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Paper for Consideration by CHRIS

Marine Environmental Protection Product Specification

Submitted by:	USA (NOAA)
Executive Summary:	The USA (NOAA) proposes the preparation and adoption of an S-57 Product Specification for the exchange and use of marine environmental protection (MEP) hydrographic data.
Related Documents:	Draft Marine Environment Protection Product Specification documents (attached at Annex A)
Related Projects:	TSMAD work program; Marine Electronic Highway in the Straits of Malacca and Singapore

Introduction / Background

The vision of the IHO is to be the authoritative worldwide hydrographic body which actively engages all coastal and interested States to advance maritime safety and efficiency and which supports the protection and sustainable use of the marine environment. Its mission is to create a global environment in which States provide adequate and timely hydrographic data, products and services, and ensure their widest possible use[1].

In order to support this vision and mission, the USA (NOAA) proposes that IHO amend S-57 by developing and adopting a Product Specification for Marine Environmental Protection (MEP) data. This Product Specification would increase the accessibility of Member States' hydrographic data for environmental users. The amendment would use the S-57 in its intended role as a transfer standard for digital hydrographic data by adding objects and attributes for environmental data. The amendment would use S-57, Appendix B, Product Specifications, to provide the additional rules applicable to the marine environmental protection application. This combination would provide a worldwide standard by which scientists, environmental stewards, and natural resource managers could reliably exchange and use hydrographic data for the purposes of marine environmental protection. Production of MEP data would be optional for Member States.

Equally important, the proposed amendment to S-57 would provide mariners with the same environmental protection data. This would assist mariners to navigate safely and avoid environmental damage by providing relevant information in a format which an ECDIS could be adapted to use. For example, the additional MEP data could be displayed as an environmental protection information overlay to ENCs in an ECDIS. The MEP data anticipated would not be redundant with information already in an ENC, nor would it be redundant with objects already adequately cataloged or attributed in S-57. For mariners, use of the marine environmental protection data would be optional.

The USA (NOAA) has prepared a draft, Marine Environmental Protection Product Specification, Object Catalog, Catalog of Attributes, and Presentation Library (attached to this proposal at Annex A). The Object Catalog and Catalog of Attributes have been populated with 2 object classes – marine protected areas, and coral reefs. It is proposed that CHRIS revise the draft Product Specification at Annex A as appropriate, and then adopt it following CHRIS' "Principles and Procedures for Making Changes to IHO Technical

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[1] Adapted from the "New IHO Basic Documents," www.IHO.org.

Standards and Specifications." The result would be immediately usable for the initial 2 object classes. Member States could later add other marine environmental protection objects and attributes in response to user requirements as part of the Product Specification maintenance.

Analysis/Discussion

The use of hydrographic data for purposes other than navigation has long been discussed by IHO. The result of these discussions led to a revision of the IHO Convention to make clear that Member States held themselves and the Organization responsible for the collection and use of hydrographic data for <u>all</u> uses, including specifically the use of hydrographic data for the protection and sustainable use of the marine environment. The proposed amendment to S-57 would help meet that commitment.

The need for improved standardization and use of marine environmental protection information is valid.
- The USA (NOAA) Coral Reef Program, and the USA national Coral Reef Task Force have asked the US hydrographic office for an appropriate international standard for detailed coral reef information.
- The USA (NOAA) Marine Protected Area Program (MPA), and the USA (NOAA) National Marine Sanctuary Program have also asked for an international standard to more fully exchange data on MPAs.

International requirements for MEP standards are also emerging.
- The "Gulf of Honduras Hydrographic Activity Implementation Plan" calls for "… bringing environmental data to the mariner so that informed decisions may be made to avoid environmental damage. " The Project plans "…an environmental data layer will be developed that can be displayed in conjunction with an ENC."
- The World Conservation Union (IUCN) has expressed great interest in an international standard for that purpose because no suitable standard exists.
- International donor organizations like the Global Environment Facility and the World Bank are providing funding to support the development of supplemental environmental information layers, such as the environment and natural resource conservation and management overlays for the Marine Electronic Highway in the Straits of Malacca and Singapore.

These national and international leaders in marine environmental protection are clearly asking for an international standard to exchange information among them, and to provide that information to mariners in a usable format.

Further, Marine Environmental Protection information is navigationally relevant. Nations around the world are taking more steps to regulate and protect their sensitive marine resources from shipping impacts. The IMO Intervention Convention affirms the right of a coastal State to take measures "...to prevent, mitigate or eliminate danger to its coastline from a maritime casualty." Marine protected areas (MPAs) are increasingly used around the world as a tool to protect marine resources. However, their diverse regulations and lack of standard terminology make it difficult for mariners to understand and comply with the requirements because that information is not available in a standard, easily accessible, and understandable format. Such information can have a direct effect on maritime operations such as voyage planning, transiting, anchoring, and (de-)ballasting, as well as ship-related operations such as cargo hold cleaning, waste disposal, etc. The inadvertent failure to comply with MPA regulations can result in major fines, or environmental damage

The IHO, using S-57, is ideally suited to improve the dissemination and use of MEP data. S-57 is a data transfer standard that was designed to accept additional hydrographic objects and attributes. Further, S-57 Product Specifications, of which the ENC is an example, are suited to specify the rule sets for applications such as marine environmental protection.

At present objects like marine protected areas and coral reefs are not adequately represented, neither in S-57 nor in ENCs, for all of the uses and data that are required. Additional relevant objects and information for MEPs would be of benefit to scientists, environmental stewards, and natural resource managers, and mariners. More specific, standardized depiction is needed. For example, the 2 new objects in the draft Product Specification documents (MPA's and coral reefs) permit the inclusion of the following requested data.

- For coral reefs, S-57 provides little means to identify coral other than as "seabed area" and calling it "coral" in attribution. Other users have requested information such as:
    - Biological cover
    - Reef structure and density
    - Category of reef
    - Nature of the surface
- For MPA's, S-57 treats them as "restricted areas" with limited attribution which is focused on SOLAS vessel navigation information. Other users have requested:
    - The MPA's IUCN classification
    - The conservation focus and purpose of the marine management
    - The level of protection afforded to resources
    - Additional restrictions, and the regulatory and boundary citations
    - Start and end dates of restrictions
    - Points of contact for the areas

The proposed amendments to S-57 would better accommodate such other uses.

An MEP Product Specification would provide mariners information to avoid property loss and damages associated with inadvertent environmental damages, such as from grounding on coral reefs. Maritime accidents as well as routine ship operations (e.g., discharge and anchoring) can injure coral reefs; can result in habitat damage that harms the tourism industry and communities that depend on coral reefs for their livelihoods. The cost of such damage can be millions of dollars per incident. Between 1984 and 1987 this amounted to $16 million dollars in the United States alone (Annex B).

As management is strengthened and extended over existing and new marine protected areas, governments will characterize habitats and ecological communities. Such information will serve integrated ocean mapping requirements to support multiple national responsibilities for safe and ecologically sound navigation, biodiversity conservation, fisheries management, and coastal management. The mariner will be a critically important user of these products.

Conclusions

A demonstrated requirement for the exchange of MEP data exists and is not being met in any other manner. The amendment of S-57 and its related documents for this purpose is within the scope of IHO and CHRIS, and within the national responsibilities of the IHO's Member States. Such amendments would be well suited to enhance the exchange of MEP data among environmental users, and would provide relevant navigation information to mariners to improve safe and environmentally sound navigation.

Recommendations

The USA (NOAA) recommends that the CHRIS establish a working group to:

- revise and refine the draft, Marine Environmental Protection Product Specification documents at Annex A, with the view to adopt the resulting Specification as an amendment to IHO Special Publication S-57;
- complete the procedures for changing S-57 as provided in the CHRIS document "Principles and Procedures for Making Changes to IHO Technical Standards and Specifications;"
- complete said work within 1 year and report the results back to CHRIS for adoption at CHRIS 20.

Justification and Impacts

Based on the state of the draft Product Specification documents at Annex A, one year of working group time is estimated to be required. The USA (NOAA) assigns a "medium" priority to the task since there is no immediate increased risk of marine or environmental casualties due to the lack of the Product Specification. The TSMAD working group would be an appropriate working group for this task. However, a new, independent working group could equally well complete the task.

Benefits to CHRIS, IHO, and Member States – The proposed amendment of S-57 would provide Member States an international standard for the exchange and use of their environmental data. The standard would serve both scientific/environmental users, and navigation users. Further, it would start the IHO on its new, broader mission adopted in the revised Convention.

Benefits to mariners and other users of the data – Mariners are one of the principal groups affected by MEPs such as marine protected areas and coral reefs. Some may be hazards to navigation. Others have complex regulatory environments that mariners need to know in order to responsibly transit, avoid, or modify their behaviour to help protect those areas, and to avoid fines, delays, or law suits. Availability of MEP data on a mariner's ECDIS would add relevant information for safe and environmentally sound navigation.

Scientists and environmental managers would have, for the first time, an international standard both for the exchange of MEP data among themselves, and for its distribution to, and use by, mariners. Using an amended S-57 would have the additional advantage to environmental managers of providing their data to mariners in a format suitable for use by mariners on navigation systems already in use.

Benefits to other international bodies – The proposed amendment would support IMO's environmental objectives. It would support the World Conservation Union's request for an international exchange standard for MEP data. It would support the World Bank's initiatives related to the Marine Electronic Highway in the Straits of Malacca and Singapore.

Impacts on CHRIS, IHO, and Member States – The adoption process would add work to the CHRIS work program and to the IHB. USA (NOAA) is prepared to contribute experienced personnel to lead and administer an appropriate working group should that be acceptable to members of CHRIS. Voluntary participants from other Member States, competent international authorities, and industry would be sought. Other impacts on member states would be in providing MEP data after the amendment is adopted should they so elect.

Impacts on mariners and other users of the data - Use of the MEP data would be optional. For mariners selecting to take advantage of that data, modest ECDIS software enhancements and training would likely be required. For mariners not selecting to have that

data available, there is no apparent impact. For scientists and environmental managers choosing to use the data, the cost of data, software, and training to use the MEP data would be an impact.

Impacts on S-57, ENCs, ECDIS and type-approval – The proposed Marine Environmental Protection Product Specification would add objects and attributes to S-57, an appendix B.3 Product Specification to S-57, and a Presentation Library. No changes would be made to the ENC Product Specification or existing S-57 objects or attributes. Since ENCs, their objects and attributes, and the ECDIS Performance Standard are unchanged, ECDIS type approval would not be affected. Existing type-approved ECDIS' would not need to be re-approved.

Impacts on manufacturers and ENC distributors – A certain amount of confusion among manufacturers and ENC distributors might be expected as IHO once again changes S-57. That confusion should be small since the proposed amendments do not affect ENCs, ECDIS, or type approval. It can be pre-empted while the standard is being amended. Modifications to ECDIS to use MEP data would be an impact on manufacturers. However, since the use of MEP data is optional, acceptance of the impact would be voluntary by manufacturers.

ENC distributors could choose to distribute MEP data or not at their option. The cell structure of the MEP data is parallel to that of ENCs, but the Product Specification calls for independent cells of MEP data so existing ENC distribution mechanisms should not be affected.

Impacts on other international bodies – None.

Action Required of CHRIS

The CHRIS is invited to agree to the Recommendation stated herein, and initiate the action indicated in that Recommendation.

ANNEX A

Draft Marine Environmental Protection Product Specification,
Object Catalog, Catalog of Attributes, and Presentation Library

Marine Environmental Protection

Product Specification

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Marine Environmental Protection

Product Specifications

This document should be used with Edition 3.1.1 of S-57

Edition 1.0

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Contents

1.   Introduction

1.1   Definitions

Cell   A cell is a geographical area containing Marine Environmental Protection (MEP) data.

MEP Data Layer   Marine Environmental Protection (MEP) data layers consist of supplementary information to be used with an Electronic Chart Display and Information System (ECDIS) that are not Electronic Navigational Chart (ENC) objects or specified navigational elements or parameters. Supplementary means additional, non-mandatory information not already covered by existing International Maritime Organization (IMO), International Hydrographic Organization (IHO), and International Electrotechnical Commission (IEC) standards or specifications.

MEP Product Specification   The set of specifications for Marine Environmental Protection is intended to enable Hydrographic Offices and other data providers to produce a consistent MEP data layer, and manufacturers to use that data efficiently in an ECDIS. An MEP data layer must be produced in accordance with the rules defined in this Specification.

1.2   Contents of the document

The MEP Product Specification contains an application profile for the basic MEP data layer.

1.3   References

The following documents affect the MEP content :

HO S-57,   *"IHO Transfer Standard for Digital Hydrographic Data"*

IHO S-52,   *"Specifications for Chart Content and Display Aspects of ECDIS"*

S-52 App 1,   *"Guidance on Updating the Electronic Navigational Chart"*

S-52 App 2,   "*Colours & Symbols Specifications for ECDIS"*

IMO Resolution A.817(19)   *"Performance Standards for Electronic Chart Display and Information Systems (ECDIS)"*

ANSI/IEEE 802.3   *"IEEE Standards for Local Area Networks, Carrier Sense Multiple Access with Collision Detection (CSMA/CD)Access Method and Physical Layer Specifications"*

2.   General information

2.1   Navigational purpose

MEP data is compiled for a variety of informational purposes. The navigational purpose for which an individual MEP data layer has been compiled is indicated in the "Data Set Identification" [DSID] field, "Intended Usage" [INTU] subfield and in the name of the data set files. The layer is normally compiled as non-scaled vector data. As such, the navigational purpose code is "zero" (0). The following codes may used:

Subfield content	Navigational purpose
0	non-scaled
1	overview
2	general
3	coastal
4	approach
5	harbour
6	berthing
	table 2.1

2.2 Cells

In order to facilitate the efficient processing of MEP data the geographic coverage of a given usage must be split into cells. Each cell of data must be contained in a physically separate, uniquely identified file on the transfer medium, known as a data set file (see clauses 5.4 and 5.6.3).

The geographic extent of the cell must be chosen by the producer to ensure that the resulting data set file contains no more than 5 Megabytes of data. Subject to this consideration, the cell size must not be too small in order to avoid the creation of an excessive number of cells.

Cells must be rectangular (i.e. defined by 2 meridians and 2 parallels).
The coordinates of the borders of the cell are encoded in decimal degrees in the "Catalogue Directory"[CATD] field.

The area within the cell which contains data must be indicated by a meta object M_COVR with CATCOV = 1. Any other area not containing data must be indicated by a meta object M_COVR with CATCOV = 2.

Cells with the same navigational purpose may overlap. However, data within the cells must not overlap. Therefore, in the area of overlap only one cell may contain data, all other cells must have a meta object M_COVR with CATCOV = 2 covering the overlap area. This rule applies even if several producers are involved.

Point or line feature objects which are at the border of two cells with the same navigational purpose must be part of only one cell. They are put in the south or west cell (i.e. north and east borders of the cell are part of the cell, south and west borders are not).

When a feature object exists in several cells its geometry must be split at the cell boundaries and its complete attribute description must be repeated in each cell.

2.3 Topology

MEP data must be encoded using chain-node topology (see S-57 Part 2, clause 2.2.1.2).

3.   Objects and attributes

3.1   Feature object identifiers

Each feature object must have a unique world-wide identifier. This identifier, called the feature object identifier, is formed by the binary concatenation of the contents of the subfields of the "Feature Object Identifier" [FOID] field.

The feature object identifier may be used to identify multiple instances of the same object. For example, the same object may appear in different usages, or an object may be split by the cell structure. In these circumstances each instance of this object may have the same identifier.

Feature object identifiers must not be reused, even when a feature has been deleted.

3.2   Standard object classes and attributes

Object classes, attributes and attribute values which are defined in the MEP Object Catalogue and the IHO Object Catalogue (S-57, Appendix A) may be used in an MEP data layer.

3.3   MEP objects and their geometric primitives

The following is a list additional object classes allowed in an MEP data layer and the geometric primitives allowed for each of them (P = point, L = line, A = area, N = none).

crlref	P	L	A		mpaare	P	L	A		C_ASSO				N		C_AGGR				N
M_COVR			A		M_ACCY			A		M_NPUB	P		A							

Additionally, the object classes and primitives defined in the ENC product specification (S-57 Appendix B.1) and supplement 1 are also allowed.

3.4   Meta objects

The maximum use must be made of meta objects to reduce the attribution on individual objects.
In a base data set (EN Application profile, see clause 6.3), some meta objects are mandatory. Each of these object classes must provide an exhaustive, non-overlapping coverage of the part of the cell containing data. These classes are in the following list:

M_COVR

The meta object M_COVR must also cover any part of the cell that does not contain geographical data.

3.5   Geo and meta object attributes

3.5.1   Missing attribute values

In a base data set, when an attribute code is present but the attribute value is missing, it means that the producer wishes to indicate that this attribute value is unknown.

The missing attribute value is encoded by the means described in S-57 Part 3, clause 2.1.

3.5.2   Mandatory attributes

There are three reasons why an attribute may be considered to be mandatory:
- some attributes are necessary, as they determine whether an object is in the display base,
- some objects make no sense without certain attributes,
- some attributes are necessary to determine which symbol is to be displayed.

The following table gives the attributes which are mandatory for each object class. When an object class is not in the list it means that there are no mandatory attributes for this class.

Object Class	Attributes						
crlref	catref						
mpaare	catuic	confcs	ecoscl	levprt			
M_COVR	CATCOV						

3.5.3 Prohibited attributes

There are no prohibited attributes for MEP objects.

3.5.4 Numeric attribute values

Floating point or integer attribute values must not be padded by non-significant zeroes.
E.g. : For a signal period of 2.5 sec, the value of SIGPER must be 2.5 and not 02.500.

3.5.5 Text attribute values

The lexical level used for the "Feature Record Attribute" [ATTF] field must be 1 (ISO 8859-1). Lexical level 1 or 2 may be used for the "Feature Record National Attribute" [NATF] field. Format effecting (C0) characters as defined in S-57 Part 3, Annex B are prohibited. The delete character is only used in the update mechanism (see S-57 part 3, clause 8.4.2.2.a and 8.4.3.2.a).

3.5.6 Hierarchy of meta data

Not required.

3.6 Cartographic objects

The use of cartographic objects is prohibited.

3.7 Time varying objects

The use of cartographic objects is prohibited.

3.8 Geometry

Edges must be encoded using SG2D fields only. ARCC fields (curves) must not be used.
Despite the saving in data volume offered by the use of arcs/curves, the disadvantages are such (e.g. during updating, generating warnings/alarms) that they must not be used for ENC.
Linear features must not be encoded at a point density greater than 0.3 mm at compilation scale.

The presentation of symbolised lines may be affected by line length. Therefore, the encoder must be aware that splitting a line into numerous small edges may result in poor symbolisation.
In certain circumstances, the symbolisation of an edge may need to be suppressed. This is done using the value {1} in the "Masking Indicator" [MASK] subfield of the "Feature Record to Spatial Record Pointer" [FSPT] field. If the value in the "Usage Indicator" [USAG] subfield is set to {3} (exterior boundary truncated by the data limit), the MASK subfield must be set to {255} (null), in all other cases it must set to {2}.

3.9 Relationships

There are two ways to define relationships between objects :
- nominated master feature record,
- collection objects of classes "aggregation" (C_AGGR), or "association" (C_ASSO).

The use of the Catalogue Cross Reference record is prohibited.
The use of the collection object class C_STAC is prohibited.

All hierarchical relationships (master to slave) must be encoded by using a nominated "master" feature record carrying the pointers to the "slave" objects in the "Relationship Indicator" [RIND] subfield in the "Feature Record to Feature Object Pointer" [FFPT] field with the value {2} = slave.

All association or aggregation relationships using collection objects are assumed to be peer to peer. The "Relationship Indicator" [RIND] subfield of these collection feature records must be {3} = peer.

The use of these relationships is described in Appendix B1, Annex A "Use of the Object Catalogue for ENC".

3.10 Groups

There is one group defined for MEP. This is Group 2 for all geo feature objects.

The group number is indicated in the "Group" [GRUP] subfield of the "Feature Record Identifier" [FRID] field.

3.11 Language and alphabet

3.11.1 Language

The exchange language must be English. Other languages may be used as a supplementary option.
In general this means that, when a national language is used in textual national attributes (NINFOM, NOBJNM,), the English translation must exist in the international attributes (INFORM, OBJNAM,). However, national geographic names do not need to be translated in the international attributes; they may be left in their original national language form or may be transliterated or transcribed.

3.11.2 Use of lexical level 2

If the national language cannot be expressed in lexical levels 0 or 1, the following rules apply:
- the exact spelling in the national language is encoded in the "National Attributes" [NATF] field using lexical level 2.
- Translated text, including transliterated or transcribed national geographic names is encoded in the "International Attributes" [ATTF] field using lexical level 0 or 1.

Whereever possible international standards should be used for the transliteration of non-Latin alphabets.

4. Cartographic framework

4.1 Horizontal datum

The horizontal datum must be WGS 84. Therefore, the "Horizontal Geodetic Datum" [HDAT] subfield in the "Data Set Parameter" [DSPM] field must have the value of {2}.

4.2 Vertical and sounding datum

The various levels which are used on paper charts for elevations and soundings will be used. The default values are encoded in the "Vertical Datum" [VDAT] subfield and the "Sounding Datum" [SDAT] subfield in the "Data Set Parameter" [DSPM] field.

4.3 Projection

No projection is used, therefore the "Data Set Projection" [DSPR] field must not be used. Coordinates must be encoded as geographical positions (latitude, longitude).

4.4 Units

Units to be used in an MEP are:
- Position: latitude and longitude in decimal degrees (converted into integer values, see below).
- Depth: metres.
- Height: metres.
- Positional accuracy: metres.
- Distance: nautical miles and decimal miles, or metres as defined in the IHO Object Catalogue (see S-57, Appendix A).

The default values for depth units, height units and positional accuracy units are encoded in the "Units of Depth Measurement" [DUNI], "Units of Height Measurement" [HUNI] and "Units of Positional Accuracy" [PUNI] subfields in the "Data Set Parameter" [DSPM] field.

Latitude and longitude values are converted from decimal degrees to integers by means of the "Coordinate Multiplication Factor" [COMF] subfield value in the"Data Set Parameter" [DSPM] field. The integer values are encoded in the "Coordinate in Y-axis" [YCOO] subfield and the "Coordinate in X-axis" [XCOO] subfield. The number of decimal digits is chosen by the data producer and is valid through out the data set.
E.g.: If the producer chooses a resolution of $0.0000001°$ (10^{-7}), then the value of COMF is 10 000 000 (10^7).
A longitude = 34.5678° is converted into XCOO = longitude * COMF = 34.5678*10 000 000 = 345678000.
The integer value of the converted coordinate is encoded in binary form.

Depths are converted from decimal meters to integers by means of the "3-D (Sounding) Multiplication Factor" [SOMF] subfield value in the"Data Set Parameter" [DSPM] field. The integer values are encoded in the "3-D (Sounding) Value" [VE3D] subfield. Soundings are never encoded with a resolution greater than one decimeter, so the value of SOMF must be 10 encoded in binary form.

5. Provision of data

5.1 Implementation

The binary implementation of S-57 must be used for MEP data layers. Therefore, the "Implementation" [IMPL] subfield of the "Catalogue Directory" [CATD] field must be set to"BIN" for the data set files.

5.2 Compression

The use of compression algorithms is prohibited.

5.3 Security scheme

Similar to ENCs, a security scheme may be used (e.g., IHO S-63). However, it is not mandatory.

5.4 Exchange set

5.4.1 Content of the exchange set

The records defined in the main part of this standard are grouped in two file types: catalogue and data set files.

An exchange set is composed of one and only one catalogue file and at least one data set file.

Text and picture files may also be included in the MEP exchange set. These files may be included in an exchange set by a data producer to provide additional information such as that normally contained in sailing directions or coastal pilots. These files must be in ASCII text format or TIF format. Files in other formats (including application files which may be used to manipulate text or picture files) may be included in an exchange set by private agreement between the producer and the receiver.

An exchange set may also contain a README file.

```
Exchange set
      |
      |--<1>--   README file
      |
      |--<1>--   Catalogue file
      |
      |--<R>--   Data set file
      |
      |--<R>--   Text file
      |
      |--<R>--   Picture file
```

The README file is an optional ASCII file of general information.

The catalogue file acts as the table of contents for the exchange set.

Each data set file contains data for one cell (see clause 2.2). This includes:
- data set descriptive information that is specific to the data set,
- the description and location of the real-world entities.

Text and picture files do not conform to ISO/IEC 8211 and are not described in the main body of S-57. These files are specific to this Product Specification.

5.4.2   Volume naming

An exchange set may be split across several media volumes, therefore, each media volume must be uniquely identified within the exchange set. A file must not be split across volumes. Individual volumes must conform to the following naming convention:

   VSSXNN

where:

V	is the mandatory first character.
SS	is the sequence number of the specific volume within the exchange set.
X	is the mandatory separator character.
NN	is the total number of media volumes within the exchange set.

For example, volume one of a three volume exchange set would be named V01X03.

5.4.3   Directory structure

The following directory structure is mandatory.
On each volume within an exchange set there must be a root directory called MEP_ROOT. The catalogue file for the exchange set must be in the MEP_ROOT directory of the first volume of the exchange set. The MEP_ROOT directory of the first volume may also contain a README file, containing ASCII text. Further directories and sub-directories may be defined under the root directory on any volume in the exchange set. The following example shows an example directory structure for a MS-DOS volume:

Volume in drive A is V01X02
Directory of A:\MEP_ROOT

.	<DIR>		09-15-96 12:40p .
..	<DIR>		09-15-96 12:40p ..
CATALOG.031		1,584	09-15-96 12:46p CATALOG.031
US0FL001.000		45,584	09-15-96 12:50p US0FL001.000
README.TXT		504	09-15-96 12:44p README.TXT
3 file(s)		49,489 bytes	
2 dir(s)		1,405,952 bytes free	

For each file in the exchange set the catalogue file must contain the name of the volume on which it is held and the full path name relative to the root directory of that volume. The full path name relative to the root directory must be encoded in the FILE subfield of the "Catalogue Directory" [CATD] field. The LFIL subfield of the CATD field may be used for other purposes. The full path name of the US0FL001.000 file shown in the example is US0FL001.000.

In the interests of efficient processing, it is recommended that a sub-directory contains no more than sixty-four files.

5.5   Data sets

Two kinds of data sets may be produced:
- new data set : no MEP data has previously been produced for this area and for the same navigational purpose.
- new edition of a data set : including new information which has not been previously distributed by updates.

Each new data set, or new edition is called a base cell file.

5.6   File naming

5.6.1   README file

README.TXT is the mandatory name for this file.

5.6.2   Catalogue file

The catalogue file of the exchange set must be named CATALOG.EEE.
Where EEE is the edition number of S-57 used for this exchange set, i.e. 031 for this edition (3.1).
No other file may be named CATALOG.

5.6.3   Data set files

MEP data set files are named according to the specifications given below:

```
CCPXXXXX.EEE
||||
||||----- EEE = update number
|||-------------- XXXXX = individual cell code
||------------------- P = navigational purpose
|----------------------- CC = producer code
```

The main part forms an eight character identifier where:
- the first two characters identify the producer. This list is given in Annex A to Appendix A (IHO ObjectCatalogue).
- the third character indicates the navigational purpose (see clause 2.1).

- the fourth to eighth characters are used for the cell code. This code can be used in any way by the producer to provide the unique file name. If characters other than numbers are used only uppercase letters are allowed.

In order to conform with ISO 9660 level 1 file names must be composed of only upper case characters A to Z, digits 0 to 9 and _ (underscore). The filename must be 8 characters long with an extension of 3 characters. The separator must be the character (period). Directory names may be up to 8 characters long.

5.6.4   Text and picture files

The text and picture files must be named according to the specifications given below:

```
CCXXXXXX.EEE
  |   |       |
  |   |       |------- EEE     = usual extension code (.TIF and .TXT)
  |   |------------------- XXXXX = individual file code
  |----------------------- CC       = producer code
```

The main part forms an eight character identifier where:
- the first two characters identify the producer. This list is given in Annex A of the IHO Object Catalogue (S-57, Appendix A).
- the third to eighth characters can be used in any way by the producer to provide the unique file name. If characters other than numbers are used only uppercase letters are allowed.
- The extension is used to identify the type of the file. It must be the usual extension for these types of files, i.e. TXT for ASCII files and .TIF for picture files. These three characters are also indicated in the "Implementation" [IMPL] subfield of the "Catalogue Directory" [CATD] field.

Files in other formats, provided through private agreements, should follow the same general naming convention and use the appropriate file extension to indicate their format.

5.7 New Editions

Only new data sets and new editions are allowed.
 In order to ensure that editions are incorporated into the SENC in the correct sequence without any omission, the file extension and a number of subfields in the "Data Set Identification" [DSID] field are used in the following way:

file extension   every new data set, re-issue or new edition must have a "000" extension.

edition number   when a data set is initially created, the edition number 1 is assigned to it. The edition number is increased by 1 at each new edition. Edition number remains the same for a re-issue.

issue date   date on which the data was made available by the data producer.

Each re-issue or new edition of a data set must have the same name as the base cell file which it replaces.

5.8   Media

MEP data layers can be provided on any standard type storage media (e.g., CD-ROM), or can be provided via Internet or telecommunication links (e.g., AIS).

5.9   Error detection

File integrity checks are based on the CRC-32 algorithm (a 32 bit Cyclic Redundancy Check algorithm) as defined in ANSI/IEEE Standard 802.3, the reference for which is given in clause 1.3.

5.9.1   Implementation

The checksums for each data set are held in the "CRC" [CRCS] subfield of the "Catalogue Directory" [CATD] field. They allow the integrity of each file in the exchange set to be checked on receipt. The CRC value computed on the received file must the same as the CRC value transmitted.

The CRC values are recorded in ASCII as a hexadecimal number least significant byte first.

5.9.2 Processing

Encoding is defined by the following generating polynomial:

$$G(x) = x^{32} + x^{26} + x^{23} + x^{22} + x^{16} + x^{12} + x^{11} + x^{10} + x^8 + x^7 + x^5 + x^4 + x^2 + x + 1$$

Processing is applied to relevant files as they appear in the exchange set.

The CRC value of the file is defined by the following process :

1. The first 32 bits of the data are complemented.
2. The n bits of the data are then considered to be the coefficients of a polynomial M(x) of degree n-1.
3. M(x) is multiplied by x^{32} and divided by G(x), producing a remainder R(x) of degree <31.
4. The coefficients of R(x) are considered to be a 32-bit sequence.
5. The bit sequence is complemented and the result is the CRC.

The hexadecimal format of CRCs are converted to ASCII characters and stored in the "Catalogue Directory" [CATD] field.

An example of coding in C language is given in Annex B.

6.   Application profiles

6.1   General

The application profiles define the structure and content of the catalogue file and data set file in an exchange set.

6.1.1   Catalogue and data set files

These files are composed of the records and fields defined in the following tree structure diagrams (see clauses 6.2.1, 6.3.1 and 6.4.1).

The order of data in each base or update cell file is described below :

```
Data set file
    Data set general information record
    Data set geographic reference record (for EN application profile)
    Vector records
        Isolated nodes (SG2D)
        Connected nodes
        Edges
    Feature records
        Meta features
        Geo features (ordered from slave to master)
        Collection features
```

This order of records will enable the import software to check that the child record exists each time the parent record references it (i.e. it will already have read the child record so it will know if it exists or not).

6.1.2 Records

Records and fields that do not appear in the following tree structure diagrams are prohibited. The order of records in the files must be the same as that described in these tree structure diagrams.

The combination of the file name and the "Name" of the record must provide a unique world-wide identifier of the record.

6.1.3 Fields

For base cell files, some fields may be repeated (indicated by <R>) and all of their content may be repeated (indicated by *). In order to reduce the volume of data, the encoder should repeat the sequence of subfields, in preference to creating several fields.

6.1.4 Subfields

Mandatory subfields must be filled by a non-null value.

Prohibited subfields must be encoded as missing subfields values (see S-57 Part 3, clause 2.1).

The exact meaning of missing attribute values is defined in clause 3.5.1.

In the tables following the tree structure diagrams, mandatory subfields are shown by "M" in the "use" column and prohibited subfields by "P" in the same column. If there is nothing in this column, it means that the use of this subfield is optional. When a subfield value is prescribed, it is indicated in the "value" column. The "comment" column contains general comments and an indication of whether the subfield is ASCII or binary coded.

6.2 Catalogue file

The catalogue structure is for EN application profile.

6.2.1 Catalogue file structure

```
Catalogue file
   |
   |--<R>-Catalogue Directory record
          |
          |--0001-- ISO/IEC 8211 Record identifier
                 |
                 |--<1>-- CATD - Catalogue directory field
```
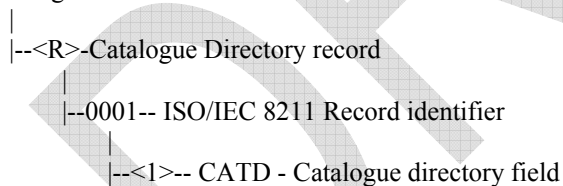
6.2.2 Catalogue Directory field - CATD

NB : All subfield values are encoded as ASCII.

Tag	subfield name	use	value	comment
RCNM	Record name	M	CD	
RCID	Record identification number	M		
FILE	File name	M		full path from MEP_ROOT directory
LFIL	File long name			
VOLM	Volume	M		name of volume on which file appears

IMPL	Implementation	M	ASC BIN TXT TIF ...	for the catalogue file for the data set files for ASCII text files (including the README.TXT file) for picture files or any other usual file extension for file provided through private agreements (see clause 5.6.4)
SLAT	Southernmost latitude			mandatory for data set files
WLON	Westernmost longitude			mandatory for data set files
NLAT	Northernmost latitude			mandatory for data set files
ELON	Easternmost longitude			mandatory for data set files
CRCS	CRC	M		except for README and catalogue files
COMT	Comment			

table 6.1

6.3   EN application profile

The EN application profile applies to any base cell file (i.e. new data set and new edition of a data set).

6.3.1   Base cell file structure

```
Base cell file
   |
   |--<1>---Data Set General Information record
   |     |
   |     |--0001 - ISO/IEC 8211 Record Identifier
   |     |       |
   |     |       |--<1>-- DSID - Data Set Identification field
   |     |               |
   |     |               |--<1>--DSSI      - Data Set Structure Information field
   |
   |--<1>---Data Set Geographic Reference record
   |     |
   |     |--0001 - ISO/IEC 8211 Record Identifier
   |     |       |
   |     |       |--<1>--DSPM - Data Set Parameter field
   |
   |--<R>--Vector record
   |     |
   |     |--0001 - ISO/IEC 8211 Record Identifier
   |     |       |
   |     |       |--<1>--VRID - Vector Record Identifier field
   |     |               |
   |     |               |--<R>--ATTV*  - Vector Record Attribute field
   |     |               |
   |     |               |--<R>--VRPT*  - Vector Record Pointer field
   |     |               |
   |     |               |-------  |--<R>--SG2D*   - 2-D Coordinate field
   |
   |
   |--<R>--Feature record
        |
        |--0001 - ISO/IEC 8211 Record Identifier
        |       |
        |       |--<1>--FRID - Feature Record Identifier field
        |               |
        |               |--<1>--FOID     - Feature Object Identifier field
        |               |
        |               |--<R>--ATTF*   - Feature Record Attribute field
        |               |
        |               |--<R>--NATF*   - Feature Record National Attribute field
        |               |
        |               |--<R>--FFPT*   - Feature Record to Feature Object Pointer field
        |               |
        |               |--<R>--FSPT*   - Feature Record to Spatial Record Pointer field
```

6.3.2 Field content (EN)

6.3.2.1 Data Set Identification field - DSID

NB : Subfield values are encoded as ASCII or binary as indicated.

Tag	subfield name	use	value	comment
RCNM	Record name	M	{10}	= DS, binary
RCID	Record identification number	M		binary
EXPP	Exchange purpose	M	{1}	data set is new, binary
INTU	Intended usage	M	{0} to {6}	navigational purpose, see clause 2.1, binary
DSNM	Data set name	M		file name with extension excluding path, ASCII
EDTN	Edition number	M		see clause 5.7, ASCII
ISDT	Issue date	M		ASCII
STED	Edition number of S-57	M	03.1	ASCII
PRSP	Product specification	M	{60}	= MEP, binary
PSDN	Product specification description	P		empty, ASCII
PRED	Product specification edition number	M	1.0	ASCII
PROF	Application profile identification	M	{1}	= EN, binary
AGEN	Producing agency	M		binary
COMT	Comment			ASCII

table 6.2

6.3.2.2 Data Set Structure Information field - DSSI

NB : All subfield values are encoded as binary.

Tag	subfield name	use	value	comment
DSTR	Data structure	M	{2}	= chain node
AALL	ATTF lexical level	M	{0} or {1}	
NALL	NATF lexical level	M	{0}, {1} or {2}	
NOMR	Number of meta records	M		
NOCR	Number of cartographic records	M	{0}	cartographic records are not permitted
NOGR	Number of geo record	M		
NOLR	Number of collection records	M		
NOIN	Number of isolated node records	M		
NOCN	Number of connected node records	M		
NOED	Number of edge records	M		
NOFA	Number of face records	M	{0}	faces are not permitted in chain node structure

table 6.3

6.3.2.3   Data Set Parameter field - DSPM

NB : Subfield values are encoded as ASCII or binary as indicated.

Tag	subfield name	use	value	comment
RCNM	Record name	M	{20}	= DP, binary
RCID	Record identification number	M		binary
HDAT	Horizontal geodetic datum	M	{2}	= WGS 84, binary
VDAT	Vertical datum	M		binary
SDAT	Sounding datum	M		binary
CSCL	Compilation scale of data	M		binary
DUNI	Units of depth measurement	M	{1}	=metres, binary
HUNI	Units of height measurement	M	{1}	=metres, binary
PUNI	Units of positional accuracy	M	{1}	=metres, binary

COUN	Coordinate units	M	{1}	= lat/long, binary
COMF	Coordinate multiplication factor	M		binary, see clause 4.4
SOMF	3-D (sounding) multiplication factor	M	{10}	binary, see clause 4.4
COMT	Comment			ASCII

table 6.4

6.3.2.4   Vector Record Identifier field - VRID

NB: All subfield values are encoded as binary.

Tag	subfield name	use	value	comment
RCNM	Record name	M	{110} or {120} or {130}	= VI, isolated node = VC, connected node = VE, edge
RCID	Record identification number	M		
RVER	Record version	M		
RUIN	Record update instruction	M	{1}	= insert

table 6.5

6.3.2.5   Vector Record Attribute field - ATTV

NB : Subfield values are encoded as ASCII or binary as indicated.

Tag	subfield name	use	value	comment
ATTL	Attribute label/code	M		binary code for an attribute
ATVL	Attribute value	M		ASCII value. Missing attribute value = attribute is relevant but value is unknown.

table 6.6

6.3.2.6   Vector Record Pointer field - VRPT

NB : All subfield values are encoded as binary.

Tag	subfield name	use	value	comment
NAME	Name	M		
ORNT	Orientation	M	{255}	= null
USAG	Usage indicator	M	{255}	= null
TOPI	Topology indicator	M	{1} or {2}	= beginning node = end node
MASK	Masking indicator	M	{255}	= null

table 6.7

6.3.2.7 2-D Coordinate field - SG2D

NB : All subfield values are encoded as binary.

Tag	subfield name	use	value	comment
YCOO	Coordinate in Y axis	M		latitude (see clause 4.4)
XCOO	Coordinate in X axis	M		longitude (see clause 4.4)

table 6.8

6.3.2.9 Feature Record Identifier field - FRID

NB : All subfield values are encoded as binary.

Tag	subfield name	use	value	comment
RCNM	Record name	M	{100}	= FE
RCID	Record identification number	M		
PRIM	Object geometric primitive	M	{1} or {2} or {3} or {255}	= point = line = area = no geometry
GRUP	Group	M	{1} or {2}	Group 1, see clause 3.10.1 Group 2, see clause 3.10.2
OBJL	Object label	M		binary code for an object class
RVER	Record version	M		
RUIN	Record update instruction	M	{1}	= insert

table 6.10

6.3.2.10 Feature Object Identifier field - FOID

NB : All subfield values are encoded as binary.

Tag	subfield name	use	value	comment
AGEN	Producing agency	M		
FIND	Feature identification number	M		
FIDS	Feature identification subdivision	M		

table 6.11

6.3.2.11   Feature Record Attribute field - ATTF

NB : Subfield values are encoded as ASCII or binary as indicated.

Tag	subfield name	use	value	comment
ATTL	Attribute label/code	M		binary code for an attribute
ATVL	Attribute value			ASCII value. Missing attribute value = attribute is relevant but value is unknown.

table 6.12

6.3.2.12   Feature Record National Attribute field - NATF

NB : Subfield values are encoded as ASCII or binary as indicated.

Tag	subfield name	use	value	comment
ATTL	Attribute label/code	M		binary code for an attribute
ATVL	Attribute value			ASCII value. Missing attribute value = attribute is relevant but value is unknown

table 6.13

6.3.2.13   Feature Record to Feature Object Pointer field - FFPT

NB : Subfield values are encoded as ASCII or binary as indicated.

Tag	subfield name	use	value	comment
LNAM	Long name	M		binary
RIND	Relationship indicator	M	{2} or {3}	= slave, binary = peer, binary
COMT	Comment			ASCII

table 6.14

6.3.2.14   Feature Record to Spatial Record Pointer field - FSPT

NB : All subfield values are encoded as binary.

Tag	subfield name	use	value	comment
NAME	Name	M		
ORNT	Orientation	M	{1} or {2} or {255}	= forward = reverse = null
USAG	Usage indicator	M	{1} or {2} or {3} or {255}	= exterior = interior =exterior boundary, truncated by the data limit = null
MASK	Masking indicator	M	{1} or {2} or {255}	= mask = show = null

table 6.15

Marine Environmental Protection
Object Catalogue

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Introduction

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Introduction

The Object Catalogue for Marine Environmental Protection is intended to be used in conjunction with the Object and Attribute Catalogue from S-57. Its primary function is to provide a means of describing real world entities used in Marine Environmental Protection (MEP) data layers. That is entities which actually exist (either physically such as a coral reef or legally such as an Marine Protected Area) in the real world. The Object Catalogue is based on the theoretical model described in Part 2 of S-57. The model assumes that real world entities can be categorized into a finite number of types, such as lights, wrecks, built up areas etc. These entity types are termed feature object classes in the Object Catalogue. An instance of a feature object class, referred to as a feature object, (that is one specific light or wreck or built up area) can be more precisely described by assigning to it a number of attributes and then specifying values for those attributes. A particular real world entity is encoded by specifying the appropriate feature object class, attributes and attribute values.
The data model defines four types of feature object:

Geo   containing the descriptive characteristics of a real world entity.

Meta   containing information about other objects (eg. compilation scale, vertical datum).

Collection   containing information about the relationships between other objects.

Chapter 1 contains a description of each feature object class. This includes a definition of the class and a list of the attributes that are allowed for that class. Instructions on how to interpret the information associated with each feature object class are given in the introduction to Chapter 1.

The Object Catalogue does not mandate the use of any attributes. However, for each instance of a feature object, a particular attribute may only be used once. In general terms it is up to the encoder to select from the appropriate list the attributes that are relevant to a particular object instance. However, for some applications, certain attributes may be designated as mandatory for specific object classes. These attributes will be listed in the appropriate product specification (MEP product specification).

A description of each attribute is contained in Chapter 2. This includes a definition of the attribute and, where appropriate, a list of allowable values, also with definitions. Instructions on how to interpret the information associated with each attribute are given in the introduction to Chapter 2.

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1.1 Introduction

Each object class is specified in a standardized way, under the following headings:

- Object Class: object class name

- Acronym: six-character code for the object class

- Code: integer code to be used in the coding of data

- For each object class the set of relevant attributes is defined. This set is divided into three subsets:

    * subset "Attribute_A":   Attributes in this subset define the individual characteristics of an object;

    * subset "Attribute_B":   Attributes in this subset provide information relevant to the use of the data, e.g. for presentation or for an information system;

    * subset "Attribute_C":   Attributes in this subset provide administrative information about the object and the data describing it;

    Each subset shows a list of ASCII attribute acronyms. For the description of each attribute see Chapter 2.

- Definition: Where possible each object class is defined and the source of the definition is quoted.

- References:

    * INT 1:   reference to the number of the paper chart feature in the "International Chart Series INT 1 - Symbols, Abbreviations, Terms used on Charts". INT 1 was one of the major guidelines for the definition of object classes.

    * M-4:   reference to the paragraph number in the "Chart Specifications of the IHO", publication M-4. This was another guideline used in the definition and description of object classes.

- Remarks: Under "Remarks" further comments and notes are given. Related but separate object classes are listed under the heading "Distinction".

1.2 Geo Object Classes

GEO OBJECT CLASSES

Object Class:	**Coral Reef**

Acronym: **crlref**   Code: 30500

Set Attribute_A: catref; crlzne, geostr, COLOUR, NATSUR, NATQUA; NOBJNM; OBJNAM

Set Attribute_B: INFORM; NINFOM; NTXTDS; PICREP; SCAMAX; SCAMIN; TXTDSC;

Set Attribute_C: RECDAT; RECIND; SORDAT; SORIND;

Definition:

reef (general**)** - A mass of rock or coral which either reaches close to the sea surface or is exposed at low tide, posing a hazard to navigation. (IHO Dictionary, S-32, 5th Edition)

Coral reef - A reef, often of large extent, composed chiefly of coral and its derivatives.   (IHO Dictionary, S-32, 5th Edition)

References:

   INT 1:

   M-4:

Remarks:

   Distinction:

GEO OBJECT CLASSES

bject Class:	**Marine Protected Area**

Acronym: **mpaare**   Code: 30501

Set Attribute_A: bndcit; catiuc; confcs; consty; contct; DATEND; DATSTA; ecoscl; levprt; lglmnd; manage; NOBJNM; OBJNAM; PEREND; perman; PERSTA; purpos; regcit; RESTRN; STATUS; websit

Set Attribute_B: INFORM; NINFOM; NTXTDS; PICREP; SCAMAX; SCAMIN; TXTDSC;

Set Attribute_C: RECDAT; RECIND; SORDAT; SORIND;

Definition:

Marine Protected Area - Any area of the intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which as been reserved by law or other effective means to protect part or all of the enclosed environment. (IUCN – The World Conservation Union. 1998. Resolution 17.38 of the 17th General Assembly of the IUCN. Gland, Switzerland and Cambridge, UK.)

  INT 1:

  M-4:

Remarks:

  Distinction: caution area; marine farm/culture; military practice area; restricted area

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1.3 Meta Object Class

META OBJECT CLASSES

Object Class: **Accuracy of data**

Acronym: **M_ACCY**   Code: **300**

Set Attribute_A: HORACC; POSACC; SOUACC; VERACC;

Set Attribute_B: INFORM; NINFOM; NTXTDS; TXTDSC;

Set Attribute_C: RECDAT; RECIND; SORDAT; SORIND;

Definition:

An area within which the best estimate of the overall accuracy of the data is uniform. The overall accuracy takes into account for example the source accuracy, chart scale, digitising accuracy etc.

References:

INT 1:   not specified;

M-4:   not specified;

Remarks:

Distinction: quality of data; survey reliability;

META OBJECT CLASSES

Object Class:	**Coverage**

Acronym: **M_COVR**   Code: **302**

Set Attribute_A: CATCOV;

Set Attribute_B: INFORM; NINFOM;

Set Attribute_C: RECDAT; RECIND; SORDAT; SORIND;

Definition:

   A geographical area that describes the coverage and extent of spatial objects.

References:

   INT 1:   not specified;

   M-4:   not specified;

Remarks:

   This object class is intended to support an indication of coverage.

META OBJECT CLASSES

Object Class:	**Nautical publication information**

Acronym: **M_NPUB**   Code: **305**

Set Attribute_A:

Set Attribute_B: INFORM; NINFOM; NTXTDS; PICREP; PUBREF; TXTDSC;

Set Attribute_C: RECDAT; RECIND; SORDAT; SORIND;

Definition:

   Used to relate additional nautical information or publications to the data.

References:

   INT 1:   not specified

   M-4:   not specified

Remarks:

   For example, geographic areas may be defined that relate to sections in Sailing Directions
   (Coast Pilots).

1.4 Collection Object Classes

COLLECTION OBJECT CLASSES

Object Class:	**Aggregation**

Acronym: **C_AGGR**   Code: **400**

Set Attribute_A: NOBJNM; OBJNAM;

Set Attribute_B: INFORM; NINFOM; NTXTDS; PICREP; SCAMAX; SCAMIN; TXTDSC;

Set Attribute_C: RECDAT; RECIND; SORDAT; SORIND;

Definition:

    Used to identify an aggregation of two or more objects. This aggregation may be named.

Remarks:

    An aggregation could be used to combine objects that are related in some way (is-a-part-of, is-a-component-of) into a higher level object.

    For example: an aggregation relationship may be used to form a traffic separation scheme from traffic separation lane parts, boundaries, etc.

    Distinction :   association; stacked on/stacked under;

COLLECTION OBJECT CLASSES

Object Class: **Association**

Acronym: **C_ASSO**   Code: **401**

 Set Attribute_A: NOBJNM; OBJNAM;

Set Attribute_B: INFORM; NINFOM; NTXTDS; PICREP; SCAMAX; SCAMIN; TXTDSC;

Set Attribute_C: RECDAT; RECIND; SORDAT; SORIND;

Definition:

   Used to identify an association between two or more objects. The association may be named.

Remarks:

   For example: an association relationship may be used to indicate that a buoy marks a wreck.

   Distinction :   aggregation; stacked on/stacked under;

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CONTENTS

2.1   Introduction

Each attribute is specified in a standardized way, under the following headings:

- Attribute: Attribute name.

- Acronym: six character code for the Attribute.

- Code: integer code to be used in the coding of data.

- Attribute type: one character code for the Attribute type (see below)

    Each Attribute is assigned to one of six types:

    * enumerated ('E'):   The expected input is a number selected from a list of pre-defined attribute values. Exactly one value must be chosen. The abbreviation for this type is 'E'.

    * list ('L'):   The expected input is a list of one or more numbers selected from a list of pre-defined attribute values. Where more than one value is used, they must normally be separated by commas but in special cases slashes ("/") may be used. The abbreviation for this type is 'L'.

    Note: In some cases, dependency exists between different attributes of a given object e.g. a bridge (BRIDGE) may have the values "concreted" and "iron/steel" for the attribute NATCON (Nature of Construction) and the values "red" and "green" for the attribute COLOUR. Even if it is known that the concreted part of the bridge is red and the iron/steel part is green, the Object Catalogue provides no means of indicating this relationship. However, such relationships may be formalized for a given application in which case the relationship must be described in the appropriate Product Specification (see S-57 Appendix B).

    * float ('F'):   The expected input is a floating point numeric value with defined range, resolution, units and format. The abbreviation for this type is 'F'.

    * integer ('I'):   The expected input is an integer numeric value with defined range, units and format. The abbreviation for this type is 'I'.

    * coded string ('A'):   The expected input is a string of ASCII characters in a predefined format. The information is encoded according to defined coding systems e.g.: the nationality will be encoded by a two character field specified by ISO 3166 'Codes for the Representation of Names of Countries', e.g. Canada => 'CA' (refer to S-57 Appendix A Annex A). The abbreviation for this type is 'A'.

    * free text ('S'):   The expected input is a free-format alphanumeric string. It may be a file name which points to a text or graphic file. The abbreviation for this type is 'S'.

- Expected input:

    Depending on the attribute type, the expected input is defined in the following ways:

    For 'E' and 'L' type attributes a list of ID-numbers with associated, defined, meanings is given. Where an attribute value which appeared in a previous edition of the Standard is no longer used, it is retained in the list but is struck-through.
    For 'A', 'F', 'I' and 'S-type attributes the expected input is indicated in accordance with the type (see above).

In certain circumstances, it may be necessary to indicate to the recipient of a data set that the value of a certain attribute for an instance of an object class is unknown. This fact is encoded by a zero length attribute value sub-field, e.g. COLOUR , (where , is the subfield delimiter). This applies to all attribute types (see S-57 Part 3 clause 2.1).

- Definitions: a definition of the Attribute, or in the case of 'E' or 'L' type Attributes, a definition of each value of an Attribute.

- References:

    * INT 1: Reference to the system of numbering for the paper chart feature as used in the "International Chart Series INT 1 - Symbols, Abbreviations, Terms used on Charts". INT 1 was one of the major guidelines for the definition of attributes.

    * M-4: Reference to the paragraph number in the "Chart Specifications of the IHO", M-4. This was another guideline for the definition and description of the attributes.

- Minimum Value: The minimum value for the expected input is indicated for floating point and integer attributes.

- Maximum Value: The maximum value for the expected input is indicated for floating point and integer attributes.

- Remarks: Under "Remarks", further comments and notes may be given.

Depending on the type of attribute, the following information is provided:

- Indication: For coded string type attributes (S) it indicates the construction of the string.

    For integer (I) and floating point (F) type attributes it indicates the units and resolution of the input.

- Format: The 'Format' statement indicates the recommended standard input template. Attributes that are identified as requiring a mandatory format, are indicated by the term **(mandatory)**. For other attributes, the format can be either implied by the domain of valid attribute values or will be variable in length depending on the attribute and its data type.

- Example: an example of coded input.

There are five National Language Attributes which are defined in Section 2.3. These are all string type attributes intended to hold text in a national language.

There are three Attributes that are defined as attributes of spatial objects. For further information see Section 2.4.

2.2 Feature Object Attribute

FEATURE OBJECT ATTRIBUTES

Attribute: **Biologic Cover Density**

Acronym: **densty**   **code: 30508**

Attribute type: L

Expected input:

ID   Meaning

1 :   Sparse 10% > 50%
2 :   Patchy 50% > 90%
3 :   Continuous 90% - 100%
17 :   Emergent Vegetation
18 :   Uncolonized
19 :   Unclassified

Sparse: 10% > 50% coverage

Patchy: 50% > 90% coverage

Continuous: 90% - 100% coverage

Uncolonized: Substrates not covered with a minimum of 10% of any of the above biological cover
                 types. This habitat is usually on sand or mud structures.

Unclassified:

Attribute: **Boundary Citation**

Acronym: **bndcit**   Code: **30501**

Attribute type: S

Definition:

    Textual information about boundaries.

Example:

    California Fish and Game Code § 10711.

References:

Remarks:

    This attribute should be used to hold information about area boundary sources.

    No formatting of text is possible within bndcit. If formatted text is required, then the attribute TXTDSC must be used.

FEATURE OBJECT ATTRIBUTES

Attribute: **Category of IUCN Protected Area**

Acronym: **catiuc**   Code: **30502**

Attribute type: L

Expected input:

ID	Meaning		INT 1	M-4
1 :	Ia Strict Nature Reserve			
2 :	Ib Wilderness Area			
3 :	II National Park			
4 :	III Natural Monument			
5 :	IV Habitat/Species Management Area			
6 :	V Protected Landscape/Seascape			
7 :	VI Managed Resource Protected Area			

Definitions:

Ia Strict Nature Reserve - Area of land and/or sea possessing some outstanding or representative ecosystems, geological or physiological features and/or species, available primarily for scientific research and/or environmental monitoring.

Ib Wilderness Area - Large area of unmodified or slightly modified land, and/or sea retaining its natural character and influence, without permanent or significant habitation, which is protected and managed so as to preserve its natural condition.

II National Park - Natural area of land and/or sea, designated to (a) protect the ecological integrity of one or more ecosystems for present and future generations, (b) exclude exploitation or occupation inimical to the purposes of designation of the area and (c) provide a foundation for spiritual, scientific, educational, recreational and visitor opportunities, all of which must be environmentally and culturally compatible.   .

III Natural Monument - Area containing one, or more, specific natural or natural/cultural feature which is of outstanding or unique value because of its inherent rarity, representative or aesthetic qualities or cultural significance.

IV Habitat/Species Management Area - Area of land and/or sea subject to active intervention for management purposes so as to ensure the maintenance of habitats and/or to meet the requirements of specific species.

V Protected Landscape/Seascape - Area of land, with coast and sea as appropriate, where the interaction of people and nature over time has produced an area of distinct character with significant aesthetic, ecological and/or cultural value, and often with high biological diversity. Safeguarding the integrity of this traditional interaction is vital to the protection, maintenance and evolution of such an area.

VI Managed Resource Protected Area - Area containing predominantly unmodified natural systems, managed to ensure long-term protection and maintenance of biological diversity, while

providing at the same time a sustainable flow of natural products and services to meet community needs.

(International Union for Conservation of Nature and Natural Resources publication "Guidelines for Protected Area Management Categories", IUCN, 1994)

FEATURE OBJECT ATTRIBUTES

Attribute: **Category of Reef**

Acronym: **catref**   Code: **30503**

Attribute type: E

Expected input:

  ID :   Meaning

  1 :   fringing reef
  2 :   barrier reef
  3 :   reticulated reef:
  4 :   patch reef
  5 :   uplifted reef
  6 :   lagoon
  7 :   atoll
  8 :   coral head

Definitions:

fringing reef   A reef closely attached to a shore, as contrasted with a barrier reef which is
                          separated from the shore by a lagoon. (IHO Dictionary, S-32, 5th Edition,
                          1995)

barrier reef   A coral reef fronting the shore, at some distance from it, and separated from
                          it by a lagoon or a navigable channel of moderate depth. (IHO Dictionary, S-
                          32, 5th Edition, 1995)

reticulated reef   Area on a bank or within an atoll lagoon containing complex reef habitat with
                          a network of sand channels, holes and other habitat types. Barrier reef and
                          lagoon zone may or may not be present. (A Classification Scheme for
                          Mapping the Shallow-water Coral Ecosystems of Southern Florida. Version 2,
                          13 July 2007 NOAA)

patch reef   Coral formations that are isolated from other coral reef formations by sand,
                          seagrass, or other habitats and that have no organized structural axis relative
                          to the contours of the shore or shelf edge. (IHO Dictionary, S-32, 5th Edition,
                          1995)

uplifted reef   A coral reef exposed above water level. (IHO Dictionary, S-32, 5th Edition,
                          1995)

lagoon -   An enclosed area of salt or brackish water separated from the open by some
                          more or less effective, but not complete, obstacle such as low sand bank.
                          The name most commonly used for the area of water enclosed by a barrier or
                          atoll. (IHO Dictionary, S-32, 5th Edition, 1995)

atoll -   A coral island consisting of a ring-shaped reef nearly or entirely surrounding a central lagoon. (IHO Dictionary, S-32, 5th Edition, 1995)

coral head   A massive mushroom or pillar shaped coral growth. (IHO Dictionary, S-32, 5th Edition, 1995)

FEATURE OBJECT ATTRIBUTES

Attribute: **Colour**

Acronym: **COLOUR**   Code: **75**

Attribute type: L

Expected input:

ID		Meaning	INT 1	M-4
1	:	white	IP 11.1;	450.2-3;
2	:	black		
3	:	red	IP 11.2;	450.2-3;
4	:	green	IP 11.3;	450.2-3;
5	:	blue	IP 11.4;	450.2-3;
6	:	yellow	IP 11.6;	450.2-3;
7	:	grey		
8	:	brown		
9	:	amber	IP 11.8;	450.2-3;
10	:	violet	IP 11.5;	450.2-3;
11	:	orange	IP 11.7;	450.2-3;
12	:	magenta		
13	:	pink		

Remarks:

No remarks.

FEATURE OBJECT ATTRIBUTES

Attribute: **Coral Ecological Zone**

Acronym: **crlzne**   code: **30507**

Attribute type: E

Expected input:

ID   Meaning

1 :   Shoreline Intertidal
2 :   Lagoon
3 :   Bank/Shelf
4   :   Back Reef
5   :   Ridges and Swales
6   :   Reef Crest
7   :   Fore Reef
8   :   Vertical Wall
9 ;   Bank/Shelf Escarpment
10 :   Channel
11 :   Dredged
12 :   Land

Shoreline Intertidal: Area between the mean high water line (or landward edge of emergent vegetation when they are present) and lowest spring tide level (excluding emergent segments of barrier reefs).

Lagoon: Shallow area (relative to the deeper water of the bank/shelf) between the shoreline intertidal zone and the back reef of a reef or a barrier island. This zone is protected from the high-energy waves commonly experienced on the bank/shelf and reef crest. If no reef crest is present there is no lagoon zone.

Bank/Shelf: Deep water area (relative to the shallow water in a lagoon) extending offshore from the seaward edge of the fore reef to the beginning of the escarpment where the insular shelf drops off into deep, oceanic water. The bank/shelf is the flattened platform between the fore reef and deep open ocean waters or between the shoreline/intertidal zone and open ocean if no reef crest is present.

|	
Back Reef:	Area between the bank/shelf and the ridge and swale or reef crest zone. This zone is present when a bank/shelf, ridges and swales, or reef crest zone exist.
Ridges and Swales:	An area of numerous thin, narrow, discontinuous bands of coral ridges and leeward sand and sediment-filled swales. Debris and reef-rubble fields behind many of the reefs may obscure these margin-parallel seabed features.
Reef Crest:	The flattened, emergent (especially during low tides) or nearly emergent segment of a reef. This zone lies between the back reef and fore reef zones. Breaking waves will often be visible in aerial images at the seaward edge of this zone
Forereef:	Area from the seaward edge of the reef crest that slopes into deeper water to the landward edge of the bank/shelf platform. Features not forming an emergent reef crest but still having a seaward-facing slope that is significantly greater than the slope of the bank/shelf are also designated as forereef.
Vertical Wall:	Area with near-vertical slope from shore to shelf or shelf escarpment. This zone is typically narrow and may not be distinguishable in remotely sensed imagery, but is included because it is recognized as a biologically important feature.
Bank/Shelf Escarpment:	This zone begins on the oceanic edge of the Bank/Shelf, where depth increases rapidly into deep, oceanic water and exceeds the depth limit of features visible in aerial images. This zone is designated to capture the transition from the shelf to deep waters of the open ocean.
Channel:	Naturally occurring channels that often cut across several other zone types.
Dredged:	Area in which natural geomorphology is disrupted or altered by excavation or dredging.
Unknown:	Zone uninterpretable due to turbidity, cloud cover, water depth, or other interference.
Land:	Terrestrial features above the spring high tide line

(A Classification Scheme for Mapping the Shallow-water Coral Ecosystems of Southern Florida. Version 2, 13 July 2007 NOAA Coral Reef Conservation Program)

Remarks:

Zone Types - Thirteen mutually exclusive zones can be identified from land to open water corresponding to typical insular shelf and coral reef geomorphology. Figure 2 (next page) is a cross-sectional diagram showing the generalized locations of most of these zones. The zones include: Shoreline Intertidal; Lagoon; Bank/Shelf; Back Reef; Ridges and Swales; Reef Crest; and Forereef.; Six zones not included in the diagram are Vertical Wall, Bank/Shelf Escarpment, Channel, Dredged, Unknown, and Land. Zone refers only to each benthic community's location and does not address substrate or cover types that are found within.
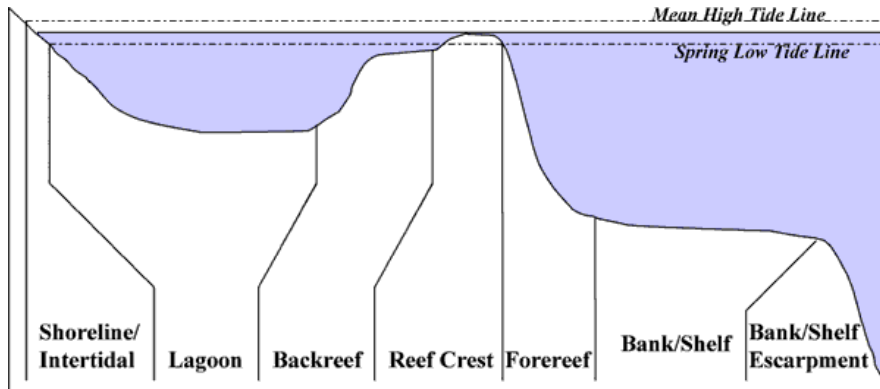
Figure 1. Barrier reef cross-section. Reef separated from the shore by a relatively wide, deep lagoon.
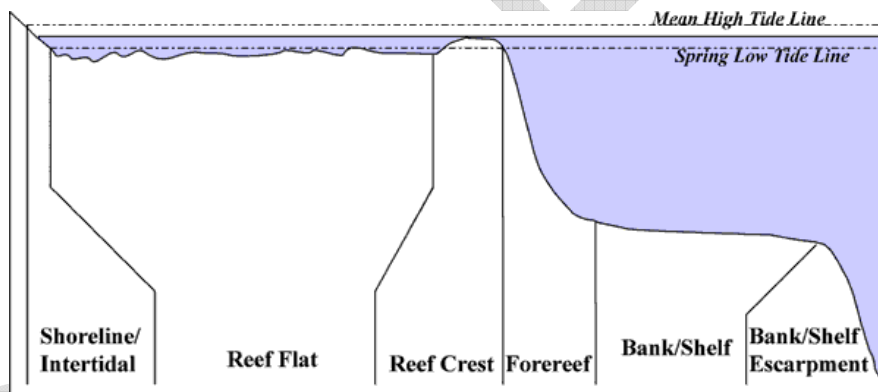
Figure 2. Fringing reef cross-section. Reef platform is continuous with the shore.

Figure 3. Atoll cross-section. Reef surrounding a lagoon.

FEATURE OBJECT ATTRIBUTES

Attribute: **Coral Ecosystem Biological Cover**

Acronym: **biocov**   code**: 30500**

Attribute type: L

Expected input:

ID   Meaning

1 :   Live Coral
2 :   Mollusk reef
3 :   Annelid reef
6 :   Seagrass
7 :   Macroalgae
8 :   Coralline Algae
9 :   Turf Algae
10 :   Uncolonized
11 :   Unclassified

Definitions:

Live Coral: Substrates colonized by live reef building corals and other organisms.
                       Habitats within this category have at least 10% live coral cover.

Mollusk Reef: Substrates colonized by concentrations of mollusks that attach to hard
                       substrate

Annelid Reef: Substrates formed from colonies of Sabellariid worm tubes.

Seagrass: Habitat with 10 percent of more of seagrass (e.g., Halophila sp.).

Macroalgae: Substrates with 10 percent or greater coverage of any combination of
                      numerous species of red,green, or brown macroalgae. Usually occurs in
                      shallow backreef and deeper waters on the bank/shelf zone.

Coralline Algae: An area with 10 percent or greater coverage of any combination of numerous
                      species of encrusting or coralline algae. May occur along reef crest, in
                      shallow back reef, relatively shallow waters on the bank/shelf zone, and at
                      depth.

Turf Algae: A community of low lying species of marine algae composed of any or a
                      combination of algal divisions dominated by filamentous species lacking
                      upright fleshy macroalgal thali.

Emergent Vegetation:

>Emergent habitat composed primarily of Rhizophora mangle (red mangrove) and Hibiscus sp (hau) trees. Generally found in areas sheltered from high-energy waves. This habitat type is usually found in the shoreline/intertidal or reef flat zone.

Uncolonized:

>Substrates not covered with a minimum of 10% of any of the above biological cover types. This habitat is usually on sand or mud structures. Overall uncolonized cover is estimated at 90%-100% of the bottom.

Unknown:

>Zone, Cover, and Structure uninterpretable due to turbidity, cloud cover, water depth, or other interference.

(A Classification Scheme for Mapping the Shallow-water Coral Ecosystems of Southern Florida. Version 2, 13 July 2007 NOAA Coral Reef Conservation Program)
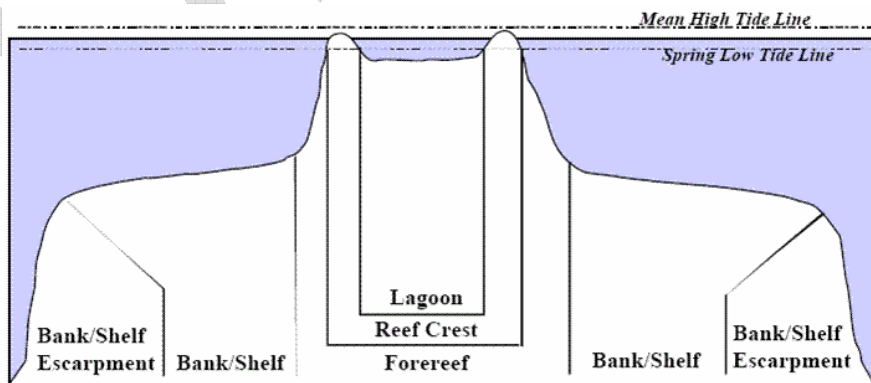
FEATURE OBJECT ATTRIBUTES

Attribute: **Coral Reef Geomorphological Structures**

Acronym: **geostr**   Code: **30510**

Attribute type: E

Expected input:

1 :   Sand
2 :   Mud
3 :   Spur and Groove
4 :   Individual Patch Reef
5 :   Aggregate Patch Reef
6 :   Aggregate Reef
7 :   Scattered Coral/Rock
8 :   Pavement
9 :   Rock/Boulder (Volcanic and Carbonate)
10 :   Reef Rubble
11 :   Pavement with Sand Channels
12 :   Artificial
13 :   Land

Definitions:

Sand:	Coarse sediment typically found in areas exposed to currents or wave energy.
Mud:	Fine sediment often associated with river discharge and build-up of organic material in areas sheltered from high-energy waves and currents.
Spur and Groove:	Habitat having alternating sand and coral formations that are oriented perpendicular to the shore or bank/shelf escarpment. The coral formations (spurs) of this feature typically have a high vertical relief relative to pavement with sand channels (see below) and are separated from each other by 1-5 meters of sand or hardbottom (grooves), although the height and width of these elements may vary considerably.
Patch Reefs:	Coral formations that are isolated from other coral reef formations by sand, seagrass, or other habitats and that have no organized structural axis relative to the contours of the shore or shelf edge.
Individual Patch Reef:	Distinctive single patch reefs that are larger than or equal to the MMU.
Aggregate Patch Reef:	Clustered patch reefs that individually are too small (less than the MMU) or are too close together to map separately.

Aggregate Reef: High relief lacking sand channels of spur and groove.

Scattered Coral/Rock: Primarily sand or seagrass bottom with scattered rocks or small, isolated coral heads that are too small to be delineated individually (i.e. smaller than individual patch reef).

Pavement: Flat, low-relief, solid carbonate rock with coverage of macroalgae, hard coral, zoanthids, and other sessile invertebrates that are dense enough to begin to obscure the underlying surface.

Rock/Boulder: Solid carbonate blocks and/or boulders or volcanic rock.

Reef Rubble: Dead, unstable coral rubble often colonized with filamentous or other macroalgae. This habitat often occurs landward of well-developed reef formations in the reef crest or back reef zone.

Pavement with
Sand Channels: Habitats of pavement with alternating sand/surge channel formations that are oriented perpendicular to the shore or bank/shelf escarpment. The sand/surge channels of this feature have low vertical relief relative to spur and groove formations and are typically erosional in origin. This habitat type occurs in areas exposed to moderate wave surge such as the bank/shelf zone.

Artificial: Man-made habitats such as submerged wrecks, large piers, submerged portions of rip-rap jetties, and the shoreline of islands created from dredge spoil.

Unknown: Structure uninterpretable due to turbidity, cloud cover, water depth, or other interference.

(A Classification Scheme for Mapping the Shallow-water Coral Ecosystems of Southern Florida. Version 2, 13 July 2007 NOAA Coral Reef Conservation Program)

Remarks:

Fourteen distinct and non-overlapping Geomorphological structure types were identified that could be mapped by visual interpretation of the IKONOS imagery. Habitats or features that cover areas smaller than the MMU were not considered. For example, sand halos surrounding patch reefs are too small to be mapped independently. Structure refers only to predominate physical structural composition of the feature and does not address location (e.g., on the shelf or in the lagoon). The structure types are defined in a collapsible hierarchy ranging from four major classes (coral reef and hard bottom, unconsolidated sediment, other delineations, and unknown), to thirteen detailed classes (sand, mud, spur and groove, individual and aggregated patch reef, aggregate reef, scattered coral/rock in unconsolidated sediment, pavement, rock/boulder (volcanic and carbonate), reef rubble, pavement with sand channels, artificial, and unknown).

Attribute: **Conservation Focus**

Acronym: **confcs**   Code: **30504**

Attribute type: L

Expected input:

ID	Meaning
1	: Natural Heritage
2	: Cultural Heritage
3	: Sustainable Production

INT 1   M-4

Definitions:

Natural Heritage: Areas established and managed wholly or in part to sustain, conserve, restore and understand the protected area's natural biodiversity, populations, communities, habitats, and ecosystems; the ecological and physical processes upon which they depend; and, the ecological services, human uses and values they provide to this and future generations.

Cultural Heritage: Areas established and managed wholly or in part to protect and understand submerged cultural resources that reflect the nation's maritime history and traditional cultural connections to the sea.

Sustainable Production:
            Areas established and managed wholly or in part with the explicit purpose of supporting the continued extraction of renewable living resources (e.g. fish, shellfish, plants, birds or mammals) that live within the MPA, or that are exploited elsewhere but depend upon the protected area's habitat for essential aspects of their ecology or life history (e.g. feeding, spawning, mating or nursery grounds).

(A Functional Classification System for Marine Protected Areas in the United States, National MPA Center, 24 July 2006)

Remarks:

        No Remarks

FEATURE OBJECT ATTRIBUTES

Attribute: **Constancy of Protection**

Acronym: **consty**   Code: **30505**

Attribute type: E

Expected input:

  ID   Meaning   INT 1   M-4

  1 : Year-Round
  2 : Seasonal
  3 : Rotating

Definitions:*

    Year-Round: MPAs or zones that provide constant protection to the site throughout the year.

    Seasonal: MPAs or zones that protect specific habitats and resources, but only during fixed seasons or periods when human uses may disrupt ecologically sensitive seasonal processes such as spawning, breeding or feeding aggregations.

    Rotating: MPAs that cycle serially and predictably among a set of fixed geographic areas in order to meet short-term conservation or management goals (e.g. local stock replenishment followed by renewed exploitation of recovered populations).

(A Functional Classification System for Marine Protected Areas in the United States, National MPA Center, 24 July 2006.)

Remarks:

No Remarks

FEATURE OBJECT ATTRIBUTES

Attribute: **Contact Information**

Acronym: **contct**   Code: **30506**

Attribute type: S

Definition:

   Contacts with phone numbers and addresses for the marine managed area.

Example:

   DFG State Office (916)445-0411, Marine Region (831)649-2870; On-Site Info – Morro Bay
   Foundation (805)756-2193

Remarks:

No Remarks

FEATURE OBJECT ATTRIBUTES

Attribute: **Date end**

Acronym: **DATEND**   Code: **85**

Attribute type: A

Indication:

The date end should be encoded using 4 digits for the calendar year (CCYY), 2 digits for the month (MM) (e.g. April = 04) and 2 digits for the day (DD), according to ISO 8601: 1988.

Format:

CCYYMMDD **(mandatory)**

Example:

19961007   for 07 October 1996 as ending date.

Remarks:

The attribute "date end" indicates the latest date on which an object (e.g. a buoy) will be present.

This attribute is to be used to indicate the removal or cancellation of an object at a specific date in the future. See also "periodic date end"

FEATURE OBJECT ATTRIBUTES

Attribute: **Date start**

Acronym: **DATSTA**   Code: **86**

Attribute type: A

Indication:

The "date start" should be encoded using 4 digits for the calendar year (CCYY), 2 digits for the month (MM) (e.g. April = 04) and 2 digits for the day (DD), according to ISO 8601: 1988.

Format:

CCYYMMDD **(mandatory)**

Example:

19960822   for 22 August 1996 as starting date.

Remarks:

The attribute "date start" indicates the earliest date on which an object (e.g. a buoy) will be present.

This attribute is to be used to indicate the deployment or implementation of an object at a specific date in the future. See also periodic date start.

FEATURE OBJECT ATTRIBUTES

Attribute: **Ecological Scale of Protection**

Acronym: **ecoscl**   Code: **30509**

Attribute type: E

Expected input:

  ID   Meaning   INT 1   M-4

  1 : Ecosystem
  2 : Focal resource

Definitions:

Ecosystem: MPAs or zones whose legal authorities and management measures are intended to
                  protect all of the components and processes of the ecosystem within its boundaries.

Focal Resource: MPAs or zones whose legal authorities and management measures specifically
                  target a particular habitat, species complex, or single resource (either natural or
                  cultural).

(A Functional Classification System for Marine Protected Areas in the United States, National MPA
         Center, 24 July 2006)

Remarks:

    Indicates whether MPA protects whole ecosystems or specific focal resources or habitats within
    larger ecosystems.

FEATURE OBJECT ATTRIBUTES

Attribute: **Information**

Acronym: **INFORM**   Code: **102**

Attribute type: S

Definition:

Textual information about the object.

References:

INT 1:   IA 16;

M-4:   242.3-5;

Remarks:

The textual information could be, for example, a list, a table or a text.

This attribute should be used, for example, to hold the information that is shown on paper charts by cautionary and explanatory notes.

No formatting of text is possible within INFORM. If formatted text is required, then the attribute TXTDSC must be used.

NATIONAL LANGUAGE ATTRIBUTES

Attribute: **Information in national language**

Acronym: **NINFOM**

Code: **300**

Attribute type: S

References:

INT 1: IA 16;

M-4: 242.3-5;

Indication:

Text (c...): Textual information in national language characters

Format:

c...

Remarks:

The attribute information in national language encodes any textual information about an object using a specified national language.

The textual information could be, for example, a list, a table or a text.

This attribute should be used, for example, to hold the information that is shown on paper charts by cautionary and explanatory notes.

FEATURE OBJECT ATTRIBUTES

Attribute: **Legal Mandate**

Acronym: **lglmnd**   Code: **30512**

Attribute type: S

<u>Definition:</u>

Textual information about the authority.

Example:

Established by the International Maritime Organization Marine Environment Protection Committee.

References:

Remarks:

This attribute should be used, for example, to hold the information about the authority establishing the marine management area.

No formatting of text is possible within LGLMND. If formatted text is required, then the attribute TXTDSC must be used.

FEATURE OBJECT ATTRIBUTES

Attribute: **Level of Protection Afforded to Resources**

Acronym: **levprt**   Code: **30511**

Attribute type: E

Expected input:

ID   Meaning   INT 1   M-4

1 : No access
2 : No impact
3 : No take
4 : Zoned with no take areas
5 : Zoned multiple use
6 : Uniform multiple use

Definitions:

No access:

MPAs that prohibit potential ecological disturbance to the area by restricting all human access, unless specifically permitted for designated special uses such as research, monitoring or restoration.

No impact:

MPAs that generally allow free access and use, but that prohibit all activities that could harm the MPA's resources or disrupt the ecological or cultural services they provide. Examples of activities typically prohibited in No Impact MPAs include resource extraction of any kind (e.g. fishing, collecting, mining); discharge of pollutants; disposal or installation of materials; and alteration or disturbance of submerged cultural resources, biological assemblages, ecological interactions, protected habitats, or the natural processes that support them.

No take:

MPAs that allow access and some potentially harmful human uses but that prohibit the extraction or significant destruction of natural or cultural resources.

Zoned multiple use with no take area(s):

Multiple-use MPAs that contain at least one legally established zone in which all resource extraction is prohibited.

Zoned multiple use:

MPAs that allow extractive activities throughout the entire site, but that use marine zoning to allocate specific uses to compatible places or times in order

to reduce user conflicts and adverse impacts

Uniform multiple use:

> MPAs that apply a uniform and consistent level of protection and allowable activities, including certain extractive uses, across the entire protected area.

Remarks:

> MPAs vary widely in the level and type of legal protections provided to the site's natural and cultural resources and to the natural environmental processes that sustain them. The six levels of protection described above influence the effectiveness of an MPA in meeting its conservation goals and objectives, and its likely impacts on human uses and activities.

FEATURE OBJECT ATTRIBUTES

Attribute: **Management Entity**

Acronym: **manage**   Code: **30513**

Attribute type: S

<u>Definition:</u>

   Text with name of managing authority

<u>Example:</u>

   California Department of Fish and Game

<u>Remarks:</u>

No Remarks

FEATURE OBJECT ATTRIBUTES

```
Attribute:  Nature of surface
```

Acronym: **NATSUR**   Code: **113**

Attribute type: L

Expected input:

ID		Meaning		INT 1	M-4
1	:	mud		IJ 2,20;	
2	:	clay		IJ 3;	
3	:	silt		IJ 4;	
4	:	sand		IC 6; IJ 1,20;	312.2;
5	:	stone		IC 7; IJ 5,20;	312.2; 425.5-6;
6	:	gravel		IJ 6,20;	
7	:	pebbles		IJ 7;	
8	:	cobbles		IJ 8;	
9	:	rock		IJ 9,21;	426.2
10	:	~~marsh~~			
11	:	lava			
12	:	~~snow~~			
13	:	~~ice~~			
14	:	coral		IJ 10,22;	425.5; 426.3;
15	:	~~swamp~~			
16	:	~~bog/moor~~			
17	:	shells		IJ 11;	425.5-6;
18	:	boulder			

Definitions:

mud: soft, wet earth.

clay: (particles of less than 0.002mm); stiff, sticky earth that becomes hard when baked.

silt: (particles of 0.002-0.0625mm); when dried on hand will rub off easily.

sand: (particles of 0.0625-2.0mm); tiny grains of crushed or worn rock.

stone: a general term for rock fragments ranging in size from pebbles and gravel to boulders or a large rock mass. (IHO Dictionary, S-32, 5th Edition, 5059)

gravel: (particles of 2.0-4.0mm); small stones with coarse sand.

pebbles: (particles of 4.0-64.0mm); small stones made smooth and round by being rolled in water.

cobbles: (particles of 64.0-256.0mm); stones worn round and smooth by water and used for paving.

rock: any formation of natural origin that constitutes an integral part of the lithosphere. The natural occurring material that forms firm, hard, and solid masses. (adapted from IHO Dictionary, S-32, 5th Edition, 4415)

lava: the fluid or semi-fluid matter flowing from a volcano. The substance that results from the cooling of the molten rock. Part of the ocean bed is composed of lava. (IHO Dictionary, S-32, 5th Edition, 2680)

coral: hard calcareous skeletons of many tribes of marine polyps. (IHO Dictionary, S-32, 5th Edition, 1061)

shells: exoskeletons of various water dwelling animals. (adapted from IHO Dictionary, S-32, 5th Edition, 4680)

boulder: a rounded rock with diameter of 256 mm or larger. (adapted from IHO Dictionary, S-32, 5th Edition, 527)

Remarks:

The attribute "nature of surface" encodes the general nature of the material of which the land surface or the sea bed is composed.

Mixed bottom: where the seabed comprises a mixture of material, the main constituent is given first e.g. fine sand with mud and shells would be indicated as 4,1,17.

Mud, sand, stone, rock are terms used for the general description.

Clay, silt, gravel, pebbles, cobbles are more specific terms related to particle size.

FEATURE OBJECT ATTRIBUTES

Attribute: **Nature of surface - qualifying terms**

Acronym: **NATQUA**   Code: **114**

Attribute type: L

Expected input:

ID	Meaning		INT 1	M-4
1	:	fine	IJ 30;	425.5-6;
2	:	medium	IJ 31;	425.5-6;
3	:	coarse	IJ 32;	425.5-6;
4	:	broken	IJ 33;	425.5-6;
5	:	sticky	IJ 34;	425.5-6;
6	:	soft	IJ 35;	425.5-6;
7	:	stiff	IJ 36;	425.5-6;
8	:	volcanic	IJ 37;	425.5-6;
9	:	calcareous	IJ 38;	425.5-6;
10	:	hard	IJ 39;	425.5-6;

Definitions:

fine: falls within the smallest size continuum for a particular nature of surface term. (M-4 425.6)

medium: falls within the moderate size continuum for a particular nature of surface term. (M-4 425.6)

coarse: falls within the largest size continuum for a particular nature of surface term. (M-4 425.6)

broken: fractured or in pieces. (adapted from Webster s II New Riverside Dictionary, 1984)

sticky: having an adhesive or glue like property. (adapted from Webster s II New Riverside Dictionary, 1984)

soft: not hard or firm. (adapted from Webster s II New Riverside Dictionary, 1984)

stiff: not pliant; thick, resistant to flow. (adapted from Webster s II New Riverside Dictionary, 1984)

volcanic: composed of or containing material ejected from a volcano. (adapted from Webster s II New Riverside Dictionary, 1984)

calcareous: composed of or containing calcium or calcium carbonate. (IHO Dictionary, S-32, 5th Edition, 603)

hard: firm; usually refers to an area of the sea floor not covered by unconsolidated sediment. (IHO Dictionary, S-32, 5th Edition, 2194 and adapted from Webster's II New Riverside Dictionary, 1984)

Remarks:

The attribute "nature of surface - qualifying terms" encodes the nature of various forms of natural surface materials in terms of their size, morphology and consistency.

FEATURE OBJECT ATTRIBUTES

Attribute: **Object name**

Acronym: **OBJNAM**   Code: **116**

Attribute type: S

Definition:

The individual name of an object.

References:

INT 1:   ID 7, IF 19, IN 12.2-3;

M-4:   371; 323.1-2; 431.2-3; 431.5;

Remarks:

No remarks.

FEATURE OBJECT ATTRIBUTES

Attribute: **Object name in national language**

Acronym: **NOBJNM**   Code: **301**

Attribute type: S

References:

    INT 1:   ID 7, IF 19, IN 12.2-3;

    M-4: 371; 323.1-2; 431.2-3; 431.5;

Indication:

    Name of object (c...):string of national language characters

Format:

    c...

Remarks:

    The attribute object name in national language encodes the individual name of an object in the specified national language.

FEATURE OBJECT ATTRIBUTES

Attribute: **Periodic date end**

Acronym: **PEREND**   Code: **118**

Attribute type: A

Definition:

The end of the active period for a seasonal object (e.g. a buoy). See also date end

References:

INT 1:   IQ71;

M-4:   460.5;

Indication:

the   periodic date end   should be encoded using 4 digits for the calendar year (CCYY), 2 digits for the month (MM) (e.g. April = 04) and 2 digits for the day (DD). When no specific year is required (ie the object is removed at the same time each year) the following two cases may be considered:
- same day each year: --MMDD
- same month each year: --MM

This conforms to ISO 8601: 1988.

Format:

CCYYMMDD   (full date, **mandatory**)
    --MMDD   (same day each year, **mandatory**)
    --MM   (same month each year, **mandatory**)

Example:

--1015   for an ending date of 15 October each year.

Remarks:

No remarks.

FEATURE OBJECT ATTRIBUTES

```
┌─────────────────────────────────────────────────────────────────────┐
│ Attribute: Periodic date start                                        │
└─────────────────────────────────────────────────────────────────────┘
```

Acronym: **PERSTA**   Code: **119**

Attribute type: A

Definition:

The start of the active period for a seasonal object (e.g. a buoy). See also   date start   .

References:

INT 1:   IQ71;

M-4:   460.5;

Indication:

the   periodic date, start   should be encoded using 4 digits for the calendar year (CCYY), 2 digits for the month (MM) (e.g. April = 04) and 2 digits for the day (DD). When no specific year is required (ie the object is deployed at the same time each year) the following two cases may be considered:
- same day each year: --MMDD
- same month each year: --MM

This conforms to ISO 8601: 1988.

Format:

CCYYMMDD   (full date, **mandatory**)
   --MMDD   (same day each year, **mandatory**)
   --MM   (same month each year, **mandatory**)

Example:

--04   for an operation starting in April each year.

Remarks:

No remarks.

FEATURE OBJECT ATTRIBUTES

Attribute: **Permanence of Protection**

Acronym: **perman**   Code: **30514**

Attribute type: E

Expected input:

ID   Meaning   INT 1   M-4

  1 : Permanent
  2 : Conditional
  3 : Temporary

Definitions:

Permanent: MPAs whose legal authorities provide some level of protection to the site in perpetuity
               for future generations, unless reversed by future legislation or regulatory actions.

Conditional: MPAs that have the potential, and often the expectation, to persist administratively
               over time, but whose legal authority has a finite duration and must be actively
               renewed or ratified based on periodic governmental reviews of performance,

Temporary: MPAs that are designed to address relatively short-term conservation and/or
               management needs by protecting a specific habitat or species for a finite duration,
               with no expectation or specific mechanism for renewal.

 (A Functional Classification System for Marine Protected Areas in the United States, National MPA
Center, 24 July 2006.)

Remarks:

No Remarks

FEATURE OBJECT ATTRIBUTES

Attribute: **Pictorial representation**

Acronym: **PICREP**   Code: **120**

Attribute type: S

Definition:

Indicates whether a pictorial representation of the object is available.

References:

INT 1:   IE 3.1-2;

M-4:   456.5; 457.3;

Indication:

the string encodes the file name of an external graphic file (pixel/vector)

Remarks:

The "pictorial representation" could be a drawing or a photo.

FEATURE OBJECT ATTRIBUTES

Attribute: **Purpose of marine management area**

Acronym: **purpos**   Code: **30515**

Attribute type: S

Definition:

Textual information about purpose of the marine management area.

Example: To designate an area for research into sea otter impacts on clam

References:

Remarks:

The textual information must be in text form

No formatting of text is possible within PURPOS. If formatted text is required, then the attribute TXTDSC must be used.

FEATURE OBJECT ATTRIBUTES

Attribute: **Regulations Citation**

Acronym: **regcit**

Code: **30516**

Attribute type: S

Definition:

Textual information about regulations.

Remarks:

This attribute should be used to hold information about regulation sources.

No formatting of text is possible within regcit. If formatted text is required, then the attribute TXTDSC must be used.

FEATURE OBJECT ATTRIBUTES

Attribute: **Restriction**

Acronym: **RESTRN**   Code: **131**

Attribute type: L

Expected input:

ID	Meaning	INT 1	M-4
1 :	anchoring prohibited	IN 20;	439.3-4;
2 :	anchoring restricted		
3 :	fishing prohibited	IN 21;	439.3-4;
4 :	fishing restricted		
5 :	trawling prohibited		
6 :	trawling restricted		
7 :	entry prohibited	IN 2.2;	439.3;
8 :	entry restricted		
9 :	dredging prohibited		
10 :	dredging restricted		
11 :	diving prohibited		
12 :	diving restricted		
13 :	no wake		
14 :	area to be avoided	IM 29.1;	435.7;
15 :	construction prohibited		
16 :	discharging prohibited		
17 :	discharging restricted		
18 :	industrial or mineral exploration/development prohibited		
19 :	industrial or mineral exploration/development restricted		
20 :	drilling prohibited		
21 :	drilling restricted		
22 :	removal of historical artifacts prohibited		
23 :	cargo transhipment (lightering) prohibited		
24 :	dragging prohibited		
25 :	stopping prohibited		
26 :	landing prohibited		
27 :	speed restricted		
28 :	Commercial finfish fishing prohibited		
29 :	Commercial finfish fishing restricted		
30 :	Commercial invertebrate fishing prohibited		
31 :	Commercial invertebrate fishing restricted		
32 :	Recreational finfish fishing prohibited		
33 :	Recreational finfish fishing restricted		
34 :	Recreational invertebrate fishing prohibited		
35 :	Recreational invertebrate fishing restricted		
36:	Specimen collection prohibited		
37 :	Specimen collection restricted		
38 :	Commercial marine plant harvesting prohibited		
39 :	Commercial marine plant harvesting restricted		
40 :	Recreational marine plant harvesting prohibited		
41 :	Recreational marine plant harvesting restricted		

42   :   Taking/disturbing of mammals/birds prohibited

43   :   Taking/disturbing of mammals/birds restricted
44   :   swimming prohibited
45   :   swimming restricted
46   :   Overfights prohibited.
47   :   Overfights restricted.
48   :   Disturbing the seabed prohibited.
49   :   Disturbing the seabed restricted.
50   :   Internal combustion engines prohibited.
51   :   Internal combustion engines restricted.
52   :   Motorized personal watercraft prohibited.
53   :   Motorized personal watercraft restricted.
54   :   Non-motorized personal watercraft prohibited.
55   :   Non-motorized personal watercraft restricted.

Definitions:

anchoring prohibited: an area within which anchoring is not permitted.

anchoring restricted: a specified area designated by appropriate authority, within which anchoring is restricted in accordance with certain specified conditions.

fishing prohibited: an area within which fishing is not permitted.

fishing restricted: a specified area designated by appropriate authority, within which fishing is restricted in accordance with certain specified conditions.

trawling prohibited: an area within which trawling is not permitted.

trawling restricted: a specified area designated by appropriate authority, within which trawling is restricted in accordance with certain specified conditions.

entry prohibited: an area within which navigation and/or anchoring is prohibited. (adapted from IHO Dictionary, S-32, 5th Edition, 4044)

entry restricted: a specified area designated by appropriate authority, within which navigation is restricted in accordance with certain specified conditions. (adapted from IHO Dictionary, S-32, 5th Edition, 4366)

dredging prohibited: an area within which dredging is not permitted.

dredging restricted: a specified area designated by appropriate authority, within which dredging is restricted in accordance with certain specified conditions.

diving prohibited: an area within which diving is not permitted.

diving restricted: a specified area designated by appropriate authority, within which diving is restricted in accordance with certain specified conditions.

no wake: mariners must adjust the speed of their vessels to reduce the wave or wash which may cause erosion or disturb moored vessels.

area to be avoided: an IMO designated area to be avoided, defined as a routeing measure. (adapted from IHO Chart Specifications, M-4, 435.7)

Construction prohibited: the erection of permanent or temporary fixed structures or artificial islands is prohibited.

discharging prohibited:
an area within which discharging or dumping is prohibited

discharging restricted:

a specified area designated by an appropriate authority, within which discharging or dumping is restricted in accordance with specified conditions.

industrial or mineral exploration/development prohibited:
an area within which industrial or mineral exploration and development are prohibited.

industrial or mineral exploration/development restricted:
a specified area designated by an appropriate authority, within which industrial or mineral exploration and development is restricted in accordance with certain specified conditions.

drilling prohibited:	an area within which excavating a hole on the sea-bottom with a drill is prohibited.

drilling restricted:	a specified area designated by an appropriate authority, within which excavating a hole on the sea-bottom with a drill is restricted in accordance with certain specified conditions.

removal of historical artifacts prohibited:
an area within which the removal of historical artifacts is prohibited.

cargo transhipment (lightering) prohibited:
an area in which cargo transhipment (lightering) is prohibited.

dragging prohibited:	an area in which the dragging of anything along the bottom, e.g. bottom trawling, is prohibited.

stopping prohibited:	an area in which a vessel is prohibited from stopping.

landing prohibited:	an area in which landing is prohibited.

speed restricted:	an area within which speed is restricted.

Commercial finfish fishing prohibited

Commercial finfish fishing restricted

Commercial invertebrate fishing prohibited

Commercial invertebrate fishing restricted

Recreational finfish fishing prohibited

Recreational finfish fishing restricted

Recreational invertebrate fishing prohibited

Recreational invertebrate fishing restricted

Specimen collection prohibited

Specimen collection restricted

Commercial marine plant harvesting prohibited

Commercial marine plant harvesting restricted

Recreational marine plant harvesting prohibited

Recreational marine plant harvesting restricted

Taking/disturbing of mammals/birds prohibited

Taking/disturbing of mammals/birds restricted

Swimming prohibited

Swimming restricted

Overfights prohibited.

Overfights restricted.

Disturbing the seabed prohibited.

Disturbing the seabed restricted.

Internal combustion engines prohibited.

Internal combustion engines restricted.

Motorized personal watercraft prohibited.

Motorized personal watercraft restricted.

Non-motorized personal watercraft prohibited.

Non-motorized personal watercraft restricted.

Remarks:

The official legal statue of each kind of restricted area defines the kind of restriction(s), e.g. the restriction for "a game preserve" may be entry prohibited, the restriction for an anchoring prohibition is anchoring prohibited.

The complete information about the restriction(s), actually held in handbooks or other publications, may be encoded by the attribute TXTDSC. A short explanation may be given by the use of the attribute INFORM.

FEATURE OBJECT ATTRIBUTES

```
┌─────────────────────────────────────────────────────────────────────┐
│                                                                     │
│   Attribute:  **Status**                                            │
│                                                                     │
└─────────────────────────────────────────────────────────────────────┘
```

Acronym: **STATUS**   Code: **149**

Attribute type: L

Expected input:

ID		Meaning	INT 1	M-4
1	:	permanent		
2	:	occasional	IP 50;	473.2;
3	:	recommended	IN 10;	431.1;
4	:	not in use	IL 14, 44;	444.7;
5	:	periodic/intermittent	IC21;IQ71;	353.3;460.5;
6	:	reserved	IN 12.9;	
7	:	temporary	IP 54;	
8	:	private	IQ 70;	
9	:	mandatory		
10	:	~~destroyed/ruined~~		
11	:	extinguished		
12	:	illuminated		
13	:	historic		
14	:	public		
15	:	synchronized		
16	:	watched		
17	:	un-watched		
18	:	existence doubtful		

Definitions:

permanent: intended to last or function indefinitely. (The Concise Oxford Dictionary, 7th Edition)

occasional: acting on special occasions; happening irregularly. (The Concise Oxford Dictionary, 7th Edition)

recommended: presented as worthy of confidence, acceptance, use, etc. (The Macquarie Dictionary, 1988)

not in use: no longer used for the purpose intended; disused.

periodic/intermittent: recurring at intervals. (The Concise Oxford Dictionary, 7th Edition)

reserved: set apart for some specific use. (adapted from The Concise Oxford Dictionary, 7th Edition)

temporary: meant to last only for a time. (The Concise Oxford Dictionary)

private: not in public ownership or operation.

mandatory: compulsory; enforced. (The Concise Oxford Dictionary, 7th Edition)

extinguished: no longer lit

illuminated: lit by floodlights, strip lights, etc.

historic: famous in history; of historical interest. (The Concise Oxford Dictionary, 7th Edition)

public: belonging to, available to, used or shared by, the community as a whole and not restricted to private use. (adapted from The New Shorter Oxford English Dictionary, 1993)

synchronized: occur at a time, coincide in point of time, be contemporary or simultaneous. (The New Shorter Oxford English Dictionary, 1993)

watched: looked at or observed over a period of time especially so as to be aware of any movement or change. (adapted from The New Shorter Oxford English Dictionary, 1993)

un-watched: usually automatic in operation, without any permanently-stationed personnel to superintend it. (adapted from IHO Dictionary, S-32, 5th Edition, 2814)

existence doubtful: an object that has been reported but has not been definitely determined to exist.

Remarks:

No remarks.

FEATURE OBJECT ATTRIBUTES

Attribute: **Textual description**

Acronym: **TXTDSC**

Code: **158**

Attribute type: S

<u>Indication:</u>

the string encodes the file name of an external text file that contains the text in English.

Remarks:

The attribute textual description indicates that a file containing text extracted from relevant pilot books or navigational publications is available.

Attribute: **Textual description in national language**

Acronym: **NTXTDS**   Code: **304**

Attribute type: S

Indication:

the string encodes the file name of an external text file that contains the text in a national language.

Remarks:

The attribute textual description in national language indicates whether a text file containing text extracted from relevant pilot books or navigational publications is available.

FEATURE OBJECT ATTRIBUTES

Attribute: **Scale maximum**

Acronym: **SCAMAX**   Code: **132**

Attribute type: I

Definition:

The maximum scale at which the object may be used e.g. for ECDIS presentation.

Minimum Value: 1

Indication:

the modulus of the scale is indicated, that is 1:25 000 is encoded as 25000;

Unit: none
resolution: 1

Format:

xxxxxxxx

Example:

If a particular maximum scale is specified as 1:25 000 (encoded as 25000), an example of a larger scale would be 1:20 000 (encoded as 20000);

Remarks:

No remarks.

FEATURE OBJECT ATTRIBUTES

Attribute: **Scale minimum**

Acronym: **SCAMIN**   Code: **133**

Attribute type: I

Definition:

The minimum scale at which the object may be used e.g. for ECDIS presentation.

Minimum Value: 1

Indication:

the modulus of the scale is indicated, that is 1:1 250 000 is encoded as 1250000;

Unit: none
resolution: 1

Format:

xxxxxxxx

Example:

If a particular minimum scale is specified as 1:1 250 000 (encoded as 1250000), and example of a smaller scale would be 1:2 000 000 (encoded as 2000000);

Remarks:

No remarks.

FEATURE OBJECT ATTRIBUTES

Attribute: **Recording date**

Acronym: **RECDAT**   Code: **128**

Attribute type: A

Definition:

The date when the specific object or cartographic primitive was captured, edited or deleted.

Reference:

INT 1:   II 22;

M-4:   414.1;

Indication:

The recording date should be encoded using 4 digits for the calendar year (CCYY), 2 digits for the month (MM) (e.g. April = 04) and 2 digits for the day (DD), according to ISO 8601: 1988.

Format:

CCYYMMDD **(mandatory)**

Example:

19930112   for 12 January 1993 as recording date.

Remarks:

No remarks.

Attribute: **Recording indication**

Acronym: **RECIND**   Code: **129**

Attribute type: A

Definition:

The procedure for the encoding and entering of data.

Indication:

country (c2):   Two letter code according to ISO 3166 (refer to Annex A to S-57 Appendix A)

authority (c2):   A string of two alphanumeric characters (refer to Annex A to S-57 Appendix A), e.g. German Bundesamt für Seeschiffahrt und Hydrographie = DE; US National Imagery and Mapping Agency = U1.

procedure (c4):   digitized   = digi
                       scanned   = scan
                       alpha/numeric input   = alph

Format:

c2,c2,c4 **(mandatory)**

Example:

DK,D1,digi

Attribute: **Source date**

Acronym: **SORDAT**   Code: **147**

Attribute type: A

Definition:

The production date of the source, e.g. the date of measurement.

Indication:

The source should be encoded using 4 digits for the calendar year (CCYY), 2 digits for the months (MM) and 2 digits for the Day (DD), according to ISO 8601: 1988.

Format:

CCYYMMDD **(mandatory)**

Example:

19820506   for 6 May 1982 as source date.

Remarks:

No remarks.

FEATURE OBJECT ATTRIBUTES

```
┌─────────────────────────────────────────────────────────────────────────────┐
│                                                                             │
│  Attribute:  Source indication                                              │
│                                                                             │
└─────────────────────────────────────────────────────────────────────────────┘
```

Acronym: **SORIND**   Code: **148**

Attribute type: A

Definition:

Information about the source of the object.

Indication:

Country (c2): **(mandatory)**
Two letter code from ISO 3166 (refer to Annex A to S-57 Appendix A)

Authority (c2): **(mandatory)**
A string of two alphanumeric characters (refer to Annex A to S-57 Appendix A), e.g. German Bundesamt für Seeschiffahrt und Hydrographie = DE; US National Imagery and Mapping Agency = U1.

Source (c5):   Graphic e.g. plotting sheet, paper chart = graph
                      Report e.g. wreck report = reprt

ID-Code (c...):   e.g. Code of paper chart

Format:

c2,**c2**,c5,c...

Example:

DK,D1,graph,chart196

FEATURE OBJECT ATTRIBUTES

Attribute: **Websites**

Acronym: **websit**   Code: **30517**

Attribute type: S

Definition:

    Text with web addresses

Remarks:

No Remarks

Marine Environmental Protection

Presentation Library

DRAFT

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Marine Environmental Protection

Presentation Library

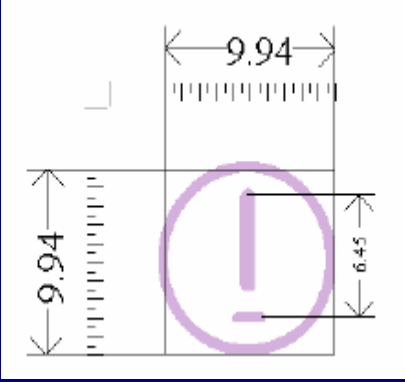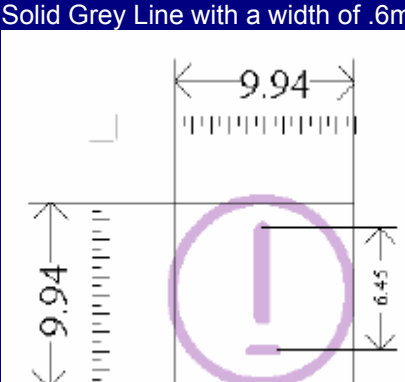This document should be used with Edition 3.4 of S-52 Appendix 2, annex A

1.   INTRODUCTION

This document is intended to provide guidance for the Marine Environmental Protection (MEP) Presentation Library. This library is a subset of the IHO ECDIS presentation library and is intended to be used in conjunction with S-52. It provides the software developer with the information he needs to translate the relatively abstract description of an MEP object into an effective ECDIS display according to S-52. However, it is not a picture book for MEP symbology, since the symbology itself is provided by diagrams showing shapes, dimensions, colours and offsets rather than scaled facsimiles of the symbols in a word-processed form in the Addendum.

This document assumes, that the reader fully understands the fundamentals of computer graphics and that he or she has carefully studied in advance the various standards for ECDIS, i.e., IHO S-52/S-57.

This document contains a presentation library for the objects described in the MEP Product Specification and is intended to be used in conjunction with S-52. It uses symbols and concepts that are documented in the S-52 Presentation Library and has corresponding Look-up Table entries for the MEP objects.

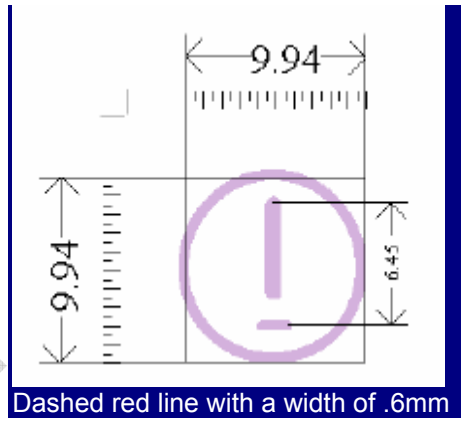Table 1: Marine Environmental Protection Presentation Library

MEP OBJECT	Geometric Primitive	Look-up Table String	Display
crlref – Coral Reef	Point	"crlref","","SY(CTNARE51)","5","S","MARINERS OTHER",""	
	Line	"crlref","",LS(SOLD,2,RESGR)","5","S","MARINERS OTHER",""	Solid Grey Line with a width of .6mm
	Area	"crlref","","LS(SOLD,2,RESGR)","5","S","MARINERS OTHER",""	Solid Grey Line with a width of .6mm
mpaare – Marine Protected Area	Point	"mpaare","","SY(CTNARE51)","5","S","MARINERS OTHER",""	
	Line	"mpaare","","LS(DASH,2,RESBL)","5","S","MARINERS OTHER",""	Dashed Blue Line with a width of .6mm
	Area	"mpaare","","LS(DASH,2,RESBL)","5","S","MARINERS OTHER",""	Dashed Blue Line with a width of .6mm

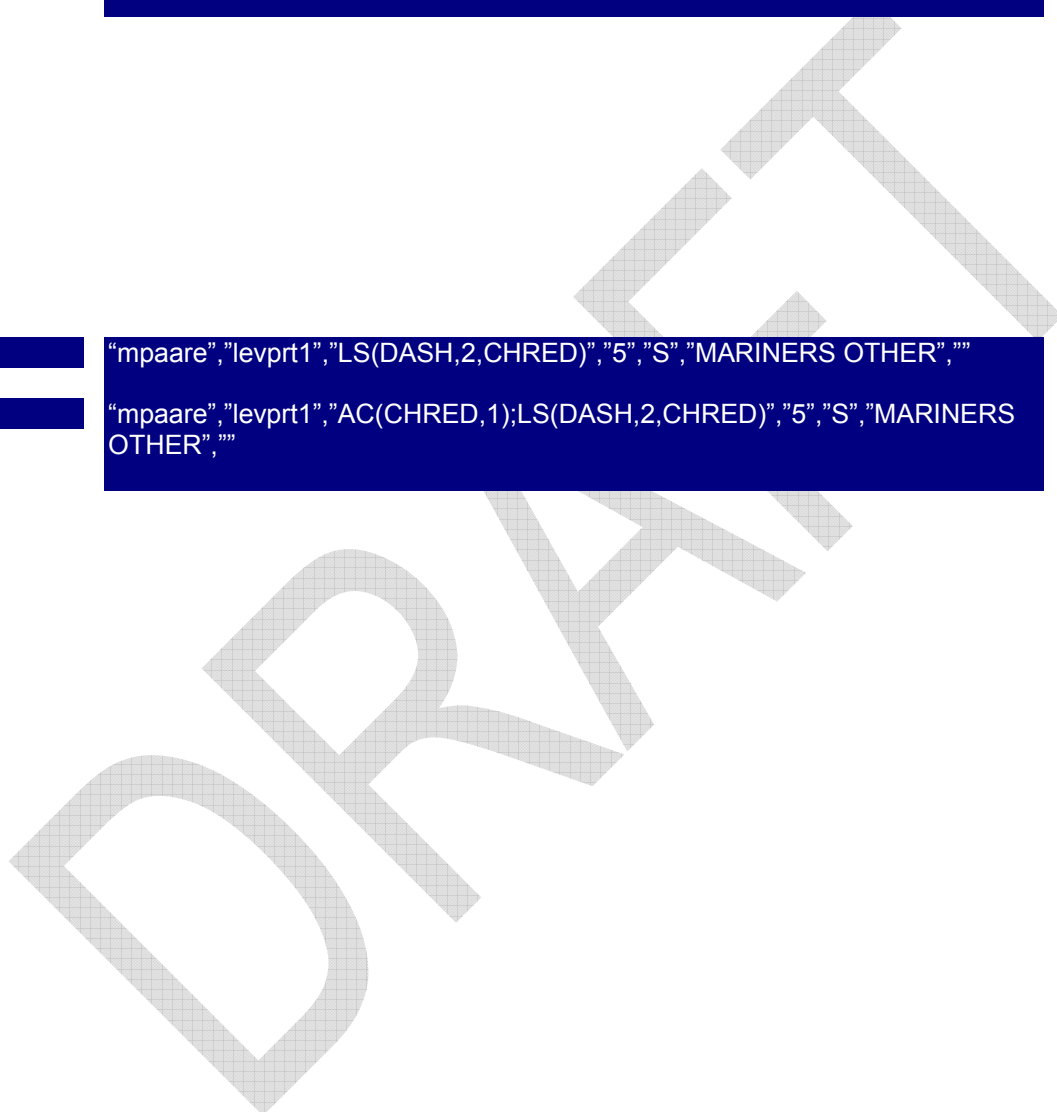| mpaare – Marine Protected Area Level of Protection = no access (lvlprt = 1) | Point | "mpaare","levprt1"," SY(CTNARE51)","5","S","MARINERS OTHER","" | |
	Line	"mpaare","levprt1","LS(DASH,2,CHRED)","5","S","MARINERS OTHER",""	Dashed red line with a width of .6mm
	Area	"mpaare","levprt1","AC(CHRED,1);LS(DASH,2,CHRED)","5","S","MARINERS OTHER",""	25% transparent fill surrounded by a dashed red line with a width of .6mm

Annex 1

S-52 Symbol reference

Symbol Name:	SY(CTNARE51)	RN: 91

Symbol Explanation:	caution area, a specific caution note applies
Look up table affected:	area symbols with plain boundaries area symbols with symbolized boundaries
Pivot Point Column: Pivot Point Row:	17.85 -6.00
Width of Bounding Box: Height of Bounding Box:	9.94 9.94
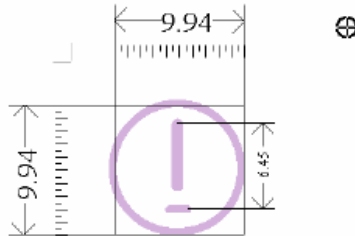
Symbol Colours:	▢ TRFCF
Comments:	Line weight 0.6 mm; circle diameter 9.94 mm
Examples on ENC:	N/A

References:

S57		INT 1
CTNARE	IM 29.2	
TSSLPT	Not specified	

Annex 2

A.2 Look-up table listings

The Presentation Library provides three look-up tables:

1.   point symbols (buoys and beacons are similar to the paper chart)
2.   line symbols
3.   area symbols with plain boundaries (for general use)

The ECDIS enabled for Marine Information Overlays should provide all of these and make the options available to the mariner.

A2.1 Look-Up table for Object Type Point 'P'

"crlref","","SY(CTNARE51)","5","S","MARINERS OTHER",""
"mpaare","","SY(CTNARE51)","5","S","MARINERS OTHER",""
"mpaare","levprt1"," SY(CTNARE51)","5","S","MARINERS OTHER",""

A2.2 Look-Up table for Object Type Line 'L'

"crlref","",LS(SOLD,2,RESGR)","5","S","MARINERS OTHER",""
"mpaare","","LS(DASH,2,RESBL)","5","S","MARINERS OTHER",""
"mpaare","levprt1","LS(DASH,2,CHRED)","5","S","MARINERS OTHER",""

A2.3 Look-Up table for Object Type Area 'A'

"crlref","","LS(SOLD,2,RESGR)","5","S","MARINERS OTHER",""
"mpaare","","LS(DASH,2,RESBL)","5","S","MARINERS OTHER",""
"mpaare","levprt1","AC(CHRED,1);LS(DASH,2,CHRED)","5","S","MARINERS OTHER",""

ANNEX B – EXAMPLES OF ECONOMIC COST OF GROUNDINGS [2]

Colombia:

Vessel Name	Date and Scope of Injury	Location	Vessel Size	Cause of Grounding/Remarks	Funds Recovered
Nother Star	Jan 26, 1993	Lat 13°31.7'N, Long 81°20.6'W	20.7m	Cost of Grounding: 10,000,000.	Unknown

Contact: Capitan de Fragata Jairo Javier Peña Gomez

Director Centro De Investigaciones Oceanograficas e Hidrograficas
Armada Nacional
Cartagena de Indias, Colombia
Tel: 575-6694286 Fax: 575-6694297

United States:

In the last two years, over 1000 vessel groundings in the Florida Keys National Marine Sanctuary alone (approximately half coral, half seagrass) have resulted in approximately 35 cases forwarded for consideration as natural resource damage actions, resulting so far in the recovery of more than U.S.$13,000,000.

Significant groundings within the Florida Keys National Marine Sanctuary, 1984 – 1997

Vessel Name	Date and Scope of Injury	Location	Vessel Size	Cause of Grounding/Remarks	Funds Recovered
Wellwood	8/4/84 - 1500m; extensive biological and structural damage	K.Largo NMS (Molasses Reef)	122 m	Operator/ navigation error	$5,654,228
Mini Laurel	12/11/86 – biological & structural damage	K. Largo NMS (Molasses Reef)	65 m		$30,000
Alec Own Maitland	10/25/89 – 930m2 partial destruction; 680.5m total destruction	K. Largo NMS (near Carysfort Light)	47 m	Operator/ navigation error	$1,450,000
Elpis	11/1/89 – 482m partial destruction; 2604.7m total destruction	K. Largo NMS (near Elbow Reef Light)	143 m		$2,275,000
Jacquelyn L.	7/7/91 – 123.1 m total	FKNMS (W.Sambo	54 ft		$251,554

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[2] This table contains all information received as of June 30, 1999. Additional submissions will be added as received

Vessel Name	Date and Scope of Injury	Location	Vessel Size	Cause of Grounding/Remarks	Funds Recovered
Wellwood	8/4/84 - 1500m; extensive biological and structural damage	K.Largo NMS (Molasses Reef)	122 m	Operator/ navigation error	$5,654,228
	injury; .5m partial injury	Reef)			
Miss Beholden	3/13/93 – 1025.6m biological destruction and physical damage	FKNMS (W. Sambo Reef)	45 m	Was taking on water and intentionally grounded to prevent sinking	($1,873,741)

Vessel Name	Date and Scope of Injury	Location	Vessel Size	Cause of Grounding/Remarks	Funds Recovered
Columbus Iselin	8/10/94 – 345m total destruction	FKNMS (Looe Key)	52 m	Operator error	$3,760,488
Contship Houston	2/2/97 – 7107m of crushed mature reef	FKNMS (Maryland Shoal)	187 m	Ship owners purchased racon beacons for FKNMS	ER/DA cost pd. RP undertaking restoration
Golden Lady	97.4m injury to coral reef crest, 20.7m living coral destroyed, 298m total area	FKNMS (W. Sambo Reef)	71ft		$54,716

Source: NOAA, Marine Sanctuaries Division
Note: The majority of groundings in the Florida Keys National Marine Sanctuary are generally caused by the inexperience of the boater, operator/navigation error, or negligence.