U. S. DEPARTMENT OF THE INTERIOR
U. S. GEOLOGICAL SURVEY

GEOLOGIC MAP OF SANTA CRUZ COUNTY, CALIFORNIA: A DIGITAL DATABASE

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Open - File Report 97-489

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This database, identified as "Geologic map of Santa Cruz County, California: A Digital Database," 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

This Open-File report is a digital geologic map database. This pamphlet serves to introduce and describe the digital data. There is no paper map included in the Open-File report. The report does include, however, a PostScript plot file containing an image of the geologic map sheet with explanation.

This digital map database is prepared from a previously published map by Brabb (1989). The geologic map database delineates map units that are identified by general age, lithology and clast size following the stratigraphic nomenclature of the U. S. Geological Survey. For detailed descriptions of the units, their stratigraphic relations and sources of geologic mapping, consult the accompanying PostScript plot file (sc-sht1.ps), or the original published paper map (Brabb, 1989). The scale of the source map limits the spatial resolution (scale) of the database to 1:62,500 or smaller.

For those interested in the geology of Santa Cruz County who do not use an ARC/INFO compatible Geographic Information System (GIS), but would like to obtain the paper map with explanation, one PostScript plot file containing map images of the data in the digital database, as well as a PostScript plot file of the explanatory text, have been included in the database package (please see the section "PostScript Plot Files Package" page 5). However, the plot files require gzip and tar utilities to access the files.

For those without computer capability, we have made the plot files available to an outside vendor, or we can provide users with the PostScript plot files on tape that can be used by other vendors (please see the section "Obtaining Plots from an Outside Vendor" page 5).

The content and character of the database and methods of obtaining it are described herein. The geologic map database itself, consisting of two ARC coverages and one base layer, can be obtained over the Internet or by magnetic tape copy as described below. The processes of extracting the geologic map database from the tar file, and importing the ARC export coverages (procedure described herein), will result in the creation of an ARC workspace (directory) called '**scruz**.'

The database was compiled using ARC/INFO, a commercial Geographic Information System (Environmental Systems Research Institute, Redlands, California), with version 3.0 of the menu interface ALACARTE (Fitzgibbon and Wentworth, 1991, Fitzgibbon, 1991, Wentworth and Fitzgibbon, 1991). It is stored in uncompressed ARC export format (ARC/INFO version 7.x) in a compressed UNIX tar (tape archive) file. The tar file was compressed with gzip, and may be uncompressed with gzip, which is available free of charge via the Internet from the gzip Home Page (http://w3.teaser.fr/~jlgailly/gzip). A tar utility is required to extract the database from the tar file. This utility is included in most UNIX systems, and can be obtained free of charge via the Internet from Internet Literacy's Common Internet File Formats Webpage (http://www.matisse.net/files/formats.html). ARC/INFO export files (files with the .e00 extension) can be converted into ARC/INFO coverages in ARC/INFO (see below) and can be read by some other Geographic Information Systems, such as MapInfo via ArcLink and ESRI's ArcView (version 1.0 for Windows 3.1 to 3.11 is available for free from ESRI's web site: http://www.esri.com).

DATABASE CONTENTS

The first digital package consists of one PostScript plot file of the geologic map and explanation and the geologic description. A second digital database package consists of the geologic map database itself and the supporting data, including the base map, map explanation, geologic description, and references.

POSTSCRIPT PLOTFILE PACKAGE

The first digital data package (sc-sht1.ps.gz) contains the PostScript image described below:

sc-sht1.ps	A PostScript plottable file containing an image of the geologic map and base map of Santa Cruz County, including the correlation chart, at a scale of 1:62,500.

DIGITAL DATABASE PACKAGE

The geologic map database consists of two layers and one base layer. Each of these layers (coverages) has been converted to uncompressed ARC/INFO export files. The ARC export files and the associated ARC/INFO coverages, as well as the additional digital material included in the database package, are described below:

ARC/INFO export file	Resultant Coverage	Description of Coverage
sc-geol.e00	sc-geol	Depositional contacts and unit labels
sc-strc.e00	sc-strc	Fold axes, strike and dip information
sc-topo.e00	sc-topo	Topographic base map taken from a scan of U.S. Geological Survey, San Francisco Bay Region, sheet 3, 1:125,000, 1970

ASCII text files and PostScript plot files:

scdb.ps	This file
scdb.txt	A text-only file containing an unformatted version of scdb.ps
import.aml	ASCII text file in ARC Macro Language to convert these ARC export files to ARC coverages in ARC/INFO

The following directory is produced in the process of converting the export files into ARC coverages:

info/	INFO directory containing the database files that accompany each ARC/INFO layer (coverage).

Once the ARC export coverages have been imported (see discussion below), the Santa Cruz County (scruz) directory, or ARC workspace, will look like this:

scruz/
- info/
- sc-geol/
- sc-strc/
- sc-topo/
- scdb.ps
- scdb.txt
- import.aml

OBTAINING PLOTS FROM AN OUTSIDE VENDOR

For those interested in the geology of Santa Cruz County who do not use computers, we have made the PostScript plot file available to Capitol Color, 2250 Walsh Ave., Santa Clara (phone: (800) 700-2656 or (408) 727-7560, FAX: (408) 727-0737). They will provide plots of the PostScript image of the geologic map sheet for a fee (around $25 per sheet, with discounts for orders of multiple copies). We will also provide the PostScript plot file on digital tape for use by other vendors. A 7.5 MB compressed tar file (sc-sht1.tar.gz, 26.6 MB when uncompressed) of the PostScript plot files can be obtained by sending a tape with request and return address to:

Santa Cruz County Geology PostScript Plotfile
c/o Database Coordinator
U.S. Geological Survey
345 Middlefield Road, MS 975
Menlo Park, CA 94025

The compressed plot file will be returned on the tape. The acceptable tape types are:

2.3 or 5.0 GB, 8 mm Exabyte tape.

Make sure your vendor is capable of reading these tape types and this PostScript plot file. Important information regarding tape file format is included in the section "PostScript Plot Files" below, so be certain to provide a copy of this document to your vendor.

POSTSCRIPT PLOTFILE PACKAGE

For those interested in the geology of Santa Cruz County who don't use an ARC/INFO compatible GIS system, but would like to obtain the paper map with explanation, we have included a separate data package (sc-sht1.ps.gz) with one PostScript plot file representing the geologic data. This plot file contains a color plot of the geologic map database, map key, and correlation chart at 1:62,500 scale (Sheet 1, sc-sht1.ps).

This plot file is available in any of the three ways described below, including the World Wide Web pages. However, the plot file is stored in a compressed UNIX file requiring gzip to access the file. The plot file was compressed with gzip, and may be uncompressed with gzip, which is available free of charge via the Internet from the gzip home page (http://w3.teaser.fr/~jlgailly/gzip).

The PostScript image of Sheet 1 is 60 inches wide by 36 inches high, so it requires a large plotter to produce paper copies at the intended scale. Because this release is primarily a digital database, the plot file (and plots derived therefrom) has not been edited to conform to U.S. Geological Survey standards. Small units have not been labeled with leaders and in some instances map features or annotation may overlap. Sample plots by the authors, however, have proven to be quite legible and useful.

Obtaining the PostScript plotfile package

The PostScript plotfile package can be obtained in any of three ways:

1. Sending a tape with request

A 7.5 MB compressed plotfile can be obtained by sending a tape with request to:

Santa Cruz County Geology PostScript Plotfile
c/o Database Coordinator
U.S. Geological Survey
345 Middlefield Road, MS 975
Menlo Park, CA 94025

The compressed tar file will be returned on the tape. The acceptable tape types are:

2.3 or 5.0 GB, 8 mm Exabyte tape.

2. Anonymous ftp over the Internet

To obtain the tar file by ftp, log in to your UNIX system and do the following:

cd local_directory	-go to a directory to receive the tar file
ftp wrgis.wr.usgs.gov	-make ftp connection with the USGS computer WRGIS
Name: anonymous	-use "anonymous" as your user name
Password: your name	-use your own user name as password
cd pub/open-file	-go down to the pub/open-file directory
cd of97-489	-go down to the open file directory
type binary	-change transfer type to binary
get sc-sht1.ps.gz	-copy the compressed plot file across Internet to your directory
quit	-close the ftp connection

3. From the Western Region Geologic Information Web Page.

The U.S. Geological Survey now supports a set of graphical pages on the World Wide Web. Digital publications (including this one) can be accessed via these pages. The web server for digital publications from the Western Region is "http://wrgis.wr.usgs.gov". Once at the main page, click on 'Geologic Map Databases' under the heading 'Data Online'; next click on 'California.' Scroll down to the section for this database and click on the Open-File button to get to this publication's web page. Or go directly to this publication's web page: http://wrgis.wr.usgs.gov/open-file/of97-489. Set your web browser to save to a local disk and click on the link labeled 'sc-sht1.ps.gz' to download the compressed plot file that contains the Santa Cruz County map.

Extracting The PostScript Plotfile

1. If you obtained the plotfile package on tape:

put the tape in your tape drive	
cd local_directory	-go to a directory to receive the tar file
tar xvfb /dev/rstn 20	-/dev/rstn is the tape device with n being an integer, this puts the tar file in local_directory; 20 is the block size of the tar file
gzip -d sc-sht1.ps.gz	-makes a 26.6 MB uncompressed plot file sc-sht1.ps

2. If you obtained the database by anonymous ftp or from the World Wide Web:

gzip -d sc-sht1.ps.gz	-makes a 26.6 MB uncompressed file sc-sht1.ps

OBTAINING THE DIGITAL DATA

The digital database package can be obtained in any of three ways:

1. Sending a tape with request

A 9.8 MB compressed tar file of the geologic map database and related files can be obtained by sending a tape with request and return address to:

Santa Cruz County Geologic Database
c/o Database Coordinator
U.S. Geological Survey
345 Middlefield Road, M/S 975
Menlo Park, CA 94025

The compressed tar file will be returned on the tape. The acceptable tape types are:

2.3 or 5.0 GB, 8mm Exabyte tape.

2. Anonymous ftp over the Internet

To obtain the tar file by anonymous ftp do the following:

cd local_directory	• go to a directory to receive the tar file
ftp wrgis.wr.usgs.gov	• make ftp connection with the USGS computer WRGIS
Name: anonymous	• use "anonymous" as your user name
Password: your email address	• use your email address as a password
cd pub/geologic	• go down to the pub/geologic directory
cd ca/of97-489	• go down to the open file directory
type binary	• change transfer type to binary
get scruz.tar.gz	• copy the compressed tar file across Internet to the receiving directory
quit	• close the ftp connection

3. From the Western Region Geologic Information Web Page.

To obtain the tar file via the World Wide Web:

The U.S. Geological Survey now supports a set of graphical pages on the World Wide Web. Digital geologic publications (including this one) can be accessed via these pages. The web page for digital geologic publications from the Western Region (including this one) is "http://wrgis.wr.usgs.gov". Once at the main page, click on '**Geologic Map Databases**' under the heading '**Data Online**'; next click on '**California**.' Scroll down to get to the listing for this database. Click on '**Open-File Report 97-489**'; this will take you to the web page for this database. Set your web browser to save to a local disk and click on the link labeled 'scruz.tar.gz' to download the compressed tar file that contains the Santa Cruz County map database, or, select a single layer, layers or the PostScript plot file (sc-sht1.ps.gz).

EXTRACTING THE GEOLOGIC MAP DATABASE FROM THE TAR FILE

If you obtained the database package on tape:

put the tape in your tape drive	
cd local_directory	-go to a directory to receive the tar file
tar xvfb /dev/rstn 20	-/dev/rstn is the tape device with n an integer, this puts the tar file in local_directory; 20 is the block size of the tar file
gzip -d scruz.tar.gz	-makes a 36.3 MB uncompressed tar file scruz.tar
cd local_directory2	-go to the directory that will hold the directory scruz (if different from local_directory)
tar xvfb {path to tar file}/scruz.tar 20	-extract the scruz directory from the tar file; 20 is the block size of the tar file.

If you obtained the database package by anonymous ftp or from the web page:

gzip -d scruz.tar.gz	-makes a 36.3 MB uncompressed tar file scruz.tar
cd local_directory2	-go to the directory that will hold the directory scruz (if different from local_directory)
tar xvfb {path to tar file}/scruz.tar 20	-extract the scruz directory from the tar file.

Each of the processes described above will create a directory "scruz" that contains the ARC export files and supporting files as described below. The directory structure at this point will look like this:

scruz/
- sc-geol.e00
- sc-strc.e00
- sc-topo.e00
- scdb.ps
- scdb.txt
- import.aml

CONVERTING ARC EXPORT FILES

ARC export files are converted to ARC coverages using the ARC command IMPORT with the option COVER. In order to ease conversion and to maintain naming conventions, we have included an ASCII text file in ARC Macro Language that will convert all of the export files in the database into coverages and create the associated INFO directory. Change directories to the scruz/ directory. From the ARC command line type:

Arc: &run import.aml

ARC export files can also be read by some other Geographic Information Systems. Please consult your GIS documentation to see if you can use ARC export files and the procedure to import them.

DIGITAL COMPILATION

The geologic map information was digitized from a stable original of the geologic map at 1:62,500 scale. The author manuscript (ink on a greenline) was scanned using a monochrome scanner with a resolution of 800 dots per inch. The scanned image was vectorized and transformed from scanner coordinates to projection coordinates with digital tics placed by hand at latitude/longitude intersections. The scanned lines were edited interactively by hand using graphical user interface ALACARTE (Fitzgibbon, 1991, Fitzgibbon and Wentworth, 1991, Wentworth and Fitzgibbon, 1991). Scanning artifacts significant for display at a scale of 1:62,500 were corrected.

BASE MAP

The base map layer (sc-topo) was prepared by scanning a scale-stable clear film of the U.S Geological Survey, San Francisco Bay Region, sheet 3, 1:125,000 (1970) topographic map. The clear film was scanned using a monochrome scanner with a resolution of 400 dots per inch. The raster scan was converted to a GRID in ARC/INFO. The GRID was then vectorized and reprojected into UTM Projection using the latitude/longitude intersections as reference points. The arcs in the base layer have not been attributed. The base map is provided for reference only.

SPATIAL RESOLUTION

Uses of this digital geologic map should not violate the spatial resolution of the data. Although the digital form of the data removes the constraint imposed by the scale of a paper map, the detail and accuracy inherent in map scale are also present in the digital data. The fact that this database was edited at a scale of 1:62,500 means that higher resolution information is not present in the dataset. Plotting at scales larger than 1:62,500 will not yield greater real detail, although it may reveal fine-scale irregularities below the intended resolution of the database. Similarly, where this database is used in combination with other data of higher resolution, the resolution of the combined output will be limited by the lower resolution of these data.

FAULTS

This database is not sufficiently detailed or comprehensive to identify or characterize site-specific hazards represented by faults shown; the faults shown do not take the place of fault-rupture hazard zones designated by the California State Geologist (see Hart, 1988).

DATABASE SPECIFICS

The map databases consist of ARC coverages which are stored in UTM projection (Table 1). Digital tics define a 2.5 minute grid of latitude and longitude in the geologic coverages corresponding with the corners of the 7.5' quadrangles that fall within the county.

Table 1 - *Map Projection*
The map is stored in Universal Transverse Mercator projection

PROJECTION UTM	
UNITS METERS	-on the ground
ZONE 10	-UTM Zone 10
DATUM NAD27	
PARAMETERS	-none

The content of the geologic database can be described in terms of the lines and the areas that compose the map. Descriptions of the database fields use the terms explained in Table 2.

Table 2 - *Field Definition Terms*

ITEM NAME	name of the database field (item)
WIDTH	maximum number of digits or characters stored
OUTPUT	output width
TYPE	B-binary integer, F-binary floating point number, I-ASCII integer, C-ASCII character string
N. DEC.	number of decimal places maintained for floating point numbers

LINES

The lines (arcs) are recorded as strings of vectors and are described in the arc attribute table (Table 3). They define the boundaries of the map units, the boundaries of open bodies of water, and the map boundaries. These distinctions, including the geologic identities of the unit boundaries, are recorded in the LTYPE field according to the line types listed in Tables 4 and 5.

Table 3 - *Content of the Arc Attribute Tables* (SC-GEOL.AAT, SC-STRC.AAT)

ITEM NAME	WIDTH	OUTPUT	TYPE	N. DEC	
FNODE#	4	5	B		starting node of arc (from node)
TNODE#	4	5	B		ending node of arc (to node)
LPOLY#	4	5	B		polygon to the left of the arc
RPOLY#	4	5	B		polygon to the right of the arc
LENGTH	4	12	F	3	length of arc in meters
<coverage>#	4	5	B		unique internal control number
<coverage>-ID	4	5	B		unique identification number
LTYPE	35	35	C		line type (see Tables 4 and 5)
SEL	1	1	I		user defined field used to save a selected set
SYMB	3	3	I		user defined field used to save symbol assignments (such as color)

Table 4 - *Line Types Recorded in the LTYPE Field* (SC-GEOL)

contact, approx. located
contact, certain
contact, inferred
fault, approx. located
fault, certain
fault, concealed
map boundary, certain
scratch boundary
scratch boundary, countyline
water boundary

Table 5 - *Line Types Recorded in the LTYPE Field* (SC-STRC)

f.a., anticline, approx. located
f.a., anticline, certain
f.a., anticline, concealed
f.a., syncline, approx. located
f.a., syncline, certain
f.a., syncline, concealed

AREAS

Map units (polygons) are described in the polygon attribute table (Table 6) The identities of the map units from compilation sources are recorded in the PTYPE field by map label (Table 7). For a full description of the map units, consult the PostScript plot file (sc-sht1.ps).

Table 6 - *Content of the Polygon Attribute Tables* (SC-GEOL.PAT)

ITEM NAME	WIDTH	OUTPUT	TYPE	N. DEC	
AREA	4	12	F	3	area of polygon in square meters
PERIMETER	4	12	F	3	length of perimeter in meters
<coverage>#	4	5	B		unique internal control number
<coverage>-ID	4	5	B		unique identification number
PTYPE	35	35	C		unit label (see Table 7)
SEL	1	1	I		user defined field used to save a selected set
SYMB	3	3	I		user defined field used to save symbol assignments (such as color)

Table 7 - *Map Units* (SC-GEOL)

Kcg	Qof	Tmm	hcg
Kgs	Qt	Tmp	m
QTc	Qtl	Tms	wf
Qae	Qwf	Tp	qd
Qaf	Qyf	Tps	sch
Qal	Qyfo	Ts	
Qar	Tbl	Tsc	
Qb	Tblc	Tsl	
Qbs	Tbm	Tsm	
Qce	Tbs	Tsr	
Qcf	Tbu	Tst	
Qcl	Tl	Tvq	
Qcu	Tla	Tz	
Qds	Tlo	db	
Qem	Tlss	ga	
Qes	Tm	gd	

POINTS

Point information (strikes and dips) is recorded as coordinate and related information and is described in the Point Attribute Table (Table 8). The identities of point types recorded in the PTTYPE field of the SC-STRC.PAT table are shown in Table 9.

Table 8 - *Content of the Point Attribute Tables* (SC-STRC.PAT)

ITEM NAME	WIDTH	OUTPUT	TYPE	N. DEC	
AREA	4	12	F	3	not used
PERIMETER	4	12	F	3	not used
<coverage>#	4	5	B		unique internal control number
<coverage>-ID	4	5	B		unique identification number
PTTYPE	35	35	C		point type (see Table 9)
DIP	3	3	I		dip angle in degrees
STRIKE	3	3	I		strike angle in degrees
SEL	1	1	I		user defined field used to save a selected set
SYMB	3	3	I		user defined field used to save symbol assignments (such as color)

Table 9 - *Point Types* (SC-STRC)

approx dip of bedding
bedding
flat bedding
foliation
ot bedding
vert bedding

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