

Global Map

Version 1.1 Specifications

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Cape Town

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For more information on the Global Mapping project,
please visit the Global Map site.

ISCGM Home Page
<http://www.iscgm.org/>



This paper is produced in reference to AUSLIG Home Page.
(http://www.auslig.gov.au/mapping/global_m/specv1_1.htm)

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1. Background

1.1 The need for a Global Map

It is only in the last few decades that people began to really become more aware of the environment around them. Satellite imagery and geo-spatial data analysis have helped monitor and understand the environment in which we live, in ways that were not possible before.

Since the 1972 United Nations Human Environment Conference, people around the world have realised that solving global environmental problems needs to be done at a global scale, that is, cooperatively. For that reason, international organisations and institutions around the globe provide and share global map information about the state of the globe and its changes. The "Earth Summit" - the United Nations Conference on Environment and Development (UNCED) - in Rio in June 1992 also addressed the issue of information access. Eight chapters of the *Agenda 21* plan dealt with the need to provide geographic information. In particular, Chapter 40 aimed at decreasing the gap in availability, quality, standardisation and accessibility of data between nations.

This was reinforced by the Special Session of the United Nations General Assembly on the Implementation of Agenda 21 held in June 1997. The report of this session includes mention of the need for global mapping, stressing the importance of public access to information and international cooperation in making it available.

It is therefore essential that we have access to the most accurate and up-to-date maps of important environmental features, if we are to properly understand our global environment. At present, available maps of the entire globe originate from various sources and therefore their accuracy is inconsistent, mainly because of irregularities in source material, lack of up-to-date data, gaps in the data, etc. Insufficient circulation of existing map information and a concern for national security has also reduced the availability of maps at a global scale.

1.2 Purpose and intended use of the Global Map

The concept of Global Mapping, and the establishment of an international body for Global Mapping, was first proposed by the Ministry of Construction of Japan (MOC) in 1992; and in 1994 the Geographical Survey Institute of Japan (GSI) proposed the first draft Map Specifications. The project currently involves the participation of many interested nations.

The main objective of this global project is to bring all nations and concerned organisations together to develop and provide easy and open access to global digital geographic information at a scale of 1:1 million. This would be used to facilitate the implementation of global agreements and conventions for environmental protection, for monitoring of major environmental phenomena and to encourage economic growth within the context of sustainable development. As part of this objective, a Global Map product will be developed to this specification.

The Global Map will also contribute to the development of a Global Spatial Data Infrastructure.

1.3 Ongoing support and future directions

At the First International Workshop on Global Mapping in Japan, it was agreed that the development of a Global Mapping product should be achieved by the year 2000. This specification is for this product.

However, Global Mapping will not just end in the year 2000. There will be plans for continued development following this date, such as revision and upgrading. Once the initial global mapping product is complete, this specification will be modified to achieve improvement in future Global Map products.

Section 9 gives contact details for the global mapping project.

1.4 Relationship to other international efforts, specifications and standards.

These specifications have been written to comply with international standardisation agreements and will be in the most part consistent with the International Organization for Standardization (ISO) TC211 recommendations for geographic data standards.

2. Data Sources

Significant data already exists on a global scale. To make the initial project efficient and achievable, this specification is built around the use of these data. The project will aim to improve the reliability and accuracy of these data sets. The upgrading of this data may involve editing the existing data or replacing parts of it with data from other sources. The data from other sources will meet the structure and other requirements of this specification. Data from other sources may exceed the minimum requirements set out in this specification, for example, in topological structure.

The base data sets are:

Global 30 Arc Second Elevation Data Set (GTOPO30) (US Geol. Survey, EROS Data Centre)

Elevation (DEM)

Global Land Cover Characteristics Database (US Geol. Survey, U. of Nebraska-Lincoln, EC Joint Research Centre).

Land Cover

Land Use

Vegetation

VMAP Level 0 (NIMA)

Drainage System (rivers, streams, lakes)

Transportation (roads, railways, airports)

Political Boundaries (including coastlines)

Populated Places

3. Data Model

3.1 Product extents

The Global Map product will encompass the entire globe, at a scale of 1:1 million. All the data sets will be consistent with this scale and these specifications. Tiling of the data sets will be required as a way to manage the data more efficiently and quickly. (See section 5 – Tiling)

3.2 Representation of features and layers

Spatial features are organised into thematic layers (coverages), with each layer containing logically related geographic information. These layers will either be in raster or vector form.

3.2.1 Vector layers

The layers in vector representation will include all those layers other than elevation, vegetation, land cover and land use. The features of the vector data model will be comprised of three spatial objects: points, edges and faces. (Formal ISO/TC211 terminology for these can be found in Appendix A.) Text features may also be included, however, these features are optional.

Vector layers and the associated feature types are shown in the following table.

Layer	Feature class	Feature name	Feature type	Inclusion
Transportation	Airport	Airport/Airfield	point	optional
	Rail yard	Railroad Yard/ Marshalling Yard	point	optional
	Railroad	Railroad	edge	mandatory
	Road	Road	edge	mandatory
	Trails and Tracks Line	Trail (Vehicle tracks)	edge	mandatory
	Structures	Bridge/Overpass/ Viaduct	edge	optional
		Ferry route	edge	optional
		Tunnel	edge	optional
	Transportation Text	Text	text	optional
Boundaries	Political Boundary	Administrative area	point	mandatory
	Coast Line	Coastline/ Shoreline	edge	mandatory
	Political Boundary Line	Administrative Boundary	edge	mandatory
	Ocean/Sea	Water (except inland)	face	mandatory
	Political Boundary	Administrative area	face	mandatory
	Political Entity Text	Text	text	optional
Drainage (Hydrography)	Miscellaneous	Dam/Weir	point	optional
		Island	point	optional
		Spring/Water-Hole	point	optional
	Aqueduct/Canal/Flume/ Penstock	Inland Water	edge	optional
	Miscellaneous	Dam/Weir	edge	optional
	Water Course	River/Stream	edge	mandatory
	Inland Water	Inland Water	face	mandatory
	Water Text	Text	text	optional
Population Centres	Built-up Area	Built-up Area	point	optional
	Miscellaneous Population	Settlement	point	optional
	Built-up Area	Built-up Area	face	optional
	Population Text	Text	text	optional

Note: Mandatory layers will only be populated where the features are present and are significant at the scale of the data.

International boundaries for the Global Map will be as defined by nations supplying data. Where the nation on one side of a border supplies no data the Vmap level 0 border will be used for that nation. Where adjoining nations supply different representations of the border both will be included in the product. All data will be identified as to its origin (see Appendix D).

3.2.2 Raster layers

Raster grid cells will be arrayed on a horizontal coordinate system in degrees of latitude and longitude referenced to ITRF94 and GRS80. See section 6.2 – Raster data structure.

Small islands less than approximately 1 square kilometre may not be represented.

The following groups of features are stored as raster layers:

ELEVATION: The vertical distance between the surface of the earth and the standard sea level that the nation has defined. Vertical units represent elevation in meters above Mean Sea Level (MSL).

VEGETATION: Codes developed for the Global Map will be adopted.

LAND COVER: Codes of characteristics adopted for International Geosphere-Biosphere Programme Land Cover Classification will be adopted.

LAND USE: Codes developed for the Global Map will be adopted.

3.3 Attributes

An attribute is a particular property of a feature.

The non-locational information about a feature instance will be stored as attributes. Attributes are classified into two groups: mandatory attributes and optional attributes. Names should be stored in upper case roman characters without diacritical marks. Attributes other than names will be stored in upper case English characters.

3.4 Data Dictionary

The data dictionary is included as Appendix D. The table lists vector and raster feature types and their attributes.

Vector features will be selected on the basis of their suitability for 1:1 million scale mapping and the feature definitions. As a result some feature types will only occur in the less densely settled areas where they are relatively more important than in the more densely settled areas. For example, Trails will be shown where there is not a well developed road network.

4. Spatial and attribute accuracy

4.1 Reference coordinate system

The ITRF94 coordinate system will be adopted as the reference coordinate system. GRS80 ellipsoid will be adopted to represent the position of spatial objects in longitude and latitude. As the difference between these coordinates and WGS84 coordinates is negligible at the scale of this product, data in WGS84 will be taken to be in ITRF94.

4.1.1 Precision

A pair of longitude and latitude values describes the position of spatial objects. The data shall be stored in decimal degrees to a minimum of three decimal points as geographic coordinates with southern and western hemispheres having a negative sign for latitude and longitude, respectively.

Resolution of vertical values is 1 metre.

4.1.2 Accuracy

The positional accuracy of spatial data is the degree to which planimetric coordinates and elevations of features agree with their real world values. The planimetric accuracy will be composed of errors from three sources:

- o The positional accuracy of the source material
- o Errors due to conversion processes.
- o Errors due to the manipulation processes.

Absolute horizontal and vertical accuracy will vary by location according to the source data. Absolute accuracy is defined as the difference between the stored coordinates and the true coordinates for a specific point.

For horizontal accuracy, 90% of points will be within $\pm 2\text{km}$ of their actual location. In the case of data obtained from satellite images, the maximum error is less than or equal to 0.5km.

Vertical accuracy is notionally ± 150 metres for 90% of points. This figure may need to be reviewed once the data are available, as sources to this accuracy may not be available in areas of high relief.

5. Tiling

Tiling will be required in order to manage the large amounts of data. All thematic coverages in the global map product share the same tiling structure and coordinate system. There is no overlap or gap between tiles.

If an area within a tile is revised with new or corrected data, only that tile will be updated for the particular feature.

The tiling schema is that used for Vmap0. Tiles will have the dimensions in the following table:

Latitude	Tile Size (Degrees Latitude by Degrees Longitude)	Origin (Latitude north and south, Longitude)
0° - 0°	5° x 5°	0° , 0°
40° - 50°	5° x 6°	40° , 0°
50° - 60°	5° x 8°	50° , 0°
60° - 65°	5° x 10°	60° , 0°
65° - 70°	5° x 12°	65° , 0°
70° - 75°	5° x 15°	70° , 0°
75° - 80°	5° x 20°	75° , 0°
80° - 90°	5° x 90°	80° , 0°

The tiling schemes used for some of the source material will differ in their spatial extent. Data from different sources will be re-tiled to meet this schema.

5.1 Tile Identification

Tiles will be identified using the GEOREF naming system.

The GEOREF system uses two pairs of letters. The first pair of letters represents the coarsest, 15° by 15° standard GEOREF division, and represents the first coordinate pair identifying the tile name. The first letter represents the first tile partition of the southwest coordinate in the x direction (longitude). There are a maximum of 24 letters from A to Z (omitting I and O), for the 15° bands of GEOREF longitude zones. Longitude zones are lettered from the zone with 180° west as its western edge. The second letter represents the second partition of the southwest coordinate in the y direction (latitude). There are a maximum of 12 subdirectories lettered from A to M (omitting I), for the 15° GEOREF latitude zones. Latitude zones are lettered from the zone with 90° south as its southern extent.

The second pair of letters represents the 1° by 1° standard GEOREF divisions, and represents the second coordinate pair of the tile name. The first letter represents the x coordinate (longitude) of the southwest corner of tile. There are a maximum of 15 letters from A to Q (omitting I and O), for the 1° bands of GEOREF longitude zones. The second letter represents the y coordinate (latitude) of the southwest corner of the tile. There are a maximum of 15 letters from A to Q (omitting I and O) for the 1° bands of GEOREF latitude zones. These letters partition each 15° by 15° GEOREF cell into a total of 225 1° by 1° cells. The following diagram illustrates this arrangement

Thus the GEOREF system identifies a grid of 1° x 1° grid. Tiles take the reference for their south west corner. So the shaded area in the above diagram represents a tile with the reference FJLA.

[illegible]

Where data collection procedures require individual source sheets, digital files or other media to be combined, features crossing source boundaries shall be continuous. Exceptions to this rule occur when more current source data are used and the feature position or presence has changed. In these cases, a discontinuity along a source boundary shall occur and be documented in the Metadata.

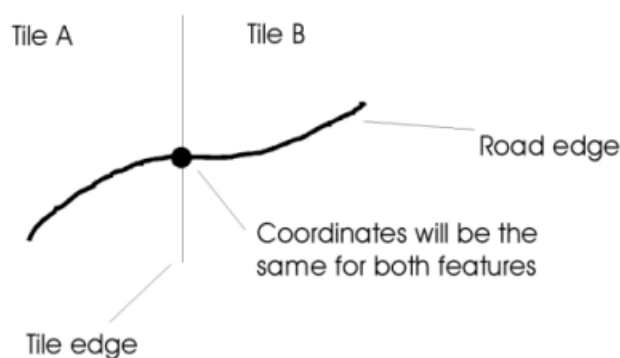
6. Structure and features

6.1 Vector Data Structure

6.1.1 Topology

Vector data in the Global Map will be partially topologically structured. Features stored as edges and faces will be individually structured. Edges making up a network such as roads will have nodes at intersections. Topological relationships between layers will not be enforced. In particular point features will not necessarily be topologically related to networks. So, for example, point railway features may not necessarily fall on the railway line when viewed at large scale and particularly if the data has been projected.

Topology will be retained across the tile boundaries. Real world phenomena that cross the tile edge will have exactly the same coordinates on the nodes on the tile edge on each tile. This will enable the database to function as a seamless unit for analysis purposes. For example, in the diagram below, the road edge in both tiles will be matched at the edge of both tiles.



6.1.2 Data quality

- o Logical consistency will be kept. For example, there will not be different elevation values in the same still water body.
- o Features will not be duplicated or omitted where they meet the selection criteria.
- o Metadata will document the data's quality (see section 7 Metadata).

6.2 Raster data structure

Cell size for raster data will be 30" by 30". With the origin being the NW corner of the tile.

At the Equator, a degree of longitude is about 111 kilometres, getting progressively finer longitudinally towards the poles. Thus, there will be slightly better than 1-km gridding at the Equator.

6.2.1 Determination of cell's attributes

A cell's attribute value represents a characteristic that is dominant near the centre position of the cell.

6.2.2 Header file

A header file will accompany each raster file. Items to be included in the header file are as follows. One of the figures in parentheses is chosen if there are any. Data will meet the default values where specified in parentheses and italicised.

BYTEORDER byte order in which image pixel values are stored.
Big endian (*M*).

LAYOUT	organisation of the bands in the file (<i>BIL = band interleaved by line</i>) (<i>note: all files are single band images</i>)
NROWS	Number of rows (cells) in longitude direction of the image
NCOLS	Number of columns (cells) in latitude direction of the image(<i>M</i>).
NBANDS	Number of spectral bands in the image (<i>1</i>).
NBITS	Number of bits per cell (<i>8 for land cover, land use and vegetation layers and 16 for elevation</i>).
BANDROWBYTES	Number of bytes of data per row(<i>M</i>).
TOTALROWBYTES	Total number of bytes of data per row
BANDGAPBYTES	The number of bytes between bands in a BSQ format image (<i>0</i>).
NODATA	Value used for masking purposes (<i>-9999 for elevation</i>).
ULXMAP	Longitude of the centre of the upper-left pixel
ULYMAP	Latitude of the centre of the upper-left pixel
XDIM	Width of a cell in longitude direction
YDIM	Width of a cell in latitude direction

A sample raster header file is at Appendix F.

6.2.3 Attributes description

The attribute for a raster file is the value of each of the cells, as referred to in the data dictionary.

7. Metadata

Metadata is data about the contents, quality, condition and other characteristics of the data. It also describes the lineage, process and accuracy of the data set. Metadata for the vector layers will be supported by and related to the quality layer.

7.1 Metadata file

A metadata file accompanies each layer within each library. This file will be an ASCII file. This file will be named after the relevant theme and have the extension '.met'.

7.2 Contents

The contents of metadata follow the ISO standard of metadata (ISO 15046) at conformance level 1 (See Appendix C for explanations of the metadata items). Metadata will be described in English. Metadata will be supplied separately for each layer in the data set.

The following will be included:

The number of asterisks before each item shows item's sublevels.

	For vector layers	For Raster layers
Cataloguing metadata information		
* Title	x	x
* Edition	x	x
* Issue identification	x	x
Initiative identification information		
*Initiative identification Name	x	x
*Reference date (Publication Date/Time)	x	x
Responsible party information		
*Responsible party organisation name	x	x
*Responsible party role code	x	x
* Postal Address	x	x
* City	x	x
* Administrative Area	x	x
* Postal Code	x	x
* Country	x	x
*On-line resource linkage	x	x
Dataset Extent		
*Geographic extent coordinates		
** West Bounding Coordinate	x	x
** East Bounding Coordinate	x	x
** North Bounding Coordinate	x	x
** South Bounding Coordinate	x	x
* Temporal extent (Content) Date/Time	x	x
*Resolution level code	x	x
Language of data set code	x	x
Dataset character code set	x	x
Abstract	x	x
Purpose	x	x
Category		
*Theme code	x	x
Access Constrains	x	x
Use Constrains	x	x
Spatial representation type code	x	x
Spatial reference system type code	x	x
*Distribution identifier	x	x
*Distribution format name	x	x
*Level of conformance of metadata	x	x
*Language of metadata code	x	x
*Metadata date	x	x

Metadata at conformance level 2 may also be included for each tile (see ISO 15046-15). Inclusion of this metadata will be optional.

8. Output formats

Vector data will be distributed in VPF format and other formats to be determined when the product is completed. Raster data will be distributed as Band Interleaved (BIL) files with a separate header file.

8.1 Area of file coverage

The area covered by each file is described in section 5 - tiling. Each layer of a tile will be stored in a separate file.

8.2 File names

8.2.1 Vector Representation

The theme and tile for vector files are identified by the directory structure (see section 8.4). File names for vector data are as shown below.

File name	Face	Edge	Point	Node	Text
Primitive Table	fac	edg	end	cnd	txt
Spatial Index	fsi	esi	nsi	csi	tsi
Ring file	rng				
Bounding Rectangle Table	fbr	ebr			
Variable-length Index		edx			txx

Vector files will be arranged into databases in the root directory for the database there will be a library attribute table (lat) and a data base header table (dht). In addition the library for the database will contain a library header table (lht), a geographic reference table (grt) and a coverage attribute table (cat). This directory will have an untiled library reference coverage (libref) and a tile reference coverage (tileref) as subdirectories. Each thematic directory will contain a metadata file named with the theme name with an extension '.met' (see section 7)

8.2.2 Raster Representation

Raster data have a file name of the form xxvvvv.zzz where xx identifies the theme, vvvv identifies the tile using the GEOREF system described in section 5.1 and zzz is the extension identifying the data (.bil) or the header (.hdr).

Theme identifiers are:

Identifier	Theme
el	elevation
ve	vegetation
lc	land cover
lu	land use

So elagaa.bil will be the file name for the elevation data for the tile whose origin is latitude 0° , longitude -180° . Metadata files will be named after the theme identifier with the extension '.met', for example 'el.met'

8.3 File format

8.3.1 Vector representation

The Vector Product Format (VPF) will be adopted. This format provides a standard format for transferring digital vector cartographic data.

8.3.2 Raster representation

Will be in a simple binary raster format without embedded header – BIL (Band Interleaved by Line) format. This type of data stores pixel information band by band for each line, or row, of the image. For example, given a one-band image such as the ones for Global Map, data is written for row 1, data is written for row 2, and so on, until the total number of rows in the image is reached. Vegetation, Land Cover and Land Use layers will be 8-bit unsigned data and the elevation data will be 16-bit signed.

A header file will accompany each raster file.

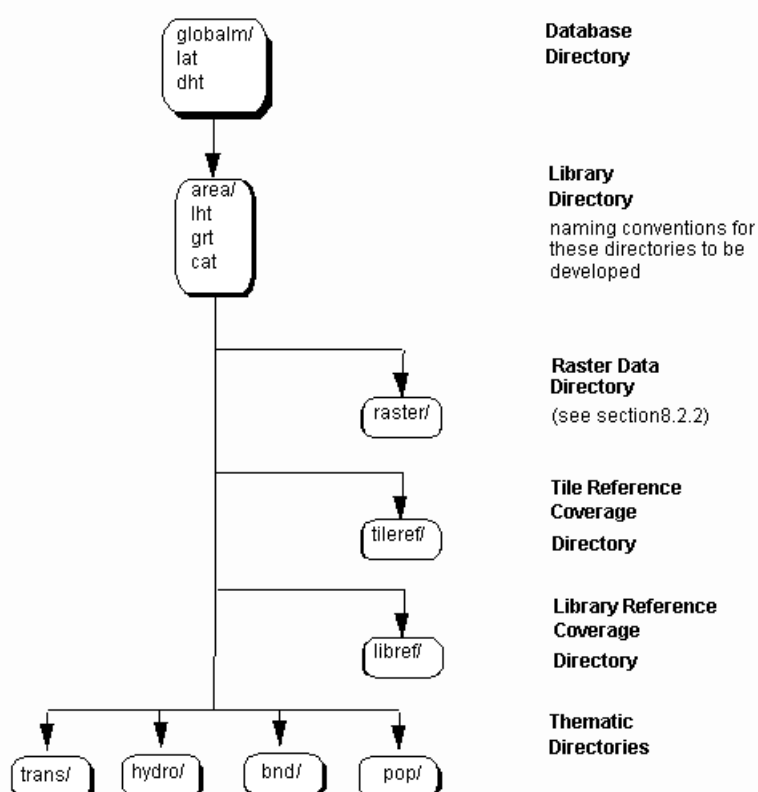
The data are stored in row major order (all the data for row 1, followed by all the data for row 2. etc.).

The elevation data are in Motorola (big-endian) byte order, that is, the most significant byte is stored first.

8.4 Directory structure

The directory structure will be that adopted for VMAP0 with modifications to account for the inclusion of the raster data layers.

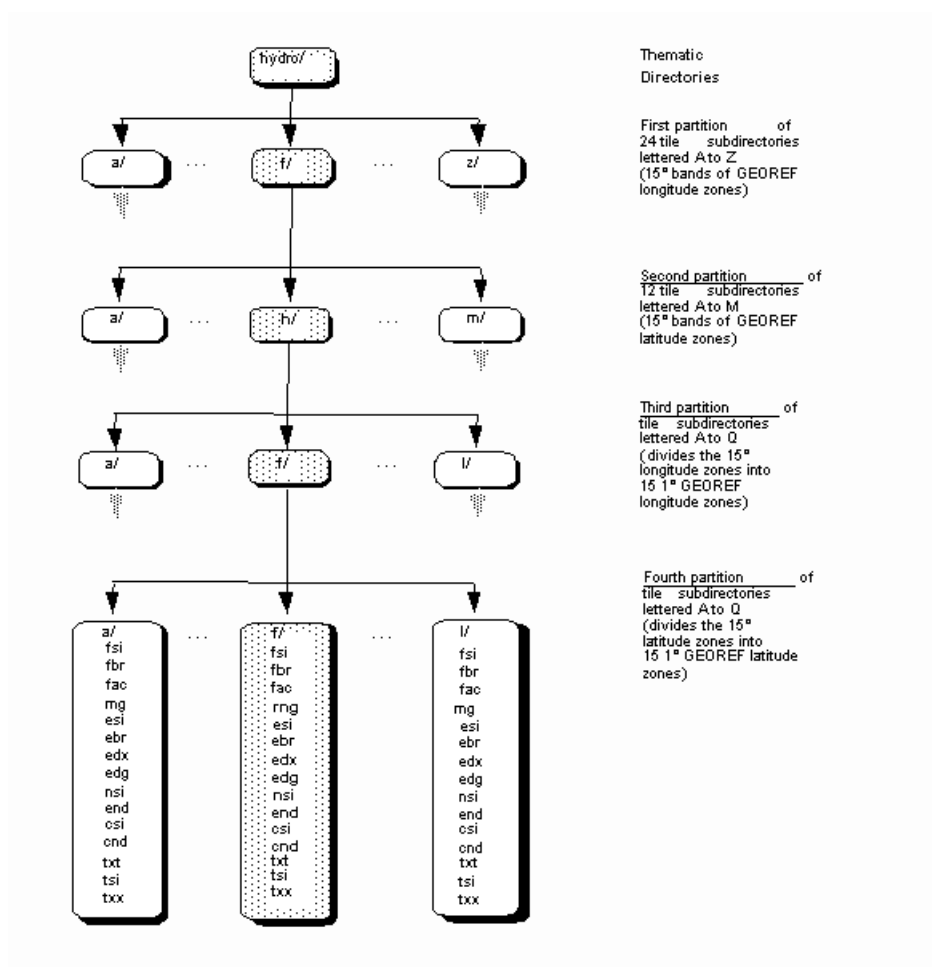
The structure will consist of a database directory with one or more libraries. Each library will contain a regional or a national data set. Beneath the library directories are a directory for the raster layers, a tile reference coverage directory and one or more thematic directories. The following diagram illustrates this arrangement.



The thematic directories will be:

Theme	Directory
Transport	/trans
Drainage	/hydro
Boundaries	/bnd
Population centres	/pop

Under the thematic directories are four levels of sub directories. Each level matches a letter in the GEOREF tile identifier (see section 5.1 Tile identification). The following diagram illustrates this with the path to the hdro files for tile fhff:



The spatial extent of the libraries will be determined as part of the distribution process.

9. Suggestions for change

Suggestions for changes or corrections to these Specifications should be referred to the Global Map Secretariat (iscgmsec@graph.gsi-mc.go.jp) or:

Global Map Secretariat

Geographical Survey Institute

Kitasato 1, Tsukuba, Ibaraki, 305-0811 JAPAN

10. References

Global Map Technical Specifications (Draft), Secretariat of ISCGM, Global Mapping Forum '97, Gifu, Japan.

Directorate of Geomatics, Department of National Defence, Canada, June 1997, *The Digital Geographic Information Exchange Standard (DIGEST)* URL: <http://www.digest.org> (custodian NIMA).

NIMA, 1995, *VMAP0 Military Specifications*, URL: <http://164.214.2.59/publications/specs/printed/VMAP0/vmap0.html>

U.S. Geological Survey (USGS), University of Nebraska-Lincoln (UNL), and European Commission's Joint Research Centre (JRC), 1996, *Global Land Cover Characterization Data Set*, product documentation, URL: <http://edcwww.cr.usgs.gov/landdaac/glcc/glcc.html>

U.S. Geological Survey's EROS Data Center (EDC), 1996, *Global 30 Arc Second Elevation Data Set*, product documentation, URL: <http://www1.gsi-mc.go.jp/gtopo30/gtopo30.html>

APPENDIX A Glossary of terms

Terminology definitions according to ISO/TC211 (may or may not be included in the specifications):

Accuracy Closeness of observations to true values or values accepted to be true.

[ISO/TC 211/WG 3 N 042, Geographic Information - Metadata; WG 3
Date of source document: 1997-06-30
Term status: current working definition
Document status: Working Draft]

Altitude Height above a reference surface.

EXAMPLE height above mean sea level

NOTE Altitude is negative only when position is below the reference surface.

[ISO/TC 211/WG 3 N 042, Geographic Information - Metadata; WG 3
Date of source document: 1997-06-30
Term status: current working definition
Document status: Working Draft]

Area A generic term for a bounded, continuous, two-dimensional object that may or may not include its boundary.

[ISO/TC 211 N 279, Geospatial services - Portrayal of Geographic Information; WG 4
Date of source document: 1996-10-23
Term status: comments given in ISO/TC 211/WG 1/PT 04 N 015
Document status: Working Draft]

Attribute A property which describes a geometrical, topological, thematic, or other characteristic of an entity.

[ISO/TC 211 N 279, Geospatial services - Portrayal of Geographic Information; WG 4
Date of source document: 1996-10-23
Term status: comments given in ISO/TC 211/WG 1/PT 04 N 015
Document status: Working Draft]

Attribute value Value assigned to a feature attribute.

[ISO/TC 211/WG 1 N 085, Definition of some common terms in ISO/TC 211, agreement Reston, USA 1996-10-07--11]

Boundary Closed non-self-intersecting curve or set of curves that bounds a surface.

[ISO/TC 211, Geographic Information - Spatial subschema; WG2
Date of source document: May 1997
Term status: current working definition
Document status: Working Draft]

Code Representation of a label according to a specified scheme.

[ISO/TC 211/WG 1 N 087, Definition of some common terms in ISO/TC 211, agreement Sydney, Australia 1997-01-20--24]

Connected node Node related to one or more edges.

[ISO/TC 211, Geographic Information - Spatial subschema; WG2
Date of source document: May 1997
Term status: current working definition
Document status: Working Draft]

Coordinates Pairs of numbers expressing horizontal distances along orthogonal axes; alternatively, triplets of numbers measuring horizontal and vertical distances.

[ISO/TC 211/WG 1 N 040.3, Geographic Information - Reference Model; WG 1
Date of source document: 1996-12-27
Term status: term taken from ISO/TC 211/WG 3 N 223
Document status: Working draft]

Curve Bounded connected 1-dimensional geometric primitive.

[ISO/TC 211, Geographic Information - Spatial subschema; WG2
Date of source document: May 1997
Term status: current working definition
Document status: Working Draft]

Data Reinterpretable representation of information in a formalised manner suitable for communication, interpretation, or processing

[ISO/TC 211/WG 1 N 085, Definition of some common terms in ISO/TC 211, agreement Reston, USA 1996-10-07--11]

Data element Unit of data that, in a certain context, is considered indivisible.

[ISO/TC 211/WG 1 N 087, Definition of some common terms in ISO/TC 211, agreement Sydney, Australia 1997-01-20--24]

Data quality element Component of the quality of a dataset documenting quantitative information

NOTE The applicability of a data quality element to a dataset depends on both the dataset's content and its product specification; all data quality elements are not applicable to all datasets.

[ISO/TC 211/WG 3, Geographic Information - Quality - Principles; WG 3]

Date of source document: 1997-05-30

Term status: current working definition

Document status: Working Draft]

Dataset Identifiable collection of related data.

NOTE A dataset may be a smaller grouping of data which, though limited by some constraint such as spatial extent or feature type, is located physically within a larger dataset. Theoretically, a dataset may be as small as a single feature or feature attribute contained within a larger dataset.

[ISO/TC 211/WG 1 N 087, Definition of some common terms in ISO/TC 211, agreement Sydney, Australia 1997-01-20--24]

Data structure A computer interpretable format used for storing, accessing, transferring, and archiving data.

[ISO/TC 211 N280, Geospatial services - Encoding; WG4]

Date of source document: 1996-10-23

Term status: comments given in ISO/TC 211/WG 1/PT 04 N 016

Document status: Working Draft]

Data transfer To move data from one point to another over a medium

NOTE Transfer of information implies transfer of data.

[ISO/TC 211/WG 1 N 087, Definition of some common terms in ISO/TC 211, agreement Sydney, Australia 1997-01-20--24]

Edge 1-dimensional topologic primitive.

[ISO/TC 211, Geographic Information - Spatial subschema; WG2]

Date of source document: May 1997

Term status: current working definition

Document status: Working Draft]

Elevation Height of a ground point above a reference surface.

EXAMPLE height of a ground point above mean sea level

NOTE Elevation is negative only when position is below the reference surface.

[ISO/TC 211/WG 3 N 042, Geographic Information - Metadata; WG 3]

Date of source document: 1997-06-30

Term status: current working definition

Document status: Working Draft]

Entity 1. Representation of a collection of data elements in a conceptual schema.

2. Class of objects with common properties [ISO 10303:11]

[ISO/TC 211/WG 2 N 037, Geographic Information - Rules for Application Schema; WG 2]

Date of source document: 1997-01-15

Term status: comments given in ISO/TC 211/WG 1/PT 04 N 026

Document status: Working Draft]

Entity attribute Description of an element of an entity.

[ISO/TC 211/WG 2 N 037, Geographic Information - Rules for Application Schema; WG 2]

Date of source document: 1997-01-15

Term status: comments given in ISO/TC 211/WG 1/PT 04 N 026

Document status: Working Draft]

Event Something (eg. a change in the state of a geographic feature) which occurs at an instant in time.

[ISO/TC 211, Geographic Information - Geomatics - Temporal subschema; WG2]

Date of source document: 1996 April

Term status: New proposal

Document status: 1st draft]

Face 2-dimensional topologic primitive.

[ISO/TC 211, Geographic Information - Spatial subschema; WG2]

Date of source document: May 1997

Term status: current working definition

Document status: Working Draft]

Feature Representation of a real world phenomenon.

[ISO/TC 211/WG 3, Geographic Information - Quality - Principles; WG 3
Date of source document: 1997-05-30
Term status: current working definition
Document status: Working Draft]

Feature attribute An essential trait, quality, or characteristic of a specific geographic feature.

[ISO/TC 211/WG 1 N 040.3, Geographic Information - Reference Model; WG 1
Date of source document: 1996-12-27
Term status: comments given in ISO/TC 211/WG 1/PT 04 N 027
Document status: Working draft]

Feature catalogue Definition and description of the feature types, feature type functions, feature attribute types, and feature relationship types occurring in one or more sets of geographic data.

[ISO/TC 211/WG 3 N 031, Geographic Information - Feature Cataloguing; WG 3
Date of source document: 1996-12-08
Term status: comments given in ISO/TC 211/WG 1/PT 04 N 022
Document status: Working Draft]

Feature element Part of a geographic feature that can be identified and treated separately.

[ISO/TC 211 N 279, Geospatial services - Portrayal of Geographic Information; WG 4
Date of source document: 1996-10-23
Term status: comments given in ISO/TC 211/WG 1/PT 04 N 015
Document status: Working Draft]

Geographic data Data with implicit or explicit reference to a location relative to the Earth.

[ISO/TC 211/WG 1 N 085, Definition of some common terms in ISO/TC 211, agreement Reston, USA 1996-10-07--11]

Geographic feature Representation of a real world phenomenon associated with a location relative to the Earth.

[ISO/TC 211/WG 1 N 085, Definition of some common terms in ISO/TC 211, agreement Reston, USA 1996-10-07--11]

Grid A set of points arrayed in a pattern that forms a regular, or nearly regular, tessellation of a surface.

[ISO/TC 211/WG 1 N 040.3, Geographic Information - Reference Model; WG 1
Date of source document: 1996-12-27
Term status: term taken from ISO/TC 211/WG 3 N 223
Document status: Working draft]

Grid cell A two-dimensional object that represents the smallest non-divisible data element of a grid.

[ISO/TC 211 N 279, Geospatial services - Portrayal of Geographic Information; WG 4
Date of source document: 1996-10-23
Term status: comments given in ISO/TC 211/WG 1/PT 04 N 015
Document status: Working Draft]

Grid coordinate system System of point positioning on a plane, arising from a system mathematical projection of points on a specific geodetic datum to that plane.

[ISO/TC 211/WG 3 N 042, Geographic Information - Metadata; WG 3
Date of source document: 1997-06-30
Term status: current working definition
Document status: Working Draft]

Intermediate node Connected node coincident with an edge without terminating it.

[ISO/TC 211, Geographic Information - Spatial subschema; WG2
Date of source document: May 1997
Term status: current working definition
Document status: Working Draft]

Isolated node Node not related to any edge.

[ISO/TC 211, Geographic Information - Spatial subschema; WG2
Date of source document: May 1997
Term status: current working definition
Document status: Working Draft]

Level Collection of data physically located within a dataset which share one or more common feature types or feature attribute types.

NOTE Level may be extended upward to include the entire dataset or the dataset series to which a dataset belongs.

NOTE If considered independently then compared, the individual data components of a level

would most likely have similar or identical data quality results.

[ISO/TC 211/WG 3, Geographic Information - Quality - Principles; WG 3
Date of source document: 1997-05-30
Term status: comments given in ISO/TC 211/WG 1/PT 04 N 045
Document status: Working Draft]

Line A generic term for a one-dimensional object.

[ISO/TC 211 N 279, Geospatial services - Portrayal of Geographic Information; WG 4
Date of source document: 1996-10-23
Term status: comments given in ISO/TC 211/WG 1/PT 04 N 015
Document status: Working Draft]

Metadata Data describing and documenting data [ISO 15404-15]

NOTE Metadata for geographic data typically provides information about its identification, extent, quality, spatial and temporal schema, spatial reference, metadata and distribution.

[ISO/TC 211/WG 3, Geographic Information - Quality - Principles; WG 3
Date of source document: 1997-05-30
Term status: term taken from ISO/TC 211/WG 3, Metadata
Document status: Working Draft]

Metadata element Unit of metadata for which the definition, identification, representation, and permissible values are specified by means of a set of attributes [ISO 15046-15]

[ISO/TC 211/WG 3, Geographic Information - Quality - Principles; WG 3
Date of source document: 1997-05-30
Term status: term taken from ISO/TC 211/WG 3, Metadata
Document status: Working Draft]

Metadata entity type Collection of similar metadata elements [ISO 15046-15].

NOTE A metadata entity type may include other metadata entity types.

[ISO/TC 211/WG 3, Geographic Information - Quality - Principles; WG 3
Date of source document: 1997-05-30
Term status: term taken from ISO/TC 211/WG 3, Metadata
Document status: Working Draft]

Model A representation, generally in miniature which serves as a copy of something

[ISO/TC 211/WG 3 N 042, Geographic Information - Metadata; WG 3
Date of source document: 1997-06-30
Term status: comments given in ISO/TC 211/WG 1/PT 04 N 048
Document status: Working Draft]

Node 0-dimensional topologic primitive

[ISO/TC 211, Geographic Information - Spatial subschema; WG2
Date of source document: May 1997
Term status: current working definition
Document status: Working Draft]

Point 0-dimensional geometric primitive

[ISO/TC 211, Geographic Information - Spatial subschema; WG2
Date of source document: May 1997
Term status: current working definition
Document status: Working Draft]

Primitive Smallest spatial component of which all features are composed.

EXAMPLE There are 3 geometric primitives (nodes, edges, and faces) and one cartographic primitive (text).

[ISO/TC 211/WG 3 N 042, Geographic Information - Metadata; WG 3
Date of source document: 1997-06-30
Term status: comments given in ISO/TC 211/WG 1/PT 04 N 048
Document status: Working Draft]

Product A completely specified data set comprised of a set of profiles; specifically including, the schema, metadata, quality information, reference system, structure primitives, and encoding.

[ISO/TC 211/WG 1 N 040.3, Geographic Information - Reference Model; WG 1
Date of source document: 1996-12-27
Term status: term taken from ISO/TC 211/WG 5 N 077
Document status: Working draft]

Product specification Description of the abstract universe and a specification for mapping the abstract universe to a dataset.

[ISO/TC 211/WG 3, Geographic Information - Quality - Principles; WG 3
Date of source document: 1997-05-30
Term status: current working definition
Document status: Working Draft]

Quality 1. The totality of characteristics of a product that bear on its ability to satisfy stated and implied needs.

2. An essential or distinguishing characteristic necessary for cartographic data to be fit for use.

[ISO/TC 211/WG 1 N 040.3, Geographic Information - Reference Model; WG 1

Date of source document: 1996-12-27

Term status: definitions taken from ISO/TC 211/WG 3 N 013 and ISO/TC 211/WG 3 N 223

Document status: Working draft]

Raster One or more overlapping layers for the same grid or digital image.

[ISO/TC 211/WG 1 N 040.3, Geographic Information - Reference Model; WG 1

Date of source document: 1996-12-27

Term status: term taken from ISO/TC 211/WG 3 N 223

Document status: Working draft]

Raster data Data represented in a regular spatial array.

[ISO/TC 211/WG 1 N 087, Definition of some common terms in ISO/TC 211, agreement Sydney, Australia 1997-01-20--24]

Raster map Map data based on a raster data model.

[ISO/TC 211/WG 3 N 042, Geographic Information - Metadata; WG 3

Date of source document: 1997-06-30

Term status: comments given in ISO/TC 211/WG 1/PT 04 N 048

Document status: Working Draft]

Resolution The minimum difference between two independently measured or computed values, which can be distinguished by the measurement or analytical method being considered or used.

[ISO/TC 211/WG 3 N 042, Geographic Information - Metadata; WG 3

Date of source document: 1997-06-30

Term status: current working definition

Document status: Working Draft]

Ring Ordered set of connected edges forming a 1-dimensional closed non-self-intersecting element that bounds a face.

[ISO/TC 211, Geographic Information - Spatial subschema; WG2

Date of source document: May 1997

Term status: current working definition

Document status: Working Draft]

Scene Geometric primitive which is a limited part of a specific grid.

[ISO/TC 211, Geographic Information - Spatial subschema; WG2

Date of source document: May 1997

Term status: comments given in ISO/TC 211/WG 1/PT 04 N 044

Document status: Working Draft]

Schema The description, or global model, of the natural structure of data [ISO/IEC Standard 11179].

[ISO/TC 211/WG 1 N 040.3, Geographic Information - Reference Model; WG 1

Date of source document: 1996-12-27

Term status: comments given in ISO/TC 211/WG 1/PT 04 N 027

Document status: Working draft]

Section Subset of metadata that defines a collection of related metadata.

[ISO/TC 211/WG 3 N 042, Geographic Information - Metadata; WG 3

Date of source document: 1997-06-30

Term status: comments given in ISO/TC 211/WG 1/PT 04 N 048

Document status: Working Draft]

Spatial attribute Feature attribute that is a spatial characteristic of a geographic feature.

NOTE Spatial attributes of a geographic feature are characteristics such as its position, size, and shape.

[ISO/TC 211, Geographic Information - Spatial subschema; WG2

Date of source document: May 1997

Term status: comments given in ISO/TC 211/WG 1/PT 04 N 044

Document status: Working Draft]

Spatial coordinate system A system of providing basic numeric primitives for describing width, length, and height; the basic dimensions of space.

[ISO/TC 211/WG 1 N 040.3, Geographic Information - Reference Model; WG 1

Date of source document: 1996-12-27

Term status: comments given in ISO/TC 211/WG 1/PT 04 N 027

Document status: Working draft]

Spatial object A collection of spatial primitives that represents the spatial characteristics of a geo-

graphic feature.

[ISO/TC 211/WG 1 N 040.3, Geographic Information - Reference Model; WG 1
Date of source document: 1996-12-27
Term status: term taken from ISO/TC 211/WG 2 N 297
Document status: Working draft]

Spatial reference Label or geocode which identifies an occurrence of a spatial unit.

[ISO/TC 211/WG 2 N 037, Geographic Information - Rules for Application Schema; WG 2
Date of source document: 1997-01-15
Term status: term taken from ISO/TC 211/WG 3 N 016
Document status: Working Draft]

Spatial unit 1. Class of features that represents the indirect spatial position of another features

2. Sub-division of an area according to value of a particular property

[ISO/TC 211/WG 2 N 037, Geographic Information - Rules for Application Schema; WG 2
Date of source document: 1997-01-15
Term status: comments given in ISO/TC 211/WG 1/PT 04 N 026
Document status: Working Draft]

Surface A generic term for a bounded, continuous, two-and-a-half-dimensional representation of a terrain-surface using connected areas.

[ISO/TC 211 N 279, Geospatial services - Portrayal of Geographic Information; WG 4
Date of source document: 1996-10-23
Term status: comments given in ISO/TC 211/WG 1/PT 04 N 015
Document status: Working Draft]

Table An ordinary arrangement of data, especially one in which the data is arranged in columns and row in a rectangular form.

[ISO/TC 211/WG 3 N 042, Geographic Information - Metadata; WG 3
Date of source document: 1997-06-30
Term status: comments given in ISO/TC 211/WG 1/PT 04 N 048
Document status: Working Draft]

Terminating node Connected node terminating an edge.

[ISO/TC 211, Geographic Information - Spatial subschema; WG2
Date of source document: May 1997
Term status: current working definition
Document status: Working Draft]

Topology Refers to properties of geometric forms that remain invariant when the forms are deformed or transformed by bending, stretching, or shrinking.

NOTE Among the topological properties of concern in geographic information are connectivity, order, and neighbourhood.

[ISO/TC 211, Geographic Information - Geomatics - Temporal subschema; WG2
Date of source document: 1996 April
Term status: New proposal
Document status: 1st draft]

Vector data Data represented by geometric primitives.

[ISO/TC 211/WG 1 N 087, Definition of some common terms in ISO/TC 211, agreement Sydney, Australia 1997-01-20--24]

Vector map Map data based on a graph theory data model.

[ISO/TC 211/WG 3 N 042, Geographic Information - Metadata; WG 3
Date of source document: 1997-06-30
Term status: comments given in ISO/TC 211/WG 1/PT 04 N 048
Document status: Working Draft]

APPENDIX B Acronyms and Abbreviations

ASCII	American Standard Code for Information Interchange
AUSLIG	Australian Surveying and Land Information Group
AVHRR	Advanced Very High Resolution Radiometer
BIL	Byte Interleaved by Line
CD-ROM	Compact Disc - Read Only Memory
DCW	Digital Chart of the World
DEM	Digital Elevation Model
DTED	Digital Terrain Elevation Data
EC	European Commission
EROS	Earth Resources Observation Systems
GLOBE	Global Land One-kilometre Base Elevation
GRS80	Geodetic Reference System 1980
GSI	Geographical Survey Institute of Japan
IMW	International Map of the World
ISCGM	International Steering Committee for Global Mapping
ISO	International Organization for Standardization
ITRF94	International Terrestrial Reference Frame 1994
MOC	Ministry of Construction of Japan
MSL	Mean Sea Level
NIMA	National Imagery and Mapping Agency
NOAA	National Oceanographic and Atmospheric Administration
ONC	Operational Navigation Charts
PC	Personal Computer
UNCED	United Nations Conference on Environment and Development
USGS	United States Geological Survey
VAX	Virtual Address eXtension
VMAP0	Vector Smart Map Level 0
VPF	Vector Product Format
WG	Working Group
WGS84	World Geodetic System 84

APPENDIX C Metadata at conformance level 1

Table 1 Definition of Metadata elements at conformance level 1 (following International Organization for Standardization 5046-15 standard)

Name	Definition	Maximum occurrence	Data type	Domain
Cataloguing metadata information	Information to uniquely identify an entire dataset and/or dataset series	1	Metadata section	
Title	Name by which the dataset is known	1	string	free text
Edition	Version of the titled dataset	1	string	free text
Issue Identification	Information identifying the issue of the series publication of which the dataset is a part	1	string	free text
Initiative identification information	Initiative under which a dataset is compiled or produced – used as a means of identification	N	Metadata entity	
Initiative identification name	Name of initiative used for identification	1	string	free text
Reference date	Date and time when the dataset was published or otherwise made available for release.	1	date	(See ISO 15046-8)
Responsible party information	Responsible party information for an individual or organisation that is knowledgeable about the dataset	N	Metadata entity	
Responsible party organisation name	Name of the organisation associated with the dataset	1	string	free text
Responsible party role code	Function performed by the responsible party	1	integer	1-originator 2-publisher 3-custodian 4-principal investigator 5-content provider 6-processor 7-distributor 8-point of contact 9-metadata provider
Postal Address	Address line for the address	1	string	free text
City	City of the address	N	string	free text
Administrative Area	State, province, or county of the address	1	string	free text
Postal Code	ZIP or other postal code of the address	1	string	free text
Country	Country of the address	1	string	free text
Online resource linkage	Uniform Resource Locator (URL) to access the resource	N	string	free text
Dataset extent	Horizontal and vertical extent covered by the dataset	N	Metadata entity	
Geographic extent coordinates	Geographic areal domain of the dataset	1	Metadata entity	
West Bounding Coordinate	Western-most coordinate of the limit of coverage expressed in longitude	1	real	-180.0 <= West Bounding Coordinate < 180.0
East Bounding Coordinate	Eastern-most coordinate of the limit of coverage expressed in longitude	1	real	-180.0 <= East Bounding Coordinate < =180.0
North Bounding Coordinate	Northern-most coordinate of the limit of coverage expressed in latitude	1	real	-90.0 <= North Bounding Coordinate <= 90.0; North Bounding Coordinate >= South Bounding Coordinate
South Bounding Coordinate	Southern-most coordinate of the limit of coverage expressed in latitude	1	real	-90.0 <= South Bounding Coordinate <= 90.0; South Bounding Coordinate <= North Bounding Coordinate
Temporal Date/Time	Date and time of the dataset. Expressed by ISO 8601:1988	1	date	(See ISO 15046-8)

Resolution level code	Factor which provides an understanding of the density of spatial data	N	integer	See below
Language of dataset code	Language(s) used within the dataset	N	string	(See ISO 639)
Dataset character code set	Character code set used by dataset	1	string	free text
Abstract	Brief narrative summary of the dataset	1	string	free text
Purpose	Summary of the intentions with which the dataset was developed	1	string	free text
Category	Words or phrases summarising a subject of the dataset	1	Metadata entity	
Theme code	High-level non-overlapping geospatial data thematic classification to assist in the grouping and search of available geospatial data sets	N	integer	See below
Access Constraints	Access constraints applied to assure the protection of privacy or intellectual property, and any special restrictions or limitations on obtaining the dataset.	1	string	"none" free text
Use Constraints	Constraints applied to assure the protection of privacy or intellectual property, and any special restrictions or limitations on using the dataset	1	string	free text—Examples: "none", "copyright", "license", "non-commercial"
Spatial representation type code	Method used to represent geographic information in the data set.	N	integer	1- text 2- vector 3- raster 4- image
Spatial reference system type code	Reference system used to spatially locate information in the dataset.	2	integer	a) geographic identifiers b) coordinates
Distribution identifier	Identifier by which the distributor knows the dataset	N	string	free text
Distribution format name	Name of the data transfer format, such as DXF and ARC/INFO	N	string	free text
Distribution media	Name of the media on which the dataset can be received	N	string	free text—see Examples below
Level of conformance code	Conformance level of metadata	1	integer	a) Level 1 b) Level 2 c) Level 1 w/ extension
Language of metadata code	Language used within metadata	1	string	(See ISO 639)
Metadata date	Date that the metadata were created or last updated	1	date	(See ISO 15046-8)

Resolution level code domain

0	1:500K-smaller	3	1:15K-1:39K	6	1:500-larger	9	2-5 meters	12	20-29 meters	15	100-999 meters
1	1:200K-1:499K	4	1:5K-1:14999	7	<1 meter	10	6-9 meters	13	30-49 meters	16	1 -9 kilometres
2	1:40K-1:199K	5	1:25K-1:4999	8	1-2 meters	11	10-19 meters	14	50-99 meters	17	=10 kilometres

Theme code domain

1- cadastral	5- geodetic control	9- soils	13-hydrologic	17-oceanographic	21-industry and energy
2-cultural and demographic	6- transportation and communications	10-political boundaries	14-environmental monitoring	18-modelling and simulation	22-buildings and structures
3- topography	7- radiance/imagery	11-vegetation	15-wetlands	19-facilities	
4- atmosphere	8- biosphere	12-cryosphere	16-land use	20-geologic	

Distribution media domain examples:

"CD-ROM", "3.5 inch floppy disk", "5.25 inch floppy disk", "9-track tape", "4 mm cartridge tape", "8 mm cartridge tape", ".25 inch cartridge tape", "electronic network", "satellite", " telephone link", "brochure"

Table 2 Sample Metadata for Global Map dataset at conformance level 1

Title>Global Map-Transport layer
 Edition>1
 Issue identification>1.1
 Initiative identification name>Global Map
 Reference date>200008
 Responsible party information:
 Responsible party organisation name>Global Map Secretariat
 Responsible party role code>2
 Postal address>Geographical Survey Institute, Kitasato 1
 City>Tsukuba
 Administrative Area>Ibaraki
 Postal Code>305-0811
 Country>JAPAN
 On-line resource linkage><http://www1.gsi-mc.go.jp/iscgm-sec/>
 Responsible party organisation name>Australian Surveying and Land Information Group (AUSLIG)
 Responsible party role code>5
 Postal address>PO Box 2 Belconnen
 City>Canberra
 Administrative Area>ACT
 Postal Code>2616
 Country>AUSTRALIA
 On-line resource linkage><http://www.auslig.gov.au/>
 Dataset extent:
 Geographic extent coordinates:
 West bounding coordinate> -180.0
 East bounding coordinate> 180.0
 North bounding coordinate> 90.0
 South bounding coordinate> -90.0
 Temporal extent date/time>200001
 Resolution level code>0
 Language of dataset code>en
 Dataset character code set> (to be determined)
 Abstract>The Global Map-Transport layer is a component of the Global Map a 1:1,000,000 scale framework dataset of the world. It consists of vector and raster layers of transport, administrative boundaries, drainage, elevation, vegetation, land use and land cover data. The data were prepared from information provided by national mapping and other organisations worldwide.
 Purpose>The Global Map is a basic framework database designed to support Geographic Information Systems applications, especially for examination of global environmental issues.
 Category:
 Theme code>6
 Access constraints>none/minimal charge for distribution
 Use constraints>Contact publisher constraints on commercial use may occur in some areas
 Spatial representation type code>2
 Spatial reference system type code>2
 Distribution identifier>(to be determined)
 Distribution format name>Vector Product Format
 Distribution media>CD-ROM
 Level of conformance code>1
 Language of metadata code>en
 Metadata date>20000830

APPENDIX D Global Map Data Dictionary

Table 1 Vector data

Optional, layers, features and attributes are shown in **red bold type**. For features with optional attributes, fields will be included for all attributes but the optional attributes will be null or have the value UNK if they are not populated.

All features will have an additional attribute. This attribute will identify the source country for the data. The attribute name will be 'soc' the attribute type 'character text string' and the field size 3. Values will be the country code of the country supplying the data (see Appendix E). The additional value 'vma' will indicate data that has been taken unchanged from the Vmap level 0 product.

Definitions in this dictionary are taken from DIGEST Edition 2.0 02 June 1997.

Field size of * is a variable length field and may be of any length.

Layer	Feature Name	Feature Code Description	Definition	Primitive type	Attributes	Field name	Field type	Field size	Value type/codes	Value Description or Example
Transportation	Airport	Airport/ Airfield	A defined area of land or water used for landing, take-off and movement of aircraft including associated buildings and facilities	point	FACC feature code ICAO Designator Name Usage Airfield/Aerodrome Elevation	f_code iko nam use zv3	Character text string Character text string Character text string Number (short integer) Number (short integer)	5 Null 4 * 1 1	GB005 Null Actual value UNK Actual value 0 8 22 49 999 29999 -400 to 9999	If not applicable e.g. FAJS Unknown e.g. JOHANNESBURG INTERNATIONAL Unknown Military/Defence Joint Military/Defence/Civilian Civilian/Public Other Unknown Elevation in metres
	Rail yard	Railroad Yard/ Marshalling Yard	A system of tracks within defined limits, and associated features, provided for loading/unloading and assembling trains. (Includes Railway stations)	point	FACC feature code	f_code	Character text string	5	AN060	
	Railroad	Railroad	A rail or set of parallel rails on which a train or tram runs.	edge	FACC feature code Existence Category Feature Configuration	f_code exs fco	Character text string Number (short integer) Number (short integer)	5 1 1	AN010 2 5 28 55 59 0 2 3	Doubtful Under Construction Operational Unexamined/Unsurveyed Not Useable Unknown Multiple Single
	Road	Road	An open way maintained for vehicular use.	edge	FACC feature code AccuracyCategory Existence Category Surface Median Category Route Intended Use Seasonal availability	f_code acc exs rst med rtt rsu	Character text string Number (short integer) Number (short integer) Number (short integer) Number (short integer) Number (short integer) Number (short integer)	5 1 1 1 1 1	AP030 1 2 2 5 28 55 0 1 2 0 1 2 0 14 15 16 999 0 1 2	Accurate Approximate Doubtful Under Construction Operational Unexamined/Unsurveyed Unknown Paved Not paved Unknown With median Without median Unknown Primary route Secondary route Limited access route (freeway) Other Unknown All year Seasonal
	Trails and Tracks Line	Trail	A path worn by the passage of people or animals.	edge	FACC feature code Existence Category	f_code exs	Character text string Number (short integer)	5 1	AP050 2 5 28	Doubtful Under Construction Operational
	Structures	Bridge	A man-made structure spanning and providing passage over a body of water, depression, or other obstacles.	edge	FACC feature code Transportation use Category	f_code tuc	Character text string Number (short integer)	5 1	AQ040 3 4	Railroad Road
		Ferry route	A route in a body of water where a ferry crosses from one shoreline to another.	edge	FACC feature code Transportation use Category	f_code tuc	Character text string Number (short integer)	5 1	AQ070 3 4	Railroad Road
		Tunnel	An underground or underwater passage, open at both ends, and usually containing a road or railroad.	edge	FACC feature code Transportation use Category	f_code tuc	Character text string Number (short integer)	5 1	AQ130 3 4	Railroad Road
	Transportation text	Text	Feature names positioned to allow production of a cartographic product.	text	text					Feature name
Boundaries	Political Boundary	Administrative area	An area controlled by administrative authority.	point	FACC feature code State/province/ prefecture name Country code Local administrative area name	f_code nam coc laa	Character text string Character text string Character text string Character text string	5 * 3 *	FA001 Null Actual value See Appendix E for county codes list Null Actual value	If not applicable e.g. VIRGINIA e.g. USA If not applicable e.g. FAIRFAX
	Coast Line	Coastline/Shoreline	The line where a land mass is in contact with a body of water.	edge	FACC feature code Accuracy Category Existence Category	f_code acc exs	Character text string Number (short integer) Number (short integer)	5 1 1	BA010 0 1 2 0 1 44 46 55 60	Unknown Accurate Approximate Unknown Definite Approximate/About Man-made Unexamined/Unsurveyed Indefinite (Shoreline)
	Political Boundary Line	Administrative Boundary	A line of demarcation between controlled areas.	edge	FACC feature code Accuracy Category Usage	f_code acc use	Character text string Number (short integer) Number (short integer)	5 1 1	FA000 1 2 23 26 30	Accurate Approximate International Primary i.e. state Secondary i.e. local
	Ocean/Sea	Water (except inland)	An area of water which normally has tidal fluctuations.	face	FACC feature code	f_code	Character text string	5	BA040	
	Political Boundary Area	Administrative area	An area controlled by administrative authority.	face	FACC feature code Name (state/province/ prefecture) Country code Local administrative area	f_code nam coc laa	Character text string Character text string Character text string Character text string	5 * 3 *	FA001 Null Actual value See Appendix E for county codes list Null Actual value	If not applicable e.g. VIRGINIA e.g. USA If not applicable e.g. FAIRFAX
	Political entity text	Text	Feature names positioned to allow production of a cartographic product.	text	text					Feature name
Drainage	Miscellaneous	Dam/Weir	A permanent barrier across a watercourse used to impound water or to control its flow.	point, edge	FACC feature code	f_code	Character text string	5	BI020	
		Island	A land mass smaller than a continent and surrounded by water.	point	FACC feature code	f_code	Character text string	5	BA030	
		Spring/Water-Hole	A natural outflow of water from below the ground surface.	point	FACC feature code	f_code	Character text string	5	BH170	
	Aqueduct/Canal/Fiume/ Penstock	Inland Water	A pipe or artificial channel designed to transport water from a remote source, usually by gravity. A man-made or improved natural waterway used for transportation. An open, inclined channel which carries water for use in such operations as mining or logging. A pipeline or channel generally used by hydroelectric plants or water mills to transport water by gravity or under pressure.	edge	FACC feature code Existence Category Location Category	f_code exs loc	Character text string Number (short integer) Number (short integer)	5 1 1	BH000 0 1 5 6 0 4 8 25	Unknown Definite Under Construction Abandoned/Disused Unknown Below Surface/Submerged Underground On Ground Surface Suspended or Elevated Above Ground or Water Surface.
	Water Course	River/Stream	A natural flowing watercourse.	edge	FACC feature code Hydrological Category Name	f_code hyc nam	Character text string Number (short integer) Character text string	5 1 *	BH140 0 6 8 UNK Actual value	Unknown Non-Perennial/ Intermittent/ Fluctuating Perennial/Permanent Unknown NILE
	Inland Water	Inland Water	Any known inland waterway body, such as: lake/pond, reservoir, river/stream, etc. requiring separation into individual features due to status/type grouping that is currently indeterminable.	face	FACC feature code Hydrological Category Name	f_code hyc nam	Character text string Number (short integer) Character text string	5 1 *	BH000 0 6 8 UNK Actual value	Unknown Non-Perennial/ Intermittent/ Fluctuating Perennial/Permanent Unknown LAKE TANGANYIKA
	Water text	Text	Feature names positioned to allow production of a cartographic product.	text	text					Feature name
Population Centres	Built-up Area	Built-up Area	An area containing a concentration of buildings and other structures.	point	FACC feature code Name	f_code nam	Character text string Character text string	5 *	AL020 UNK Actual value	Unknown EMBARCACION
	Miscellaneous Population	Settlement	A concentration of small dwellings.	point	FACC feature code Name	f_code nam	Character text string Character text string	5 *	AL105 UNK Actual value	Unknown HALL
	Built-up Area	Built-up Area	An area containing a concentration of buildings and other structures.	face	FACC feature code Name	f_code nam	Character text string Character text string	5 *	AL020 Actual value	NAIROBI
	Population text	Text	Feature names positioned to allow production of a cartographic product.	text	text					Feature name

Table 2 Raster data

Layer	Definition	Primitive type	Attributes description	Value meaning	
Elevation	Elevation above mean sea level.	cell	Elevation in metres	-407 to 8752 (-9999 for areas masked as sea)	
Vegetation	Global Map Vegetation Classification (Modified Walter)	cell		Tropical rainforest: Evergreen forest which has high rainfall and high humidity throughout the year. This class has an upper canopy formed by trees from 30 to 40m tall and may have occasional emerging trees taller than the upper canopy.	10
				Hydrotropic forest: Deciduous broad-leaved trees which are defoliated in dry season and foliate in rainy season.	20
				Grassland in tropical or sub-tropical zone: Grassland which has a long dry season and is heavily dried. Trees are only sparsely distributed. Plant density depends on dryness.	30
				Semi desert in tropical or sub-tropical zone: Plants are sparsely distributed in the area which has a little rainfall and is heavily dried.	40
				Desert in tropical or sub-tropical zone: Plants are very sparsely distributed in the area which has a little rainfall and is extremely dried.	50
				Evergreen thick-leaved forest: Forest which has high rainfall in the rainy season and is relatively dried in summer. Trees which have evergreen thick and hard leaves dominate this forest.	60
				Evergreen broad-leaved forest: Forest in the warm temperate zone which has high rainfall in summer, or is humid throughout the year. Broad-leaved trees which have a little larger leaves than evergreen thick-leaved trees are the main component of this forest.	70
				Deciduous broad-leaved forest: Forest which mainly consists of trees defoliated in winter. This forest appears in the area which has sufficient rainfall in cool temperate zone.	80
				Grassland in temperate zone: Grassland in drier climates in temperate zone. No trees grow.	90
				Semi-desert in temperate zone: Heavily dried area in the temperate zone. Grasses, such as mugwort and pigweed cover this area.	100
				Desert in temperate zone: Extremely dried area in temperate zone. Grasses, such as mugwort and pigweed cover this area.	110
				Northern coniferous forest: Coniferous trees in semi-frigid zone which has very cold and long winter. Trees in this forest are usually evergreen.	120
				Tundra: Plant colony consists of shrub, grass with broad leaves, moss and lichen. Trees cannot become tall due to severe cold.	130
				Water body: Water surfaces, such as rivers and lakes.	140
				Ice and snow: Area which is covered with snow and ice throughout the year.	150
				Wetland: Vegetated area with waterlogged soils or surface water for significant periods of the year.	210
				Mixed forest: Forest containing a mixture of types. Usually deciduous and coniferous.	220
				Mixed land: Area containing a mosaic of other types.	230
				Non natural: Cultivated, urban or otherwise modified vegetation.	240
				unclassified: Areas not included in other classifications. For example, barren land.	250
Land Cover	International Geosphere Biosphere Programme Land Cover Classification (DISCOVer data set)	cell		Evergreen Needleleaf Forest : Lands dominated by trees with a percent canopy cover >60% and height exceeding 2 meters. Almost all trees remain green all year. Canopy is never without green foliage.	1
				Evergreen Broadleaf Forest: Lands dominated by trees with a percent canopy cover >60% and height exceeding 2 meters. Almost all trees remain green all year. Canopy is never without green foliage.	2
				Deciduous Needleleaf Forest: Lands dominated by trees with a percent canopy cover >60% and height exceeding 2 meters. Consists of seasonal needleleaf tree communities with an annual cycle of leaf-on and leaf-off periods.	3
				Deciduous Broadleaf Forest: Lands dominated by trees with a percent canopy cover >60% and height exceeding 2 meters. Consists of seasonal broadleaf tree communities with an annual cycle of leaf-on and leaf-off periods.	4
				Mixed Forest: Lands dominated by trees with a percent canopy cover >60% and height exceeding 2 meters. Consists of tree communities with interspersed mixtures or mosaics of the other four forest cover types. None of the forest types exceeds 60% of the landscape.	5
				Closed Shrublands: Lands with woody vegetation less than 2 meters tall and with shrub canopy cover >60%. The shrub foliage can be either evergreen or deciduous.	6
				Open Shrublands: Lands with woody vegetation less than 2 meters tall and with shrub canopy cover between 10-60%. The shrub foliage can be either evergreen or deciduous.	7
				Woody Savannas: Lands with herbaceous and other understory systems, and with forest canopy cover between 3-60%. The forest cover height exceeds 2 meters.	8
				Savannas: Lands with herbaceous and other understory systems, and with forest canopy cover between 10-30%. The forest cover height exceeds 2 meters.	9
				Grasslands: Lands with herbaceous types of cover. Tree and shrub cover is less than 10%.	10
				Permanent Wetlands: Lands with a permanent mixture of water and herbaceous or woody vegetation that cover extensive areas. The vegetation can be present in either salt, brackish, or fresh water.	11
				Croplands: Lands covered with temporary crops followed by harvest and a bare soil period (e.g., single and multiple cropping systems). Note that perennial woody crops will be classified as the appropriate forest or shrub land cover type.	12
				Urban and Built-Up: Land covered by buildings and other man-made structures.	13
				Cropland/Natural Vegetation Mosaic: Lands with a mosaic of croplands, forests, shrublands, and grasslands in which no one component comprises more than 60% of the landscape.	14
				Snow and Ice: Lands under snow and/or ice cover throughout the year.	15
				Barren or Sparsely Vegetated: Lands with exposed soil, sand, rocks, or snow and never has more than 10% vegetated cover during any time of the year.	16
				Water Bodies: Oceans, seas, lakes, reservoirs, and rivers. Can be either fresh or salt water bodies.	17
Land Use	Global Map Land use classification	cell		Forest: Area dominated by trees higher than shrubs with a canopy cover greater than or equal to 10 percent.	10
				Mixture: Area where more than two classes are mixed including Non-vegetated area, Agricultural area, Grassland/Shrub and Wetland. This class is not applied where one class dominates.	20
				Grassland/shrub: Area covered by trees with canopy cover less than 10 percent.	30
				Agricultural area: Area where agricultural activities are implemented constantly.	40
				Wetland: Area where underground water level is near the ground surface, or area with humid soil.	50
				Barren area: Non-vegetated area where no artificial structures exist.	60
				Built-up area: Area where artificial structures occupy significant surfaces.	70
				Drainage/water: Area inside coastline forming water surface.	80
				Ocean: Area outside coastline forming water surface.	90

APPENDIX E Three-character ISO 3166 Nation Code

Country	3 character code	Country	3 character code	Country	3 character code	Country	3 character code
Afghanistan	AFG	Dominican Republic	DOM	Lesotho	LSO	Saint Lucia	LCA
Albania	ALB	East Timor	TMP	Liberia	LBR	Saint Vincent and the Grenadines	VCT
Algeria	DZA	Ecuador	ECU	Libyan Arab Jamahiriya	LBY	Samoa	WSM
American Samoa	ASM	Egypt	EGY	Liechtenstein	LIE	San Marino	SMR
Andorra	AND	El salvador	SLV	Lithuania	LTU	Sao tome and Principe	STP
Angola	AGO	Equatorial Guinea	GNQ	Luxembourg	LUX	Saudi Arabia	SAU
Anguilla	AIA	Eritrea	ERI	Macau	MAC	Senegal	SEN
Antarctica	ATA	Estonia	EST	Macedonia, the former Yugoslav Republic of	MKD	Seychelles	SYC
Antigua and Barbuda	ATG	Ethiopia	ETH	Madagascar	MDG	Sierra Leone	SLE
Argentina	ARG	Falkland Islands (Malvinas)	FLK	Malawi	MWI	Singapore	SGP
Armenia	ARM	Faroe Islands	FRO	Malaysia	MYS	Slovakia (Slovak Republic)	SVK
Aruba	ABW	Fiji	FJI	Maldives	MDV	Slovenia	SVN
Australia	AUS	Finland	FIN	Mali	MLI	Solomon islands	SLB
Austria	AUT	France	FRA	Malta	MLT	Somalia	SOM
Azerbaijan	AZE	France, metropolitan	FXX	Marshall Islands	MHL	South Africa	ZAF
Bahamas	BHS	French Guiana	GUF	Martinique	MTQ	South Georgia and the South Sandwich Islands	SGS
Bahrain	BHR	French Polynesia	PYF	Mauritania	MRT	Spain	ESP
Bangladesh	BGD	French Southern Territories	ATF	Mauritius	MUS	Sri Lanka	LKA
Barbados	BRB	Gabon	GAB	Mayotte	MYT	St. Helena	SHN
Belarus	BLR	Gambia	GMB	Mexico	MEX	St. Pierre and Miquelon	SPM
Belgium	BEL	Georgia	GEO	Micronesia, Federated States of	FSM	Sudan	SDN
Belize	BLZ	Germany	DEU	Moldova, Republic of	MDA	Suriname	SUR
Benin	BEN	Ghana	GHA	Monaco	MCO	Svalbard and Jan Mayen Islands	SJM
Bermuda	BMU	Gibraltar	GIB	Mongolia	MNG	Swaziland	SWZ
Bhutan	BTN	Greece	GRC	Montserrat	MSR	Sweden	SWE
Bolivia	BOL	Greenland	GRL	Morocco	MAR	Switzerland	CHE
Bosnia and Herzegovina	BIH	Grenada	GRD	Mozambique	MOZ	Syrian Arab Republic	SYR
Botswana	BWA	Guadeloupe	GLP	Myanmar	MMR	Taiwan, province of China	TWN
Bouvet Island	BVT	Guam	GUM	Namibia	NAM	Tajikistan	TJK
Brazil	BRA	Guatemala	GTM	Nauru	NRU	Tanzania, United Republic of	TZA
British Indian Ocean Territory	IOT	Guinea	GIN	Nepal	NPL	Thailand	THA
Brunei Darussalam	BRN	Guinea-Bissau	GNB	Netherlands	NLD	Togo	TGO
Bulgaria	BGR	Guyana	GUY	Netherlands Antilles	ANT	Tokelau	TKL
Burkina faso	BFA	Haiti	HTI	New Caledonia	NCL	Tonga	TON
Burundi	BDI	Heard and Mc Donald Islands	HMD	New Zealand	NZL	Trinidad and Tobago	TTO
Cambodia	KHM	Holy See (Vatican City State)	VAT	Nicaragua	NIC	Tunisia	TUN
Cameroon	CMR	Honduras	HND	Niger	NER	Turkey	TUR
Canada	CAN	Hong Kong	HKG	Nigeria	NGA	Turkmenistan	TKM
Cape Verde	CPV	Hungary	HUN	Niue	NIU	Turks and Caicos Islands	TCA
Cayman Islands	CYM	Iceland	ISL	Norfolk Island	NFK	Tuvalu	TUV
Central African Republic	CAF	India	IND	Northern Mariana Islands	MNP	Uganda	UGA
Chad	TCO	Indonesia	IDN	Norway	NOR	Ukraine	UKR
Chile	CHL	Iran (Islamic Republic of)	IRN	Oman	OMN	United Arab Emirates	ARE
China	CHN	Iraq	IRQ	Pakistan	PAK	United Kingdom	GBR
Christmas Island	CXR	Ireland	IRL	Palau	PLW	United States	USA
Cocos (Keeling) Islands	CCK	Israel	ISR	Panama	PAN	United States minor outlying islands	UMI
Colombia	COL	Italy	ITA	Papua New Guinea	PNG	Uruguay	URY
Comoros	COM	Jamaica	JAM	Paraguay	PRY	Uzbekistan	UZB
Congo	COG	Japan	JPN	Peru	PER	Vanuatu	VUT
Congo, the Democratic Republic of the	COD	Jordan	JOR	Philippines	PHL	Venezuela	VEN
Cook Islands	COK	Kazakhstan	KAZ	Pitcairn	PCN	Viet Nam	VNM
Costa Rica	CRI	Kenya	KEN	Poland	POL	Virgin Islands (British)	VGB
Cote d'Ivoire	CIV	Kiribati	KIR	Portugal	PRT	Virgin Islands (U.S.)	VIR
Croatia (local name: Hrvatska)	HRV	Korea, Democratic People's Republic of	PRK	Puerto Rico	PRI	Wallis and Futuna Islands	WLF
Cuba	CUB	Korea, Republic of	KOR	Qatar	QAT	Western Sahara	ESH
Cyprus	CYP	Kuwait	KWT	Reunion	REU	Yemen	YEM
Czech Republic	CZE	Kyrgyzstan	KGZ	Romania	ROM	Yugoslavia	YUG
Denmark	DNK	Lao People's Democratic Republic	LAO	Russian Federation	RUS	Zambia	ZMB
Djibouti	DJI	Latvia	LVA	Rwanda	RWA	Zimbabwe	ZWE
Dominica	DMA	Lebanon	LBN	Saint Kitts and Nevis	KNA		

APPENDIX F Sample header file for Raster representation

BYTEORDER	M
LAYOUT	BIL
NROWS	600
NCOLS	600
NBANDS	1
NBITS	8
BANDROWBYTES	600
TOTALROWBYTES	600
BANDGAPBYTES	0
NODATA	
ULXMAP	100.00416666666667
ULYMAP	9.995833333333333
XDIM	0.008333333333333
YDIM	0.008333333333333