

**OceanWise Ltd**

# **Marine and Coastal Data Products**

## **User Guide**

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## Preface

This user guide provides an overview of the family of Marine and Coastal Data Products created and maintained by OceanWise Limited. It provides guidelines on how to derive the maximum benefit from the products and answers many common questions.

If you experience any problems using the data and you have obtained a copy or are accessing the data from an OceanWise Licensed Partner, please contact your Licensed Partner. If not, or you have any other concerns, please email OceanWise directly at [support@oceanwise.eu](mailto:support@oceanwise.eu).

We would like to know what you think of the data and supporting documents including this user guide. Please email your comments to [info@oceanwise.eu](mailto:info@oceanwise.eu).

Usage of the data is in accordance with the standard terms and conditions document you received with your order.

This guide is provided for guidance only and does not constitute any warranty, representation, undertaking, commitment or obligation (express or implied) about the product or its suitability for any particular or intended purpose. It is your responsibility to ensure that this product is suitable for your intended purpose.

OceanWise does not accept any liability (whether for breach of contract, negligence or otherwise) for any loss or liability you or any third party may suffer in relying on this guide and any guidance, suggestion, advice or explanation provided in it.

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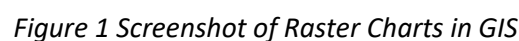
This document provides details of the family of Marine and Coastal Data Products available from OceanWise either directly or via a Licensed Partner. A list of current Licensed Partners is available on the OceanWise website. The User Guide has been prepared to help users understand the contents of the datasets provided, details of the nature and provenance of the data, and how maximum benefit can be gained from its use.

Having read this document carefully, if you have any questions about the products, or have any suggestions about how the data products or accompanying documentation – including this user guide – can be improved, please do not hesitate to contact us.

The Marine and Coastal Data Products currently available comprise:

- Raster Charts
- Raster Charts XL (eXcluding Land)
- Marine Themes
- Marine Themes Digital Elevation Model (DEM)
- ENC Web Map Service

Each of these products is described separately in the following sections.



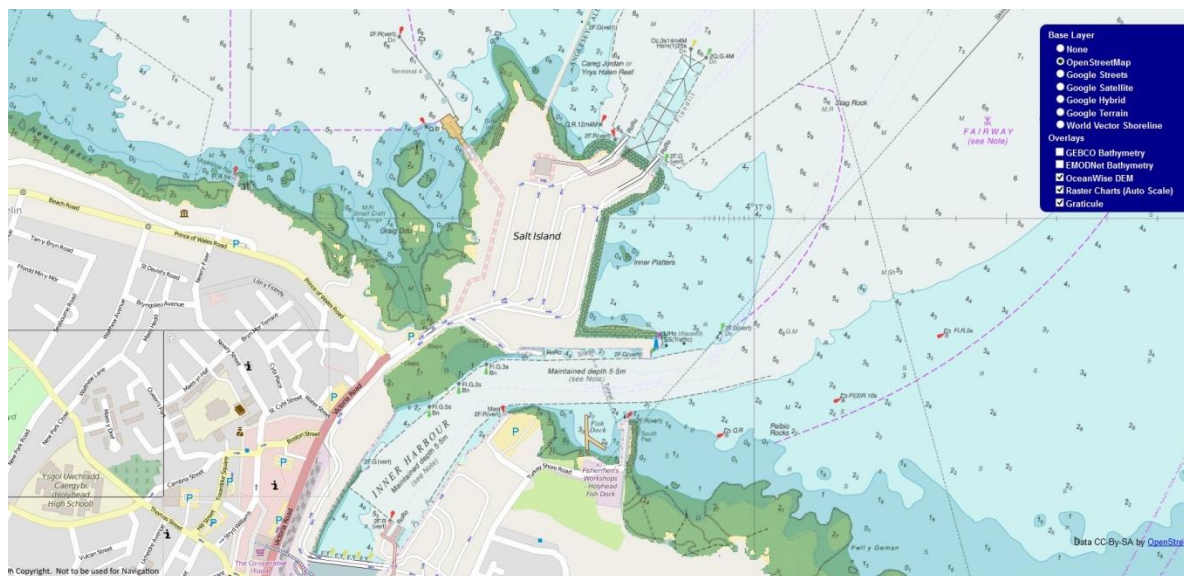


Figure 2 Screenshot of Raster Charts XL (combined with OpenStreetMap data)

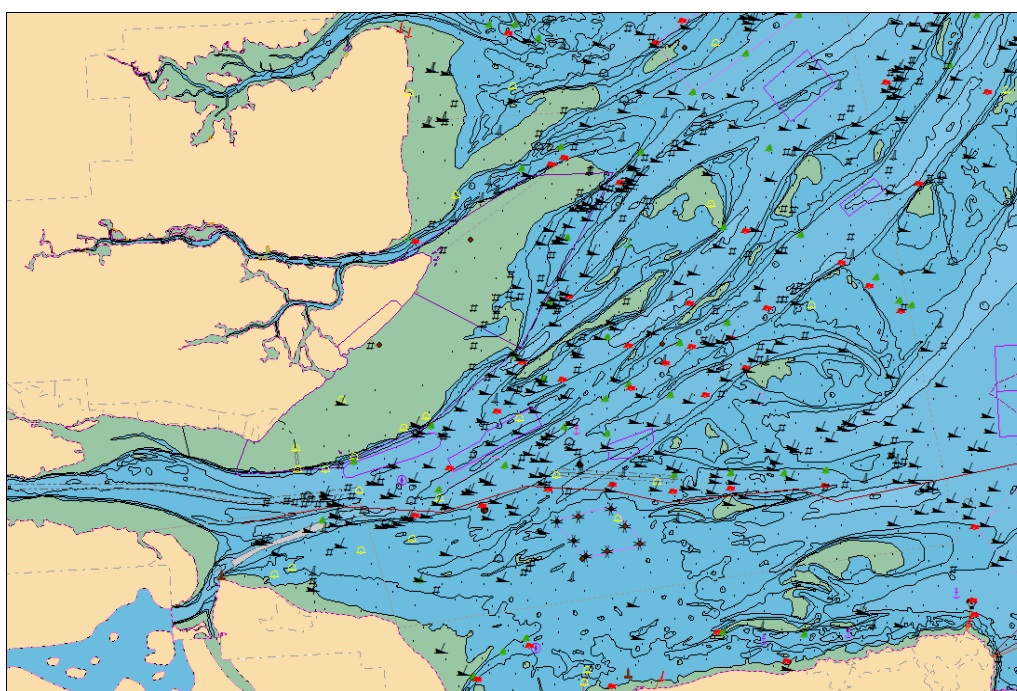


Figure 3 Screenshot of Marine Themes in GIS



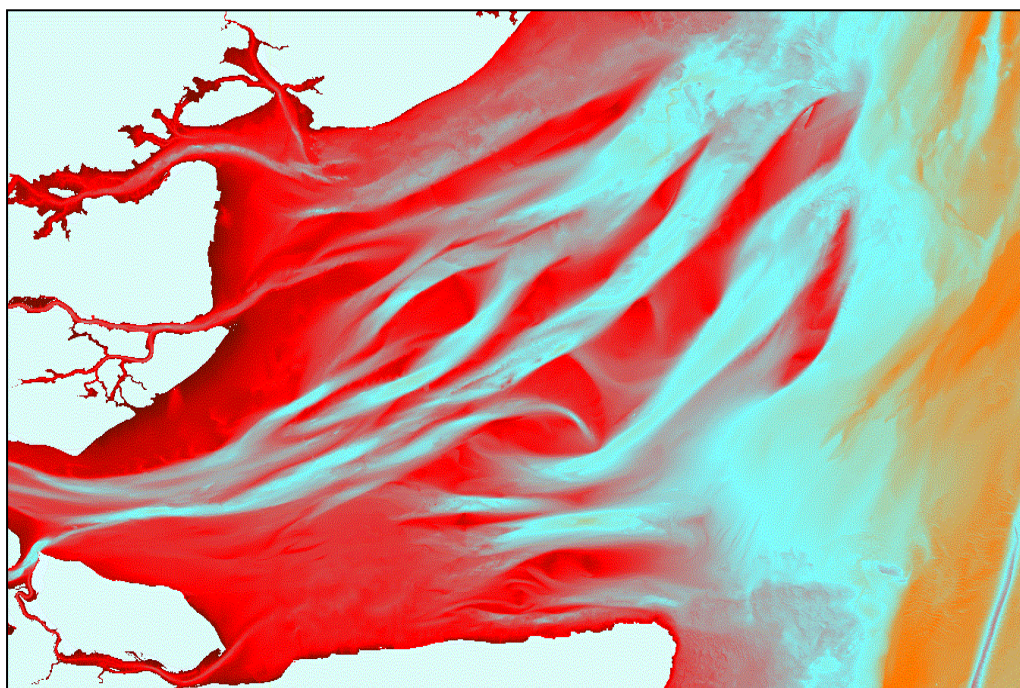


Figure 4 Screenshot of Marine Themes DEM in GIS

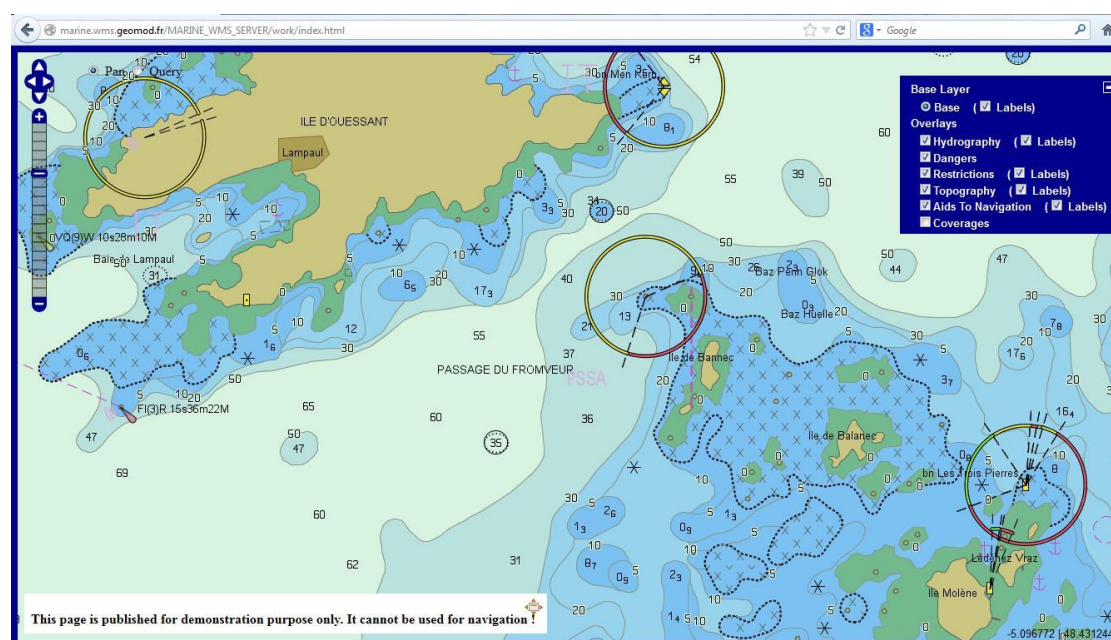


Figure 5 Screenshot of ENC Web Map Service in a Web Application

## Copyright Notices

**Acknowledgement:** This product has been derived in part from material obtained from the UK Hydrographic Office with the permission of the UK Hydrographic Office, Keeper of Public Records and other relevant authorities. Where YYYY corresponds to the current year

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## Raster Charts

### 3.1 Background

Raster Charts comprises the well-known and popular nautical chart series from the UK Hydrographic Office, supplied as individual image files for easy loading and use in geographical information systems (GIS). It provides a comprehensive marine map base and is ideal for applications where a set of familiar features and related symbology is required for reference or as a backdrop to other data.

The Product is supplied as individual charts at different scales depending on their geographic coverage. Small scale charts cover the whole of British Waters, for example, while large scale charts cover individual estuaries and harbours in greater detail. There are many different scales of chart depending on the geographic area they cover.

Because of the way the original charts are compiled, individual charts may overlap with adjacent charts at the same or different scale levels, and charts at a given scale level may not provide complete coverage, the latter being particularly true for large scale charts that cover, for example, the approaches to a harbour or the harbour itself.

For convenience, we have grouped charts of a similar scale level into bands corresponding to the following levels:

- Small: Chart scales of less than 1: 150,000
- Medium: Chart scales of equal to or greater than 1:150,000, and less than 1: 30,000
- Large: Chart scales equal to or greater than 1: 30,000.

Customers may choose to purchase a single chart or a number of charts covering a similar area by selecting these within the scale bands described above.

Because of the way Hydrographic Offices charge for content, more than one chart may be automatically included in your selection for no additional cost. However, if a single chart is required, without purchasing other charts in the same scale band and selected area, this may be arranged. In a few cases, some very small scale charts (of less than 1: 350,000) may attract a discount. Please contact us with your requirements and we will be pleased to provide advice and, if appropriate, revised pricing for single charts.

The UK Hydrographic Office website contains the details of all original charts and their geographic coverage. Please note though that not all of these charts have been captured digitally and a few that have been captured cannot be supplied for reasons of copyright or national security.

Please contact us if you require a chart that you know exists in its original form but that you cannot find on your chosen Licensed Partner's website.

## 3.2 File Naming

Each chart is provided as a separate file that is named according to the number of the original chart. Where the original chart contained smaller charts, known as panels, on the same sheet, each panel chart is provided as a separate file using the following naming convention:

- For charts comprising a main chart and one or more smaller charts on the same sheet, these are supplied as separate files and are given the name XXXX-0 for the main chart and XXXX-1 for the first panel, XXXX-2 for the second panel etc.
- For charts comprising two or more smaller charts on the same sheet without a main chart, these are also supplied as separate files but the file named XXXX-0 is omitted.

## 3.3 Coordinate Reference System

Charts are mostly standardised to the WGS84 Datum, especially in UK waters, and are projected either to Mercator or Transverse Mercator. **Be aware that each Transverse Mercator CRS is unique with a different central meridian defined.** This is how the data is received from the supplier and is down to the product being designed for navigational systems. This means some software applications may not read the custom CRS. The files containing these charts, and any that are referenced to a different system, include appropriate georeference metadata which is available to the user or system to ensure accurate positioning in Geographic Information Systems (GIS).

All depths and drying heights are referenced to Chart Datum, which approximates to Lowest Astronomical Tide (LAT).

## 3.4 Symbolology

Charts are symbolised to the international standard known as INT1. If you are unfamiliar with this standard or you require further information, details are contained in the publication 'Symbols and Abbreviations Used on Admiralty Charts 5011' available from the UK Hydrographic Office and most retail and online chandlers.

## 3.5 Metadata

Metadata is presently not supplied with the Raster Charts Product.

## 3.6 Data Formats

The Raster Charts Product is supplied in the GeoTIFF format, which is read by GIS software. If you are a MapInfo user and require TAB files for the charts you have purchased, please contact your Licensed Partner or OceanWise directly.

The Raster Charts Product is available in the following delivery methods:

## Marine and Coastal Data Products User Guide

- FTP Download
- CD-ROM or DVD
- Web Mapping Service.

The available delivery methods may vary according to your chosen Licensed Partner. Please select one that suits your requirements or contact OceanWise for further information.

## Raster Charts XL (eXcluding Land)

### 4.1 Background

Raster Charts are familiar to many working in the marine domain, however the yellow land, title blocks and unique Coordinate Reference Systems can make working with more than one chart at a time messy and time consuming.

With the wider availability of off-the-shelf open source land mapping more users have access to these comprehensive datasets which they do not want obstructed by the vague yellow land.

Raster Charts XL comprises the well-known and popular nautical chart series from the UK Hydrographic Office with one major difference - all land has been removed. In addition the information panels, scale bars and title blocks have also been removed leaving just the marine data.

The Charts are supplied as individual image files for easy loading and use in geographical information systems (GIS) or Web Mapping services. It still provides a comprehensive marine map base and is ideal for applications where a set of familiar features and related symbology is required for reference or as a backdrop to other data but can now be used alongside more appropriate land mapping.

The Product is supplied as individual charts at different scales depending on their geographic coverage. Small scale charts cover the whole of British Waters, for example, while large scale charts cover individual estuaries and harbours in greater detail. There are many different scales of chart depending on the geographic area they cover.

Because of the way the original charts are compiled, individual charts may overlap with adjacent charts at the same or different scale levels, and charts at a given scale level may not provide complete coverage, the latter being particularly true for large scale charts that cover, for example, the approaches to a harbour or the harbour itself.

For convenience, we have grouped charts of a similar scale level into bands corresponding to the following levels:

- Small: Chart scales of less than 1: 150,000
- Medium: Chart scales of equal to or greater than 1:150,000, and less than 1: 30,000
- Large: Chart scales equal to or greater than 1: 30,000.

Customers may choose to purchase a single chart or a number of charts covering a similar area by selecting these within the scale bands described above.

Because of the way Hydrographic Offices charge for content, more than one chart may be automatically included in your selection for no additional

cost. However, if a single chart is required, without purchasing other charts in the same scale band and selected area, this may be arranged. In a few cases, some very small scale charts (of less than 1: 350,000) may attract a discount. Please contact us with your requirements and we will be pleased to provide advice and, if appropriate, revised pricing for single charts.

The UK Hydrographic Office website contains the details of all original charts and their geographic coverage. Please note though that not all of these charts have been captured digitally and a few that have been captured cannot be supplied for reasons of copyright or national security.

Please contact us if you require a chart that you know exists in its original form but that you cannot find on your chosen Licensed Partner's website.

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- For charts comprising two or more smaller charts on the same sheet without a main chart, these are also supplied as separate files but the file named XXXX-0 is omitted.

## 4.3 Coordinate Reference System

Raster Charts XL have been standardised to the World Mercator projection on WGS84 Datum (EPSG::3395).

All depths and drying heights are referenced to Chart Datum, which approximates to Lowest Astronomical Tide (LAT).

## 4.4 Symbology

Charts are symbolised to the international standard known as INT1. If you are unfamiliar with this standard or you require further information, details are contained in the publication 'Symbols and Abbreviations Used on Admiralty Charts 5011' available from the UK Hydrographic Office and most retail and online chandlers.

## 4.5 Metadata

Metadata is presently not supplied with the Raster Charts XL Product.



## 4.6 Data Formats

The Raster Charts XL Product is supplied in the GeoTIFF format, which is read by GIS software. If you are a MapInfo user and require TAB files for the charts you have purchased, please contact your Licensed Partner or OceanWise directly.

The Raster Charts XL Product is available in the following delivery methods:

- FTP Download
- CD-ROM or DVD
- Web Mapping Tile Service.

The available delivery methods may vary according to your chosen Licensed Partner. Please select one that suits your requirements or contact OceanWise for further information.

## Raster Charts XL Oceans

### 5.1 Background

Following on from Raster Charts XL the Raster Charts XL Oceans product provides a small scale global coverage Web Service to act as a background for global projects.

It is still based on the familiar nautical chart series from Hydrographic Offices but only comprises data down to 1:3,500,000. All land has been removed so can be combined with appropriate land mapping services or datasets.

The data is only available as OGC compliant Web Services – both Web Map Service and Web Map Tile Service. The Service can be consumed by both desktop and web mapping applications.

### 5.2 Coordinate Reference System

The Service is supplied at EPSG::3857 which is the Psuedo Mercator used by many web mapping applications.

If your application requires a different Coordinate Reference System (CRS) and cannot do on-the-fly reprojection then please request via [support@oceanwise.eu](mailto:support@oceanwise.eu). However the Service can only accommodate world scale CRS.

### 5.3 Symbology

Charts are symbolised to the international standard known as INT1. If you are unfamiliar with this standard or you require further information, details are contained in the publication 'Symbols and Abbreviations Used on Admiralty Charts 5011' available from the UK Hydrographic Office and most retail and online chandlers.

### 5.4 Metadata

Metadata is available as a Web Feature Service layer which describes the Chart boundaries and usage level.

### 5.5 Data Formats

The Product is only available as an OGC Web Map Service and Web Map Tile Service.

## Marine Themes Vector

### 6.1 Background

Marine Themes Vector comprises authoritative data from different public sector data agencies, including the UK and other Hydrographic Offices. The dataset uses different sources of data available for a particular feature and scale range, derived either from the production Electronic Navigational Charts (ENCs) or from original source datasets, where available.

Marine Themes Vector is supplied as individual themed layers corresponding to marine reference data or base mapping required for general situation awareness, planning, site selection and investigation and outline engineering design. As with Ordnance Survey MasterMap™ Topography Layer, Marine Themes Vector contains unique identifiers that can be used for data linking and feature attributes that can be queried for differential display and spatial analysis.

### 6.2 Data Structure

Marine Themes Vector is provided at four levels of scale or resolution, MTS, MTM, MTL and MTF. The first three levels correspond to the compilation scale of the input data where this is derived directly from ENCs. The latter, MTF, corresponds to data that has been acquired from primary sources to create seamless layers of data for a particular Feature Type. Because of the availability and nature of the source data, features are included at the most appropriate level. The four levels are defined as follows:

|                          |  |
|--------------------------|--|
| Small Scale (MTS):       | Derived from ENCs in the scale range 1: 150,000 and smaller. Coverage includes all waters      |
| Medium Scale (MTM):      | Derived from ENCs in the scale range 1: 150,000 to 1: 30,000. Coverage includes coastal waters |
| Large Scale (MTL):       | Derived from ENCs in the scale range 1: 30,000 and greater. Coverage includes most harbours    |
| Scale Independent (MTF): | Data based on primary sources and provided as a seamless layer of data for all waters          |

Marine Themes Vector is structured into eight Themes, with each Theme comprising various Feature Types pertinent to that Theme. Summary details are provided below. A full list of Feature Types is provided in Annex 1 – Marine Themes List of Feature Types.

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The 'Marine Themes Feature Catalogue', contains a full list of Feature Types and their definition. Photographs of features in the real world, and a screenshot of their presence in GIS, are included where available. The catalogue is available [online](#).

A unique Feature Code and one or more Descriptive Terms define each Feature Type. Feature Codes contain five characters commencing with the number of the relevant theme. For example the Feature Type 'Bathymetry, Area, Subtidal' has the unique Feature Code of 10011, the first 1 indicating the feature belongs to the Theme 'Elevation' (See Annex 1). A list of the Themes is presented in Table 1 below.

The nature or character of each Feature Type is further defined by up to twenty base Attributes, including the Feature Code and Description outlined above. Where the Theme is sourced entirely from a primary data source additional attributes have been added appropriate to the data. The Attributes provided for each Marine Theme is presented in Table 2 overleaf.

*Table 1 List of Themes*

| <b>CODE</b> | <b>NAME</b>                       | <b>DESCRIPTION</b>  |
|-------------|-----------------------------------|---|
| 10000       | Elevation                         | The Earth's surface divided into multiple subtidal, intertidal and land areas, contours and spot soundings. Includes bathymetry and multiple shorelines categorised by tidal level and type.                |
| 20000       | Shipwrecks & Obstructions         | Sunken ships and other disused man-made objects. Includes objects being re-used for another purpose and those of historical interest.   |
| 30000       | Transport                         | Transport networks and related infrastructure. Includes aids to navigation.   |
| 40000       | Industrial Facilities             | Production, industrial, aquaculture and research facilities. Includes hydrocarbon and renewable energy infrastructure, submarine cables and equipment for environmental monitoring.                         |
| 50000       | Administrative & Management Units | Areas of administration, governance and management at international, national, regional and local levels. Includes national boundaries, dumping sites, safety and prohibition zones and regulated fairways. |
| 60000       | Geographical Regions              | Names of subtidal and intertidal areas, and other geographical or topographical features of public or historical interest.  |

|       |                        |   |
|-------|------------------------|---|
| 70000 | Geology                | Geological units including bedrock features and sea bed sediments |
| 80000 | Tides & Tidal Currents | Tide related features including stations and streams              |

Please note the following when considering and using attributes:

- Not all Attributes are relevant to all Feature Types and, where this is the case, have been omitted
- Not all records for all Attributes have been populated by the appropriate Hydrographic Office or source data supplier
- Attribute values may be enumerated or contain descriptive text. Where there is descriptive text, spelling and other errors may be present and terms may not be consistent. Typographical errors in attribute data received from Hydrographic Offices have been corrected wherever possible.

Table 2 List of Attributes

| ATTRIBUTE NAME    | DEFINITION  | ELEVATION | OBSTRUCTIONS | TRANSPORT | INDUSTRIAL | ADMINISTRATIVE | REGIONS | GEOLOGY | TIDES | ABBREVIATED ATTRIBUTE NAME (see note) |
|-------------------|---|-----------|--------------|-----------|------------|----------------|---------|---------|-------|---------------------------------------|
| GID               | Object Identifier   | Y         | Y            | Y         | Y          | Y              | Y       | Y       | Y     | GID                                   |
| THEME             | Theme Name  | Y         | Y            | Y         | Y          | Y              | Y       | Y       | Y     | THEME                                 |
| FEATURE_CODE      | A numeric identifier of the Feature Type                            | Y         | Y            | Y         | Y          | Y              | Y       | Y       | Y     | CODE                                  |
| NAME              | The individual name of an object                                    | Y         | Y            | Y         | Y          | Y              | Y       | Y       | Y     | NAME                                  |
| DESCRIPTION       | An explanation of the Feature Type                                  | Y         | Y            | Y         | Y          | Y              | Y       | Y       | Y     | DESCRIPTN                             |
| CATEGORY          | A class or division of features sharing characteristics             | Y         | Y            | Y         | Y          | Y              | Y       | Y       | Y     | CATEGORY                              |
| SOURCE_DATE       | The production date of the Source data e.g. the date of publication |           | Y            | Y         | Y          | Y              | Y       | Y       | Y     | SOURCE_DAT                            |
| SOURCE_INDICATION | Information about the source of the object                          |           | Y            | Y         | Y          | Y              | Y       | Y       | Y     | SOURCE_IND                            |
| INFORMATION       | Textual information about an object                                 | Y         | Y            | Y         | Y          | Y              | Y       | Y       | Y     | INFORMATN                             |



|                |  |   |   |   |   |   |   |   |  |            |
|----------------|--|---|---|---|---|---|---|---|--|------------|
| CONDITION      | The state of the feature. Default is assumed to be complete, undamaged and working                                   |   | Y | Y | Y | Y | Y |   |  | CONDITION  |
| STATUS         | Defines the status of the feature from a selected list e.g. permanent, occasional                                    |   | Y | Y | Y | Y | Y |   |  | STATUS     |
| RESTRICTIONS   | A limiting condition on what can take place at the location  |   | Y | Y | Y | Y | Y |   |  | RESTRICTNS |
| NATIONALITY    | The nation owing the Feature Type  |   | Y | Y | Y | Y | Y |   |  | NATIONALTY |
| ACCURACY       | The best estimate of the exactness of the Feature  |   | Y | Y | Y | Y |   |   |  | ACCURACY   |
| MATERIAL       | What the Feature Type is made from or carries  | Y | Y | Y | Y |   |   | Y |  | MATERIAL   |
| WATER_LEVEL    | The effect of the surrounding water on an object   | Y | Y |   | Y |   |   |   |  | WATER_LVL  |
| HEIGHT         | Height   |   |   |   | Y |   |   |   |  | HEIGHT     |
| DEPTH          | The distance from the surface level to the bottom point of any body of water   | Y | Y |   | Y |   |   |   |  | DEPTH      |
| DEPTH_MINIMUM  | The minimum (shoalest) value of a depth range  | Y |   |   |   |   |   |   |  | DEPTH_MIN  |
| DEPTH_MAXIMUM  | The maximum (deepest) value of a depth range   | Y |   |   |   |   |   |   |  | DEPTH_MAX  |
| MARKER_LIGHT   | A luminous or lighted aid to navigation  |   |   | Y | Y |   |   |   |  | LIGHT      |
| MARKER_TOPMARK | A characteristic shape secured at the top of a buoy or beacon to aid in its identification                           |   |   | Y | Y |   |   |   |  | TOPMARK    |
| MARKER_DAYMARK | The identifying characteristics of an aid to navigation which serve to facilitate its recognition against a daylight |   |   | Y | Y |   |   |   |  | DAYMARK    |

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|             |  |   |   |   |   |   |   |   |   |            |
|-------------|--|---|---|---|---|---|---|---|---|------------|
|             | viewing background   |   |   |   |   |   |   |   |   |            |
| UPDATED     | Date feature was last processed  | Y | Y | Y | Y | Y | Y | Y | Y | UPDATED    |
| RECORD_DATE | Latest Issue Date/Updated Date from S57 cell   | Y | Y | Y | Y | Y | Y | Y | Y | RECORD_DAT |
| LEXICON     | Lexicon code giving the name of the unit   |   |   |   |   |   |   | Y |   | LEXICON    |
| RCS         | Rock Classification Scheme code  |   |   |   |   |   |   | Y |   | RCS        |
| MAX_INDEX   | Number representing the maximum age of the unit  |   |   |   |   |   |   | Y |   | MAX_INDEX  |
| MIN_INDEX   | Number representing the minimum age of the unit  |   |   |   |   |   |   | Y |   | MIN_INDEX  |
| MAX_TIME    | Maximum age in years of the oldest time division during which the geological unit was formed   |   |   |   |   |   |   | Y |   | MAX_TIME   |
| MIN_TIME    | Minimum age in years of the youngest time division during which the geological unit was formed |   |   |   |   |   |   | Y |   | MIN_TIME   |
| AGE         | Name of the max and min ages of geochronological time  |   |   |   |   |   |   | Y |   | AGE        |
| EPOCH       | Name of the max and min epochs of geochronological time  |   |   |   |   |   |   | Y |   | EPOCH      |
| SUBPERIOD   | Name of the max and min subperiods of geochronological time                                    |   |   |   |   |   |   | Y |   | SUBPERIOD  |
| PERIOD      | Name of the max and min periods of geochronological time                                       |   |   |   |   |   |   | Y |   | PERIOD     |
| ERA         | Name of the max and min eras of geochronological time  |   |   |   |   |   |   | Y |   | ERA        |

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|               |   |  |  |  |  |  |  |  |   |   |           |
|---------------|---|--|--|--|--|--|--|--|---|---|-----------|
| EON           | Name of the max and min eons of geochronological time   |  |  |  |  |  |  |  | Y |   | EON       |
| STANDARD_PORT | Name of major port where tidal constituents have been established and act as a reference for a tidal stream                   |  |  |  |  |  |  |  |   | Y | STD_PORT  |
| HAT           | Highest Astronomical Tide   |  |  |  |  |  |  |  |   | Y | HAT       |
| MSL           | Mean Sea Level  |  |  |  |  |  |  |  |   | Y | MSL       |
| LAT           | Lowest Astronomical Tide  |  |  |  |  |  |  |  |   | Y | LAT       |
| MHHW          | Mean Higher High Water or Mean High Water (Springs)   |  |  |  |  |  |  |  |   | Y | MHHW      |
| MLHW          | Mean Lower High Water or Mean High Water (Neaps)  |  |  |  |  |  |  |  |   | Y | MLHW      |
| MHLW          | Mean Higher Low Water or Mean Low Water (Neaps)   |  |  |  |  |  |  |  |   | Y | MHLW      |
| MLLW          | Mean Lower Low Water or Mean Low Water (Springs)  |  |  |  |  |  |  |  |   | Y | MLLW      |
| TIDE_TYPE     | Type of tide e.g. Diurnal or semi-diurnal   |  |  |  |  |  |  |  |   | Y | TIDE_TYPE |
| CONSTITUENTS  | Tidal curve constituents  |  |  |  |  |  |  |  |   | Y | CONSTITS  |
| DATA          | Tidal stream values made up of Standard Port code, Standard Port Name, 13 sets of (time, direction, Spring speed, Neap speed) |  |  |  |  |  |  |  |   | Y | DATA      |

Notes: The abbreviated attribute name is used where the file format cannot support fieldnames of more than 10 characters (e.g. ESRI shapefile).

## 6.3 INSPIRE Compliance

Please note that all of the Marine Themes, other than the 'Shipwrecks and Obstructions' and Tides themes, correspond to themes contained within Annexes of the INSPIRE Directive<sup>1</sup>. Shipwrecks and Obstructions are not included in the INSPIRE Annexes at present, although shipwrecks that are protected may be included in the Annex I theme 'Protected Sites'.

Whilst it may be possible for Marine Themes Vector to comply with the INSPIRE specifications for data in the future, this is not the case at present. There are a number of factors that do not allow compliance at this stage, including the lack of a published final specification for all relevant themes, the nature and availability of data from public sector data agencies, including the UK and other Hydrographic Offices, and the ability of some GIS to load the GML data format. It is our intention though to create an INSPIRE compliant version of the Marine Themes in the future.

*Table 3 Comparison of Marine Themes Data Product with INSPIRE Themes*

| <b>CODE</b> | <b>MARINE THEMES</b>                | <b>INSPIRE THEMES</b>  |
|-------------|-------------------------------------|--|
| 10000       | Elevation                           | Elevation (Annex I)  |
| 20000       | Shipwrecks and Obstructions         | Not specified - although shipwrecks designated under the Protection of Wrecks Act, 1973 or the Protection of Military Remains Act, 1986 may be included in Protected Sites (Annex I) |
| 30000       | Transport                           | Transport networks (Annex I)   |
| 40000       | Industrial Facilities               | Production and industrial facilities (Annex III) or Agricultural and aquaculture facilities (Annex III)  |
| 50000       | Administrative and Management Units | Administrative units (Annex I) or Area management / restriction / regulation zones & reporting units (Annex III)   |
| 60000       | Geographical Regions                | Geographical Names (Annex I) or Sea Regions (Annex II)   |
| 70000       | Geology                             | Geology (Annex II)   |
| 80000       | Tides and Tidal Currents            | Time series observations is included in Oceanographic Geographical Features (Annex III)  |

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<sup>1</sup> Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE).

## 6.4 Source Data Provenance and Scale

Marine Themes Vector has been created from data from different public sector data agencies, including the UK and other Hydrographic Offices. This includes:

- Chart derived data originally captured for the production of Electronic Navigational Charts (ENCs)
- Data collated from various sources and managed by the Hydrographic Office as a primary dataset to support the creation of ENCs and other navigational and defence products.
- Data collated from various sources determined to be the most appropriate data holder.

These sources contain numerous features held to different standards e.g. IHO S-57. Their characteristics and how these are managed in the design and creation of the Marine Themes are explained below.

## 6.5 Data sourced from ENCs

Many of the features held digitally within Hydrographic Offices only exist in the form they were captured to support the creation of ENCs. In other words, they are only in their product form, rather than as source datasets that can then be used to support product development. As with paper and raster charts (see Section 3), ENCs are compiled at different scale levels, overlap with adjacent ENCs and do not necessarily provide complete coverage of the Earth's surface (sea surface and seabed).

A real world feature may exist in several ENCs at different scales and may be represented differently in each case. For example, at ENC boundaries, a single feature in the real world will be represented as separate records (one for each ENC) with split geometries. Features present on one chart may be missing from an adjacent chart, their geometries discontinuous and their attributes captured differently.

There are many reasons why a feature contained in the data may not be wholly representative of the feature in the real world. This includes how the feature was portrayed by the Hydrographic Office on the original paper chart, the scale of that chart and the precision of capture, digitising errors, deliberate bias towards safety in compilation, and where its purpose is purely cartographic. Examples include the processing and selection of water depth to introduce a shoal bias, the coordinates of administrative areas being offset from any legal definition and geographical regions used for labelling. As a consequence, users should contact OceanWise, the Hydrographic Office or other relevant authority with regard to the accuracy and provenance of a given feature prior to its use for legal, contractual or regulatory purposes.



## 6.6 Creation of Marine Themes Vector

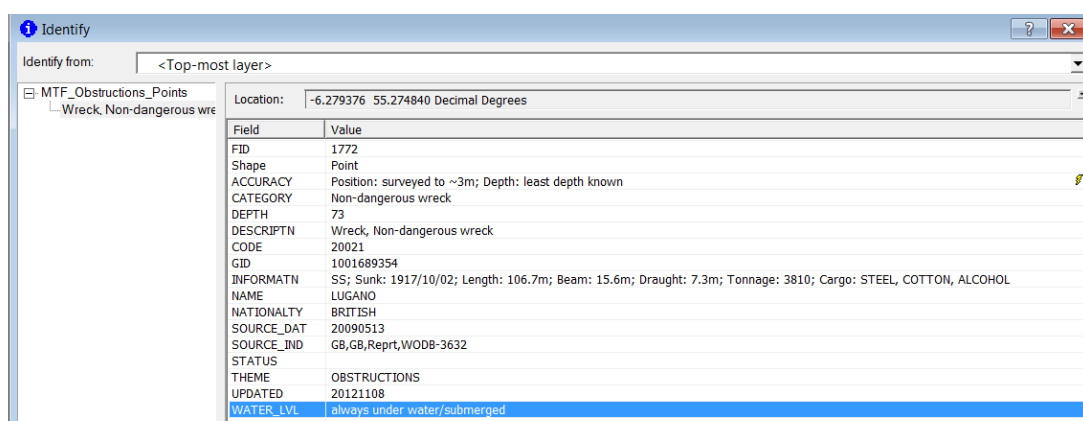
Marine Themes Vector uses the most complete and comprehensive geometric representation of a real world feature derived from one or more ENC or primary source dataset. This does not mean automatically using the representation of a feature derived from the largest scale ENC, as the feature may not be present at all scale levels, or may not be appropriate to the resolution of the final data product. Where possible, features are joined at chart boundaries to create as near a seamless layer as possible. The most up to date attribute data is used to populate the attributes for each conjoined feature. Errors in spelling or terminology are corrected where these are present and obvious. Where there is any doubt, features are left as separate records. The seeming discrepancy is reported to the relevant Hydrographic Office for consideration and any corrections included in future updates.

Where features exist in primary source datasets, these are used to complement or replace those features derived from ENCs, as they are more comprehensive and accurate. Examples where this is the case include the 'Wrecks and Obstructions Theme' and 'Military Practice Areas' Feature Type. As Hydrographic Offices streamline their production lines and aim to make their data fit for uses other than navigation, it is expected that more data will be managed at source and hence used to replace ENC derived data in Marine Themes. We continue to work closely with Hydrographic Offices to encourage and help with this process.

In UK Waters Marine Themes Wrecks and Obstructions Layer is populated (as a single seamless layer) by data from UKHO Wrecks and Obstructions database and carefully selected chart derived data i.e. ENCs. We have de-conflicted and excluded any wrecks derived from ENCs (i.e. S-57) as these replicate features in the UKHO database and give a false indication of the quantity of wrecks in an area. We have however retained obstructions from S-57 where these do not conflict with the UKHO database, as there are many of these that are not in the source database. Some are underwater rocks but others indicate the presence of debris which may be manmade.

Marine Themes Vector includes much of the attribution contained in the Wrecks and Obstructions database (WODB) unless this has needed to be truncated because of format limitations e.g. Shapefile. There are no such limitations in the GML supplied. Screenshot of the attribution in Shapefile format is visible in Figure 6. Note the WODB ID in the 'Source Indication' field (see below) and the parsed data in the 'Information' field.

Figure 6 Abbreviated Attribution for Shapefile



The screenshot shows a 'Identify' window with the following content:

Identify from: <Top-most layer>

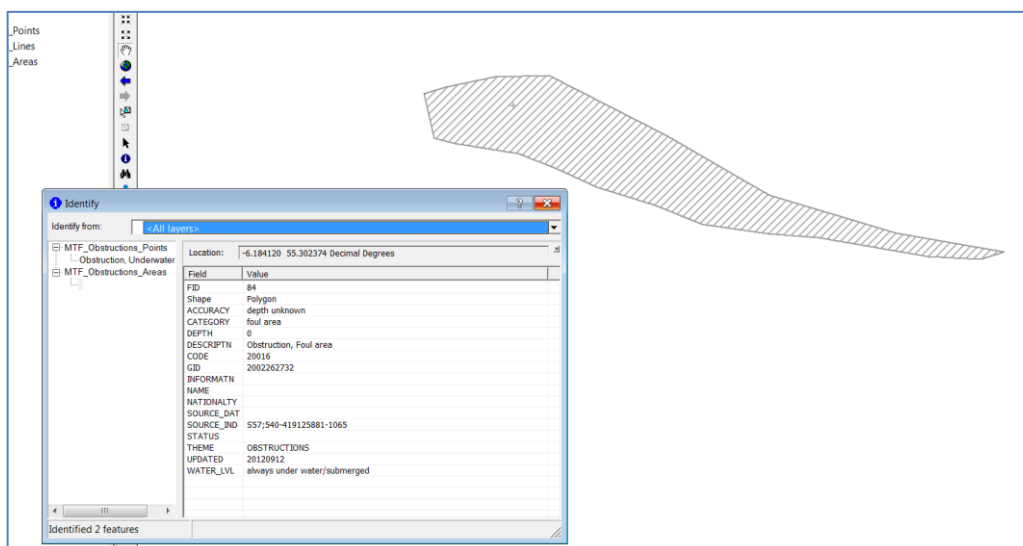
MTF\_Obstuctions\_Points  
Wreck, Non-dangerous wre

Location: -6.279376 55.274840 Decimal Degrees

| Field      | Value  |
|------------|--|
| FID        | 1772   |
| Shape      | Point  |
| ACCURACY   | Position: surveyed to ~3m; Depth: least depth known  |
| CATEGORY   | Non-dangerous wreck  |
| DEPTH      | 73   |
| DESCRIPTN  | Wreck, Non-dangerous wreck   |
| CODE       | 20021  |
| GID        | 1001689354   |
| INFORMATN  | SS; Sunk: 1917/10/02; Length: 106.7m; Beam: 15.6m; Draught: 7.3m; Tonnage: 3810; Cargo: STEEL, COTTON, ALCOHOL |
| NAME       | LUGANO   |
| NATIONALTY | BRITISH  |
| SOURCE_DAT | 20090513   |
| SOURCE_IND | GB,GB,Reprt,WODB-3632  |
| STATUS     |  |
| THEME      | OBSTRUCTIONS   |
| UPDATED    | 20121108   |
| WATER_LVL  | always under water/submerged   |

To counter the limitation in some GIS formats, for users not able to access the GML or if preferred in any case, we are able to supply the full UKHO database in another format e.g. MS Access. Please request this when you place your order. Please note though that the attribution for chart derived obstruction features is sparse, a limitation of what is known and what has been plotted on the chart (Figure 7). Note the Source Indication field referring to S-57, the ENC and Feature ID.

*Figure 7 S57 Sparse Attribution on Foul Area*



Marine Themes presently does not include data from the heritage agencies as this data is generally freely available. However, the wrecks data could be extended by using the Source Indication field containing the UKHO's Wreck ID (WODB-XXXX) to join this data to the source data.

## 6.7 Coordinate Reference System

The Marine Themes Vector Data Product is standardised to the WGS84 Datum (EPSG:4326) and geometries are presented in geographic coordinates (i.e. latitude and longitude). Please note that some sources of data are either referenced to the ETRS89 Datum (EPSG:4258) or would be better referenced to this datum as it is the local realisation of WGS84 in Europe to allow for plate tectonics. Presently, the difference between

WGS84 and ETRS89 is around 0.5 m and for the different datums can be used synonymously for most purposes other than for tasks where highly accurate positioning is required.

In Great Britain, datum transformation available in GIS can be used to combine marine themes with land data products, although these transformations should be used with caution. Please note that due to the nature and provenance of different source data, land and marine features are unlikely to align exactly along a common coastline.

All depths and drying heights are referenced to Chart Datum, which approximates to Lowest Astronomical Tide (LAT). For some purposes, depths may need to be referenced to a different datum. This includes environmental modelling where Mean Sea Level is required, and integration with land height data where a land datum such as Ordnance Survey (Newlyn) is required.

Please contact us for further details and if you would like transformations or harmonisation work to be undertaken on your behalf.

### 6.8 Metadata

Discovery metadata is supplied with Marine Themes created to the ISO 19115/19139 standard using the current MEDIN profile (see [www.oceannet.org](http://www.oceannet.org) for details). The MEDIN profile is a superset of the Gemini 2.1 profile, which is used widely in the UK.

In addition to dataset level i.e. discovery metadata, record level i.e. use metadata is supplied with Marine Themes as an attribute of all features types, providing the user with essential information on the source of each feature and, where known, the accuracy and method of capture.

### 6.9 Data Formats

The Marine Themes Vector Product is supplied in a number of data formats which are listed below:

- GML
- ESRI Shapefile
- Esri FileGeodatabase
- MapInfo TAB
- MapInfo MID/MIF

The Marine Themes Vector Product is available in the following delivery methods:

- FTP Download
- USB

- Web Mapping Service
- Web Feature Service.

The available formats and delivery methods may vary according to your chosen Licensed Partner. Please select one that suits your requirements or contact OceanWise for further information.

## 6.10 Symbology

Symbology may be applied to Marine Themes to determine how the data is portrayed in GIS. How this is achieved depends on the format in which the data is supplied and the target application. Descriptions of the methods used for commonly used systems are provided below.

For Cadcorp users a MarineThemes Named Object Library (NOL) file is supplied which contains Pens, Brushes and Symbols along with Themes that can be applied directly to Cadcorp overlays.

ESRI Layer Files are supplied with the data, which applies standard ESRI symbology. There is a Layer File (\*.lyr – ArcGIS 9.x+) for each theme and scale level, which contains links to the source data. The Layer Files must reside in the same folder as the data.

An ESRI Stylefile is supplied for use where Layer files may not be appropriate e.g. when supplied data is subsequently loaded into a local data store (Geodatabase)

The following reference scales for each Marine Theme scale level are recommended for users of ESRI ArcGIS:

- |                           |            |
|---------------------------|------------|
| • Small scale (MTS)       | 1: 500,000 |
| • Medium scale (MTM)      | 1: 250,000 |
| • Large scale (MTL)       | 1: 100,000 |
| • Scale Independent (MTF) | 1: 100,000 |

Due to the way the data is stored and extracted, symbology is not included in MapInfo TAB format automatically. Instead, symbology can be applied to TAB files post supply using a utility tool. Please contact us for details.

Due to the nature of the features within each Theme, the Theme order suggested below will give the best display within a GIS system, where 1 is the top-most Theme on display (actual order is GIS dependant).

1. Obstructions
2. Tides

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3. Industrial
4. Transport
5. Administrative
6. Geology
7. Regions
8. Elevation

Within each Theme, Shapefiles are provided for Point, Line and Area features. Points should be displayed on top of Lines, which in turn should be displayed on top of Areas. This does not affect other file formats which can handle multiple geometry types.

NOTE: Although all files are supplied for each order, some files may not contain data due to the spatial variation in some features.

## Marine Themes Digital Elevation Model

### 7.1 Background

Marine Themes Digital Elevation Model (DEM) comprises a gridded (raster) dataset of seabed elevation relative to a specified datum. The surface has been created from hydrographic survey and chart derived data depending on the data available for a particular area and has a resolution of 1 and 6 arc seconds, which is approximately 30 and 180 m, respectively. The 1 arc second DEM is provided as individually named half degree tiles and the 6 arc second as individually named two degree tiles. Depending on the resolution of input data the 1 arc second DEM is not available for all areas.

The DEM has been created by utilising these different sources of data in order of resolution, survey method and age in a process known as 'de-confliction'. A meta-layer that accompanies the DEM describes the source data used in any given area. The DEM coastline is the High Water Line on the largest scale of ENC available for any given area. This coastline corresponds to the coastline feature contained within Marine Themes (MTL Elevation), conjoined and height attributed to create a contiguous three dimensional line which was used as a break line.

### 7.2 DEM Creation

#### 6.2.1 Data Sources

Typical sources of data used in the creation of the DEM include:

- Civil and Military Survey Programmes
- Port and Harbour Authorities
- Pipeline, cable and other site surveys from industry
- Output from scientific and environmental studies and surveys
- Compilations of the above used in the creation of ENCs

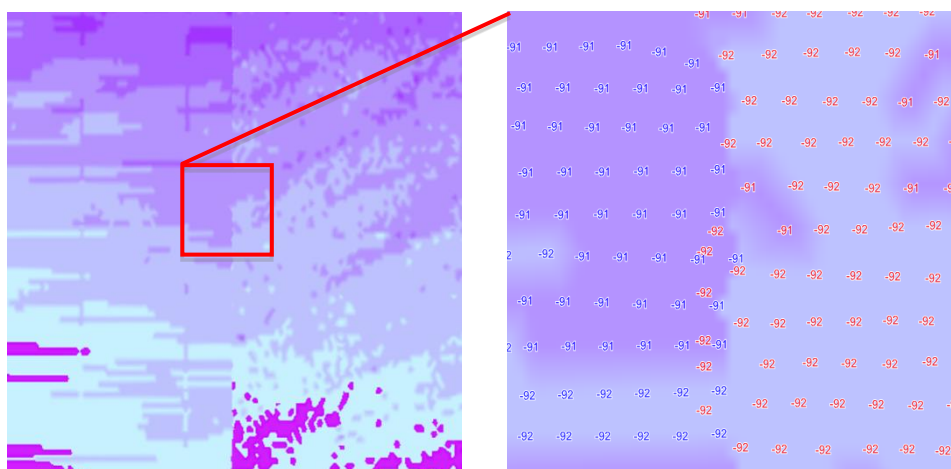
All of the above sources have been quality controlled, so only those verified as fit for use in charting were used in the creation of the DEM.

Whilst Hydrographic Offices are permitted to use all of the data it holds for charting, some data sources may be restricted for commercial or security reasons. Wherever permitted the most up to date, highest resolution data has been used in DEM creation.

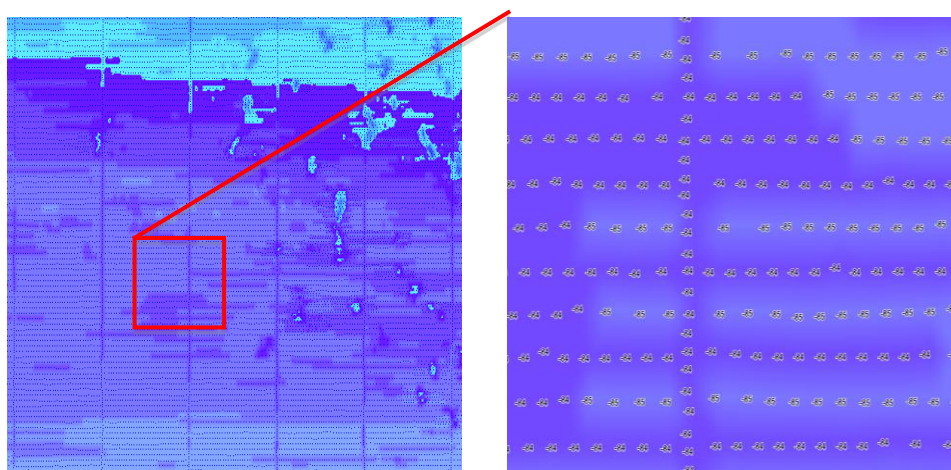
New sources of data either acquired from surveys or released from archive by Hydrographic Offices and other data holders will be incorporated into the DEM during the revision cycle in the future. The meta-layer (also known as a coverage layer) will be updated to reflect these changes.

## 6.2.2 Data Processing

Individual surveys are reduced to Chart Datum by removing the height of tide (and other effects) at the time and location of measurement. This process is known as tidal correction. Various techniques have been used to do this, depending on the age and extent of the survey. Errors, inaccuracy or imprecision in the way surveys are reduced can lead to artefacts in the data. These include height differences between adjacent surveys (Figure 8), and the appearance of cross and tramlines (Figure 9). As the input data and details of how the tidal correction was undertaken are generally unavailable, it is impossible to correct or otherwise remove these artefacts and their presence should be noted in the DEM.



*Figure 8 Steps in the DEM as a result of Height Differences in Source Data*

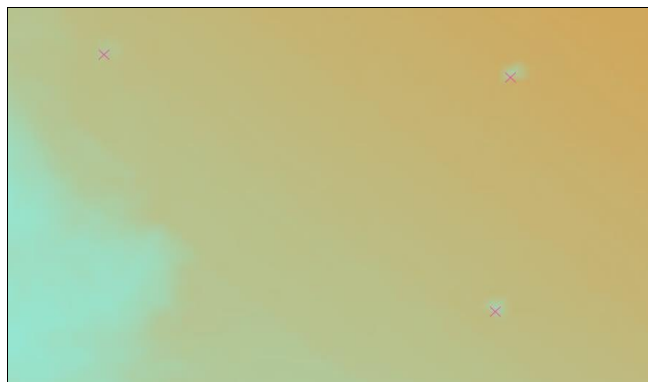


*Figure 9 Cross (vertical) and Tram (horizontal) Lines inherent in some Source Data and hence in DEM*

Soundings on shipwrecks and other manmade objects have not been removed from data received digitally from Hydrographic Offices and hence



appear in the DEM as anomalies or 'spikes' (Figure 10). General policy is not to remove any soundings in the vicinity of a wreck, so as not to leave a hole in the data. Any information about a wreck gathered by a systematic investigation (e.g. the least depth - perhaps gathered by a wire sweep) is rendered by the survey vessel and is recorded separately. This information was not used in creation of the DEM.



*Figure 10 Section of DEM indicating the impact of Shipwrecks in the Source Data  
(a cross indicates a shipwreck)*

### 7.3 Coordinate Reference System

The horizontal datum of the DEM is the WGS84 Datum (EPSG: 4326). Where the source data was determined to be on the WGS84 or the ETRS89 Datum (EPSG: 4258), the local equivalent to WGS84 for Europe, the data was used as read. Where the source data was determined to be in a datum other than WGS84, a datum transformation was undertaken to as high degree of accuracy as possible.

The vertical datum of the source data, and hence the resulting DEM, was standardised on Chart Datum. Chart Datum is commonly used by Hydrographic Offices and other organisations as the reference datum for marine depths (and drying heights), as it approximates to Lowest Astronomical Tide (LAT). As such it is not a geodetic datum but varies from place to place according to tidal range.

In order to use the DEM in a different horizontal Coordinate Reference System (CRS) (e.g. British National Grid) or reference it to a different vertical datum (e.g. Mean Sea Level), for example as input to hydrodynamic modelling, then a transformation needs to be applied.

While it is possible to transform the DEM to another CRS horizontally, the DEM will become distorted. It is more accurate to transform the source data and recreate the DEM in the new CRS. Vertical datum transformation can be applied using a constant shift (for small areas with a similar tidal range) or by applying a separation model, such as that available as the UK Hydrographic Office's Vertical Offshore Reference Frame (VORF). Transformations are available from OceanWise as an additional service.

Please contact your chosen Licensed Partner or OceanWise directly for details.

## 7.4 File Naming

Each half degree (1 arc second DEM) or two degree (6 arc second DEM) tile is provided as an individual file named according to the following convention. Each file is prefixed with "MTF", which means Marine Themes Feature:

TGYYYHXXXX.asc e.g. MTF5051010050.asc

Where

- T is the tile size (5 for 0.5 degrees, 2 for 2 degrees)
- G denotes the northern or southern hemisphere, 0 for north and 1 for south
- YYY is the latitude of the most southern and most western corner of the tile e.g. 505 is 50.5 degrees or 50 degrees 30 minutes
- H denotes the eastern or western hemisphere, 0 for east and 1 for west
- XXXX is the longitude of the most southern and western corner of the tile e.g. 0050 is 005.0 degrees or 005 degrees 0 minutes
- .asc is the extension of the file indicating its format e.g. ASCII grid.

## 7.5 Symbology

OceanWise provides a recommended colour ramp for its DEM. The colour ramp is contained within a Layer file (for ESRI ArcGIS users) which is available from your chosen Licensed Partner. Shading and other relief effects can be added as required. Please consult your GIS manual for details.

## 7.6 Metadata

Discovery metadata is supplied with Marine DEM created to the ISO 19115/19139 standard using the current MEDIN profile (see [www.oceannet.org](http://www.oceannet.org) for details). The MEDIN profile is a superset of the Gemini 2.1 profile, which is used widely in the UK.

In addition to dataset level i.e. discovery metadata, evaluation level metadata is supplied in the form of a meta-layer or coverage layer describing the input data used in DEM creation for any given area. This meta-layer is supplied as a separate file in GIS format e.g. GML.

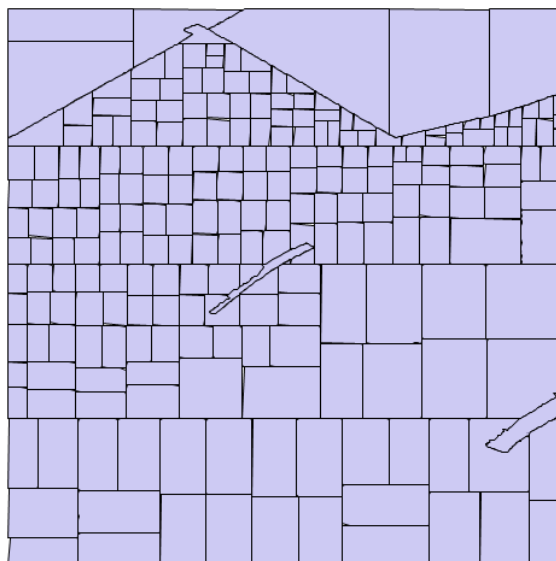


Figure 11 Example of the Meta-Layer or (Coverage Layer)

Figure 11 is a screenshot in GIS showing the extents of each survey block used in DEM creation for the area shown. The meta-layer has the attributes described below.

| Attribute  | Source Data Type  |   |
|------------|---|---|
|            | Survey  | ENC   |
| IDTILE     | Unique Identifier of the tile - used in the File Naming.  |   |
| IDMETADATA | Unique identifier of the Survey   | Identifier of the ENC Intended Usage Band used:<br>1=Overview, 2=General, 3=Coastal, 4=Approach, 5=Harbour, 6=Berthing  |
| NAME       | UKHO Identifier of the Survey - either Bathy ID, SDRA Number  | S57 Cell name   |
| DESCRIPTN  | Descriptive title of the survey - where this is available   | Description of the feature used to describe the coverage<br><br>Either general "Coverage" or "Survey Reliability" where that information is available in ENCs |
| INFORMATN  | General Information about the Survey, as exists in the XYZ or ENC Metadata. Or 'Interpolated' where holes were filled |   |
| NATIONALTY | Source nation of the data   |   |
| SCALE      | Compilation Scale of the data – if applicable and where known   |   |
| SOURCE_DAT | Survey Start and End dates - as encoded in ENC SURSTA, SUREND and SORDAT - where available                            |   |

|            |   |  |
|------------|---|--|
| SOURCE_IND | Concatenation of source identifiers, where known<br>e.g. for GB data:<br>HOID Hydrographic Identifier<br>ORID Originators Identifier<br>HOIN Hydrographic Instruction | ENC Source Indication - encoded as SORIND (S-57 Attribute) |
| UPDATED    | Date the data was incorporated into the output Grid   |  |

## 7.7 Data Formats

The Marine DEM is supplied in a number of data formats which are listed below:

- ESRI ASCII Grid
- Surfer 7 Grid
- ESRI File Geodatabase
- GeoTIFF

It is available in the following delivery methods:

- FTP Download
- USB
- Web Mapping Service.

The available formats and delivery methods may vary according to your chosen Licensed Partner. Please select one that suits your requirements or contact OceanWise for further information.

## 8.1 Background

The service is delivered as an OGC compliant Web Map Service which can be read into standard GIS software or online mapping applications.

The ENC WMS is split into layers so the data being viewed can be customised to the user's needs. This includes allowing the user to switch off the Land layer so the data can be viewed combined with more appropriate Land mapping e.g. Ordnance Survey data (in the UK), OpenStreetMap or Satellite imagery.

The features in the WMS can be selected to see attribute information, however as it is delivered as images the features cannot be used for analysis purposes.



The ENC WMS is supplied as EPSG:3857 (Pseudo Mercator - WGS84).

The Service has IHO S52 symbology applied as standard

## Annex 1 – Marine Themes List of Feature Types

The Feature Types listing is also available from our Website, containing links to attribute details and examples of the data within the product (<http://www.oceanwise.eu/data/marine-themes/feature-catalogue/>).

| FEATURE CODE | THEME                     | DESCRIPTION  |
|--------------|---------------------------|--|
| 10010        | Elevation                 | Bathymetry, Area, Undefined                                |
| 10011        | Elevation                 | Bathymetry, Area, Subtidal                                 |
| 10013        | Elevation                 | Bathymetry, Area, Intertidal                               |
| 10014        | Elevation                 | Bathymetry, Area, Dredged                                  |
| 10015        | Elevation                 | Bathymetry, Area, Land                                     |
| 10021        | Elevation                 | Bathymetry, Contour  |
| 10022        | Elevation                 | Bathymetry, Sounding                                       |
| 10031        | Elevation                 | Coastline, Natural   |
| 10032        | Elevation                 | Coastline, Man made  |
| 13100        | Elevation                 | Coastline, Undefined                                       |
| 13101        | Elevation                 | Coastline, steep coast                                     |
| 13102        | Elevation                 | Coastline, flat coast                                      |
| 13103        | Elevation                 | Coastline, sandy shore                                     |
| 13104        | Elevation                 | Coastline, stony shore                                     |
| 13105        | Elevation                 | Coastline, shingly shore                                   |
| 13106        | Elevation                 | Coastline, glacier (seaward end)                           |
| 13107        | Elevation                 | Coastline, mangrove  |
| 13108        | Elevation                 | Coastline, marshy shore                                    |
| 13109        | Elevation                 | Coastline, coral reef                                      |
| 13110        | Elevation                 | Coastline, ice coast                                       |
| 13111        | Elevation                 | Coastline, shelly shore                                    |
| 13200        | Elevation                 | Coastline, man made  |
| 20010        | Shipwrecks & Obstructions | Obstruction, Undefined                                     |
| 20011        | Shipwrecks & Obstructions | Obstruction, Snag or stump                                 |
| 20015        | Shipwrecks & Obstructions | Obstruction, Fish haven                                    |
| 20016        | Shipwrecks & Obstructions | Obstruction, Foul area                                     |
| 20017        | Shipwrecks & Obstructions | Obstruction, Foul ground                                   |
| 20019        | Shipwrecks & Obstructions | Obstruction, Ground tackle                                 |
| 20020        | Shipwrecks & Obstructions | Wreck, Undefined   |
| 20021        | Shipwrecks & Obstructions | Wreck, Non-dangerous wreck                                 |
| 20022        | Shipwrecks & Obstructions | Wreck, Dangerous wreck                                     |
| 20023        | Shipwrecks & Obstructions | Wreck, Distributed remains of wreck                        |
| 20024        | Shipwrecks & Obstructions | Wreck, Wreck showing mast/masts                            |
| 20025        | Shipwrecks & Obstructions | Wreck, Wreck showing any portion of hull or superstructure |

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|       |                           |   |
|-------|---------------------------|---|
| 20030 | Shipwrecks & Obstructions | Hulk  |
| 20040 | Shipwrecks & Obstructions | Obstruction, Underwater rock                  |
| 31010 | Transport Facilities      | Beacon, Cardinal, Undefined                   |
| 31011 | Transport Facilities      | Beacon, Cardinal, North                       |
| 31012 | Transport Facilities      | Beacon, Cardinal, East                        |
| 31013 | Transport Facilities      | Beacon, Cardinal, South                       |
| 31014 | Transport Facilities      | Beacon, Cardinal, West                        |
| 31030 | Transport Facilities      | Beacon, Isolated danger                       |
| 31040 | Transport Facilities      | Beacon, Lateral, Undefined                    |
| 31041 | Transport Facilities      | Beacon, Lateral, Port                         |
| 31042 | Transport Facilities      | Beacon, Lateral, Starboard                    |
| 31043 | Transport Facilities      | Beacon, Lateral, Preferred channel, Starboard |
| 31044 | Transport Facilities      | Beacon, Lateral, Preferred channel, Port      |
| 31050 | Transport Facilities      | Beacon, Safe water                            |
| 31060 | Transport Facilities      | Beacon, Special purpose/general               |
| 32010 | Transport Facilities      | Buoy, Cardinal, Undefined                     |
| 32011 | Transport Facilities      | Buoy, Cardinal, North                         |
| 32012 | Transport Facilities      | Buoy, Cardinal, East                          |
| 32013 | Transport Facilities      | Buoy, Cardinal, South                         |
| 32014 | Transport Facilities      | Buoy, Cardinal, West                          |
| 32020 | Transport Facilities      | Buoy, Installation                            |
| 32030 | Transport Facilities      | Buoy, Isolated danger                         |
| 32040 | Transport Facilities      | Buoy, Lateral, Undefined                      |
| 32041 | Transport Facilities      | Buoy, Lateral, Port                           |
| 32042 | Transport Facilities      | Buoy, Lateral, Starboard                      |
| 32043 | Transport Facilities      | Buoy, Lateral, Preferred channel, Starboard   |
| 32044 | Transport Facilities      | Buoy, Lateral, Preferred channel, Port        |
| 32050 | Transport Facilities      | Buoy, Safe water                              |
| 32060 | Transport Facilities      | Buoy, Special purpose/general                 |
| 33010 | Transport Facilities      | Light float                                   |
| 33020 | Transport Facilities      | Light vessel                                  |
| 34020 | Transport Facilities      | Route, Undefined                              |
| 34021 | Transport Facilities      | Route, Deep water, Centreline                 |
| 34022 | Transport Facilities      | Route, Deep water, Part                       |
| 34023 | Transport Facilities      | Route, Fairway                                |
| 34024 | Transport Facilities      | Route, Recommended, Centreline                |
| 34025 | Transport Facilities      | Route, Recommended, Part                      |
| 34026 | Transport Facilities      | Route, Recommended, Track                     |
| 34027 | Transport Facilities      | Route, Recommended, Two-way                   |
| 34030 | Transport Facilities      | Route, Ferry, Undefined                       |
| 34031 | Transport Facilities      | Route, Ferry, Free-moving                     |
| 34032 | Transport Facilities      | Route, Ferry, Cable                           |



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|       |                       |   |
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| 34033 | Transport Facilities  | Route, Ferry, Ice   |
| 35010 | Transport Facilities  | Navigation line, Undefined                                    |
| 35011 | Transport Facilities  | Navigation line, Clearing line                                |
| 35012 | Transport Facilities  | Navigation line, Transit line                                 |
| 35013 | Transport Facilities  | Navigation line, Leading line                                 |
| 40010 | Industrial Facilities | Pile, Undefined   |
| 40011 | Industrial Facilities | Pile, Stake   |
| 40012 | Industrial Facilities | Pile, Snag  |
| 40013 | Industrial Facilities | Pile, Post  |
| 40014 | Industrial Facilities | Pile, Tripodal  |
| 41000 | Industrial Facilities | Harbour facility, Undefined                                   |
| 41010 | Industrial Facilities | Harbour facility, Dry dock                                    |
| 41020 | Industrial Facilities | Harbour facility, Pontoon                                     |
| 41030 | Industrial Facilities | Harbour facility, Mooring/Warping facility, Undefined         |
| 41031 | Industrial Facilities | Harbour facility, Mooring/Warping facility, Dolphin           |
| 41032 | Industrial Facilities | Harbour facility, Mooring/Warping facility, Deviation dolphin |
| 41033 | Industrial Facilities | Harbour facility, Mooring/Warping facility, Bollard           |
| 41034 | Industrial Facilities | Harbour facility, Mooring/Warping facility, Tie-up wall       |
| 41035 | Industrial Facilities | Harbour facility, Mooring/Warping facility, Post or pile      |
| 41036 | Industrial Facilities | Harbour facility, Mooring/Warping facility, Chain/wire/cable  |
| 41037 | Industrial Facilities | Harbour facility, Mooring/Warping facility, Mooring buoy      |
| 41040 | Industrial Facilities | Harbour facility, Boom  |
| 42010 | Industrial Facilities | Marine farm/culture, Undefined                                |
| 42011 | Industrial Facilities | Marine farm/culture, Crustaceans                              |
| 42012 | Industrial Facilities | Marine farm/culture, Oysters/mussels                          |
| 42013 | Industrial Facilities | Marine farm/culture, Fish                                     |
| 42014 | Industrial Facilities | Marine farm/culture, Seaweed                                  |
| 42015 | Industrial Facilities | Marine farm/culture, Pearl culture farm                       |
| 42020 | Industrial Facilities | Fishing facility, Undefined                                   |
| 42021 | Industrial Facilities | Fishing facility, Fishing stake                               |
| 42022 | Industrial Facilities | Fishing facility, Fish trap                                   |
| 42023 | Industrial Facilities | Fishing facility, Fish weir                                   |
| 42024 | Industrial Facilities | Fishing facility, Tunny net                                   |
| 43001 | Industrial Facilities | Offshore platform   |
| 43010 | Industrial Facilities | Oil barrier, Undefined  |
| 43011 | Industrial Facilities | Oil barrier, Oil retention (high pressure pipe)               |
| 43012 | Industrial Facilities | Oil barrier, Floating oil barrier                             |
| 43024 | Industrial Facilities | Log pond  |

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| 43025 | Industrial Facilities | Ice boom                                 |
| 43040 | Industrial Facilities | Turbine, Undefined                       |
| 43041 | Industrial Facilities | Turbine, Wind                            |
| 43042 | Industrial Facilities | Turbine, Tidal                           |
| 44010 | Industrial Facilities | Cable, Submarine, Undefined              |
| 44011 | Industrial Facilities | Cable, Submarine, Power line             |
| 44013 | Industrial Facilities | Cable, Submarine, Transmission line      |
| 44014 | Industrial Facilities | Cable, Submarine, Telephone              |
| 44015 | Industrial Facilities | Cable, Submarine, Telegraph              |
| 44016 | Industrial Facilities | Cable, Submarine, Mooring cable/chain    |
| 44020 | Industrial Facilities | Pipeline                                 |
| 44021 | Industrial Facilities | Pipeline, Joint                          |
| 44022 | Industrial Facilities | Pipeline, Manifold                       |
| 44030 | Industrial Facilities | Wellhead                                 |
| 44040 | Industrial Facilities | Diffuser                                 |
| 44050 | Industrial Facilities | Crib                                     |
| 44060 | Industrial Facilities | Storage Tank                             |
| 44070 | Industrial Facilities | Loading facility                         |
| 44080 | Industrial Facilities | Installation, Undefined                  |
| 44081 | Industrial Facilities | Installation, Template                   |
| 45100 | Industrial Facilities | Shoreline construction, Undefined        |
| 45101 | Industrial Facilities | Shoreline construction, breakwater       |
| 45102 | Industrial Facilities | Shoreline construction, groyne (groin)   |
| 45103 | Industrial Facilities | Shoreline construction, mole             |
| 45104 | Industrial Facilities | Shoreline construction, pier (jetty)     |
| 45105 | Industrial Facilities | Shoreline construction, promenade pier   |
| 45106 | Industrial Facilities | Shoreline construction, wharf (quay)     |
| 45107 | Industrial Facilities | Shoreline construction, training wall    |
| 45108 | Industrial Facilities | Shoreline construction, rip rap          |
| 45109 | Industrial Facilities | Shoreline construction, revetment        |
| 45110 | Industrial Facilities | Shoreline construction, sea wall         |
| 45111 | Industrial Facilities | Shoreline construction, landing steps    |
| 45112 | Industrial Facilities | Shoreline construction, ramp             |
| 45113 | Industrial Facilities | Shoreline construction, slipway          |
| 45114 | Industrial Facilities | Shoreline construction, fender           |
| 45115 | Industrial Facilities | Shoreline construction, solid face wharf |
| 45116 | Industrial Facilities | Shoreline construction, open face wharf  |
| 45117 | Industrial Facilities | Shoreline construction, log ramp         |
| 45118 | Industrial Facilities | Shoreline construction, wall             |
| 45119 | Industrial Facilities | Shoreline construction, sill             |
| 45121 | Industrial Facilities | Shoreline construction, weir             |
| 45122 | Industrial Facilities | Shoreline construction, dam              |
| 45123 | Industrial Facilities | Shoreline construction, flood barrage    |
| 45131 | Industrial Facilities | Shoreline construction, gate in general  |

|       |                                   |  |
|-------|-----------------------------------|--|
| 45132 | Industrial Facilities             | Shoreline construction, flood barrage gate |
| 45133 | Industrial Facilities             | Shoreline construction, caisson            |
| 45134 | Industrial Facilities             | Shoreline construction, lock gate          |
| 45135 | Industrial Facilities             | Shoreline construction, dyke gate          |
| 45136 | Industrial Facilities             | Shoreline construction, sluice             |
| 45140 | Industrial Facilities             | Shoreline construction, Causeway           |
| 45150 | Industrial Facilities             | Shoreline construction, Bridge             |
| 48010 | Industrial Facilities             | Mast                                       |
| 51000 | Administrative & Management Units | Administration Area, Undefined             |
| 51001 | Administrative & Management Units | Administration Area, International         |
| 51002 | Administrative & Management Units | Administration Area, National              |
| 51003 | Administrative & Management Units | Administration Area, National sub-division |
| 51010 | Administrative & Management Units | Contiguous zone                            |
| 51020 | Administrative & Management Units | Continental shelf area                     |
| 51030 | Administrative & Management Units | Exclusive Economic Zone (EEZ)              |
| 51040 | Administrative & Management Units | Territorial sea area                       |
| 51050 | Administrative & Management Units | Fishery zone                               |
| 51060 | Administrative & Management Units | 3 nautical mile limit                      |
| 51070 | Administrative & Management Units | 1 nautical mile limit                      |
| 51080 | Administrative & Management Units | Baseline                                   |
| 52010 | Administrative & Management Units | Harbour area (administrative)              |
| 52020 | Administrative & Management Units | Dock area, Undefined                       |
| 52021 | Administrative & Management Units | Dock area, Tidal                           |
| 52022 | Administrative & Management Units | Dock area, Non-tidal (wet dock)            |
| 52023 | Administrative & Management Units | Lock basin                                 |
| 52024 | Administrative & Management Units | Anchor berth                               |
| 52025 | Administrative & Management Units | Floating Dock                              |
| 52030 | Administrative & Management Units | Anchorage area                             |
| 52040 | Administrative & Management Units | Cargo transshipment area                   |
| 52050 | Administrative & Management Units | Pilot boarding place, Undefined            |

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|-------|-----------------------------------|---|
| 52051 | Administrative & Management Units | Pilot boarding place, Boarding by pilot-cruising vessel |
| 52052 | Administrative & Management Units | Pilot boarding place, Boarding by helicopter            |
| 52053 | Administrative & Management Units | Pilot boarding place, Pilot comes out from shore        |
| 52071 | Administrative & Management Units | Custom zone   |
| 52072 | Administrative & Management Units | Free port area  |
| 52080 | Administrative & Management Units | Sea-plane landing area                                  |
| 53010 | Administrative & Management Units | Traffic zone, Undefined                                 |
| 53011 | Administrative & Management Units | Traffic zone, Inshore                                   |
| 53012 | Administrative & Management Units | Traffic separation, Boundary                            |
| 53013 | Administrative & Management Units | Traffic separation, Crossing                            |
| 53014 | Administrative & Management Units | Traffic separation, Lane part                           |
| 53015 | Administrative & Management Units | Traffic separation, Line                                |
| 53016 | Administrative & Management Units | Traffic separation, Roundabout                          |
| 53017 | Administrative & Management Units | Traffic separation, Zone                                |
| 53018 | Administrative & Management Units | Two-way route part                                      |
| 53020 | Administrative & Management Units | Submarine transit lane                                  |
| 54010 | Administrative & Management Units | Dumping ground  |
| 54020 | Administrative & Management Units | Incineration area                                       |
| 54030 | Administrative & Management Units | Military practice area                                  |
| 54040 | Administrative & Management Units | Offshore production area                                |
| 54050 | Administrative & Management Units | Restricted area   |
| 54051 | Administrative & Management Units | Precautionary area                                      |
| 54060 | Administrative & Management Units | Fishing ground  |
| 54070 | Administrative & Management Units | Caution area  |
| 54080 | Administrative & Management Units | Environmental Area, Undefined                           |
| 54081 | Administrative & Management Units | Environmental Area, Particularly Sensitive Sea Area     |
| 60000 | Geographic Regions                | Sea area/named water area, Undefined                    |

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|-------|--------------------|--|
| 60001 | Geographic Regions | Sea area/named water area, Sea area in general |
| 60002 | Geographic Regions | Sea area/named water area, Gat                 |
| 60003 | Geographic Regions | Sea area/named water area, Bank                |
| 60004 | Geographic Regions | Sea area/named water area, Deep                |
| 60005 | Geographic Regions | Sea area/named water area, Bay                 |
| 60006 | Geographic Regions | Sea area/named water area, Trench              |
| 60007 | Geographic Regions | Sea area/named water area, Basin               |
| 60008 | Geographic Regions | Sea area/named water area, Mud flats           |
| 60009 | Geographic Regions | Sea area/named water area, Reef                |
| 60010 | Geographic Regions | Sea area/named water area, Ledge               |
| 60011 | Geographic Regions | Sea area/named water area, Canyon              |
| 60012 | Geographic Regions | Sea area/named water area, Narrows             |
| 60013 | Geographic Regions | Sea area/named water area, Shoal               |
| 60014 | Geographic Regions | Sea area/named water area, Knoll               |
| 60015 | Geographic Regions | Sea area/named water area, Ridge               |
| 60016 | Geographic Regions | Sea area/named water area, Seamount            |
| 60017 | Geographic Regions | Sea area/named water area, Pinnacle            |
| 60018 | Geographic Regions | Sea area/named water area, Abyssal plain       |
| 60019 | Geographic Regions | Sea area/named water area, Plateau             |
| 60020 | Geographic Regions | Sea area/named water area, Spur                |
| 60021 | Geographic Regions | Sea area/named water area, Shelf               |
| 60022 | Geographic Regions | Sea area/named water area, Trough              |
| 60023 | Geographic Regions | Sea area/named water area, Saddle              |
| 60024 | Geographic Regions | Sea area/named water area, Abyssal hills       |
| 60025 | Geographic Regions | Sea area/named water area, Apron               |
| 60026 | Geographic Regions | Sea area/named water area, Archipelagic apron  |
| 60027 | Geographic Regions | Sea area/named water area, Borderland          |
| 60028 | Geographic Regions | Sea area/named water area, Continental margin  |
| 60029 | Geographic Regions | Sea area/named water area, Continental rise    |
| 60030 | Geographic Regions | Sea area/named water area, Escarpment          |
| 60031 | Geographic Regions | Sea area/named water area, Fan                 |
| 60032 | Geographic Regions | Sea area/named water area, Fracture zone       |
| 60033 | Geographic Regions | Sea area/named water area, Gap                 |
| 60034 | Geographic Regions | Sea area/named water area, Guyot               |
| 60035 | Geographic Regions | Sea area/named water area, Hill                |
| 60036 | Geographic Regions | Sea area/named water area, Hole                |
| 60037 | Geographic Regions | Sea area/named water area, Levee               |
| 60038 | Geographic Regions | Sea area/named water area, Median valley       |

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| 60039 | Geographic Regions  | Sea area/named water area, Moat           |
| 60040 | Geographic Regions  | Sea area/named water area, Mountains      |
| 60041 | Geographic Regions  | Sea area/named water area, Peak           |
| 60042 | Geographic Regions  | Sea area/named water area, Province       |
| 60043 | Geographic Regions  | Sea area/named water area, Rise           |
| 60044 | Geographic Regions  | Sea area/named water area, Sea channel    |
| 60045 | Geographic Regions  | Sea area/named water area, Seamount chain |
| 60046 | Geographic Regions  | Sea area/named water area, Shelf-edge     |
| 60047 | Geographic Regions  | Sea area/named water area, Sill           |
| 60048 | Geographic Regions  | Sea area/named water area, Slope          |
| 60049 | Geographic Regions  | Sea area/named water area, Terrace        |
| 60050 | Geographic Regions  | Sea area/named water area, Valley         |
| 60051 | Geographic Regions  | Sea area/named water area, Canal          |
| 60052 | Geographic Regions  | Sea area/named water area, Lake           |
| 60053 | Geographic Regions  | Sea area/named water area, River          |
| 60054 | Geographic Regions  | Sea area/named water area, Reach          |
| 70010 | Geological Features | Geology, Undefined                        |
| 70020 | Geological Features | Bedrock                                   |
| 70030 | Geological Features | Sediment                                  |
| 70040 | Geological Features | Fault                                     |
| 70050 | Geological Features | Anticline                                 |
| 70060 | Geological Features | Syncline                                  |
| 70070 | Geological Features | Monocline                                 |
| 70080 | Geological Features | Limit of Subcrop                          |
| 70090 | Geological Features | Hydrocarbon Fields                        |
| 80010 | Tides & Currents    | Tides, Undefined                          |
| 80020 | Tides & Currents    | Tides, Tidal Station                      |
| 80030 | Tides & Currents    | Tides, Tidal Stream                       |