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User Guide for the British Geological Survey DiGSBS250K Dataset

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BRITISH GEOLOGICAL SURVEY

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User Guide for the British Geological Survey DiGSBS250K Dataset

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Foreword

This report presents a description and review of the methodology developed by the British Geological Survey (BGS) to produce a national scale assessment of sea-bed sediments. The method has been critically assessed and its fitness for purpose determined by specialists within the BGS. The purpose of this user guide is to enable those licensing this dataset to have a better appreciation of how the data set has been created and therefore better understand the potential applications and limitations that the dataset may have.

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This report presents a description and review of the methodology developed by the British Geological Survey (BGS) to produce a national scale assessment of sea-bed sediments. The method has been critically assessed and its fitness for purpose determined by specialists in BGS.

Acknowledgements

A number of individuals in the Information Products and the Marine programmes have contributed to the project and helped compile this report. This assistance has been received at all stages of the study. In addition to the collection and processing of data, many individuals have freely given their advice, and provided their local knowledge.

1 Introduction

Founded in 1835, the British Geological Survey (BGS) is the world's oldest national geological survey and the United Kingdom's premier centre for earth science information and expertise. The BGS provides expert services and impartial advice in all areas of geoscience. Our client base is drawn from the public and private sectors in the UK and internationally.

Our innovative digital data products aim to help describe the ground surface and what's beneath across the whole of Great Britain and the United Kingdom Continental Shelf (UKCS). These digital products are based on the outputs of the BGS survey and research programmes and our substantial national data holdings. This data coupled with our in-house Geoscientific knowledge are combined to provide products relevant to a wide range of users in central and local government, insurance and housing industry, engineering and environmental business, and the British public.

Further information on all the digital data provided by the BGS can be found on our website at http://www.bgs.ac.uk/data/digitaldata/digitaldata.cfm or by contacting:

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2 About the DiGSBS250k Dataset

2.1 BACKGROUND

The purpose of this digital dataset is to provide accurate mapping of the distribution of sea-bed sediment types. Sea-bed sediments are mapped offshore, where the most recent deposits commonly form a veneer or superficial layer of unconsolidated material on the seabed. Their distribution and composition is determined using a range of remotely sensed and physical ground truthing data.

The sediment divisions on the map are primarily based on particle size analysis (PSA) of both surface sediment samples and the uppermost sediments taken from shallow cores. Sediments are classified according to the modified Folk scale (Figure 1).The modified Folk diagram and classification used by BGS differs from that created by Folk (1954) in that the boundary between "no gravel" and "slightly gravelly" is changed from trace (0.05%) to 1% weight of particles coarser than -1Ø (2mm). The boundaries between sediment classifications or types are delineated using sample station particle size analyses and descriptions, seafloor topography derived from shallow geophysical data and, where available, multibeam bathymetry, backscatter and side scan sonar profiles.

This dataset can be used in conjunction with other BGS offshore datasets that include; DiGRock250k, DiGBath250k and the DiGHardSubstrate250k datasets.

2.2 WHO MIGHT REQUIRE THIS DATA?

The sediment types present on the sea-bed are of importance to a range of groups, including marine habitat mappers, marine spatial planners, the offshore construction and development sector, and the dredging and aggregate industries. These groups require detailed information on the nature of the sea-bed, including the sediment types present.

With growing interest and investment in these areas it became necessary to update previous sea-bed sediment mapping in order to provide the most current and accurate mapping of the distribution of sediments on the sea-bed.

2.3 WHAT THE DATASET SHOWS?

The sediments are classified according to Folk (1954). This classification divides sediments into 15 classes, according to the proportions of sand, gravel and mud present. It is based on the weight percentages of Gravel, particles with an average diameter larger than -1Ø (2mm); Sand, particles with an average diameter between -1Ø (2mm) and 4Ø (63µm), and Mud, particles with an average diameter smaller than 4Ø (63µm). A modified Folk triangle classification (Folk, 1954, Journal of Geology, Vol. 62, pp 344–359), shown below, has been used based on the gravel percentage and the sand to mud ratio.

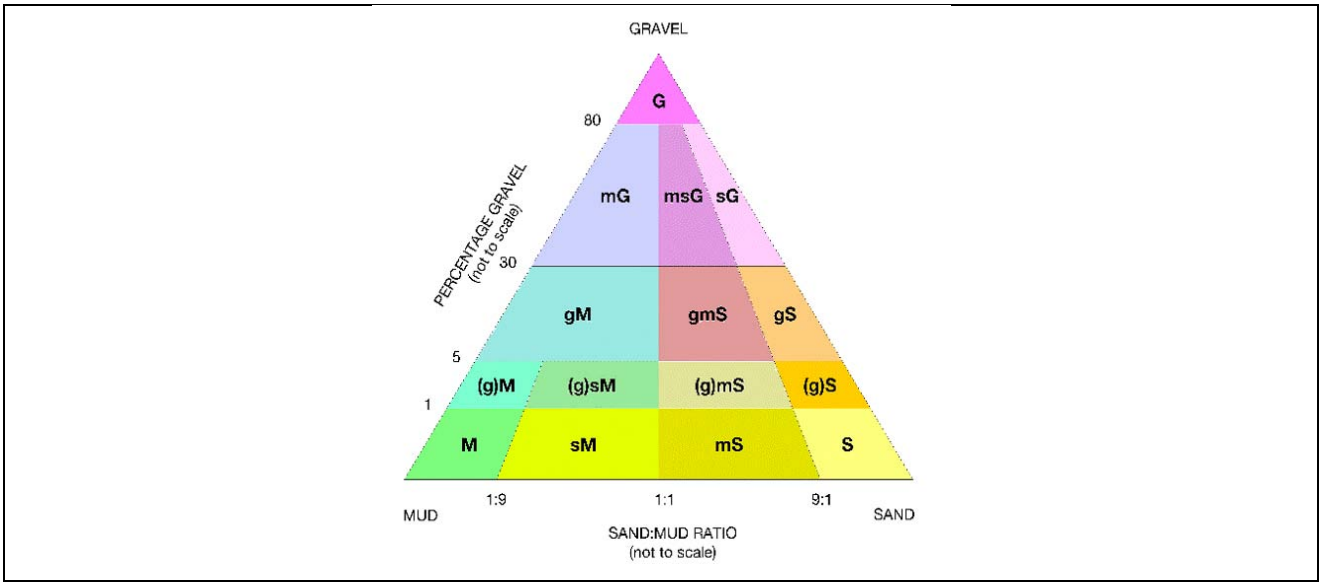

Figure 1. DiGSBS250k -Modified Folk classification scheme

The terminology and grade classification are those used by Folk but the percentage Gravel subdivision line at 'trace' has been changed to a percentage Gravel subdivision line at 1%. The boundaries shown on the map are generally transitional and have been drawn taking bathymetry and other factors, such as tidal currents, into consideration.

The Folk classifications for the sea-bed sediments are tabulated below (Table 1). There are also areas where sea-bed sediments are absent or undifferentiated, and areas where other sediment classification schemes have been adopted (non-UK waters) as listed. The sea-bed sediment data has single feature attribution which replicates these classifications.

In areas where many samples are taken in close proximity it is possible that several sea-bed sediment types are present, for example in an area of sediment waves the surface sediment type may differ between the crests and troughs of the sediment wave. In these cases, the most commonly sampled sediment type is used to define the mapped area. .

Major Textural Class	**Mixture**
Sand (S)	<1% gravel and 90% of remainder sand
Mud (M)	<1% gravel and >90% of remainder mud
Gravel (G)	>80% gravel
Slightly gravelly mud ((g)M)	1 – 5% gravel particles and >90% of the remainder mud
Slightly gravelly sand ((g)S)	1 – 5% gravel particles and >90% of the remainder sand
Slightly gravelly muddy sand ((g)mS)	1 – 5% gravel particles and 50-90% of the remainder sand
Muddy sand (mS)	<1% gravel particles and 50-90% of the remainder sand
Muddy gravel (mG)	30 – 80% gravel with >90% of remainder sand
Muddy sandy gravel (msG)	30 – 80% gravel with 50 – 90% of remainder sand
Sandy gravel (sG)	30 - 80% gravel with >90% of remainder sand
Gravelly mud (gM)	5 – 30% gravel with >50% of the remainder sand
Gravelly sand (gS)	5 – 30% gravel with >90% of the remainder sand
Sandy mud (sM)	<1% gravel with 50 – 90% of remainder sand
Gravelly muddy sand (gmS)	5 – 30% gravel with 50 – 90% of remainder sand
Additional classifications used by for SBS by BGS	**Comment**
Clay and sand	Pre-Holocene deposit
Diamicton	Pre-Holocene deposit
Gravel, sand and silt	Undifferentiated
Undifferentiated mud	Undifferentiated
Rock and sediment	Undifferentiated
Rock and diamicton	Pre-Holocene
Mussel deposit	Biological
Gravel (G)	French classification
Gravelly sand (gS)	French classification
Sand (S)	French classification
Sandy gravel (sG)	French classification

Table 1: Folk classifications and sediment composition.

3 Technical Information

3.1 DEFINITIONS

Table 1 details the definitions of the different sediment types used within this dataset (according to Folk, 1954).

3.2 SCALE

The DigSBS dataset is produced for use at 1:250,000 scale. This scale data should not be relied on for local or site-specific geology, or navigation.

The British Geological Survey should be contacted if more details are required as additional geological information may be available in BGS files, or we may be able to direct enquirers to other bodies or third parties.

The scale of the original information is indicated by the nominal scale attribute (NOM_SCALE: 250000) embedded in the data. Do not over-enlarge the data; for example, do not use 1:250 000 nominal scale data at 1:100 000 or 1:50 000 working scale.

The compilation of geological lines (i.e. the cartographical accuracy) is probably no better than 1 mm on the 1:250 000 base map which equates to 250 m on the ground.

3.3 FIELD DESCRIPTIONS

FIELD NAME	FIELD TYPE	DESCRIPTION
LEX	TEXT	Lexicon (or LEX) code. First part of the LEX_ROCK label. Up to 5 characters (mostly letters). An abbreviation of the rock unit or deposit as listed in the BGS Lexicon of Named Rock Units: e.g. MSQH
LEX_D	TEXT	Description of the Lexicon code above giving the name of the unit: e.g. Marine Sediments, Holocene is the full name of the unit coded as MSQH
LEX_RCS	TEXT	The two-part code, LEX & RCS, used to label each polygon of DiGSBS250k data:e.g. MSQH-GV
RCS	TEXT	The RCS code (or an abbreviation for the string of RCS codes given in full in RCS_X) :e.g GV - Gravel
RCS_X	TEXT	RCS codes. An alternative code abbreviation (or a string of such codes joined by+ signs with square brackets used for subordinate types), each up to 6 characters, for the type of rock or lithology as based on the hierarchical BGS Rock Classification Scheme (RCS):
RCS_D	TEXT	Description of the RCS code(s) above giving the lithology of the unit: e.g. GRAVEL (SEA BED SEDIMENT, BASED ON FOLK)
MAX_TIME_D	DOUBLE	Maximum age of the unit, to the most accurate time (or geochronological) division possible: e.g. HOLOCENE
MIN_TIME_D	DOUBLE	Minimum age of unit, to the most accurate time (or geochronological) division possible: e.g. HOLOCENE
MAX_TIME_Y	DOUBLE	Maximum age, in years, of the oldest time division during which the geological unit was formed: e.g. 333800000
MIN_TIME_Y	DOUBLE	Minimum age, in years, of the youngest time division during which the geological unit was formed: e.g. 320710000
MAX_INDEX	TEXT	Maximum index. A number representing the maximum age (earliest time) of the unit: MAX_TIME_D field. Used for GIS querying and legend building: e.g. 1322120
MIN_INDEX	TEXT	Minimum index. A number representing the minimum age (latest time) of the unit: MIN_TIME_D field. Used for GIS querying and legend building: e.g. 1321340
MAX_AGE	TEXT	Maximum age. Name of the age of maximum geochronological

		time applicable: e.g. ASBIAN
MIN_AGE	TEXT	Minimum age. Name of the age of minimum geochronological time applicable: e.g. ALPORTIAN
MAX_EPOCH	TEXT	Maximum epoch. Name of the epoch of maximum geochronological time applicable: e.g. VISEAN
MIN_EPOCH	TEXT	Minimum epoch. Name of the epoch of minimum geochronological time applicable: e.g. NAMURIAN
MAX_PERIOD	TEXT	Maximum period. Name of the period of maximum geochronological time applicable: e.g. CARBONIFEROUS
MIN_PERIOD	TEXT	Minimum period. Name of the period of minimum geochronological time applicable: e.g. PERMIAN
MAX_ERA	TEXT	Maximum era. Name of the era of maximum geochronological time applicable: e.g. PALAEOZOIC
MIN_ERA	TEXT	Minimum era. Name of the era of minimum geochronological time applicable: e.g. MESOZOIC
MAX_EON	TEXT	Maximum eon. Name of the eon of maximum geochronological time applicable: e.g. PROTEROZOIC
MIN_EON	TEXT	Minimum eon. Name of the eon of minimum geochronological time applicable: e.g. PHANEROZOIC
PREV_NAME	TEXT	Previous name(s) for the unit as listed in the BGS Lexicon of Named Rock Units
BGSTYPE	TEXT	The DiGMapGB theme e.g. bedrock, superficial, mass movement or artificial
LEX_RCS_I	TEXT	Concaternation of Lexicon and RCS codes, plus the maximum index number
LEX_RCS_D	TEXT	Description of Lex_RCS above
BGSREF	DOUBLE	BGS reference colour for the polygon based on the LEX_ROCK code pair. The default printing colour defined as a 3-digit number:
VERSION	DOUBLE	Version number and attribute level of the digital data: e.g. V4_16 is version 4, with attribute level 16. The version number is changed when a new dataset is released following major changes or periodic update. Data with the same attribute level have the same structure. As fields are added, renamed or removed so the attribute level is changed
RELEASED	DATE	Date released.
NOM_SCALE	DOUBLE	Nominal scale of the published (or compiled) information used to prepare the digital data: e.g.250000 for 1:250 000
LEX_ROCK	TEXT	A two-part code, LEX & ROCK, formerly used as the primary label for each polygon of DiGMapGB data and for creating map keys or legends
FOLK	TEXT	Folk Classification
FOLK_S	TEXT	Folk symbol text

Table 2: Attribute table field descriptions

3.4 CREATION OF THE DATASET

The original version of DiGSBS250k was the result of digitising the existing 1:250 000 series of geological sediment maps of the offshore regions. Details of the printed map sheet names, numbers and publication dates are available from the BGS online catalogue at:

http://shop.bgs.ac.uk/Bookshop/UTMMaps.cfm

These maps were compiled from a number of sources at a variety of scales over some 20 years; the first map being published in 1977, and the last one in 1993, with a few more-recent revisions. The maps display bedrock geology on the 'solid' (S) edition and sea-bed sediments with or without offshore Quaternary geology on the superficial edition (SBS +/- Q).

The sediment divisions on the map are primarily based on particle size analysis (PSA) of both surface sediment samples and the uppermost sediments taken from shallow cores. The sediments are classified according to the modified Folk diagram (Table 1). The boundaries between sediment types are delineated using sample station analyses and descriptions and seafloor topography derived from shallow geophysical data and, where available multibeam bathymetry, backscatter and side scan sonar profiles.

The latest version used ESRI ArcGIS to update the mapping based on a variety of new data sources. These included new samples and the increasing availability of multibeam bathymetry and backscatter.

3.5 DATASET HISTORY

Version 1 (released 2000):

Version 2 (released 2007):

In 2007 the positional accuracy of the data in sea-bed sediment dataset was improved which may mean shifts of up to about 100 m on the 'ground'.

Version 3 (released 2011):

Over 3000 new PSA samples have been sourced and used to develop existing interpretations.

Increased availability of multibeam bathymetry and backscatter has improved sediment boundary delineation.

BGS 250k tile boundaries removed and attribution reduced.

Polygon line work smoothed to improve cartographic appearance.

3.6 COVERAGE

The dataset covers the majority of UKCS, but does not include coastal waters.

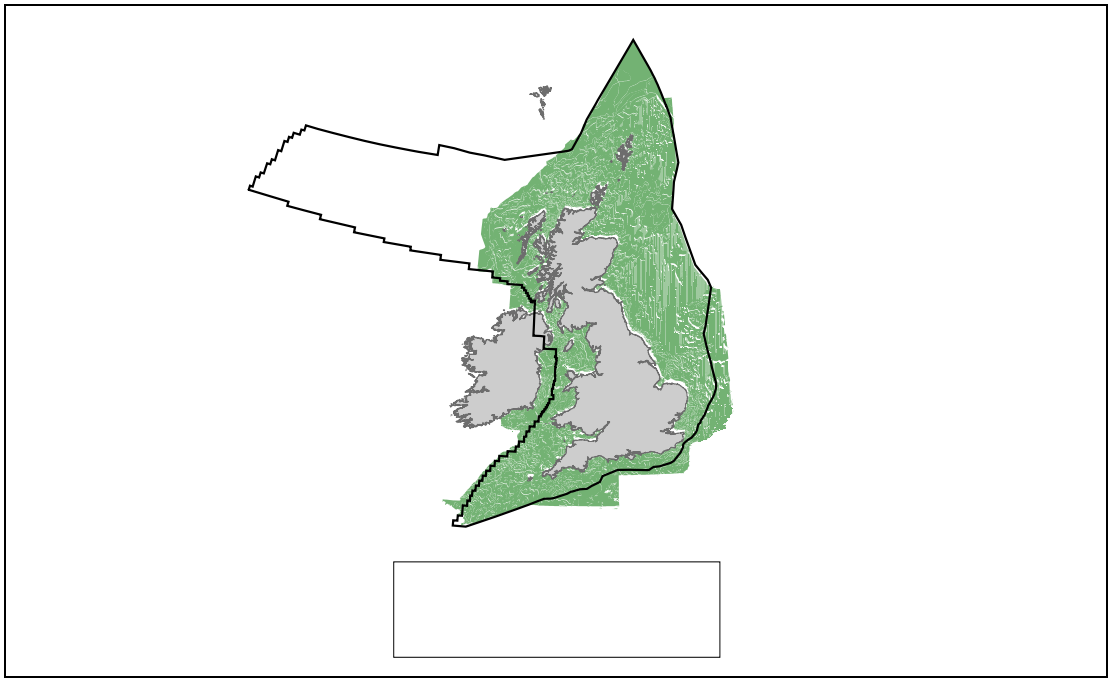

Figure 2. The coverage of the DiGSBS250k version 3 dataset

3.7 DATA FORMAT

The DiGSBS250k dataset has been created as vector polygons and are available in a range of GIS formats, including ArcGIS (.shp), ArcInfo Coverages and MapInfo (.tab). More specialised formats may be available but may incur additional processing costs.

3.8 LIMITATIONS

- DiGSBS250k has been developed at 1:250 000 scale and must not be used at larger scales. All spatial searches against the data should therefore be conducted using a minimum 250 m buffer.
- DiGSBS250k is based on, and limited to, an interpretation of data in the possession of The British Geological Survey at the time the data set was created.

4 Licensing Information

The British Geological Survey does not sell its digital mapping data to external parties. Instead, BGS grants external parties a licence to use this data, subject to certain standard terms and conditions. In general, a licence fee will be payable based on the type of data, the number of users, and the duration (years) of a licence.

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References

British Geological Survey holds most of the references listed below, and copies may be obtained via the library service subject to copyright legislation (contact libuser@bgs.ac.uk for details). The library catalogue is available at: http://geolib.bgs.ac.uk.

FOLK, R.L. 1954. The distinction between grain size and mineral composition in sedimentary rock nomenclature. Journal of Geology 62 (4), 344-359