U.S. DEPARTMENT OF THE INTERIOR
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OPEN-FILE REPORT 03-302

GEOLOGIC MAP AND DIGITAL DATABASE OF THE REDLANDS 7.5’ QUADRANGLE, SAN BERNARDINO AND RIVERSIDE COUNTIES, CALIFORNIA, v. 1.0

Readme

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This database, identified as "Geologic map and digital database of the Redlands 7.5’ quadrangle, San Bernardino and Riverside Counties, California, version 1.0" has been approved for release and publication by the Director of the USGS. Although this database has been reviewed and is substantially complete, the USGS reserves the right to revise the data pursuant to further analysis and review. This database is released on condition that neither the USGS nor the U.S. Government may be held liable for any damages resulting from its use.

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INTRODUCTION

Open-File Report 03-302 is a digital geologic-map database of the Redlands 7.5’ quadrangle prepared by the Southern California Areal Mapping Project (SCAMP), a geologic-mapping project sponsored jointly by the U.S. Geological Survey and the California Geological Survey. The database was created in version 7.1.1 of ARC/INFO (Environmental Systems Research Institute), and includes the following files:

- This readme describing how to access and extract files in the database package
- An FGDC-compliant metadata file (.txt file)
- Geologic-map coverages
- Associated data tables
- A browse graphic of the geologic-map plot and explanatory information (.pdf file)
- A PostScript graphics file of the geologic-map plot and explanatory information
- A .pdf file listing coded geologic attributes stored in the database, including plain-word definitions of each coded attribute
- Pamphlets describing geologic-map units of the Redlands quadrangle and their geologic age and geologic history (.pdf files)

DIGITAL COMPILATION

Data capture and editing

The digital geologic-map database was produced from geologic linework drafted on a 1:24,000-scale greenline chronoflex of the Redlands 7.5’ quadrangle. A right-reading clear-film blackline contact print (.007 mil) of the chronoflex linework was generated to remove the green cartographic base. Optronics Specialty Company used proprietary software to auto-vectorize the raster file. USGS staff, using a Sun SPARC20 computer system running Solaris v. 2.4 and ARC/INFO v. 7.1.1 software, processed the Optronics-derived .dxf file and subsequently edited the resulting ARC/INFO coverages. The geologic lines, points, and polygons were edited using standard ARC/INFO commands and, for some procedures, using the graphical user interface ALACARTE (Fitzgibbon, 1991; Fitzgibbon and Wentworth, 1991; Wentworth and Fitzgibbon, 1991).

Digital editors and their contributions

Pamela M. Cossette—responsible for editing the vector scan, most geologic database editing, and assembling the final database and plot-file products;

Bradley Jones—responsible for preliminary database editing;

Stephen A. Kennedy—responsible for preliminary database editing.

Base Map

A geo-referenced base-map image (**red.tif**) was prepared by scanning a scale-stable right-reading blackline .007-mil clear film of the U.S. Geological Survey, 1:24,000-scale Redlands 7.5’ quadrangle topographic map (1967, photorevised, 1980). Scanning was done using an Anatech Eagle 4080 monochrome 800 dots-per-inch scanner at a resolution of 500 dpi. The raster scan was converted to a monochromatic image in ARC/INFO. No elements of the base layer are attributed. The base map is provided for reference only.

DATABASE CONTENTS

Database tar file red.tar.gz

The Redlands geologic-map data files are bundled into a single tar (tape archive) file named **red.tar.gz**. The files were compressed with gzip (.gz extension). Instructions for extracting the files are provided below.

The tar file **red.tar.gz** contains the following ARC/INFO interchange files (Table 1), a gzip compressed PostScript plot file, a .tif file of the topographic base, and a plain text version of the Redlands 7.5’ quadrangle metadata:

ARC/INFO INTERCHANGE FILES	REDLANDS COVERAGES and DATA FILES	DESCRIPTION
red_geo.e00	**red_geo**	Coverage containing geologic-map units (geologic features represented as polygons), map-unit labels, geologic contacts and faults (geologic features represented by lines). NOTE: labels for map units and named faults are contained in two annotation sub-classes (**anno.geo** and **anno.fault**)
red_pts.e00	**red_pts**	Coverage containing quantitative structural-point data (azimuth and dip data for bedding and foliation, plunge data for lineations, etc). Dip and plunge values are plotted as annotation from annotation sub-class anno.dip
red_str.e00	**red_str**	Coverage containing fold axes
red_ptsorn.e00	**red_ptsorn**	Coverage containing non-quantitative point data used to ornament or symbolize certain kinds of geologic-line features (fold-axes, faults, etc.)
red_obs.e00	**red_obs**	Coverage containing the location of observation stations and subsurface-boring locations
red_ldr.e00	**red_ldr**	Leaders for polygon labels and fault names
lines.rel.e00	**lines.rel**	Line dictionary accessed in the relate environment
points.rel.e00	**points.rel**	Point dictionary accessed in the relate environment
red_summ.rel.e00	**red_summ.rel**	Data table containing coded geologic attributes for general map-unit features

Table 1. ARC/INFO interchange files in the data package **red.tar.gz**

When the Redlands interchange .e00 files are imported as ARC coverages into ARC/INFO, an info/ directory is produced. The Redlands info/ directory will contain the following INFO tables (Tables 2, 3) along with the converted symbolsets that are included for the user's convenience:

POLYGON-ATTRIBUTE TABLES
red_geo.pat
ARC-ATTRIBUTE TABLES
red_geo.aat
red_str.aat
red_ldr.aat
POINT-ATTRIBUTE TABLES
red_pts.pat
red_ptsorn.pat
red_obs.pat

Table 2. Feature-attribute tables in the Redlands info/ directory

TABLE NAME	CONTAINS
lines.rel	Line dictionary, contains all SCAMP line codes and their explanations
points.rel	Point dictionary, contains all SCAMP point codes and their explanations
red_summ.rel	Contains geologic-summary information for polygons

Table 3. Data tables in the Redlands info/ directory

Plot files

Once unzipped, **red.ps.gz** yields a PostScript file, **red.ps,** which will plot a 1:24,000-scale, full-color geologic map of the Redlands quadrangle on its topographic base, including a detailed Correlation of Map Units diagram and an abbreviated Description of Map Units. The plot is approximately 36 x 48 inches in size. It has been plotted successfully using Hewlett-Packard large-format plotters, models HP650C, HP755CM, and HP2500C.

Table 4 lists symbolsets and fonts used to prepare plots of the geologic map and its legend. Most of the files are contained in the **red.tar.gz** data package. Others can be accessed from web sites as indicated in Table 4.

FILE NAME	DESCRIPTION
geoscamp2.lin	Geologic-line symbolset scamp.wr.usgs.gov/scamp/html/sc_gis.html
geoscamp2.mrk	Geologic-point symbolset scamp.wr.usgs.gov/scamp/html/sc_gis.html
scamp2.shd	Color shadeset
geology2.shd	Pattern shadeset

Table 4. Marker-set, line-set, and shade-set files used to display the Redlands quadrangle map and its legend.

Raster Files

RASTER FILE	RASTER IMAGE	CONTAINS
red.tif	Redlands 7.5’ basemap	Georeferenced topographic base (monochromatic)

Table 5. Image of Redlands topographic base included in data package.

PDF Files

Several Portable Document Format (.pdf) files (Table 6) are included in the Redlands data package and are intended to provide the user with information about particular features contained in the database, and how to access them.

FILE NAME	DESCRIPTION
red_readme.pdf	This document
red_attribute_codes.pdf	Document describing geologic database structure and how to access data in it; includes description of geologic-attribute codes and their explanations
red_dmu.pdf	Description of Map Units
red_map.pdf	Browse graphic of Redlands geologic map and legend (pdf format)

Table 6. Portable Document Format (.pdf) files describing the Redlands database.

HOW TO OBTAIN THE DIGITAL FILES

The interchange (.e00) files for the Redlands geologic-map database may be obtained over the Internet at the following: http://geopubs.wr.usgs.gov/open-file/of03-302.

Be sure to use binary transfer mode.

HOW TO EXTRACT THE GEOLOGIC MAP DATABASE FROM THE TAR FILE red.tar.gz

Extracting the database files

After the files are downloaded, they must be uncompressed using a gzip utility such as gzip itself or WinZip available at http://www.winzip.com/. Gzip utilities are available free of charge via the internet through links on the Common Internet File Formats web page (http://www.matisse.net/files/formats.html); also, see the gzip home page http://www.gzip.org.

Once uncompressed, individual data files must be extracted from **red.tar** using a tar utility. In the UNIX environment, follow the instructions in Table 7. This process will create a directory (**red_of/)** that contains the ARC/INFO interchange files, supporting files, and the info/ directory.

TO DO THIS	TYPE THIS AT THE UNIX COMMAND PROMPT
decompress **red.tar.gz** to create tar file named red.tar	gzip -d red.tar.gz (or use gzip utility of choice)
Go to the directory that will hold the directory red_of (if different from local_directory)	cd local_directory
Extract the red_of directory from the tar file	tar -xvbv {path to tar file}/red.tar (or use tar utility of choice)

Table 7. How to extract files from **red.tar.gz**

Accessing the Portable Document Format (.pdf) files

The .pdf files are not stored as gzip files. They are accessed using Adobe Acrobat Reader software, available free of charge from the Adobe website. Follow instructions at the website to download and install the software. Acrobat Reader contains an on-line manual and tutorial.

HOW TO CONVERT THE ARC/INFO INTERCHANGE FILES

The ARC interchange (.e00) files are converted to ARC coverages using the ARC command IMPORT. While in the red_of directory, at the ARC prompt, type:

import <option> <interchange_file> <output file>
e.g. import auto red_geo red_geo

Please consult the Arc/Info Online Help for details on how to use the import and option commands.

ARC interchange files can be read by other Geographic Information Systems, including ArcView (ESRI) and MapInfo (http://www.mapinfo.com/). Please consult your GIS documentation to see if you can

use ARC interchange files and follow the appropriate procedure to import them. NOTE: the graphical symbols contained in the two symbolsets “geoscamp2.lin” and “geoscamp2.mrk” (referenced by the item **L-SYMB** in **red_geo.aat** and **red_str.aat** and the item **P-SYMB** in **red_pts.pat** and **red_ptsorn.pat**) cannot be accessed in ArcView.

ARC/INFO PROJECTION PARAMETERS

The ARC coverages are stored in polyconic projection (Table 8). Four digital tics define the geographic extent of the Redlands 7.5’ database.

	DESCRIPTION
Projection	Polyconic
Datum	NAD27
Zunits	No
Units	Meters
Spheroid	Clark 1866
X shift	0.0000000000
Y shift	0.0000000000
Parameters	-117º 11’ 15” longitude of central meridian 34º 00’ 00” latitude of projection’s origin 0.00000 false easting (meters) 0.00000 false northing (meters)

Table 8. Map-projection parameters

REFERENCES CITED

Environmental Systems Research Institute, Inc, 1991, ARC/INFO command references 6.0: Proprietary software manual

Fitzgibbon, T.T., 1991, ALACARTE installation and system manual (version 1.0): U.S. Geological Survey, Open-File Report 91-587B.

Fitzgibbon, T.T., and Wentworth, C.M., 1991, ALACARTE user interface - AML code and demonstration maps (version 1.0): U.S. Geological Survey, Open-File Report 91-587A

Wentworth, C.K., 1922, A scale of grade and class terms for clastic sediments: Journal of Geology, v. 30, p. 377-392.

Wentworth, C.M., and Fitzgibbon, T.T., 1991, ALACARTE user manual (version 1.0): U.S. Geological Survey Open-File Report 91-587C.

APPENDIX 1: THE RIGHT-HAND RULE FOR QUANTITATIVE POINTS

The Redlands database contains quantitative information collected by the database authors at specific observation stations. These data are referred to as "quantitative point data", are stored in the data table **red_pts.pat**, and are displayed on the geologic map image by various symbols like the one in Figure 1. Many of these point data record the orientation of planar geologic features such as sedimentary bedding, fault-plane dip, and metamorphic foliation. For such planar features, the "right-hand rule" is used to avoid ambiguities attendant to how the azimuth or bearing of the strike is recorded relative to the direction in which the planar surface dips, using a 360˚ azimuthal scheme.

Consider a bedding surface that trends due north and is inclined 45˚ to the east (fig. 1). In the field, the geologist can record the strike azimuth (bearing) either as 360˚ or 180˚, so long as the E inclination of the 45˚ dip amount is specified (e.g., 360˚, 45˚E or 180˚, 45˚E). From an analysis point of view, the choice of 360˚ or 180˚ as azimuth doesn't matter, so long as the E direction of the 45˚ dip is indicated. However, if the paired measurements (strike, dip) are recorded only as (360˚, 45˚) or (180˚, 45˚), the direction of dip (E or W) can not be determined from the record.

The "right-hand rule" resolves this dilemma by requiring the azimuth of each planar feature to be recorded so that the dip-direction can be determined from the azimuth alone. Specifically, in the database all planar azimuths are recorded with DIP TO THE RIGHT. For the example cited above, the bedding azimuth would be recorded in the database so that the E dip is implicit—in this case, azimuth of 360˚ with DIP TO THE RIGHT. Figure 1 shows a bedding symbol that represents this geometry. For such an E-tilted layer, an azimuth of 180˚ using the right-hand rule would yield a dip of 45˚ W.

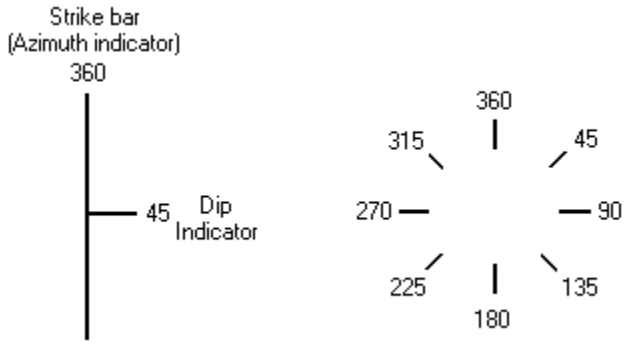

Figure 1.—Diagram illustrating a quantitative-point symbol for sedimentary bedding trending 360˚ and dipping 45˚ in an east direction (the symbol is greatly enlarged from its counterpart in geoscamp2.mrk). The value stored in P-STRIKE of **red_pts.pat** must be entered as 360 to conform to the right-hand rule and in order for the 45˚ value in P-DIP to be deciphered as E-dipping. For these values (360, 45), P-DIPDIR in **red_pts.pat** would by 090. Also illustrated is a schematic drawing of ordinal values for a 360˚ azimuthal compass.

The Yucaipa database adheres to the right-hand rule. In **red_pts.pat** the Item **P-STRIKE** records the azimuth of each planar feature, and the right-hand rule allows the user to decipher the dip direction for the dip value recorded in the Item **P-DIP**. For convenience, **red_pts.pat** also contains the Item **P-DIPDIR**, which indicates directly the direction in which each planar feature dips (090, in this example).