Tony Pharaoh (IHB) participated in the following ISO/TC211 meetings during the reporting period.

- 27th Plenary and Working Group meetings - 1st to 5th of December 2008 (Tsukuba, Japan).
- 28th Plenary and Working Group meetings - 25th to 29th of May 2009 (Molde, Norway).

The next ISO/TC211 meeting is scheduled to take place during the first week of November 2009 in Québec City, Canada.

3.1.2 Items of Interest to HSSC 1

ISO/TC 211 have published a *Standards Guide* which provides background information on the work carried out by this Technical Committee. It also provides summaries of each of the published International Standards and Technical Specifications produced by ISO/TC 211. The *Standards Guide* can be downloaded from the ISO/TC211 web site.

Approval of new projects, - the following projects were approved during the reporting period:

- 19154 Standardization Requirements for Ubiquitous Public Access
- 19155 Place Identifier (PI) Architecture
- 19156 Observations and measurements
- 19145 Registry of representations of geographic point location.
- 19157 Data Quality
- 19158 Quality assurance of data supply (Technical Specification)
- 19115 Metadata. A new project to revise the existing standard was approved.

Resolutions to carry out systematic reviews of the following standards were also approved during the reporting period;

- 19127:2005 Geodetic codes and parameters
- 19109:2005 Rules for application schema
- 19107:2003 Spatial schema
- 19119:2005 Services
- 19110:2005 Methodology for feature cataloguing
- 19114:2003 Quality evaluation procedures
- 19123:2005 Schema for coverage geometry and functions
- 19112:2003 Spatial referencing by geographic identifiers
- 19128:2005 Web Map Server interface
- 19133:2005 Location-based services – Tracking and navigation
- 19135:2005 Procedures for item registration

ISO/TC211 established an ad hoc work group on Spatial Data Infrastructures (SDI). This group was tasked with the preparation of an SDI workshop, to take place at the 28th meeting in Molde, Norway. The following papers (available from the ISO/TC211 web site http://www.isotc211.org) were presented at the workshop

- NSDI Implementation in Malaysia: Issues and Challenges
- Views on the Canadian Geospatial Data Infrastructure
- A New Look at SDI
- African requirements for SDI standardization
- The Search for an SDI Model
- INSPIRE and the role of standardization

3.2 DGIWG

During the past year there hasn't been a direct attendance by TSMAD to DGIWG meetings. With the completion of a final draft S-100, liaison with the DGIWG has reduced to a level of monitoring progress. The TSMAD DGIWG representative who also fulfills the role of DGIWG secretariat will continue to appraise TSMAD of any cooperative requirements for the foreseeable future.

3.3 DOALOS

At TSMAD 18 Robert Sandev (Geographic Information Systems Officer – Division for Ocean Affairs and the Law of the Sea, UN) gave a presentation outlining a requirement for a S-100 product specification to assist States Parties to United Nations Convention on the Law of the Sea (UNCLOS) to comply with their depository obligations under articles 16(2), 47(9), 75(2), 76(9), and 84(2) of UNCLOS. TSMAD considered S-100 to be ideally suited for this project and agreed to seek direction from the IHO in offering assistance to DOALOS. This was further substantiated with a letter to the IHO from Mr. Serguei Tarassenko, the Director of DOALOS.

The TSMAD chair subsequently briefed the UKHO Law of the Sea section who have been investigating and developing solutions to similar requirements. This was followed by further discussions with Robert Sandev and at the recent DOALAS meeting. The outcome of this meeting was as follows:

A meeting took place at DOALOS in New York on 19 August between UKHO and DOALOS to assist DOALOS in their requirement for a S100 compliant product specification as described above. DOALOS was represented by Robert Sandev and Vladimir Jares.

The DOALOS requirement is for a standardised S100 compliant law of the sea feature code directory that could be offered to States Parties to enable them to deposit their limits and boundaries data in a format that could be accessed by all States in an agreed format as developed by the International Hydrographic Organisation (IHO).

It was agreed that DOALOS would forward their comments on CARIS' law of the sea feature code dictionary to the LOS Section at the UKHO, who would in turn forward these comments to CARIS for further development of the dictionary. If the law of the sea feature code directory could be agreed by all interested parties, including DOALOS, TSMAD-IHO and CARIS, an agreed feature code for law of the sea limits and boundaries data could then be offered to the States Parties as a jointly agreed data set.

The way ahead was agreed that the data set would be jointly developed by DOALOS, UKHO-LOS and CARIS and when finalised presented to TSMAD-IHO for approval before DOALOS presents the preferred format for State depository obligations under UNCLOS to the States Parties to the Convention.

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TSMAD recommends that HSSC approve that:

a. when required TSMAD WG to advise and assist DOALOS in the development of a product specification.
b. the finished product specification is considered for publication as a S15X on review by TSMAD and the approval of member states.

4 Progress on CHRIS Action Items

5.1	Dynamic tides in ECDIS	20/6	**TSMAD** in consultation with TWLWG, CSMWG and other relevant HO bodies to develop proposals to enable the use of tidal and water height information to adjust charted depths in S-57 based ECDIS equipment for consideration by HSSC-1.	**Done –** HSSC1 0.6.1D
6.1	S-57 temporal attribution	20/12	**TSMAD** to issue an encoding bulletin regarding issues relating to S-57 temporal attribution and "master / slave" relationships, based on CHRIS20-WP1.	**Done:** EB24 (Apr 09) on IHO website
6.1	S-57 temporal attribution	20/13	**TSMAD** to urgently consider by correspondence revisions to S-57 temporal attribution and "master / slave" relationships, taking into account CHRIS20-WP1.	**Done:** See CL 32/09
6.1	S-57 temporal attribution & CATZOC	20/14	As soon as practicable and subject to no adverse findings from TSMAD, **volunteer MS's** may wish to submit a late proposal to 4EIHC seeking approval for an amending Supplement to S-57 (S-57 3.1.2) containing revisions to S-57 temporal attribution and "master/slave" relationships which would also include amendments to CATZOC parameters and definitions (see Action 20/25).	**Done** by correspondence:
6.1	ENC consistency	20/18	**TSMAD** to review S-65 Annex A – *Recommendations for Consistent ENC Data Encoding* and revise as necessary to take into account the practical experience of Canada and the BSHC (see CHRIS20-06.1D and CHRIS20-06.1F) regarding the regional implementation of the guidelines.	**Done** – See below
7.1	Hydro-related MIO register	20/29	**TSMAD** to further develop the infrastructure described in CHRIS20-06.1B Annex A for the governance and management of the GII, to decide if a hydro-related MIO register is to be created, and report to HSSC-1.	**In progress**
7.1	OEF Orphan S-57 objects / attributes	20/30	**TSMAD** in consultation with OEF to propose arrangements to HSSC-1 that accommodate the "miscellaneous" S-57 objects currently registered on the OEF	**In progress**
7.1	Outreach functions	20/31	**IHB and Chair TSMAD** to review ToRs and RoPs for TSMAD to ensure that the proposed TSMAD outreach functions outlined in CHRIS20-07.1C are addressed.	**Done.** An updated TOR has been produced (approved at TSMAD 18) and is ready for HSSC consideration. See annex A

4.1 ENC Consistency

In response to CHRIS action 20/18:- "TSMAD to review S-65 Annex A – *Recommendations for Consistent ENC Data Encoding"* and revise as necessary to take into account the practical experience of Canada and the BSHC (CHRIS20-06.01D and CHRIS20-06.1F) regarding the regional implementation of the guidelines.", together with comments from NOAA, SHOM, Shanghai MSA and UKHO a number of changes and clarifications have been made to S-65 Annex A, Appendix 1.

These changes consist of:-

- Additional advice for the use of SCAMIN on navigational aids
- Simplification of the basic recommendations for using SCAMIN on soundings
- Simplification of the basic recommendations for using SCAMIN on obstructions, wrecks and underwater rocks.
- Addition of a new optional rule for the use of SCAMIN on soundings
- Clarification of a number of the conditions for the use of SCAMIN.

A new version of Annex A highlighting the changes can be found at annex B to this report. HSSC are recommended to approve the new version.

5 Problems Encountered

The continuing issues with the development of the S-100 portrayal component due to serious delays in the publication of ISO 19117 have been resolved. DIPWG will extend and enhance an existing contract to develop a portrayal register; further details can be found in the DIPWG report.
As mentioned above, the lack of support for the development of the S-101 survey product specification is disappointing.

6 Summary of Recommended Actions

HSSC 1 is invited to endorse the continued activity of TSMADWG and in particular the recommendations for the following:

6.1 S-100

To be completed following the TSMAD S-100 Focus Group meeting.

6.2 Marine Environment Protection WG

Approve the disbanding of this WG and the transferral of the remaining project work to SNPWG.

6.3 DOALOS product specification

a. when required TSMAD WG to advise and assist DOALOS in the development of a product specification.

b. the finished product specification is considered for publication as a S15X on review by TSMAD and the approval of member states.

6.4 S-65

Approve the publication of a new version of S-65 to include the changes to Annex A Appendix 1.

7 Action Required of CHRIS

The CHRIS is invited to note this report and endorse the continuance of the Work Plan.

TSMAD Work Plan

TSMAD Tasks

A Develop S-100 based on ISO TC211 geo-spatial standards (IHO T3.4.2 refers)

B Keep S-58 Recommended ENC validation checks up to date (IHO O3.1.1 refers)

C Support FAQ and encoding advice sections of IHO web site up to date (IHO O3.1.1 refers)

D Develop Marine Environment Protection Programme based on S-100

Task	Work item	Priority*	Milestones	Start Date	End Date	Status **	Contact Person(s)	Affected Pubs/Standard	Remarks
A	S-100	H	Draft Version published March 2008, S-100 Editing Committee Meeting Sept 2008	2001	2009	O	Barrie greenslade		
A.1a	Develop S-100 Feature Dictionary component	H		2001	Feb 06	C	Holger Bothien		
A.1b	Develop S-100 Feature Catalogue component	H		2007	Dec 07	C	Holger Bothien		
A.2	Develop S-101 ENC product specification	M		2006	Jan 12	O	Julia Powell, Richard Fowle		
A.3	Develop S-100 Imagery and Gridded Data component	H		2001	Feb.06	C	Don Vachon		

* * P = Planned, O = Ongoing, C = Completed

Task	Work item	Priority*	Milestones	Start Date	End Date	Status **	Contact Person(s)	Affected Pubs/Standard	Remarks
A.4	Develop S-100 Time varying and 3-D data. component	H		2001	Oct.04		Jim Radice		Deleted, absorbed into other work items.
A.5a	Develop S-100 metadata component	H		2001	Dec 07	C	Tony Pharaoh		
A.5b	Develop S-100 quality metadata component	H		2007	Jan 08	C	Dion Gaulton		
A.6a	Develop Application Schema component	H		2001	Jan 08	C	Barrie Greenslade		
A 6b	Develop S-100 Framework Document	H		2006	Dec 07	C	Barrie Greenslade		
A 6c	Develop S-100 Spatial Component	H		2003	Sep 06	C	Barrie Greenslade		
A 6d	Develop S-100 Encoding Component	H				O	Barrie Greenslade		
A.7	Develop S-100 Bathymetric Content Specification.	H		2001		O	Wade Ladner		
A.8	Develop S-100 Portrayal Component	H		2006		O	CSMWG		
A.9	Develop S-57 to paper chart functionality and Print-on-Demand (POD) file transfer guidelines.	M		2003		P	No current work item leader		Not Activated
A.10	Liaise with Non-IHO Constituents, e.g. Inland ECDIS, Marine Navigation Industry, DGIWG, AML, WMO Ice, and GIS Industry.	H		2004	-	O			
B.1	Keep S-58 Recommended Validation Checks up to date	H		2003	-	O	Guy Uguen		
C.1	Support FAQ and Encoding Bulletins	H		2003	-	O	Jeff Wooton		

Task	Work item	Priority*	Milestones	Start Date	End Date	Status **	Contact Person(s)	Affected Pubs/Standard	Remarks
D	Develop Marine Environment Protection Programme based on S-100	M		2008	2009	O			

TSMAD Meetings

TSMAD

Date	Location	Activity
29 Sep – 3 Oct 03	Wollongong, Australia	10th Meeting
11-12 November 04	IHB, Monaco	11th Meeting
10-11 November 05	Wollongong, Australia	12th Meeting
18-22 September 06	Wellington, New Zealand	13th Meeting
4-8 June 07	UKHO, Taunton	14th Meeting
14-18 January 08	IHB, Monaco	15th Meeting
5-9 May 08	Cape Town, South Africa	16th Meeting
8-12 September 08	Seattle, USA	17th Meeting
4-8 May 09	Ottawa, Canada	18th Meeting
26-30 Oct 09	Sydney, Australia	19th Meeting

TSMAD S-100 Sub-WG

Date	Location	Activity
25-29 April 05	Univ. of NH, USA	1st Meeting

TSMAD S-100 Sub-WG

Date	Location	Activity
7-9 November 05	Wollongong, Australia	2nd Meeting
15-19 May 06	Brest, France	3rd Meeting
18-22 September 06	Wellington, New Zealand	4th Meeting
27-1 December 06	Silver Spring, USA	5th Meeting
23-27 April 07	Ottawa, Canada	6th Meeting
17-21 September 07	Hamburg, Germany	7th Meeting
2-4 September	Taunton, UK	8th Meeting

Annex A

M-3 TR K2.21

TRANSFER STANDARD MAINTENANCE AND APPLICATIONS DEVELOMENT W.G. (TSMAD) – Terms of Reference

1. Objective

a) To maintain, develop and extend:

(i) the S-57 IHO transfer standard for digital hydrographic data;
(ii) the S-100 IHO Geospatial Standard for Hydrographic Data;
(iii) the S-101 IHO ENC Product Specification;

b) To monitor the development of other related international standards.

2. Authority

This WG is a subsidiary of the Hydrographic Services and Standards Committee (HSSC). Its work is subject to HSSC approval.

3. Procedures

a) The WG should:

(i) maintain the S-57 IHO transfer standard for digital hydrographic data by preparing and promulgating maintenance documents containing clarifications, corrections and extensions when required;

(ii) maintain the S-100 IHO Geospatial Standard for Hydrographic Data as directed in Part 13 (S-100 Maintenance Procedures)

(iii) maintain the S-100 IHO ENC Product Specification as directed in …..

(iv) review relevant international standards and specifications and advise HSSC accordingly;

(v) consider new topics as instructed by HSSC and advise HSSC accordingly and/or draft the relevant extension documents;

(vi) draft new editions of the IHO transfer standard for digital hydrographic data as instructed by HSSC.

b) The WG should work by correspondence, group meetings, workshops or symposia. Permanent or temporary sub-working groups may be created by the WG to undertake detailed work on specific topics such as: maintenance of the IHO transfer standard for digital hydrographic data, product specifications, tidal information, survey information, etc. The WG should meet at least once a year.

c) The WG should liaise with other HSSC WG's, international organizations and industry to educate and encourage the application of IHO standards to the work of those organizations.

d) The WG should identify and promote the availability of other navigation-related data in ECDIS and in IHO geospatial standard-compliant format.

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e) The WG should identify a work programme for each year, including expected time frame.

4. Composition and Chairmanship

a) The WG shall comprise representatives of IHO Member States (M/S), Expert Contributors and Accredited NGIO Observers.

b) Decisions should generally be made by consensus. If votes are required on issues or to endorse proposals presented to the WG, only M/S may cast a vote. Votes shall be on the basis of one vote per M/S represented.

c) Expert Contributor membership is open to entities and organisations that can provide a relevant and constructive contribution to the work of the WG.

d) The Chair and Vice-Chair shall be a representative of a Member State. The election of the Chair and Vice-Chair shall be decided at the first meeting after each ordinary session of the Conference (Conference to be replaced by Assembly when the revised IHO Convention enters force) and shall be determined by vote of the Member States present and voting.

e) If the Chair is unable to carry out the duties of the office, the Vice-Chair shall act as the Chair with the same powers and duties.

f) Expert Contributors shall seek approval of membership from the Chairman.

g) Expert Contributor membership may be withdrawn in the event that a majority of the M/S represented in the WG agree that an Expert Contributor's continued participation is irrelevant or unconstructive to the work of the WG.

h) All members shall inform the Chairman in advance of their intention to attend meetings of the WG.

i) In the event that a large number of Expert Contributor members seek to attend a meeting, the Chairman may restrict attendance by inviting Expert Contributors to act through one or more collective representatives.

ANNEX B

S-65 ANNEX A APPENDIX 1

SPECIFIC SCAMIN STEP VALUES FOR OBJECT AND ATTRIBUTE COMBINATIONS

~~In the following table, group 2 objects have been sub-divided into the following sub-groups:-~~

~~2 Group 2 object (not part of standard display).~~
~~2M Meta objects.~~
~~2B Group 2 objects that are always part of base display.~~
~~2CB Group 2 objects that are part of base display dependent on safety contour setting.~~
~~2S Group 2 objects in standard display.~~

The final column **SCAMIN STEPS** indicates the number of steps above (smaller scale) the compilation scale that SCAMIN values should be set to.

Notes

1. ~~NB.~~ Producers should be prepared to deviate from the step values specified when the significance of the feature dictates, e.g. the recommended number of steps for a LIGHTS object is 4, but there will be circumstances where a LIGHTS object is so important that no SCAMIN value be applied; alternatively, the light could be so minor that a step value of 1 can be applied.
2. SCAMIN should only be applied to navigational aids where they contribute to "screen clutter" and where their removal from the display does not constitute a risk to safe navigation.
3. ~~2.~~ It is generally accepted that objects making up a NAVAID will have the same attributes, and therefore those with Master/Slave relationships should be assigned the same SCAMIN value.

OBJECT	PRIMITIVE	CONDITION	SCAMIN STEPS
ACHARE	Point/ Area		2
ACHARE	Point/Area	If RESTRN defined	3
ACHBRT	Point/Area		1
ADMARE	Area		3
AIRARE	Point/Area	If CONVIS = 1(visually conspicuous)	3
AIRARE	Point/Area		1
ARCSLN	Line/Area		4
BCNCAR	Point		3(see Notes 2 & 3 above)
BCNISD	Point		4(see Notes 2 & 3 above)
BCNLAT	Point		3(see Notes 2 & 3 above)
BCNSAW	Point		3(see Notes 2 & 3 above)

OBJECT	PRIMITIVE	CONDITION	SCAMIN STEPS
BCNSPP	Point		3(see Notes 2 & 3 above)
BERTHS	Point/Line/Area		1
BOYCAR	Point		3(see Notes 2 & 3 above)
BOYINB	Point		3(see Notes 2 & 3 above)
BOYISD	Point		4(see Notes 2 & 3 above)
BOYLAT	Point		3(see Notes 2 & 3 above)
BOYSAW	Point		3(see Notes 2 & 3 above)
BOYSPP	Point		3(see Notes 2 & 3 above)~~3~~
BRIDGE	Point/Line/Area	Covered by an area DEPARE, DRGARE, or UNSARE object	4
BRIDGE	Point/Line/Area	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous) and covered by an area LNDARE	3
BRIDGE	Point/Line/Area	Covered by an area LNDARE	1
BUAARE	Point/Area	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
BUAARE	Point/Area		1
BUISGL	Point/Area	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous) or FUNCTN = 33	3
BUISGL	Point/Area		1
C_AGGR	N/A		NOT SET
C_ASSO	N/A		NOT SET
CANALS	Line		1
CANALS	Area		4
CAUSWY	Line/Area		2
CBLARE	Area	If RESTRN defined	3
CBLARE	Area		2
CBLOHD	Line	~~Over Navigable Water~~Covered by an area DEPARE, DRGARE, or UNSARE object	4
CBLOHD	Line	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
CBLOHD	Line		1
CBLSUB	Line		3
CGUSTA	Point		1

OBJECT	PRIMITIVE	CONDITION	SCAMIN STEPS
CHKPNT	Point/Area		1
COALNE	Line		NOT SET
CONVYR	Line/Area	Covered by an area DEPARE, DRGARE, or UNSARE object~~Over Navigable Water~~	4
CONVYR	Line/Area	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
CONVYR	Line/Area		1
CONZNE	Area		3
COSARE	Area		3
CRANES	Point/Area	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
CRANES	Point/Area		1
CTNARE	Point/Area		4
CTRPNT	Point		1
CTSARE	Point/Area		1
CURENT	Point		3
CUSZNE	Area		2
DAMCON	Point/Line/Area		1
DAMCON	Line/Area	If sharing geometry with area LNDARE & (DEPARE or DRGARE) objects	NOT SET
DAMCON	Line/Area	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
DAYMAR	Point	If Slave SCAMIN must match that of Master	3
~~DEPARE~~	~~Line~~	-	~~1~~
DEPARE	Area		NOT SET
DEPCNT	Line	If VALDCO = 0 (drying line) or 30 (default safety contour ref S-52)	4
DEPCNT	Line		2
DISMAR	Point		2
DMPGRD	Point/Area	If RESTRN defined	3
DMPGRD	Point/Area		2
DOCARE	Area		1
DRGARE	Area		NOT SET
DRYDOC	Area		1
DWRTCL	Line		NOT SET
DWRTPT	Area		NOT SET
DYKCON	Line/Area	If sharing geometry with area LNDARE & (DEPARE or DRGARE) objects~~If sharing geometry with LNDARE & DEPARE or DRGARE~~	NOT SET
DYKCON	Line		1
EXEZNE	Area		3
FAIRWY	Area		3
FERYRT	Line/Area		3

OBJECT	PRIMITIVE	CONDITION	SCAMIN STEPS
FLODOC	Line	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
FLODOC	Area		NOT SET
FNCLNE	Line	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
FNCLNE	Line		1
FOGSIG	Point	If Slave SCAMIN must match that of Master	3
FORSTC	Point/Line/Area	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
FORSTC	Point/Line/Area		1
FRPARE	Area		2
FSHFAC	Point/Line/Area		2
FSHGRD	Area		1
FSHZNE	Area		3
GATCON	Point/Line/Area		2
GATCON	Line/Area	If sharing geometry with area LNDARE & (DEPARE or DRGARE) ~~If sharing geometry with LNDARE & DEPARE or DRGARE~~	NOT SET
GENOBJ	Point/line/Area		4
GRIDRN	Point/Area		1
HRBARE	Area		3
HRBFAC	Point/Area		1
HULKES	Point		1
HULKES	Point	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
HULKES	Area		NOT SET
ICEARE	Area		3
ICNARE	Point/Area		1
ICNARE	Point/Area	If RESTRN defined	3
ISTZNE	Area		NOT SET
LAKARE	Area		1
LIGHTS	Point	If Slave SCAMIN must match that of Master	4(see Notes 2 & 3 above)
LITFLT	Point		4(see Notes 2 & 3 above)
LITVES	Point		4(see Notes 2 & 3 above)
LNDARE	Point/Line/Area		NOT SET
LNDELV	Point	If CONVIS = 1(visually conspicuous)	3
LNDELV	Point/Line		1
LNDMRK	Point/Line/Area	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous) or	3

OBJECT	PRIMITIVE	CONDITION	SCAMIN STEPS
		FUNCTN = 33	
LNDMRK	Point/Line/Area		1
LNDRGN	Point/Area		1
LOCMAG	Point/Line/Area		3
LOGPON	Point/Area	Covered by an area DEPARE, DRGARE, or UNSARE object~~On Navigable Water~~	4
LOGPON	Point/Area		1
LOKBSN	Area		1
M_ACCY	Area		NOT SET
M_COVR	Area		NOT SET
M_CSCL	Area		NOT SET
M_HOPA	Area		NOT SET
M_NPUB	Area		NOT SET
M_NSYS	Area		NOT SET
M_QUAL	Area		NOT SET
M_SDAT	Area		NOT SET
M_SREL	Area		NOT SET
M_VDAT	Area		NOT SET
MAGVAR	Point/Line/Area		1
MARCUL	Point/Line/Area	If EXPSOU = 2(shoaler than range of the surrounding depth area) & VALSOU ≤ 30m	4
MARCUL	Point/LineArea	If RESTRN defined	3
MARCUL	Point/Line/Area		1
MIPARE	Point/Area		3
MORFAC	Point/Line/Area	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
MORFAC	Point/Line/Area		2
NAVLNE	Line		3
OBSTRN	Point/ Line/Area		NOT SET
OBSTRN	Point/ Line/Area	If VALSOU >~~=~~ 30m and EXPSOU <> 2	4
~~OBSTRN~~	~~Point/ Line/Area~~	~~If VALSOU < 30m~~	~~NOT SET~~
OFSPLF	Point	~~Isolated Installations~~Not covered by an area OSPARE	4
OFSPLF	Point/Area		3
OFSPLF	Area		4
OILBAR	Line		4
OSPARE	Area		4
PILBOP	Point/Area		3
PILPNT	Point	Where used to mark position of LIGHTS object in water	4
PILPNT	Point	If CONVIS = 1(visually conspicuous)	3
PILPNT	Point		2
PIPARE	Point/Area		3

OBJECT	PRIMITIVE	CONDITION	SCAMIN STEPS
PIPOHD	Line	Covered by an area DEPARE, DRGARE, or UNSARE object~~Over Navigable Water~~	4
PIPOHD	Line	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
PIPOHD	Line		1
PIPSOL	Point/Line	Covered by an area DEPARE, DRGARE, or UNSARE object~~Submarine~~	3
PIPSOL	Point	~~On land~~Covered by an area LNDARE object.	1
PONTON	Line		2
PONTON	Line	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
PONTON	Area		NOT SET
PRCARE	Point/Area		3
PRCARE	Point/Area	~~When part of TSS~~Sharing geometry with either DWRTCL,DWRTPT,ISTZNE,TSELNE, TSEZNE, TSSCRS, TSSLPT or TSSRON objects	NOT SET
PRDARE	Point/Area	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
PRDARE	Point/Area		1
PYLONS	Point/Area	C~~Bridge supports~~ overed by an area DEPARE, DRGARE or UNSARE object~~in navigable water~~	~~4~~NOT SET
PYLONS	Point/Area	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
PYLONS	Point/Area		1
RADLNE	Line		3
RADRFL	Point	If Slave SCAMIN must match that of Master	3
RADRNG	Area		3
RADSTA	Point	If Slave SCAMIN must match that of Master	2
RAILWY	Line		1
RAPIDS	Point/Line/Area		1
RCRTCL	Line		3
RCTLPT	Point/Area		3
RDOCAL	Point/Line		3
RDOSTA	Point	If Slave SCAMIN must match that of Master	1
RECTRC	Line/Area		3
RESARE	Area		3
RETRFL	Point	If Slave SCAMIN must match that of Master	3
RIVERS	Line		1
RIVERS	Area		4
ROADWY	Point/Line/Area		1

OBJECT	PRIMITIVE	CONDITION	SCAMIN STEPS
RSCSTA	Point		3
RTPBCN	Point	If Slave SCAMIN must match that of Master	3
RUNWAY	Point/Line/Area	If CONVIS = 1(visually conspicuous)	3
RUNWAY	Point/Line/Area		1
SBDARE	Point/Line/Area		1
SEAARE	Point/Area		1
SILTNK	Point/Area	If CONVIS = 1(visually conspicuous) or CONRAD = 1(radar conspicuous). ~~or Representative of a group of SILTNKs~~	3
SILTNK	Point/Area		1
SISTAT	Point	If Slave SCAMIN must match that of Master	1
SISTAW	Point	If Slave SCAMIN must match that of Master	1
SLCONS	Point/Line/Area		NOT SET
SLOGRD	Point/Area	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
SLOGRD	Point/Area		1
SLOTOP	Line	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
SLOTOP	Line		1
SMCFAC	Point/Area		1
SNDWAV	Point/Line/Area		3
SOUNDG	Point	~~If VALSOU > 30m~~	1
~~SOUNDG~~	~~Point~~	~~If VALSOU ≤30m~~	~~3~~
~~SOUNDG~~	~~Point~~	~~If EXPSOU = 2(shoaler than range of the surrounding depth area) & VALSOU ≤ 30m~~	~~4~~
SPLARE	Point/Area	If RESTRN defined	3
SPLARE	Point/Area		1
SPRING	Point		1
STSLNE	Line		3
SUBTLN	Area		3
SWPARE	Area		3
T_HMON	Point/Area		1
T_NHMN	Point/Area		1
T_TIMS	Point/Area		1
TESARE	Area		3
TIDEWY	Line/Area		1
TOPMAR	Point	If Slave SCAMIN must match that of Master	3
TS_FEB	Point/Area		3
TS_PAD	Point/Area		2
TS_PNH	Point/Area		2

OBJECT	PRIMITIVE	CONDITION	SCAMIN STEPS
TS_PRH	Point/Area		2
TSELNE	Line/Area		NOT SET
TSEZNE	AREA		NOT SET
TSSBND	Line		NOT SET
TSSCRS	Area		NOT SET
TSSLPT	Area		NOT SET
TSSRON	Area		NOT SET
TS-TIS	Point/Area		2
~~TUNNEL~~	~~Point/Line/Area~~	~~-~~	~~1~~
TUNNEL	Line/Area	Covered by an area DEPARE, DRGARE, or UNSARE object~~If Navigable~~	4
TUNNEL	Line/Area	Covered by a LNDARE object	1
TWRTPT	Area		NOT SET
UNSARE	Area		NOT SET
UWTROC	Point	-	NOT SET
UWTROC	Point	If VALSOU > 30m and EXPSOU <> 2~~If EXPSOU = 2(shoaler than range of the surrounding depth area) & VALSOU ≤ 30m~~	4
UWTROC	Point	~~Not within an OBSTRN area~~Covered by an area OBSTRN object	~~3~~2
~~UWTROC~~	~~Point~~	~~-~~	~~2~~
VEGATN	Point/Line/Area	If CONVIS = 1(visually conspicuous)	3
VEGATN	Point/Line/Area		1
WATFAL	Point/Line	If CONVIS = 1(visually conspicuous)	3
WATFAL	Point/Line		1
WATTUR	Point/Line/Area		3
WEDKLP	Point/Area		3
WRECKS	Point/Area	~~If CATWRK = 1 or VALSOU > 30m~~	4NOT SET
WRECKS	Point/Area	If CATWRK = 1 or (VALSOU > 30m and EXPSOU <> 2)	~~NOT SET~~3
WRECKS~~WRECKS~~	Point/Area~~Point/Area~~	CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)~~If EXPSOU = 2(shoaler than range of the surrounding depth area) & (VALSOU ≤ 30m or CATWRK = 2,4 or 5)~~	3~~4~~

Optional additional rules that can be manually applied to fine tune the application of SCAMIN after the above values have been automatically applied.

OBJECT	PRIMITIVE	CONDITION	SCAMIN STEPS
~~BRIDGE~~	~~Point/Line/Area~~	~~If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous) and not over navigable water~~	~~3~~
~~BRIDGE~~	~~Point/Line/Area~~	~~Not over Navigable water~~	~~1~~
OBSTRN	Point	The most significant OBSTRN of a group of OBSTRNS within close proximity	NOT SET

OBSTRN	Point	For groups of OBSTRNs in close proximity, or within an OBSTRN area	2
SOUNDG	Point	~~Critical Depths over sand bars etc where VALSOU < 30m~~SCAMIN should be applied so that the least significant soundings are set to 1 step progressing to 4 steps for the most significant, above the compilation scale in order to achieve a gradual reduction in the sounding displayed as the user zooms out.	~~3~~1,2,3,4
~~SOUNDG~~	~~Point~~	~~-~~	~~1~~
UWTROC	Point	The most significant UWTROC of a group of UWTROCs within close proximity and not within an OBSTRN area	NOT SET
~~WRECKS~~	~~Point/Area~~	~~CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)~~	~~3~~
WRECKS	Point/Area	For groups of WRECKSs in close proximity (the most significant should not have SCAMIN)	2
~~WRECKS~~	~~Point/Area~~	~~The most significant WRECKS of a group of WRECKS within close proximity~~	~~NOT SET~~