One Geology Cookbook 1

How To Serve A OneGeology Level 1 Conformant WMS Using Mapserver

Version 1.0

Contents

1 INTRODUCTION

1.1 Background

The OneGeology project aims for a complete covering of the world with a target 1:1 000 000 Geological Map. Every country will display its own map series within the national or wider boundaries that it chooses. Further integration or international harmonisation of the content is not included in the project. The maps are displayed as Web Services, so the source keeper keeps full control of the national map, while it is still possible by calling all the webservices to compose a full covering of the world.

This document is one of a series of "cookbooks" written to assist organisations contributing to OneGeology. This particular cookbook describes how to deliver images of geological maps over the Internet as an Open Geospatial Consortium (OGC) Web Mapping Service (WMS: see http://portal.opengeospatial.org/files/?artifact_id=1081&version=1&format =pdf from the web page http://www.opengeospatial.org/standards/wms for the WMS 1.1.1 standards definition that OneGeology aims to implement; we are currently using this version of the WMS standard because few if any clients understand how to use the newer 1.3/ISO standard WMS, in time OneGeology will evolve towards newer versions of standards as the software to support them becomes generally available on the WWW).

You will need to do this to conform to being a **Level 1** participant in OneGeology. If you are already familiar with how to set up a WMS using software you already possess, you can read this guide just to

find out the standard requirements for a OneGeology conformant WMS. If you are unfamiliar with how to set up a WMS, you can use the example in this guide which shows one way of doing it using the Open Source Mapserver software. This cookbook consists of three parts: 1). this document 2). An exemplar WMS service from the British Geological Survey to be found at the web page http://ogc.bgs.ac.uk/GBR_625k_BGS_Bedrock_and_Superficial_Geology/ (with the getcapabilities request being: http://ogc.bgs.ac.uk/cgi-bin/GBR_625k_BGS_Bedrock_and_Superficial_Geology/wms?service=WMS&version=1.1.1&request=GetCapabilities&) and 3). A fully configured Mapserver template application populated with a shapefile and exemplar configuration using the BGS 625K data available for download over the WWW from a BGS FTP (file transfer protocol) server.

1.2 Who should be using this cookbook?

The minimum technical capability that a Geological Survey wishing to contribute a WMS to OneGeology has to have is an existing web server and the technical staff to maintain and support that. If a survey does not have this capability then OneGeology is setting up a system of volunteer neighbouring 'buddy' organisations who may be prepared to serve your data as a WMS for you.

The audience of this cookbook is therefore the survey's web applications installer and a geoscientist who is going to work with him to provide the digital data to be served.

A few OneGeology participants are already serving WMS' using Mapserver or other similar technologies. If they are going to continue to use those technologies then they simply have to follow the naming and WMS configuration guidelines here to serve a OneGeology conformant WMS that can be registered with the OneGeology Portal and Client. Example technologies that are currently being used include opensource software like Geoserver and commercial software such as ESRI's ArcIMS services with various WMS add-on capabilities and/or extra middleware such as Cocoon. Software like Geoserver is likely to be included in the future OneGeology Level 2 WFS cookbook, however it needs improvements before it can be packaged and recommended for use in a OneGeology cookbook and the OneGeology Technical Working Group are working on getting these improvements available. ESRI's ArcIMS software is not uncommon in the world's Geological survey's but it cannot publish a legend to go with the map symbolised polygon's and ESRI have stated that no future version of ArcIMS will have this capability. Current and future versions of ESRI Arc Server software (the wider capable new software from ESRI) do and will have such legend capability. Whilst having a legend is optional in the WMS 1.1.1 standard we as geoscientists do not believe that such a geological map should be published without a legend to aid interpretation and so it is part of a OneGeology conformance that each WMS much have some form of legend available as part of the service. Future versions of this cookbook — which will be improved over time in response to reader feedback — could include chapters on using other software to serve OneGeology Level 1 WMS as time and submitted texts allows.

1.3 What type of data should be served as a contribution to OneGeology Level 1?

The OneGeology initiative web site at http://www.onegeology.org/technical_progress/brief_overview.html explains that whilst "each contributor decides which maps to contribute. It is anticipated that the majority of contributed maps will be bedrock and/or superficial maps, lithological and/or lithostratigraphical and/or chronostratigraphical where possible, but again, each contributor decides". If chronostratigraphical symbolisation is being offered then if possible the target scheme to use would be the IUGS 2004 colour scheme which can be found at http://stratigraphy.org/cheu.pdf.

This definition of these target ideal data contents represented by the Level 1 participants was agreed at the Brighton meeting but it also forms a small part of the GeoSciML V2.0 logical model of geoscience concepts that OneGeology aspires in the long term to use to serve Level 2 Web Feature Service (WFS is the actual data in GML XML form being served over the web and not just a pictorial image of the map as in a WMS service) web services.

A relevant UML (Universal Modelling Language) fragment of that GeoSciML model is shown here for those who want to understand the long term context:
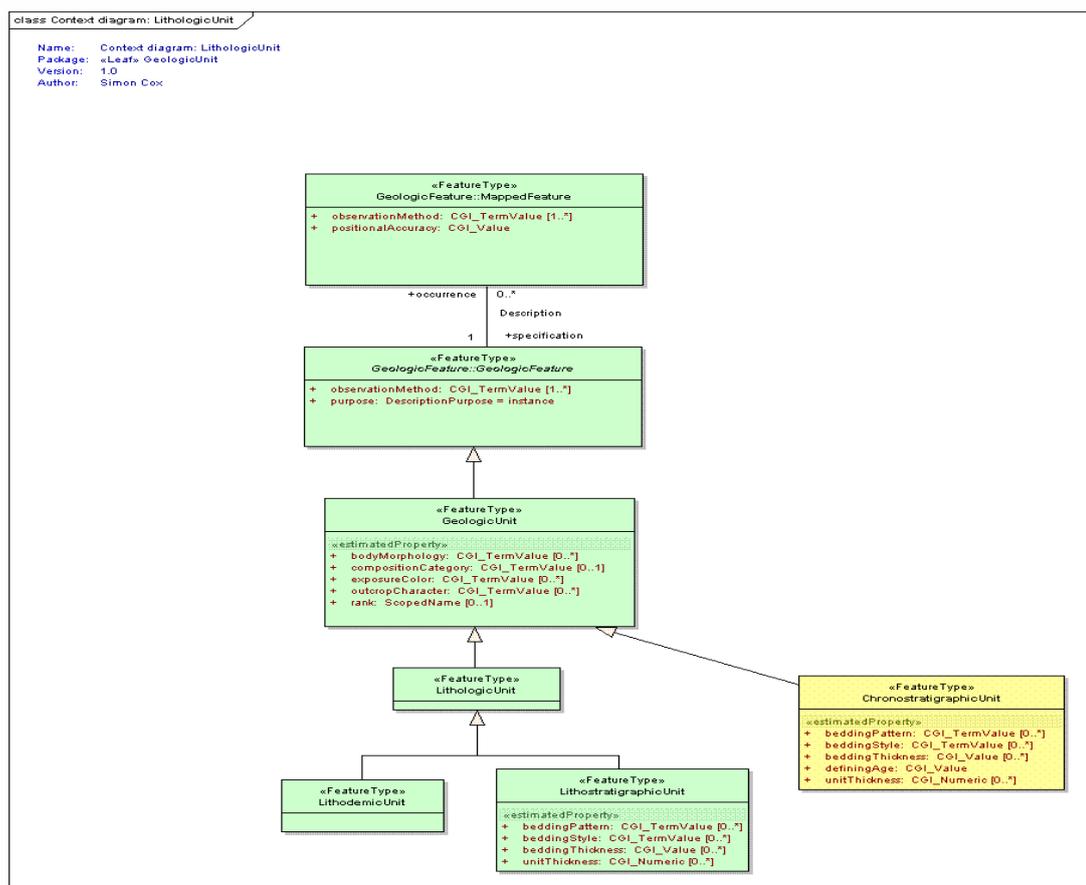
Any Level 1 participant that plans in the long term to serve a Level 2 OneGeology WFS web service will want to serve this type of category of data to make it straightforward to move from a Level 1 WMS to a Level 2 WFS (which is likely to be served using 'sister' software to Mapserver called Geoserver — we plan to make available such software in the same packaged and pre-configured as far as possible form as here with this Level 1 cookbook).
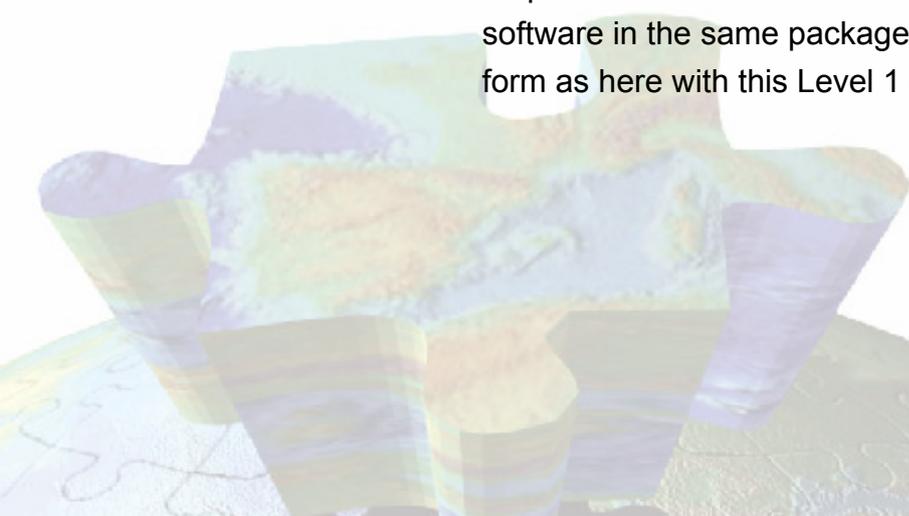
We emphasise that these geoscientific categories or featuretypes are only the target aim for OneGeology and if you have other data that you wish to serve and contribute then you are very much encouraged to do so. Similarly, whilst the target scale of data to be published is 1:1000 000 OneGeology will happily accept data between the scales 1:500 000 and 1:5000 000 with some other useful baseline datasets being of even larger scale. For example the British Geological Survey has decided to contribute it's 1:625 000 scale data — and as it would take time and money to change this to a 1:1 000 000 scale it is not worth the effort to make this change.

A WMS on the WWW is served from digital data and this comes in two forms. Vector digital geological data in a GIS format such as ESRI's shapefile or a digitally scanned map in geotiff or jpeg format. The latter is required if the map you wish to serve is only currently available in paper map form — perhaps from a historical library source.

If you wish to serve a WMS from a paper map source then follow chapter 2 on scanning a paper map and then proceed to chapter 3 on setting up a Mapserver WMS. If you already have GIS digital data then proceed directly to chapter 3.

2 SCANNING A PAPER MAP

2.1 Scanning

Your chosen paper map may look something like this one from the Dutch Geological Survey of Dutch Guyana or Suriname:
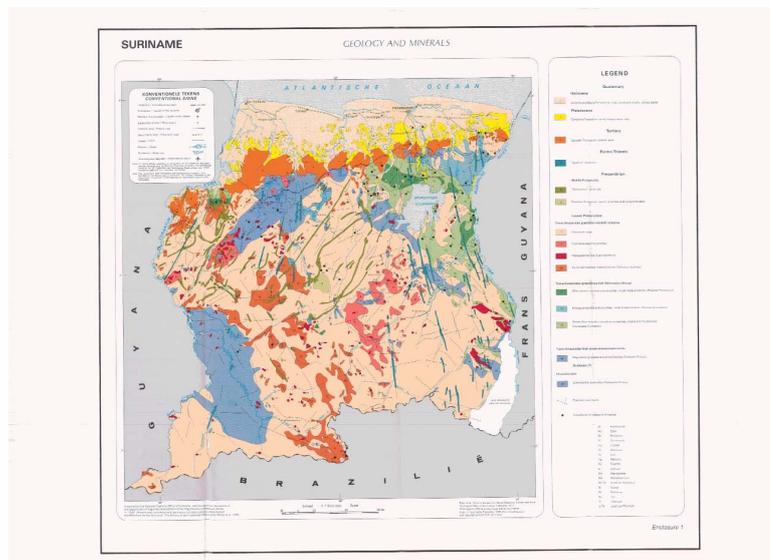
Step 1

It is important to find a large scanner in your city, which could cover a whole paper map. If this scanner is not available at your survey, you may try the Topographical Survey or a large bookshop or bookprinter.

Step 2A

If you could use a large scanner, you can scan the whole map at one time. But remember to scan the geological map portion into a separate file from that for the legend i.e. you will have two files one for the map and one for the legend. Alternatively, make a copy of an original digital image of the whole map face and cut out the map from the legend . Good software to do this is IrfanView or Photoshop. Tip: This cropped map is now ready for geo-referencing. If you have a slow Personal Computer, you could temporarily work with a JPEG copy. The file size is than much smaller and it can be accessed and geo-referenced faster.

The preferable output format should be .TIFF as this format keeps most information.

Step 2B

For larger maps, or if you have only a small scanner, the map should be scanned in parts and later stitched together.
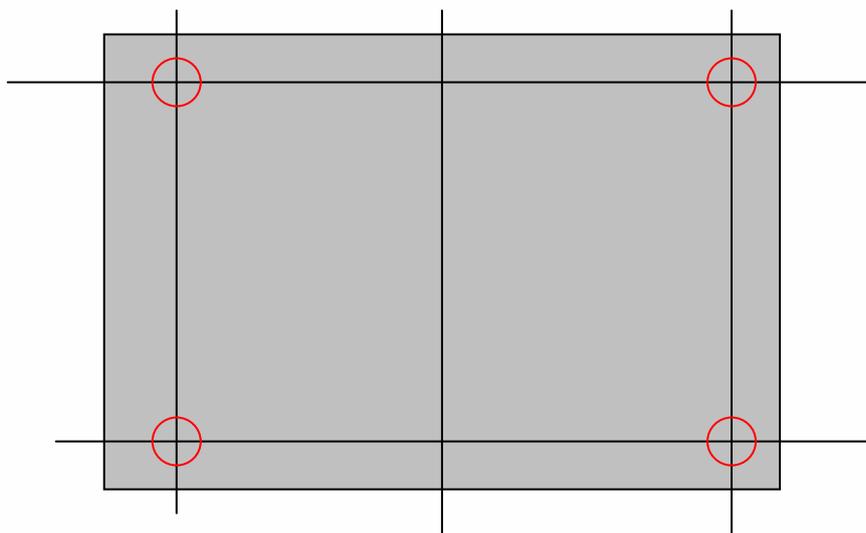
If you scan in parts always try to keep the crossings of the horizontal and vertical black lines in each of the four corners. The straight horizontal and vertical black lines on the map are the altitude and longitude. Then the stitching and geo-referencing will be much easier.

The output format should be .TIFF as this format keeps most pixel information available.

Step 2C

If scanners are not available, you could use a good digital camera. Unfold the map on a well lit place without glare or light reflections. Sometimes white sheets on the side will diffuse the light and prevent ugly reflections from the sun or from the light-bulb. Take a picture right above the centre of the map.
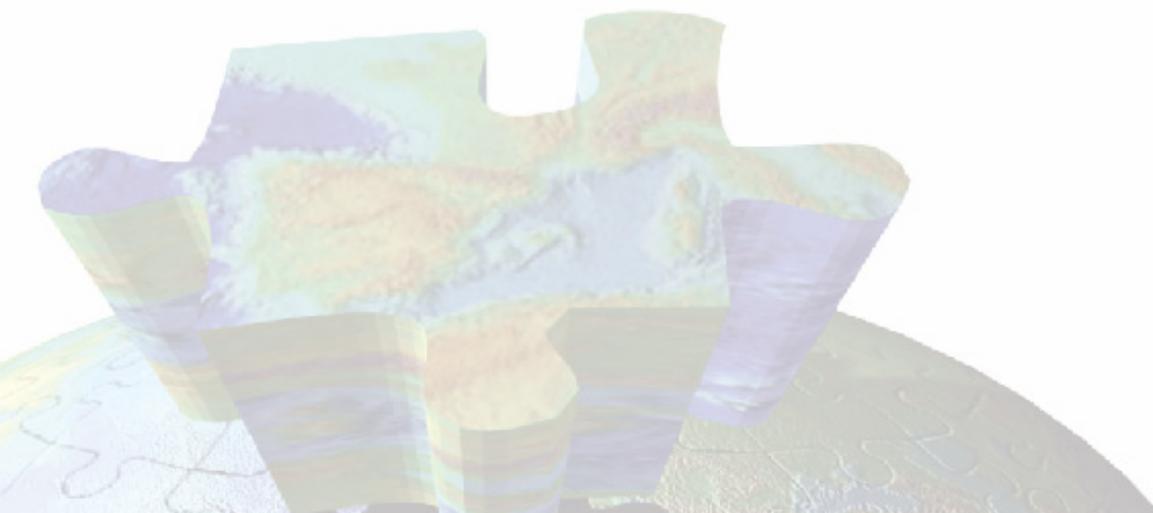
Make several pictures with different lighting and shutter speed. Choose the best colorful result. Usually the export format is .JPG.

Step 3

Stitching. For the stitching of map parts many applications or free software is available.

2.2 Geo-referencing a scanned map

You have now a .TIF file or maybe a .JPG-file, which is a representation of your paper map.

This digital file should now brought into relation with the surface of the earth. This is called geo-referencing.

For this action you need GIS- software.

Commercial GIS-software such as ESRI or MapInfo is widely available and 'no-cost' GIS-software, which also could perform this task, is: ILWIS, which can be found at the site of the International Institute for Geo-Information Science and Earth Observation. The URL of the site is: http://www.itc.nl/ilwis/

Note down the Coordinate system of the paper map, as this is necessary for the following process. Sometimes paper maps are found and we are not sure what coordinate system was being used as it has not been clearly stated on the paper copy. Some research may have to

- 11 -
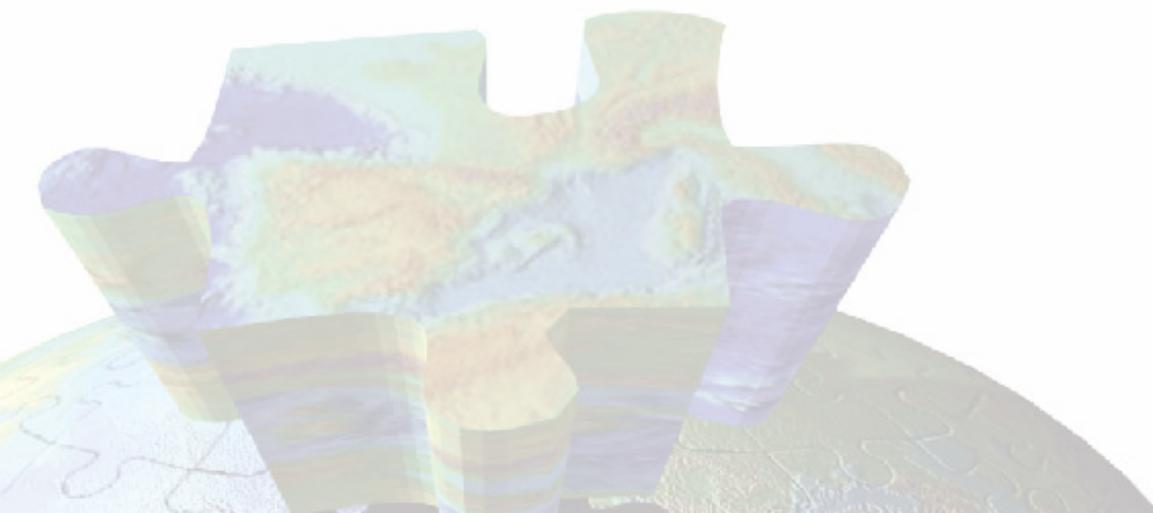
be done to estimate the original coordinate system used. For the Suriname map example it is thought probable that the coordinate system originally used was `GCS North American 1927`.

It is important to find four or more fixed points in the corner of the picture, from which you know exactly the position. Reliable points are church towers, railway and roads crossings, canals or bridges. Be careful with coastal features or rivers as these tend to change slowly in time. More points are desirable to prevent conical distortions, which often happen with digital cameras.
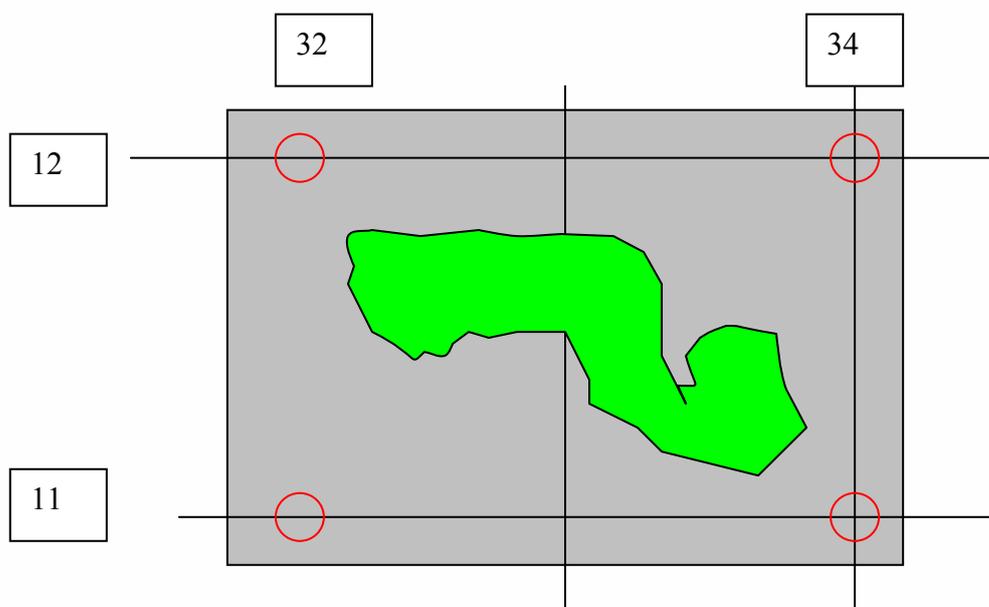
Usually these are crossing points of an altitude line and a longitude line.
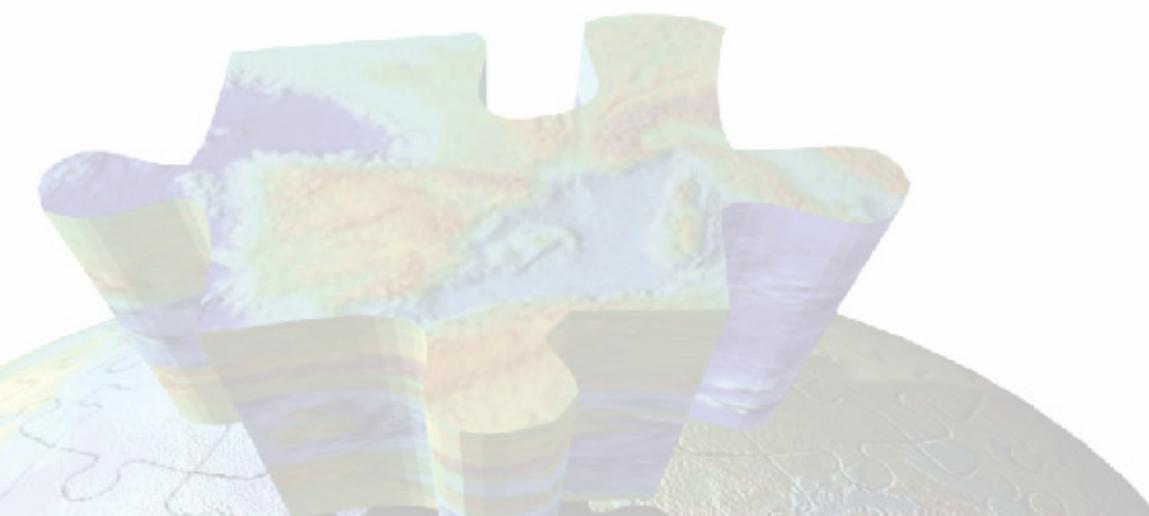
The x- and y-coordinates of each crossing should be given to the program.

Be careful to use the relevant degree-minutes-seconds or decimal entries for degrees depending on the particular program's requirements. After confirming the picture will be warped by the program so it fits now on the world surface.

Please check the accuracy, preferable with a topographical map, as often even the cartographers have made mistakes. With slight alterations of the fixed points you can try to make a perfect overlap with a topographical map.

2.3 The Legend for the scanned map

A WMS based on a scanned map will not have the ability to click on a symbolised polygon and see what attributes and therefore what classification it has according to the legend. A WMS based on GIS digital data polygons and attributes does have this capability and the legend is automatically created from such information by the Mapserver software. However for this scanned map based WMS it is possible to associate the scanned legend file for the map — which in the case of the Suriname example looked like this:

With the WMS service by including the following lines in the Metadata section of the Mapserver .map configuration file which is discussed later:

Metadata
...
wms_style "default"
wms_style_default_legendurl_height "174"
wms_style_default_legendurl_width "270"
wms_style_default_legendurl_href
"http://yourwebserver/Suriname_legend.jpg"
wms_style_default_legendurl_format "image/jpeg"
END

It is a OneGeology target aim to provide any legends in English as well as the originating language, in this case you would have to create a .jpg file with a relevant translation. To keep things simple we have decided that any alternative language WMS services should be completely separate language specific services e.g. the BRGM plans to serve an English service and a French one.

3 SETTING UP A MAPSERVER WMS

3.1 Pre-requisites for setting up a WMS

This cookbook assumes you have an Internet connected machine on which the server software can be installed and kept running.
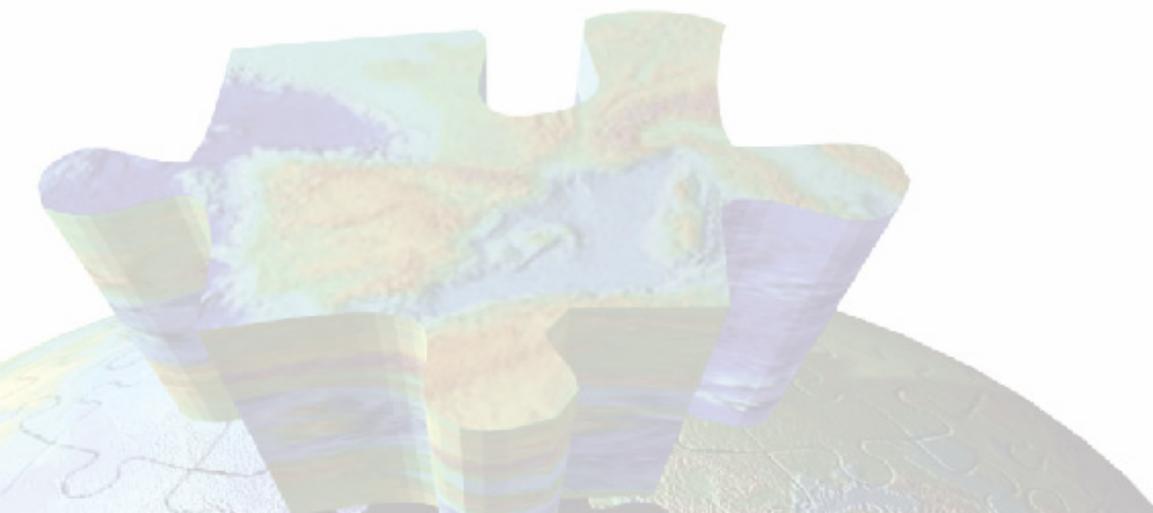
As far as source data goes, the examples will cover GeoTiff format raster files and ESRI shapefiles for vector data. However, access to other formats of raster data is described at http://mapserver.gis.umn.edu/docs/howto/raster_data and many possible vector formats, including access to spatial databases are listed at http://mapserver.gis.umn.edu/docs/reference/vector_data. See also http://mapserver.gis.umn.edu/docs/howto/ogr_howto

3.2 Software installation

This cookbook will give you simple step-by-step instructions for setting up the MS4W "all-in-one" package of the Apache webserver, Mapserver web mapping application and various associated utility programs on a Microsoft Windows platform. It is actually possible to set up Mapserver on a wide variety of different operating systems and webservers, it isn't possible to describe them all here but we will give pointers to the comprehensive documentation that is available on the Mapserver website at http://mapserver.gis.umn.edu/.

Step-by-step instructions for installing MS4W

You may find the latest version of the MS4W package by visiting http://maptools.org/ms4w/. Follow the downloads link and download the latest version. (You will also see a link to Install notes which you may find useful but the instructions here are sufficient for a basic installation.) However, versions of Mapserver of v5 and later which are included with MS4W v2.2.6 onwards have adopted a strict conformance to the OGC standard interface which gives some

problems with certain. We therefore recommend downloading MS4W v2.2.5 which includes a more forgiving version of Mapserver (4.10.3) which nonetheless has certain web security features that your web master would require in such software. This can be downloaded from the URL http://maptools.org/dl/ms4w/ms4w_2.2.5.zip.

Please take the time to read the Copyright and Open Source license terms for the use of this no cost software at http://maptools.org/ms4w/index.phtml?page=license.html.

Unzip the downloaded file to the top level of one of your web server computer drives (we recommend that you practise installation and configuration on your personal desktop computer first).

Run the `apache-install.bat` script inside the newly created `ms4w` directory (e.g. by double-clicking it).

Open your Services control panel and check that you can see a service called something like "Apache MS4W Web Server" and that it is started.

Open http://localhost in a web browser and check that you get a MS4W - Mapserver 4 Windows welcome page. Click the link to mapserv.exe under the Features heading and check you get an error message like "No query information to decode. QUERY_STRING is set, but empty".

You have successfully installed Mapserver.

If you already have an Apache installation

If you already have an installation of Apache which you want to use it is possible to copy the necessary parts of the MS4W bundle to your installation. The details will depend on exactly how you have

configured your installation but the main steps you will need to follow are as follows. They are in the context of using a pristine Apache (v2.2.4) installation so, if you have done a lot of customisation of your installation you may need to adapt them.

Instead of following all the above steps for installation simply unzip the ms4w_2.2.5.zip file to a convenient temporary location. You will then need to copy the following files over to your existing Apache installation. In the following we give directory paths from the ms4w root wherever you unzipped it.

Copy the contents of ms4w\Apache\cgi-bin to the cgi-bin directory of your Apache installation. (Strictly you may not need all these files but it is easier just to copy them all across.)

Add the following directives in an appropriate place in your httpd.conf file.

```
##
## Alias for MapServer tmp directory
##
Alias /ms_tmp/ /ms4w/tmp/ms_tmp/
<Directory "/ms4w/tmp/">
 AllowOverride None
 Options None
 Order allow,deny
 Allow from all
</Directory>
```
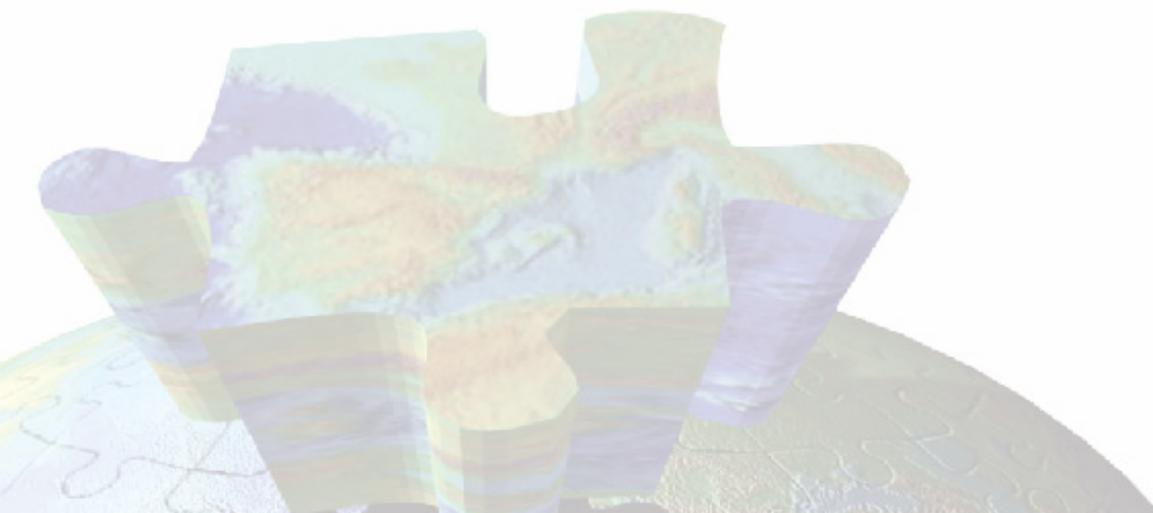
Replace "/ms4w/tmp/" with the path to somewhere on your machine suitable for storing the temporary image files which Mapserver generates during its operation. You may also want to copy the contents of ms4w\tmp to this directory as it contains a script that can be used to delete old files from this directory and could be set as a scheduled task.

You will also want to copy the following directories from the MS4W bundle to somewhere convenient on your machine: ms4w\proj\nad, ms4w\gdaldata and ms4w\gdalplugins. Then add the following to your httpd.conf file, replacing the path /ms4w/ with the directory you have copied the above directories to.

```
# set environment vars necessary for MapServer
SetEnv PROJ_LIB /ms4w/proj/nad/
# Replace /Apache/cgi-bin/ below with your
# Apache cgi-bin directory path
SetEnv PATH /Apache/cgi-bin/
# set GDAL_DATA environment variable to location
# of supporting gdal files
SetEnv GDAL_DATA "/ms4w/gdaldata"
# set GDAL_DRIVER_PATH environment variable for gdal plugins
SetEnv GDAL_DRIVER_PATH "/ms4w/gdalplugins"
# uncomment the following line to log MapServer errors to a file
#SetEnv MS_ERRORFILE "/ms4w/tmp/ms_error.txt"
```

3.3 Configuring the WMS

The first query a WMS client will send to a server is a GetCapabilities request. In the response the server will supply information necessary for the client to know how many layers it is serving and how to retrieve them. It will also supply human readable information that could be useful for humans to understand what data is being served, what limitations it has, what restrictions on use etc. The way this information is viewable is dependent on the client, here we will just describe how you can make sure that it is included in the server response. MapServer will generate much of this information automatically for you from the configuration of data layers you include but there are some extra WMS specific parameters to include to fill in all the fields of a GetCapabilities response. Appendix 3 shows how Mapserver mapfile parameters map to the parts of a GetCapabilities response. The first main section is inside the <Service> element which can contain a variety of metadata, such as keywords and contact information about your WMS. These are essentially all defined by corresponding fields in the Mapserver map file. The next <Capability> section contains some essentially automatically generated <Request> specifications detailing what URLs to use for requesting maps, feature information etc. and a series of <Layer> elements inside one parent <Layer> which give some automatically generated and some WMS specifically configured data on on each of your layers. The example layers show exactly what parameters should be supplied for each layer and Appendix 3 shows how these relate to the GetCapabilities response.

Step-by-step configuration for MS4W

Create a sub-directory inside ms4w\Apache\cgi-bin with a name including your country code, map scale and organization initials in the same way as the example application shows for BGS (GBR_625k_BGS_Bedrock_and_Superficial_Geology). The first three letters should be the ISO 3-letter code for your country (see http://en.wikipedia.org/wiki/ISO_3166-1_alpha-3). The next part should be an abbrieviated scale specifier so that here 625k means 1:625000. Next are your organisation initials and finally "Bedrock_and_Superficial_Geology" as written.

All OneGeology participants should aim to produce one English language service if they can. If you wish to setup services in other languages you should create similar sub-directories with the ISO 3 letter language code appended to the country code in the directory name – see http://en.wikipedia.org/wiki/List_of_ISO_639-1_codes. You then need to copy the `ms4w\Apache\cgi-bin\mapserv.exe` file and all the libraries it depends on in the cgi-bin directory the newly-created directory (or directories). Rather than attempt to list exactly which libraries are necessary it is probably easier simply to copy all the files from the top level of cgi-bin to the newly created directory. Rename the copy of `mapserv.exe` inside the new directory to `wms`. (N.B. Make sure there is no .exe extension, especially if you do not have file extensions visible in your Explorer windows. You may get a warning about changing the file suffix; this is OK.)

Obtain the OneGeology template application in the 20Mbytes approx. sized onegeology.zip file from the BGS ftp website at: ftp://ftp.bgs.ac.uk/pubload/OneGeology/.

If you are using a web browser clicking on this URL may take you directly to it without requesting a password. If you prefer to use the older DOS prompt style FTP user interface then as normal with such anonymous ftp services enter anonymous if prompted for a userid and type your email address as the password to allow the FTP manager to monitor who is using the service.

Unzip the OneGeology template application to the same drive and directory level as the MS4W resulting from the mapserver installation e.g. if you installed MS4W on C:\MS4W then point the unzip extract to c\. It should create a number of files inside the ms4w directory. The main part of the applicatiion will be inside a `GBR_625k_BGS_Bedrock_and_Superficial_Geology` directory which will be created inside ms4w\apps. You should rename the latter appropriately for your service. (Make more copies with appropriate names if you are also making multiple language services.) In addition there will be a `ms4w\httpd.d\httpd_GBR_625k_BGS_Bedrock_and_Superficial_Geology .conf` file which should be renamed and edited so that all occurences of the string "GBR_625k_BGS_Bedrock_and_Superficial_Geology" are replaced with one appropriate for you. (Again make more copies if making multiple language services.) The same should be done for the file `ms4w\Apache\htdocs\GBR_625k_BGS_Bedrock_and_Superficial_Geology .pkg.html`

If you are using your own Apache installation as described above then, rather than just unzipping the onegeology.zip file into it you will need to unzip it to a temporary location first. Then copy the contents of the onegeology\httpd.d\httpd_GBR_625k_BGS_Bedrock_and_Superficial_ Geology.conf file to your httpd.conf file and the contents of the onegeology\apps\ httpd_GBR_625k_BGS_Bedrock_and_Superficial_Geology

folder to a convenient location on your machine. The ms4w/apps/
httpd_GBR_625k_BGS_Bedrock_and_Superficial_Geology/ paths in
the httpd.conf file will need to be edited to reflect the latter location.

Re-start the Apache service using the Services control panel and then
reload the http://localhost page in your browser.

A link to the template onegeology application should have appeared
below the Applications heading and if you follow it you should find a
page with some test requests for some example layers we have
included with the application.

Next you need to configure your own data with the service. You can
use the example UK geology layers as a guide to creating your own
shapefile based layers and the world map image layer as a guide to
creating your own GeoTIFF based layers. You should remove the
examples when you have finished i.e. make sure that you do not serve
to the WWW the BSG 625k dataset! We will soon see if more than one
web server is serving it! The BGS 625k dataset and configuration is
provided in the template application so that you can see everything that
is required to set up a real OneGeology Level 1 WMS service including
real metadata and example WMS service layer Names, Titles,
Keywords etc.

First you should copy your source date (Shapefiles or GeoTIFF
rasters) to your renamed version of the
`apps\GBR_625k_BGS_Bedrock_and_Superficial_Geology\data` directory.

Next you need to edit the `onegeology.map` file appropriately for your server. There are comments included to indicate where you need to edit values. The important sections are reproduced below with comments.

At the top of the map file you will need to edit the EXTENT and UNITS lines shown in the extract below. The shipped example specifies units of decimal degrees and an extent (minx miny maxx maxy) covering the whole Earth. You should change these according to the map units in your data files and their total extent.

```
NAME ONEGEOLOGY
STATUS ON
SIZE 600 600
# Change extent to appropriate coordinates
# for your data
EXTENT -180 -90 180 90
# UNITS [feet|inches|kilometers|meters|miles|dd]
# Units of the map coordinates.
# Used for scalebar and scale computations.
UNITS dd
SHAPEPATH "data"
IMAGECOLOR 255 255 255


IMAGETYPE PNG


PROJECTION
"init=epsg:4326"
END
```

The next (WEB) section of the map file (extract shown below) sets general information for your web service including a general description, contact information, default projection system etc. You can edit it according to the comments included in the example.

```
#
# Start of web interface definition (including WMS enabling metadata)
#
WEB
HEADER "templates/query_header.html"
FOOTER "templates/query_footer.html"
IMAGEPATH "/ms4w/tmp/ms_tmp/"
IMAGEURL "/ms_tmp/"
METADATA
WMS_TITLE "BGS 1:625k Bedrock and Superficial geology"
WMS_ABSTRACT "The 1:625k DiGMap data covering the whole of
Great Britain is available in this OGC WMS service for your personal,
non-commercial use only and is being served as a contribution to the
OneGeology initiative(www.onegeology.org). Separate bedrock
geology and superficial deposits layers are available in this service.
Layers available for bedrock are lithostratigraphy, chronostratigraphy,
and lithology. The layer names are lithostratigraphy, chronostratigraphy
and lithology respectively.
Layers available for superficial deposits layer are lithostratigraphy and
lithology. The layer names are lithostratigraphy and lithology
respectively.
For information about more of the British Geological Survey's maps
that are available digitally please visit
http://www.bgs.ac.uk/products/digitalmaps/digmapgb.html"
```

Put your organisation name and any other information you
want to include.
 WMS_KEYWORDLIST "OneGeology,Geology,Map,United
Kingdom,Bedrock,Superficial,Lithology,Lithostratigraphy,Age"
 WMS_SERVICE_ONLINERESOURCE
"http://www.bgs.ac.uk/products/digitalmaps/digmapgb.html"
 WMS_ONLINERESOURCE "http://ogc.bgs.ac.uk/cgi-bin/onegeology?"
 WMS_CONTACTPERSON "Richard Hughes"
 WMS_CONTACTORGANIZATION "British Geological Survey"
 WMS_CONTACTPOSITION "Head of Information Delivery"
 WMS_ADDRESSTYPE "postal"
 WMS_ADDRESS "Kingsley Dunham Centre"
 WMS_CITY "Keyworth"
 WMS_STATEORPROVINCE "Nottinghamshire"
 WMS_POSTCODE "NG12 5GG"
 WMS_COUNTRY "UK"
 WMS_CONTACTVOICETELEPHONE "+44 (0)115 936 3100"
 WMS_CONTACTFACSIMILETELEPHONE "+44 (0)115 936 3200"
 WMS_CONTACTELECTRONICMAILADDRESS enquiries@bgs.ac.uk
WMS_FEES "none"
 WMS_ACCESSCONSTRAINTS "The 1:625k DiGMap data is
available for free download for your personal, teaching, research or
non-commercial use as described on the previous web-page. Your use
of any information provided by the British Geological Survey ("BGS") is
at your own risk. Neither BGS nor the Natural Environment Research
Council ("NERC") gives any warranty, condition or representation as to
the quality, accuracy or completeness of the information or its
suitability for any use or purpose. All implied conditions relating to the
quality or suitability of the information, and all liabilities arising from the
supply of the information (including any liability arising in negligence)
are excluded to the fullest extent permitted by law."
WMS_FEATURE_INFO_MIME_TYPE "text/html"
 WMS_SRS "EPSG:4326 EPSG:27700"
 END
 END

The items you should edit as appropriate for your organisation are:
WMS_ABSTRACT, WMS_CONTACTPERSON,
WMS_CONTACTORGANIZATION, WMS_CONTACTPOSITION,
WMS_ADDRESS, WMS_CITY, WMS_STATEORPROVINCE,
WMS_POSTCODE and WMS_COUNTRY. You may edit some of the
others as appropriate. The SRS specifies the coordinate system that
the WMS can serve data in. These are commonly specified using
EPSG codes and must include EPSG:4326 so that all services have at
least one coordinate system in common. You may specify other
systems that are appropriate for your region if you wish.

You can find out more information about EPSG codes at http://www.epsg.org/. The file ms4w\proj\nad\epsg in your MS4W distribution contains a list of EPSG codes and their projection parameters in a form that the PROJ library used by MapServer can understand. Hopefully, this should cover all cases. If you do not find your system there you could try looking in some of the other files in the nad directory and copying the appropriate line or following some of the links given in the MapServer FAQ at http://mapserver.gis.umn.edu/docs/faq/epsg_codes/. You might also try posting a question to the OneGeology self-help helpdesk forum to see if any projection system specialist can help you.

You must then create "LAYER" sections for each map (e.g. bedrock map, superficial geology map etc.) that you are going to serve. The contents of these LAYER sections will depend on whether your data is in Shapefile format or a GeoTiff image. Examples are given below with comments where you will need to edit them according to your own data.

GeoTiff data layer

An example of adding a tif layer is included in the default onegeology application. The relevant section is reproduced below for reference. The data is a world map image which was created from the world_borders shapefile available at http://mappinghacks.com/data/. In this case we won't be setting up a response to GetFeatureInfo or GetLegendGraphic requests, we are just returning a coloured map. There is more detailed documentation at http://mapserver.gis.umn.edu/docs/howto/raster_data, in particular as regards efficient serving of large images, using 8-bit vs 24-bit images, tiling etc.

Example extract from map file below:

```
LAYER
NAME ex2
TYPE RASTER
STATUS ON
DATA world_borders.tif
PROJECTION
"init=epsg:4326"
END

CLASS
EXPRESSION ([pixel] < 1300000000)
STYLE
COLOR 150 150 0
END
END

METADATA
WMS_TITLE "OneGeology Ex2"
WMS_ABSTRACT "An example world map from a TIFF data source"
WMS_SRS "EPSG:4326 EPSG:27700 EPSG:23030"
"wms_metadataurl_href"
"http://yourservername.org/onegeology/data/metadata.html"
"wms_metadataurl_format" "text/html"
```

```
"wms_metadataurl_type" "TC211"
"wms_dataurl_href"
"http://yourservername.org/onegeology/data/data.html"
"wms_dataurl_format" "text/html"
END

TOLERANCE 10

DUMP TRUE

END
```

Shapefile data layer

The example file includes the following shapefile based layers: UK bedrock geology classified by lithology, lithostratigraphy and age, and UK superficial geology classified by lithology and lithostratigraphy. These are typical of the sorts of layer expected for OneGeology but you may have slightly different theme layers and slightly different available classification schemes. Please consult on the OneGeology forum if you are uncertain about exactly what layers and classifications to serve.

The fields you will need to edit for each LAYER section are described below. The NAME must be unique for each layer. This is a short identifier used by WMS clients to choose the layers they wish to display and doesn't need to be human friendly but you may as well choose something like "bedrock", "superficial" etc. as appropriate.

DATA should specify the name of your shapefile. The HEADER, TEMPLATE and FOOTER values refer to files with snippets of HTML template which format the results of GetFeatureInfo requests when requested in text/html format. The examples have been written for the data fields in the example shapefiles; it should be straightforward for you to edit them to match the fields in your shapefiles. The PROJECTION section should specify the coordinate system that your data is actually in. This may not be EPSG:4326 if you have your data in some regional projected system. However, as most OneGeology clients will want to retrieve your data in the EPSG:4326 system it may be best for performance reasons to convert your data files rather than have MapServer convert it on-the-fly in response to requests. See Appendix 1 for one way to do this with the tools bundled with MS4W.

```
LAYER
  NAME bedrock_lithology
  TYPE POLYGON
  STATUS ON
  DATA bedrock625ll
  TRANSPARENCY 100
  TOLERANCE 0
  TOLERANCEUNITS pixels
  TRANSFORM TRUE
  DUMP TRUE

  HEADER "templates/bedrock_lithology_query_header.html"
  TEMPLATE "templates/bedrock_lithology_query_body.html"
```

```
FOOTER "templates/bedrock_lithology_query_footer.html"
PROJECTION
"init=epsg:4326"
END
```

In the METADATA section you should edit the following values. WMS_TITLE is the human readable layer name and should specify your organisation and the type of map e.g. "BGS Bedrock Lithology". The WMS_ABSTRACT should expand on this with some extra information like scale (e.g. "BGS 625k Bedrock Lithology"). The WMS_SRS values specify which coordinate systems the WMS can supply the data in and must include at least EPSG:4326, others are up to you. The gml_include_items and wms_include items will depend on the data fields in your shapefile and which ones you which to make available by a GetFeatureInfo request and should be a comma separated list of field names. These should be the same as the fields included in the HTML templates above. It is optional to include any information here but obviously if you have fields with geological unit names or ages they would be useful to include. The wms_metadataurl_href and wms_dataurl_href are supposed to contain URLs for web pages which describe the dataset used for the layer in more detail. It is possible that you may already have suitable web pages on your organisation's website, or you may wish to create suitable pages to be served by this same server. These URL's give users of your WMS service quick and easy links back to your web pages that may describe your available data offerings in more detail. Should you also require a copyright symbol layer associated with your WMS service layers then it is possible to set this up using Mapserver – see appendix 4. The only difference between the metadataurl and

dataurl is that the metadataurl should contain information corresponding to the ISO TC211 recognised metadata standard. The UK geology layer examples point to some pre-existing web pages on the BGS website which were suitable so that you can get an idea of what you might use for your own data.

```
METADATA
WMS_TITLE "BGS Bedrock Lithology"
WMS_ABSTRACT "BGS 625k Bedrock Lithology"
WMS_SRS "EPSG:4326 EPSG:27700"
GML_INCLUDE_ITEMS "ROCK_D"
WMS_INCLUDE_ITEMS "ROCK_D"
WMS_METADATAURL_HREF
"http://www.bgs.ac.uk/discoverymetadata/13480426.html"
WMS_METADATAURL_FORMAT "text/html"
WMS_METADATAURL_TYPE "TC211"
WMS_DATAURL_HREF
"http://www.bgs.ac.uk/products/digitalmaps/digmapgb_625.html"
WMS_DATAURL_FORMAT "text/html"
WMS_KEYWORDLIST "Bedrock,Lithology"
END
```

The CLASS related items are the most complicated. These sections are setting up the legend and colour scheme of your map polygons so you will need a separate item for each rock type or lithology you have in your data. This will depend on your data and which field in your

shapefile you are going to use for colouring the map. The example below specifies that the ROCK_D field will be used for specifying which colour to use with the CLASSITEM VALUE. Then for each CLASS section the EXPRESSION specifies the value of ROCK_D this colour will apply to and the COLOR and BACKGROUNDCOLOR give the respective RGB colour values. It is likely that creating a CLASS for all your values would be very timeconsuming to do manually. If you already have an ESRI .avl legend file you can automatically convert this to the MapServer format using the utility described in Appendix 2.

Colour codes for the lithostratigraphic and lithology layers are specific to the British Geological Survey but OneGeology agreed, where possible, to serve a chronostratigraphic layer using the new IUGS 2004 colour scheme which can be found at http://stratigraphy.org/cheu.pdf. This will give some form of harmonisation between the different chronostratigraphic layers served by the contributing geological surveys and this is only possible where such an internationally agreed scheme exists. In this case the British Geological Survey had to refine, re-allocate and 'map' the internal age to fit this IUGS 2004 one. The information to make such a legend therefore forms part of the template application here.

```
 CLASSITEM 'ROCK_D'

 CLASS
 NAME 'ANORTHOSITE'
 EXPRESSION 'ANORTHOSITE'
 #RASTERFILL_STYLE_SOLID
 STYLE
 COLOR 237 237 237
 BACKGROUNDCOLOR 255 255 255
 END #STYLE
 END #CLASS

 #... MORE CLASSES NEEDED TO ASSIGN COLOURS
 # FOR EACH VALUE OF ROCK_D
```

You may notice that in two of our example layers we have defined some "DUMMY" classes. This is a hack to work around a bug we found with Google Earth. It should only affect you if you have layers with fewer than 16 classes. If this is the case then read the comments in the map file for an explanation and add some dummy classes to your own layers so that there are at least 16.

You will also notice that we do not currently recommend enabling some capabilities in a WMS service such as setting Transparency (this can upset some WMS viewing clients and also other clients can allow the user to set the level of transparency interactively) and ScaleHint (this can upset several clients and make your service difficult to use in them).

4 REGISTERING YOUR WMS SERVICE WITH THE ONEGEOLOGY PORTAL REGISTRY

The prototype OneGeology Portal (http://portal.onegeology.org) and client, hosted and implemented by the BRGM, will be made available at the same time as this WMS cookbook. Like this cookbook it will be continually developed and improved until its formal launch in August 2008 at IGC33 Oslo.

At this time the registering process and WMS service layer naming conventions that are deemed to be OneGeology Level 1 conforming are likely to look like:

To register a new WMS:

1 The service provider must have been registered as a OneGeology partner and have a username-password

2 He enters his username/password, the system checks the rights

3 He clicks on the button "Register your WMS" in the OneGeology portal, the system displays the form "Register your WMS into the OneGeology Registry"

4 He enters the WMS URL, click OK, the system checks the capabilities of the WMS and displays some capabilities elements on the screen:

4.1 If all mandatory elements are present:

● the system asks for complementary elements (as the provider logo, the WFS to query for getFeatureInfo, language.) and activates the button "Submit your WMS", sends an e-mail to the registry administrator (BRGM) to check the content and to the OneGeology secretariat (BGS) to validate if the service provider is mandated to provide the layers (this is a more "political" check that BRGM cannot do by its own)

● Once this double check passes, the WMS is published in the OneGeology Registry

4.2 If all mandatory elements are not present

● the system displays the message: "Some mandatory elements from WMS Capabilities are missing. Please check the cookbook." (a link to the cookbook must be provided in this form)

Userids and password for being able to use this registration process on the Portal will be the same as those issued by the OneGeology secretariat to formal Onegeology participants for accessing the Helpdesk User forum.

Elements of the Capabilities for a OneGeology WMS:

WMS URL : **example =** `http://ogc.bgs.ac.uk/cgi-bin/`
`GBR_625k_BGS_Bedrock_and_Superficial_Geology/wms`
structure = `.../country_scale_organisation_featureTypes/wms`

Note that within this structure the URL elements to the left of /cgi-bin/ are likely to indicate the server of the data e.g. ogc.bgs.ac.uk shows it is BGS that owns this URL.

1 For the WMS service itself:

- Name: OGC:WMS
- Title: example = «BGS 1:625k Bedrock and Superficial geology»
- Abstract
- Keywords
- OnlineResource: *a link to the provider web site*
- Contact Information with at least: Contact, Organization, Country, Contact Electronic Mail Address

2 For each layer:

- Name: example = «BGS_Bedrock_Age» *(organisation_featureType)*
- Title: example = "BGS Bedrock Age" *(organisation_featureType)*
- Abstract
- Keywords
- DataURL (with Format and OnlineResource) — optional
- LegendURL (with Format and OnlineResource)
- MetadataURL (with Format and OnlineResource) — optional

Depending on the data you have available for each layer and your WMS software you may be able to configure what is returned in response to GetFeatureInfo requests on each layer. Ideally the response should include a field for age/lithology/lithostratigraphy as appropriate for each layer. You may choose to include other information you consider useful but please try to exclude data fields that only have meaning internal to your organisation. Preferably it should be possible to retrieve the information in at least text/html and text/plain formats.

APPENDIX 1: CONVERTING COORDINATE SYSTEM IN DATA FILES

As mentioned in the documentation on setting up the WMS the OneGeology project requires that your WMS can serve data in lat-lon coordinates with the WGS84 ellipsoid and datum (epsg:4326). If your data files are stored in a different coordinate reference system, Mapserver can convert the coordinates to epsg:4326 or other client requested coordinate reference systems on-the-fly. However, to reduce the load on your server, as we can expect that a substantial proportion of requests to OneGeology servers will be for epsg:4326 then we suggest that you convert your underlying data sets to this coordinate reference system so that the conversion won't have to be carried out on every request. The same tools that Mapserver uses internally are available with command line programs bundled in the MS4W package and can be used to convert your underlying data sets as follows.

For shapefiles the main program you will want to use is ogr2ogr.exe which is located in ms4w\tools\gdal-ogr where ms4w is the top-level folder of your MS4W installation. The easiest way to use the programs is to run the batch file ms4w\setenv.bat from a DOS window which will set up your path. (You may need to edit the setenv.bat file to reflect the location where you have installed MS4W.) Next you need to find out whether your current data set has a coordinate reference system assigned to it. If you have, for example, a dataset in a shapefile called datafile.shp you would issue a command like:

```
ogrinfo -so datafile.shp datafile
```

(The first datafile.shp refers to the file name, the datafile afterwards is a layer name which is redundant in the case of shapefiles which only have one layer but is the way ogrinfo works.)

You should get some information including something like that below:

Layer SRS WKT:
PROJCS["British_National_Grid",
 GEOGCS["GCS_OSGB_1936",
 DATUM["OSGB_1936",
 SPHEROID["Airy_1830",6377563.396,299.3249646]],
 PRIMEM["Greenwich",0.0],
 UNIT["Degree",0.0174532925199433]],
 PROJECTION["Transverse_Mercator"],
 PARAMETER["False_Easting",400000.0],
 PARAMETER["False_Northing",-100000.0],
 PARAMETER["Central_Meridian",-2.0],
 PARAMETER["Scale_Factor",0.999601272],
 PARAMETER["Latitude_Of_Origin",49.0],
 UNIT["Meter",1.0]]

The details do not matter as long as you don't get the below:

Layer SRS WKT:
(unknown)

In the latter case you will need to find out what coordinate system your data is in. If the data has a coordinate system assigned you can issue a command like that below to convert the data (*note that the destination file is specified before the source file*): ogr2ogr -t_srs epsg:4326 new_datafile.shp datafile.shp

If your data set does not have a coordinate system assigned to it but you have found out what it is you can specify the source coordinate system on the command line with the parameter -s_srs, for example: ogr2ogr -s_srs epsg:27700 -t_srs epsg:4326 new_datafile.shp datafile.shp

For GeoTIFF files the utilities you will want to use are gdalinfo.exe and gdalwarp.exe. Issuing a commnand like: gdalinfo imagefile.tif will result in some information including projection information like that below:

Driver: GTiff/GeoTIFF

Size is 522, 252

Coordinate System is:

GEOGCS["WGS 84",

 DATUM["WGS_1984",

 SPHEROID["WGS 84",6378137,298.2572235630016,

 AUTHORITY["EPSG","7030"]],

 AUTHORITY["EPSG","6326"]],

 PRIMEM["Greenwich",0],

 UNIT["degree",0.0174532925199433],

 AUTHORITY["EPSG","4326"]]

Origin = (-180.000000000000000,83.879999999999995)

Pixel Size = (0.690000000000000,-0.690000000000000)

Metadata:

You can transform an image in a similar way to the ogr2ogr utility for shapefiles *but unlike ogr2ogr the source and destination files are specified in the more common source then destination file order* so typical command lines would be: `gdalinfo –t_srs epsg:4326 imagefile.tif new_imagefile.tif` or `gdalinfo -s_srs epsg:27700 -t_srs epsg:4326 imagefile.tif new_imagefile.tif`

APPENDIX 2: CREATING MAPSERVER CLASS DEFINITIONS FROM ARCVIEW LEGENDS

The Gix Export Tool can help you create the CLASS sections of your MapFile from an ESRI ArcView 3.x .apr file. This tool converts ESRI ArcView 3.x (NOT ArcMap) projects to common open source alternatives including a MapServer MapFile. (Please note that this tool has only been used to convert simple symbology e.g. geology polygons symbolised by a solid colour according to its lithology value. Its ability to convert more complex symbology has not been tested.)

Download the Gix Export Tool from http://mapserver.gis.umn.edu/docs/link/Gix. Run the executable and follow the instructions to install the tool as an ArcView 3.x extension.

Having installed the Gix Export Tool, create or open an ArcView project containing your symbolised data.
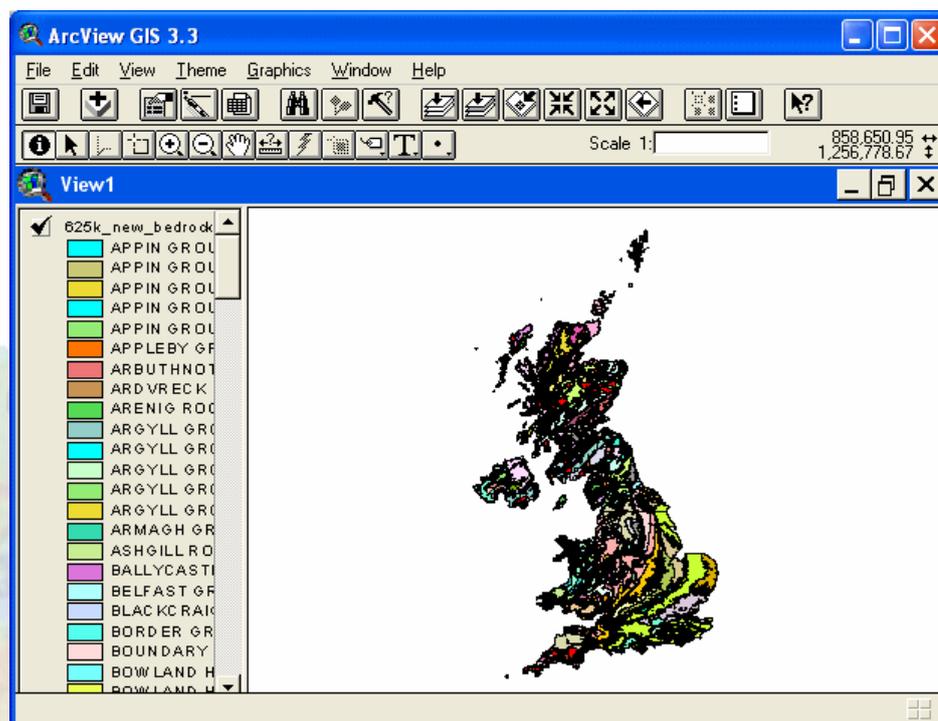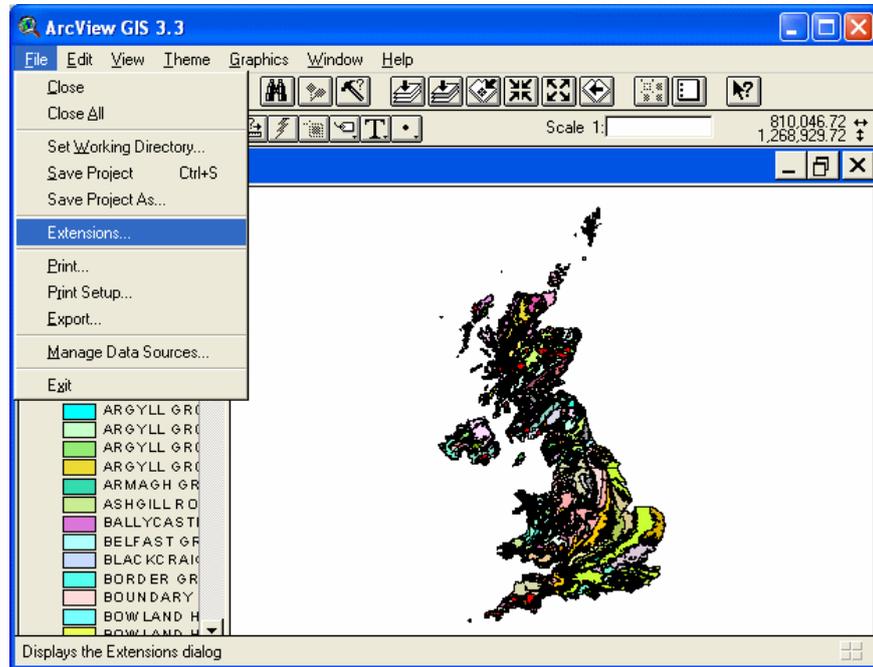
Load the Gix Export Tool Extension (File — Extensions, tick required extension, click OK).
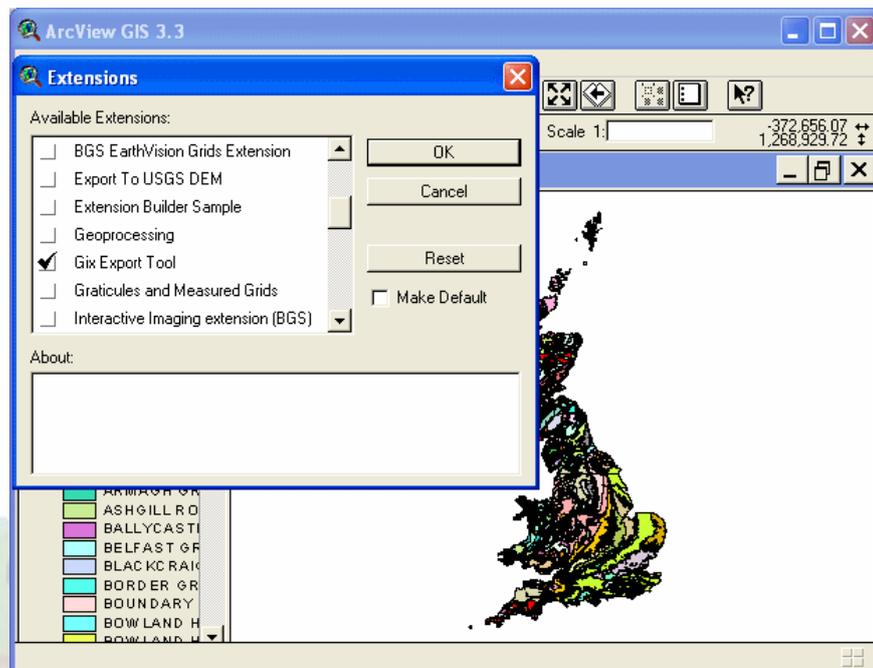
Complete the following steps to convert your project to a MapServer MapFile.

1   Select View — Export View.
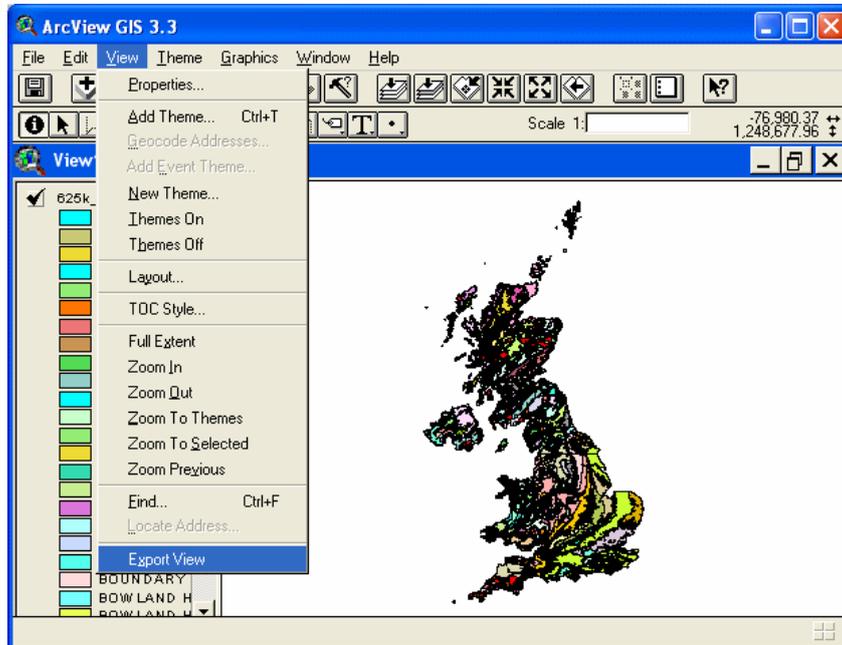
2   The first screen asks you to select your output file format — choose
mapServer MapFile (.map) and click next.
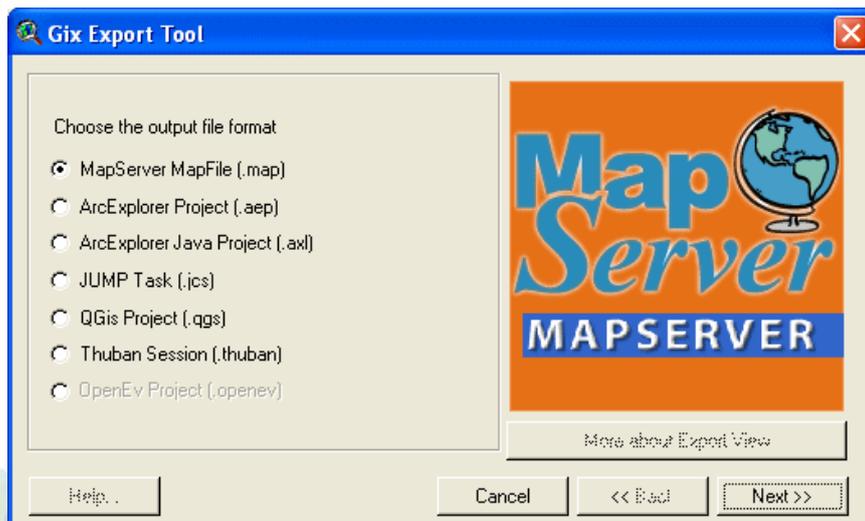
3   The next screen asks you to select a version (choose default) and output file. The output file generated will be a temporary file from which you will cut the CLASS components and paste them into the master MapFile you have been creating elsewhere. Select a location for your output file and click next.
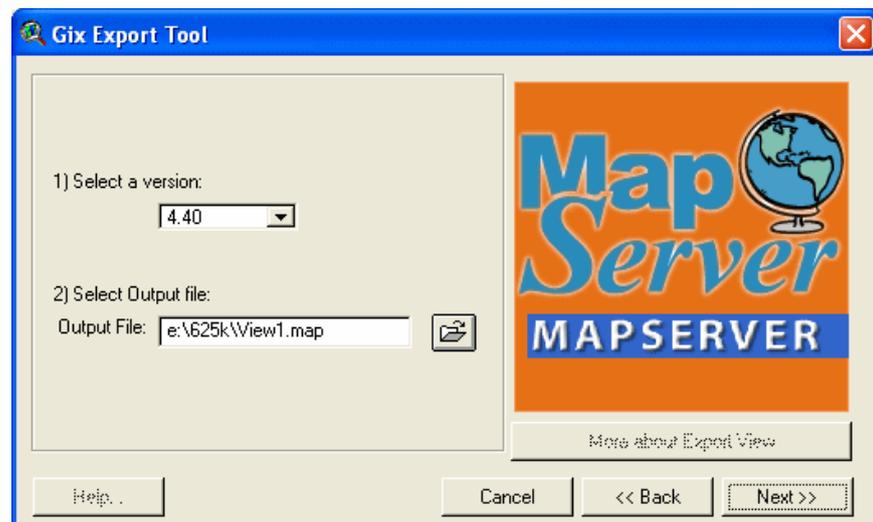
4   The next screen asks for details of the main and reference map. You won't use these sections so accept the defaults and click next.
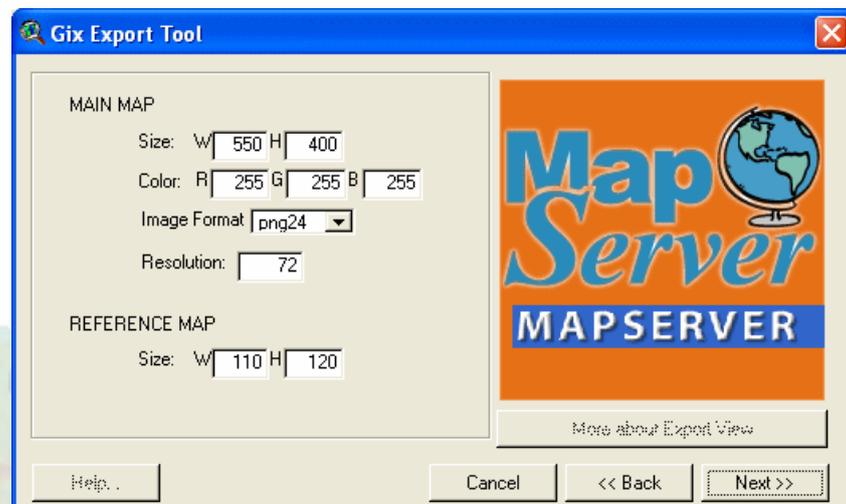
5   The next screen asks for details of the legend. Again, you won't use these sections so accept the defaults and click next.
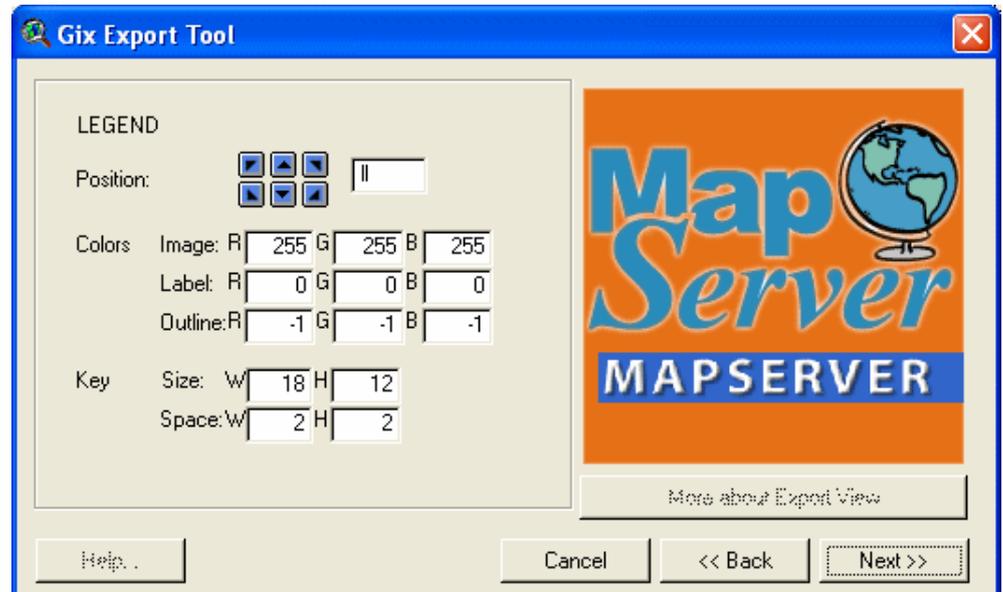
6   The next screen asks for details of the scalebar. Again, you won't use these sections so accept the defaults and click next.
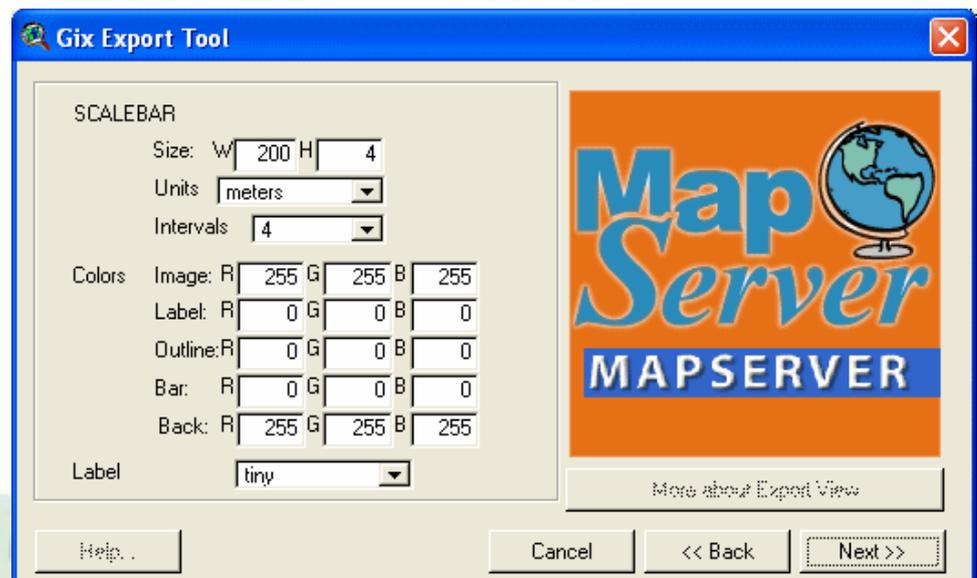
7   The next screen asks for details of the OGC metadata. Again, you won't use these sections so accept the defaults and click next.

8   The next screen asks for details of final options. Again, you won't use these sections so accept the defaults.
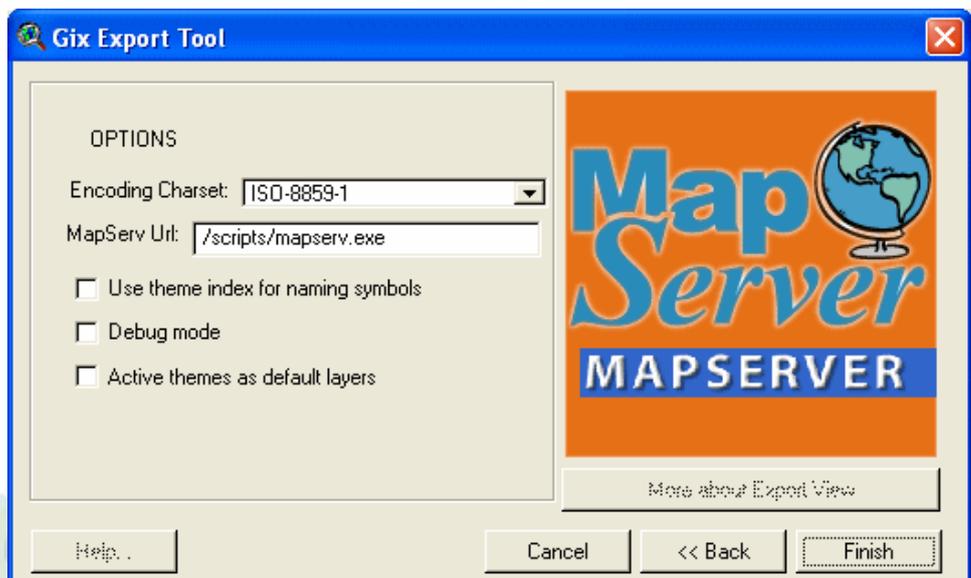
9   Click Finish to create your mapfile.

Open up the MapFile you created in a text editor and complete the following steps for each layer in your mapfile:

1 Navigate to the line beginning **CLASSITEM**

2 Highlight from here down to the **END #CLASS** line associated with that layer

3 Copy and paste the selected lines to an empty text file

4 Delete all **TEMPLATE 'template.html'** lines (one for each class)

5 Paste the remaining content into your master mapFile within the section for the layer you are dealing with. A good position is after the **END** line which closes the **METADATA** for that layer.

APPENDIX 3: MAPSERVER MAPFILE SETTINGS AFFECTING WMS GETCAPABILITIES RESPONSE

In the the following partial skeleton of a GetCapabilities response, the parts that are determined by settings in the Mapserver map file are indicated by putting the corresponding Mapserver keyword in green at the relevant part. Keywords inside a sub-section of the map file are qualified by the enclosing section name before the keyword so that, for example, the WMS_TITLE keyword inside the WEB section is written WEB/WMS_TITLE.

```
<?xml version='1.0' encoding="ISO-8859-1" standalone="no" ?>
<!DOCTYPE WMT_MS_Capabilities SYSTEM
"http://schemas.opengis.net/wms/1.1.1/WMS_MS_Capabilities.dtd"
[
<WMT_MS_Capabilities version="1.1.1">
…
<Service>
<Name>OGC:WMS</Name>
<Title>WEB/WMS_TITLE</Title>
<Abstract>WEB/WMS_ABSTRACT</Abstract>
<KeywordList>
<Keyword>WEB/WMS_KEYWORDLIST</Keyword>
<Keyword>WEB/WMS_KEYWORDLIST</Keyword>
…
<OnlineResource xmlns:xlink="http://www.w3.org/1999/xlink"
xlink:href=" WEB/WMS_SERVICE_ONLINERESOURCE"/>
<ContactInformation>
<ContactPersonPrimary>
<ContactPerson>WEB/WMS_CONTACTPERSON</ContactPerson>
<ContactOrganization>WEB/WMS_CONTACTORGANIZATION</ContactOrganization>
```

```
</ContactPersonPrimary>
<ContactPosition>WEB/WMS_CONTACTPOSITION</ContactPosition
>
<ContactAddress>
<AddressType>WEB/WMS_ADDRESSTYPE</AddressType>
<Address>WEB/WMS_ADDRESS</Address>
<City>WEB/WMS_CITY</City>
<StateOrProvince>WEB/WMS_STATEORPROVINCE</StateOrProvin
ce>
<PostCode>WEB/WMS_POSTCODE</PostCode>
<Country>WEB/WMS_COUNTRY</Country>
</ContactAddress>
<ContactVoiceTelephone>WEB/WMS_CONTACTVOICETELEPHONE
</ContactVoiceTelephone>
<ContactFacsimileTelephone>WEB/WMS_CONTACTFACSIMILETEL
EPHONE </ContactFacsimileTelephone>
<ContactElectronicMailAddress>WEB/WMS_CONTACTELECTRONIC
MAILADDRESS </ContactElectronicMailAddress>
</ContactInformation>
<Fees>WEB/WMS_FEES</Fees>
<AccessConstraints>WEB/WMS_ACCESSCONSTRAINTS</AccessC
onstraints>
</Service>

<Capability>
<Request>
<GetCapabilities>
<Format>application/vnd.ogc.wms_xml</Format>
<DCPType>
<HTTP>
<Get><OnlineResource xmlns:xlink="http://www.w3.org/1999/xlink"
xlink:href="http://www.gis.bgs.ac.uk/cgi-bin/bgs-625k?"/></Get>
<Post><OnlineResource xmlns:xlink="http://www.w3.org/1999/xlink"
xlink:href="http://www.gis.bgs.ac.uk/cgi-bin/bgs-625k?"/></Post>
</HTTP>
```

```
</DCPType>
</GetCapabilities>
<GetMap>
<Format>image/gif</Format>
<Format>image/png</Format>
<Format>image/png; mode=24bit</Format>
<Format>image/jpeg</Format>
<Format>image/wbmp</Format>
<Format>image/tiff</Format>
<Format>image/svg+xml</Format>
<DCPType>
<HTTP>
<Get><OnlineResource xmlns:xlink="http://www.w3.org/1999/xlink"
xlink:href="http://www.gis.bgs.ac.uk/cgi-bin/bgs-625k?"/></Get>
<Post><OnlineResource xmlns:xlink="http://www.w3.org/1999/xlink"
xlink:href="http://www.gis.bgs.ac.uk/cgi-bin/bgs-625k?"/></Post>
</HTTP>
</DCPType>
</GetMap>
<GetFeatureInfo>
<Format>text/plain</Format>
<Format>text/html</Format>
<Format>application/vnd.ogc.gml</Format>
<DCPType>
<HTTP>
<Get><OnlineResource xmlns:xlink="http://www.w3.org/1999/xlink"
xlink:href="http://www.gis.bgs.ac.uk/cgi-bin/bgs-625k?"/></Get>
<Post><OnlineResource xmlns:xlink="http://www.w3.org/1999/xlink"
xlink:href="http://www.gis.bgs.ac.uk/cgi-bin/bgs-625k?"/></Post>
</HTTP>
</DCPType>
</GetFeatureInfo>
<DescribeLayer>
<Format>text/xml</Format>
<DCPType>
```

```xml
<HTTP>
<Get><OnlineResource xmlns:xlink="http://www.w3.org/1999/xlink"
xlink:href="http://www.gis.bgs.ac.uk/cgi-bin/bgs-625k?"/></Get>
<Post><OnlineResource xmlns:xlink="http://www.w3.org/1999/xlink"
xlink:href="http://www.gis.bgs.ac.uk/cgi-bin/bgs-625k?"/></Post>
</HTTP>
</DCPType>
</DescribeLayer>
<GetLegendGraphic>
<Format>image/gif</Format>
<Format>image/png</Format>
<Format>image/png; mode=24bit</Format>
<Format>image/jpeg</Format>
<Format>image/wbmp</Format>
<DCPType>
<HTTP>
<Get><OnlineResource xmlns:xlink="http://www.w3.org/1999/xlink"
xlink:href="http://www.gis.bgs.ac.uk/cgi-bin/bgs-625k?"/></Get>
<Post><OnlineResource xmlns:xlink="http://www.w3.org/1999/xlink"
xlink:href="http://www.gis.bgs.ac.uk/cgi-bin/bgs-625k?"/></Post>
</HTTP>
</DCPType>
</GetLegendGraphic>
<GetStyles>
<Format>text/xml</Format>
<DCPType>
<HTTP>
<Get><OnlineResource xmlns:xlink="http://www.w3.org/1999/xlink"
xlink:href="http://www.gis.bgs.ac.uk/cgi-bin/bgs-625k?"/></Get>
<Post><OnlineResource xmlns:xlink="http://www.w3.org/1999/xlink"
xlink:href="http://www.gis.bgs.ac.uk/cgi-bin/bgs-625k?"/></Post>
</HTTP>
</DCPType>
</GetStyles>
</Request>
```

```
<Exception>
<Format>application/vnd.ogc.se_xml</Format>
<Format>application/vnd.ogc.se_inimage</Format>
<Format>application/vnd.ogc.se_blank</Format>
</Exception>
<VendorSpecificCapabilities />

<UserDefinedSymbolization SupportSLD="1" UserLayer="0"
UserStyle="1" RemoteWFS="0"/>
<Layer>
<Name>NAME</Name>
<Title>WEB/WMS_TITLE</Title>
<SRS>WEB/WMS_SRS</SRS>
<SRS>WEB/WMS_SRS</SRS>
…
<LatLonBoundingBox minx="-9.28889" miny="49.7662"
maxx="3.47803" maxy="60.6838" />
<BoundingBox SRS="EPSG:27700"
minx="0" miny="0" maxx="700000" maxy="1.2e+006" />
<ScaleHint min="0.498902848429637" max="773.299415065937" />
<Layer queryable="1" opaque="0" cascaded="0">
<Name>LAYER/NAME</Name>
<Title>LAYER/METADATA/WMS_TITLE</Title>
<Abstract>LAYER/METADATA/WMS_ABSTRACT</Abstract>
<SRS>LAYER/METADATA/WMS_SRS</SRS>
<SRS>LAYER/METADATA/WMS_SRS</SRS>
…
<LatLonBoundingBox minx="-9.21459" miny="49.8334"
maxx="2.69552" maxy="60.853" />
<BoundingBox SRS="LAYER/PROJECTION/init"
minx="6193.24" miny="7047" maxx="655614" maxy="1.21884e+006"
/>
<MetadataURL
```

```
type="LAYER/METADATA/WMS_METADATAURL_TYPE">
<Format>LAYER/METADATA/WMS_METADATAURL_FORMAT</Format>
<OnlineResource xmlns:xlink="http://www.w3.org/1999/xlink"
xlink:type="simple"
xlink:href="LAYER/METADATA/WMS_METADATAURL_HREF"/>
</MetadataURL>
<DataURL>
<Format> LAYER/METADATA/WMS_DATAURL_FORMAT </Format>
<OnlineResource xmlns:xlink="http://www.w3.org/1999/xlink"
xlink:type="simple" xlink:href="
LAYER/METADATA/WMS_DATAURL_HREF "/>
</DataURL>

<Style>
<Name>default</Name>
<Title>default</Title>
<LegendURL width="20" height="10">
<Format>image/png</Format>
<OnlineResource xmlns:xlink="http://www.w3.org/1999/xlink"
xlink:type="simple" xlink:href="http://www.gis.bgs.ac.uk/cgi-bin/bgs-
625k?version=1.1.1&amp;service=WMS&amp;request=GetLegendGra
phic&amp;layer=bedrock&amp;format=image/png"/>
</LegendURL>
</Style>
</Layer>
…
</Layer>
</Capability>
</WMT_MS_Capabilities>
```

APPENDIX 4: ADDING A COPYRIGHT SYMBOL LAYER

You may wish to add a small copyright note to the images your server is returning. One way of doing this is to add a copyright layer to the Mapserver map file which is set to always be displayed. The template application contains such a layer commented out. The settings are reproduced below. The STATUS DEFAULT line means that this layer is always returned, whether requested by the WMS client or not. This is not strictly in accordance with the WMS specification, it is a capability that Mapserver happens to provide. Most Surveys will be satisfied with relying on the fact that the metadata always available with each service from the getcapabilities response leads the viewer quickly back to the host's home web pages for further information and clear copyright evidence.

A copyright symbol layer works by creating a labeled point feature inside the map file (not using an external data file), with your copyright text as the label. In this case we have put the point at coordinates 1,1 in British National Grid (epsg:27700) so that the label appears at the bottom left of UK maps. You should specify a point somewhere suitable within your data extent. (You may find a method on the Mapserver site for making such a label appear at a fixed image position rather than geographical position using TRANSFORM false. Although this works, it produces undesirable results with 3D globe WMS clients which ask for the maps in pieces and then get the copyright text repeated over the globe.)

```
LAYER
NAME copyright
STATUS DEFAULT
TYPE annotation
TRANSFORM true
PROJECTION
"init=epsg:27700"
END
```

```
FEATURE
POINTS
1 1
END
TEXT "(c) Your organization" #this is your displaying text
END
CLASS
LABEL #defines the font, colors etc. of the text
TYPE bitmap
SIZE medium
BUFFER 2
COLOR 0 0 0
BACKGROUNDCOLOR 255 255 255
FORCE TRUE
POSITION LR
END
END
METADATA
WMS_TITLE "copyright"
WMS_SRS "EPSG:4326 "
"wms_metadataurl_href"
"http://yourservername.org/onegeology/data/metadata.html"
"wms_metadataurl_format" "text/html"
"wms_metadataurl_type" "TC211"
"wms_dataurl_href"
"http://yourservername.org/onegeology/data/data.html"
"wms_dataurl_format" "text/html"
END
END
```