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

Digital Bedrock Geologic Map Database of the Beatty 30 x 60-minute quadrangle, Nevada and California

By

[1]Michael D. Carr; [2]David A. Sawyer; [3]Kathryn Nimz;
[2]Florian Maldonado; and [2]WC Swadley

Open-File Report 96-291

[1] Reston, Virginia; [2]Denver, Colorado; [3]Menlo Park, California

1996

DESCRIPTION OF THE DATABASE

This geologic map database is a bedrock compilation of the Beatty 30'x 60' quadrangle in southern Nevada and adjoining parts of California. The database represents a new compilation at 1:100,000-scale of the southern part of the southwestern Nevada volcanic field and Paleozoic and late Precambrian sedimentary rocks in Bare Mountain and the Funeral Mountains. The map area includes the entire region around Yucca Mountain, the proposed national high-level nuclear waste repository, and the eastern part of Death Valley National Park. A major epithermal disseminated gold deposit is being mined at Ladd Mountain, in the southeastern Bullfrog Hills, and the geology of numerous other areas of mineralization in the Bullfrog Hills and adjoining Bare Mountain is depicted. A major part of the map area is included within the Nevada Test Site (previously geologically mapped at 1:24,000-scale, the new compilation reflects numerous recent studies of stratigraphy and structure), and parts of the Nellis Air Force Base Bombing Range. Together with the description of map units (btyrep.txt or btyrep.ps), and in conjunction with the recently published Nevada Test Site Region map database (Sawyer and others, 1995, USGS Open-File Report-567), the Beatty geologic map database provides the most recent synthesis of the stratigraphy and structural geology of the southwestern Nevada volcanic field, the Nevada Test Site, and the Yucca Mountain site. The content and character of the database files are described herein, along with two methods of obtaining the database.

DATABASE CONTENTS

The digital database consists of the geologic map database itself and the supporting data including base maps, annotation layers, symbol sets and related data not included with ARC/INFO, plot files, amls, and text files. The data is available in ARC/INFO export format.

ARC/INFO export files	ARC/INFO coverages	Tar file size (in Kb)
bty_geo.e00	Faults, depositional contacts, and geologic unit identities	????
bty_fold.e00	Fold axes	
bty_att.e00	Oriented symbols (strike and dip information)	
bty_bar.e00	Point layer containing bar & ball points for normal faults	
bty_meta.e00	Lines and polygons delineating metamorphic zones	
bty_cald.e00	Line coverage of caldera features	
bty_anno.e00	Labels for metamorphic zones	
bty_cult.e00	Base map- culture separate	
bty_drn.e00	Base map- drainage separate	
bty_indx.e00	Base map- index contours separate	

bty_int.e00	Base map- intermediate contours separate

Accessory Data
Custom symbolsets and fonts (not included with the ARC/INFO package) and plot AML

alc.shd	Shadeset of colors for geologic polygons
alcgeol.mrk	Markerset for plotting structural symbols and bar & ball symbols
geol61.lin	Lineset for geologic lines
k.carto.lin	Lineset for isograd and caldera layers
kdroid.mrk	Lineset for fold layer symbols
gp.txt	Textset used for plotting geologic unit labels; contains special geologic characters for Cambrian, Pennsylvanian, Triassic, etc.
johanna.txt	Textset for rest of map
fnt027	Font for custom markerset, lineset, or textset
fnt038	Font for custom markerset, lineset, or textset
fnt039	Font for custom markerset, lineset, or textset
btyplot.aml	AML for plotting the beatty map
geopoly.key	Keyfile of geologic polygons and labels

INFO
INFO directory containing look-up tables used to match symbols, colors, etc., to the existing open file 96-261 of the Beatty map

caldlera.lut.e00	Lookup table for caldera linetypes
clinemrk.lut.e00	Lookup table for marker symbols used for anticlines and synclines
geopoly.lut.e00	Lookup table for geologic unit color designations
geol61.lut.e00	Lookup table for geologic linetypes
metaline.lut.e00	Lookup table for metamorphic boundary lines
ptpl.lut.e00	Lookup table for structural symbols and bar & ball symbol

Associated plot files

bty_map.ps	Rotated postscript file of the Beatty Quadrangle (Sheet 1)
bty_map.pdf	Above in PDF format (Portable Document Format used by Adobe Acrobat)
bty_sht2.eps	Sheet 2 containing a correlation chart, an index of supplemental sources of geologic mapping, an index of topographic maps, and a location map
bty_sht2.pdf	Above in PDF format (Portable Document Format used by Adobe Acrobat)

Report files:

btydb.txt	ASCII text file of this report
btydb.pdf	PDF file of this report; formatting retained
btyrep.txt	ASCII version of the text file containing detailed unit descriptions and geological information which accompanied OpenFile Report 96-261.
btyrep.pdf	PDF version of the text file containing detailed unit descriptions and geological information which accompanied OpenFile Report 96-261; formatting and graphics retained

ORGANIZATION OF THE DATA RELEASE

The database was compiled in ARC/INFO, a commercial Geographic Information System (Environmental Systems Research Institute, Redlands, California), and is available in uncompressed ARC export format (ARC/INFO version 7.0.3) in a compressed UNIX tar (tape archive) file. Tar and uncompress utilities are therefore required to extract the database from the tar file. Export files (.e00 extension) can be imported into ARC/INFO coverage format or can be read by some other Geographic Information Systems such as MapInfo via ArcLink. The digital compilation was done using version 7.0.3 of ARC/INFO with version 3.0 of the menu interface ALACARTE (Fitzgibbon and Wentworth, 1991, Fitzgibbon, 1991, Wentworth and Fitzgibbon, 1991).

The ARC/INFO export files, accessory data and INFO files are contained in a single compressed tar file: beatty.tar.Z. The plot files and report files are available as individual files.

OBTAINING THE DIGITAL DATA

The digital data can be obtained in three ways:

a. The Web over the Internet
b. Anonymous ftp over Internet
c. By sending a tape with request

a. To obtain files via the Web go to the following page:

   http://wrgis.wr.usgs.gov/open-file/of96-261

b. To obtain the tar file by ftp, ftp to wrgis.wr.usgs.gov using user name of anonymous and your email address as password. Then cd to pub/open-file/of96-261. Change transfer type to binary with the “bin” command. List directory contents with the “ls”

command. Use “get” to download the file(s) of interest.

c. Send a tape with request and return address to:

Beatty Digital Database
c/o BWRG Data Coordinator
U.S. Geological Survey
345 Middlefield Road, M/S 975
Menlo Park, CA 94025

Do not omit any part of this address

The compressed tar file will be returned on the tape. The acceptable tape types are:
1/4 inch, 150 MB cartridge tape
2.3 or 5.0 GB, 8 mm Exabyte tape.

Extracting the Database from the Tar file:

If you obtained the database 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	-/dev/rstn is the tape device with n an integer this puts the tar file in local_directory
uncompress <file>.tar.Z	-makes an uncompressed tar file <file>.tar
cd local_directory2	-go to the directory that will hold the data <file> (if different from local_directory)
tar xvfb {path to tar file}/<file>.tar	-extract the <file> workspace from the tar file.

This process will create a directory "/<file>". Import and export AMLs are included with the export format data so that the files can be converted into ARC coverage format.

DIGITAL COMPILATION

The current map database incorporates geologic data from: (1) digitized (by scanning) polygon, fault, and structural attitude layers of the published 1:100,000-scale geologic map of the NTS (Frizzell and Shulters, 1990, and Figure 1a, Sources of Compiled Geologic Data); (2) the digital 1:100,000-scale geologic compilation of the Pahute Mesa 30' by 60' quadrangle (Minor and others, 1993); (3) the recent digital database compilation of the NTS by Sawyer and others (1995), and (4) recent field studies of stratigraphy and structure by the authors and others. Numerous revisions of the of the NTS area were also made by adding new field and stratigraphic data to the published 1:24,000- scale geologic data (see Figure 1b; Sources of Original Geologic Data).

The scanned images were vectorized and transformed from scanner coordinates to projection coordinates using digital tics at quadrangle corners and internal locations. The

scanned lines were edited interactively using ALACARTE, unit boundaries were tagged as a contact or fault as appropriate, and scanning artifacts visible at 1:100,000 were removed.

The map dataset may produce some minor display conflicts that reflect limitations of the algorithms used to automatically generate the labels; unit labels of some narrow polygons extend into adjoining polygons, and faults or fault decorations (e.g., ball and bars) locally overlap map unit labels or structural attitude symbols. These labeling conflicts were not resolved for this version of the map because they do not affect the quality or resolution of the database when used in a GIS. The reader is referred to published copies of the U.S. Geological Survey Beatty 1:100,000-scale base map for clarification of place names and other geographic base map features.

Base Maps

Base map layers were prepared from scale-stable film positives at 100,000 scale, of the U.S. Geological Survey Beatty (1986 edition) topographic map. The base was scanned on a Scitex scanner as four separate layers (culture, drainage, index contours, and intermediate contours). Scanned and vectorized images were transformed from scanner coordinates to projection coordinates using digital tics. Scanning artifacts are common in the base map coverages, and they were not removed. The base is intended for reference only; no information other than location is attached to the lines.

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 geologic map dataset is considered an accurate compilation at the line-width and simplified polygon geometry depicted at 1:100,000-scale level of detail. Enlarging or viewing the dataset at scales greater than about 1:50,000 (in particular with comparison to 1:24,000-scale topographic or published geologic maps) will in some cases show polygon contacts or structural features to be inaccurately located at the larger scales of resolution. 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.

DATABASE SPECIFICS

The map databases consist of ARC coverages and supporting INFO files, which are stored in a UTM (Universal Transverse Mercator) projection (Table 1). Digital tics define a 30 x 60 minute grid of latitude and longitude with the tics corresponding to quadrangle corners.

Table 1 - ARC/INFO Map Projection Specifications

PROJECTION UTM -Universal Transverse Mercator
UNITS METERS -on the ground
ZONE 11 -UTM zone
PARAMETERS
END

The content of the geologic database can be described in terms of the lines (arcs), areas (polygons) and the point locations (points) 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

The Beatty digital data set will include the following ARC/INFO coverages: a geology layer (bty_geo), a boundary layer (bty_bnd) a fold layer (bty_fld), an attitude layer (bty_att), an annotation layer (bty_ann), caldera lines layer (bty_cald), metamorphic boundaries layer (bty_meta), and 4 base layers (bty_cult_topo; bty_dr_topo; bty_ind_topo; bty_int_topo)

Geology layer (bty_geo) -
Geology layer contain lines and areas.

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 (contacts), faults, dikes, boundaries of open bodies of water, and the map boundaries (fold axes are recorded on structure layers). These distinctions, including the geologic identities of the unit boundaries, are recorded in the LTYPE field according to the line types listed in Table 4.

Table 3 - Content of the Arc Attribute Tables of geology and structure layers

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

Table 4 - Line Types Recorded in the LTYPE Field of geology layers

(The geologic line types are ALACARTE line types that correlate with the geologic line symbols in the ALACARTE line set GEOL61.LIN according to the ALACARTE lines lookup table GEOL61.LUT. The LTYPE, "thrust fault, inferred, queried_" is equivalent to "thrust fault, inferred, queried" and is used to display question mark symbols according to fault orientation. The scratch boundary is used to close off areas with unknown aerial extent for display purposes.)

atten. fault, certain
atten. fault, concealed
atten. fault, inferred
contact, certain
fault, Quaternary fault, certain
fault, Quaternary fault, inferred
fault, approx. located
fault, certain
fault, concealed
fault, inferred
map boundary, certain
normal fault, approx. located
normal fault, certain
normal fault, concealed
scratch boundary, certain
thrust fault, certain
thrust fault, concealed

Areas -

Geologic map units (polygons) are described in the polygon attribute table (Table

5) The identities of the map units are recorded in the PTYPE field by map label (Table 6). Map units are described more fully in the accompanying text file (btyrep.txt or btyrep.ps).

Table 5 - Content of the Polygon Attribute Tables of geology layers

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

Table 6 - Map Units Recorded in the PTYPE Field of geology layer
(See btyrep.txt or btyrep.ps for descriptions of units)

Note:
The symbol } represents the special character for Cambrian;
The symbol @ represents the special character for Pennsylvanian

Qe
Qp
Qt
QTa
QTp
Qby
Qbo
Typ
Tgf
Tgy
Tgfc
Tgo
Tsp
Tyb
Tgm
Tgc
Tgyx
Ttt
Ttp
Tfu
Tfn
Tfs
Tfd

Tiy
Tfr
Tft
Tfb
Tfl
Tff
Tmaw
Tma
Tmx
Tmc
Tmt
Tmr
Tmrf
Tgnx
Tmn
Tpu
Tpc
Tpx
Tpy
Tpm
Tpp
Tpt
Tac
Tio
Tw
Tws
Tcp
Tcb
Tcr
Tct
Tgp
Tgox
Trl
Trd
Trr
Tn
Tqs
Ton
Toy
Tgt
Tge
TKd
Kg
P@t
@Mcs
MDe

Dsf
Dg
Ds
DSlm
DSsl
Sr
Oes
Oe
Op
{n
{bb
{bp
{c
{z
{Zw
Zs
Zj
Yk
Yb
Yc
Xmi

Structure layers (bty__att; bty_fold; bty_bar) -

Structure layers contain points and annotation, and may contain lines if fold axes are represented.

Points -

Points are described in the point attribute table (Table 7) Point types are recorded in the PTTYPE field according to the point types listed in Table 8. Points in the structure layer represent attitude measurements. Planar attitudes record strike in the STRIKE field and dip in the DIP field. Linear attitudes record bearing in the STRIKE field and plunge in the DIP field.

Table 7 - Content of the Point Attribute Tables of structure layer

ITEM NAME	WIDTH	OUTPUT	TYPE	N. DEC	
AREA	4	12	F	3	not applicable (always 0)
PERIMETER	4	12	F	3	not applicable (always 0)
<coverage>#	4	5	B		unique internal control number
<coverage>-ID	4	5	B		unique identification number
PTTYPE	35	35	C		point type
DIP	3	3	I		plunge or dip of linear or planar feature
STRIKE	3	3	I		azimuth of oriented symbol

Table 8 - Point Types Recorded in the PTTYPE Field of structure layer

(The orientation of the point symbol which represents the attitude is rotated to match the appropriate orientation indicated in the STRIKE field. The amount of rotation for each symbol is stored in the $ANGLE pseudo item.)

bedding
flat bedding
foliation
horz foliation
ot bedding
vert bedding
vert foliation and bedding

Annotation -

Structure coverages contain annotation features. Annotation has meaning for display purposes only and does not represent any real world object. Annotation representing the value coded in the DIP field is placed near each point. The text of the annotation, a character string identical to the DIP value, is stored in the $TEXT pseudo item. No annotation is placed by attitude symbols which imply dip inherently, e.g. horizontal or vertical bedding symbols.

Lines -

The lines (arcs) are recorded as strings of vectors and are described in the arc attribute table (Table 3). They define fold axes and are recorded in the LTYPE field according to the line types listed in Table 9.

Table 9 - Line Types Recorded in the LTYPE Field of structure layers

(The geologic line types are ALACARTE line types that correlate with the geologic line symbols in the ALACARTE line set GEOL61.LIN according to the ALACARTE lines lookup table (GEOL61.LUT). The designation "f.a." is used in ALACARTE to distinguish fold axes.)

f.a., anticline, approx. located
f.a., anticline, certain
f.a., minor plunging anticline, app
f.a., minor plunging anticline, certain
f.a., minor plunging overturned anticline
f.a., minor plunging syncline, approx. located
f.a., minor plunging syncline, certain

f.a., overturned anticline, approx. located
f.a., overturned syncline, approx. located
f.a., overturned syncline, certain
f.a., plunging anticline, approx. located
f.a., plunging anticline, certain
f.a., plunging overturned syncline, certain
f.a., syncline, approx. located

Annotation layer (bty_anno) -
Annotation layers contain annotation and lines. Annotation layers do not include geologic data; they are cartographic layers to be used for graphical display.

Annotation -

Annotation coverages contain the names of geologic units and metamorphic zones. These are placed and sized for display on a plotted version of the map at 1:100,000 scale. They are meant to be displayed with their associated leaders as some labels may lie outside of the geologic unit they describe.

Lines -

The lines (arcs) are recorded as strings of vectors and are described in the arc attribute table (Table 3). Lines on an annotation layer are leaders to unit labels which lie outside of their geologic unit. The LTYPE field is left blank for these layers.

Base layers (bty_cult_topo; bty_dr_topo; bty_int_topo; bty_ind_topo) -
Base layers contain lines.

Lines -

The lines (arcs) are recorded as strings of vectors and are described in the arc attribute table (Table 3). The base layers are scans and have no attributes (there is no LTYPE field in the arc attribute table of base layers).

Caldera layer (bty_cald) -
Caldera layer contains lines only

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 alteration zones as well as oil shale locations. These distinctions are recorded in the LTYPE field according to the line types listed in Table 10.

Table 10 - Line Types Recorded in the LTYPE Field of caldera layer
(The caldera line types are custom line types that correlate with the line symbols in the lineset K.CARTO.LIN. according to the look-up table CALDERA.LUT)

caldera-struct-margin, certain
caldera-struct-margin, approx. located
caldera-topo-wall, approx. located
caldera-topo-wall, certain
margin-uncertain, inferred, queried

Metamorphic boundaries layer (bty_meta) -
Metamorphic boundaries layer contain lines and areas.

Lines -

The lines (arcs) are recorded as strings of vectors and are described in the arc attribute table (Table 3). These distinctions are recorded in the LTYPE field according to the line types listed in Table 11.

Table 11 - Line Types Recorded in the LTYPE Field of metamorphic layer
(The metamorphic line types are custom line types that correlate with the line symbols in the lineset K.CARTO.LIN. according to the look-up table METALIN.LUT)

contact, certain
fault, certain
metamorphic.facies, approx. located
metamorphic.isograd, certain

Areas -

Metamorphic zones (polygons) are described in the polygon attribute table (Table 5) The identities of the metamorphic zones are recorded in the PTYPE field by label (Table 12).

Table 12 - Polygon Types Recorded in the PTYPE Field of metamorphic layer
(See Description of Map symbols in btyrep.txt or btyrep.ps for explanation)

LA
G
MA
SG
UA

Sheet 2

Sheet 2 was created on an Apple Macintosh computer in Adobe Illustrator v 5.5. The sheet consists of a correlation chart, description of map symbols, index map, and index of geologic mapping. The plate was saved an encapsulated postscript file (eps) with preview= none and compatibily= illustrator 5 . The filename is bty.sheet2.ps

INQUIRIES

Inquiries about the geologic interpretation should be directed to Michael D. Carr or David A. Sawyer. Technical inquiries concerning the data structures and data files can be addressed to Kathryn Nimz.

Michael D. Carr
U.S. Geological Survey
12201 Sunrise Valley Drive, MS 107
Reston, VA 22092

David A. Sawyer
U.S. Geological Survey
P.O. Box 25046, MS 913
Denver, CO 80225

Kathryn Nimz
U.S. Geological Survey
345 Middlefield Rd. MS 975
Menlo Park, CA 94025

E mail:
mdcarr@usgs.gov
dsawyer@usgs.gov
kpnimz@usgs.gov

Phone:
(703)-648-4408 (Carr)
(303)-236-1021 (Sawyer)
(415)-329-4958 (Nimz)

ACKNOWLEDGMENTS

Compilation of the digital database depended on advice and assistance in the use of ALACARTE - ARC/INFO from T.T. Fitzgibbon, C.M. Wentworth, and G.A. Phelps, and Johanna Fenton

REFERENCES CITED

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.
__ALACARTE 2.0 for ARC/INFO 6.x is available over Internet.
Wentworth, C.M., and Fitzgibbon, T.T., 1991, ALACARTE user manual (version 1.0): U.S. Geological Survey, Open-File Report 91-587C.