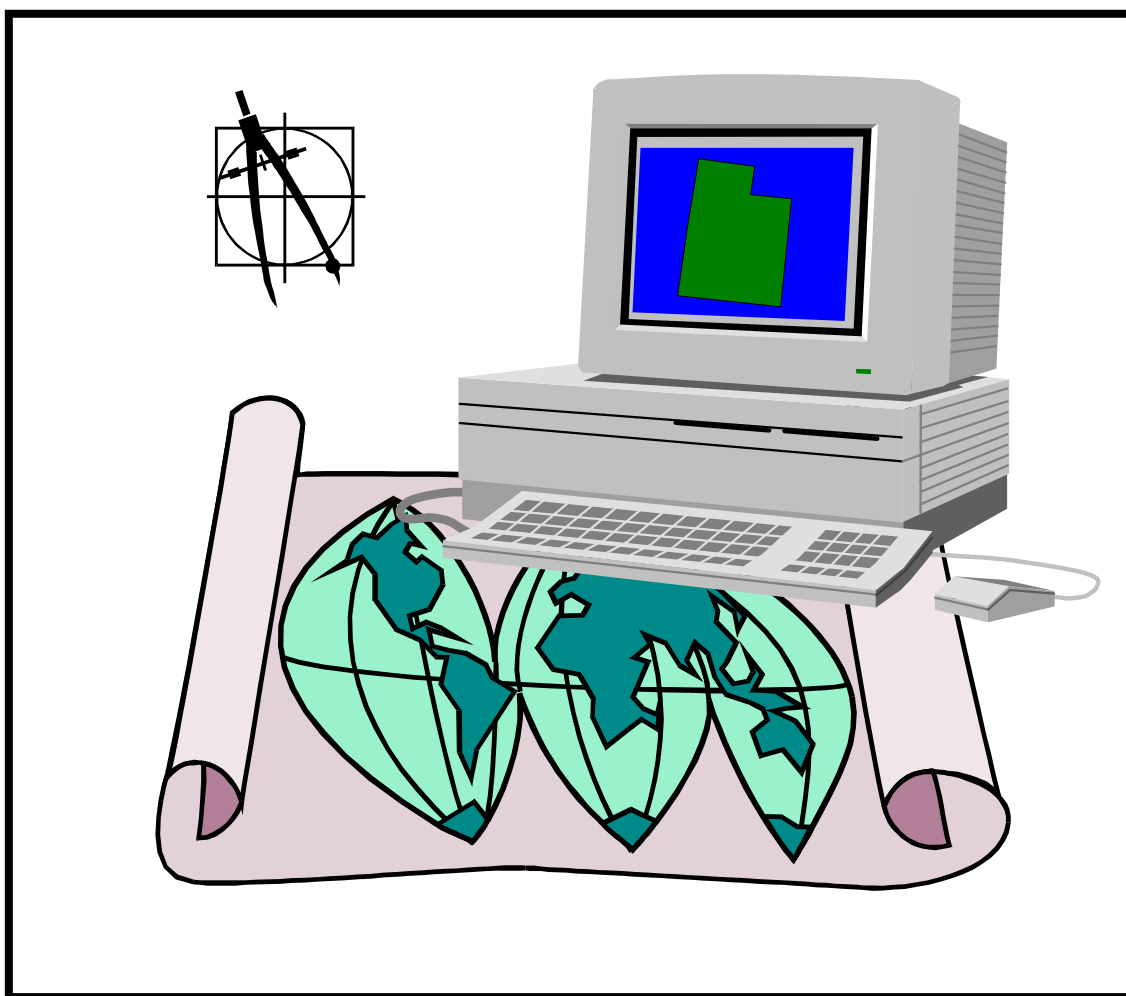


DIGITAL GEOLOGIC MAP OF UTAH

Compiled by

Lehi F. Hintze
Grant C. Willis
Denise Y.M. Laes
Douglas A. Sprinkel
Kent D. Brown



Map 179DM March 2000
UTAH GEOLOGICAL SURVEY
a division of
Utah Department of Natural Resources

in cooperation with
U.S. Geological Survey



STATE OF UTAH
Michael O. Leavitt, Governor

DEPARTMENT OF NATURAL RESOURCES
Kathleen Clarke, Executive Director

UTAH GEOLOGICAL SURVEY
Kimm M. Harty, Acting Director

UGS Board

Member	Representing
Craig Nelson (Chairman)	Civil Engineering
D. Cary Smith	Mineral Industry
C. William Berge	Mineral Industry
E.H. Deedee O'Brien	Public-at-Large
Robert Robison	Mineral Industry
Charles Semborski	Mineral Industry
Richard R. Kennedy	Economics-Business/Scientific
David Terry, Director, Trust Lands Administration	<i>Ex officio member</i>

UTAH GEOLOGICAL SURVEY

The **UTAH GEOLOGICAL SURVEY** is organized into five geologic programs with Administration, Editorial, and Computer Resources providing necessary support to the programs. The **ECONOMIC GEOLOGY PROGRAM** undertakes studies to identify coal, geothermal, uranium, hydrocarbon, and industrial and metallic resources; initiates detailed studies of these resources including mining district and field studies; develops computerized resource data bases, to answer state, federal, and industry requests for information; and encourages the prudent development of Utah's geologic resources. The **APPLIED GEOLOGY PROGRAM** responds to requests from local and state governmental entities for engineering-geologic investigations; and identifies, documents, and interprets Utah's geologic hazards. The **GEOLOGIC MAPPING PROGRAM** maps the bedrock and surficial geology of the state at a regional scale by county and at a more detailed scale by quadrangle. The **GEOLOGIC EXTENSION SERVICE** answers inquiries from the public and provides information about Utah's geology in a non-technical format. The **ENVIRONMENTAL SCIENCES PROGRAM** maintains and publishes records of Utah's fossil resources, provides paleontological and archeological recovery services to state and local governments, conducts studies of environmental change to aid resource management, and evaluates the quantity and quality of Utah's ground-water resources.

The UGS Library is open to the public and contains many reference works on Utah geology and many unpublished documents on aspects of Utah geology by UGS staff and others. The UGS has several computer data bases with information on mineral and energy resources, geologic hazards, stratigraphic sections, and bibliographic references. Most files may be viewed by using the UGS Library. The UGS also manages a sample library which contains core, cuttings, and soil samples from mineral and petroleum drill holes and engineering geology investigations. Samples may be viewed at the Sample Library or requested as a loan for outside study.

The UGS publishes the results of its investigations in the form of maps, reports, and compilations of data that are accessible to the public. For information on UGS publications, contact the Natural Resources Map/Bookstore, 1594 W. North Temple, Salt Lake City, Utah 84116, (801) 537-3320 or 1-888-UTAH MAP. E-mail: nrugs.geostore@state.ut.us and visit our web site at <http://www.ugs.state.ut.us>.

UGS Editorial Staff

J. Stringfellow	Editor
Vicky Clarke, Sharon Hamre	Graphic Artists
Patricia H. Speranza, James W. Parker, Lori Douglas.....	Cartographers

The Utah Department of Natural Resources receives federal aid and prohibits discrimination on the basis of race, color, sex, age, national origin, or disability. For information or complaints regarding discrimination, contact Executive Director, Utah Department of Natural Resources, 1594 West North Temple #3710, Box 145610, Salt Lake City, UT 84116-5610 or Equal Employment Opportunity Commission, 1801 L Street, NW, Washington DC 20507.



Digital Geologic Map of Utah

Map Scale -- 1:500,000

compiled by

Lehi F. Hintze¹
Grant C. Willis²
Denise Y.M. Laes²
Douglas A. Sprinkel²
Kent D. Brown²

Map 179DM

Utah Geological Survey
a division of
Utah Department of Natural Resources

in cooperation with
U.S. Geological Survey

This digital map was produced from source mapping at 1:500,000 scale and is not intended for use at larger scales. Enlargement of parts of the map to larger scales may result in incorrect geographic placement or interpretation of geologic features.

The Utah Geological Survey is not responsible for any unauthorized modification of this data. Any modification of this digital data must be clearly and prominently reported in printed and digital materials produced or distributed by the data modifier, and must not be attributed to, nor implied to be endorsed by, the Utah Geological Survey.

The views and conclusions contained in this digital and printed map and report are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the U.S. Government.

¹ Brigham Young University, Provo, Utah 84602 and Utah Geological Survey, retired

² Utah Geological Survey, 1594 W. North Temple, PO Box 146100, Salt Lake City, Utah 84114-6100; phone: 801-537-3300; fax 801-537-3400; <http://www.ugs.state.ut.us>

CONTENTS

ABSTRACT	1
METHODS	2
MODIFICATIONS TO THE ORIGINAL MAP	4
COMPACT DISC CONTENTS AND ACCESSING THE FILES	7
DESCRIPTION OF DIGITAL FILES.....	9
Description of ArcInfo Coverage.....	10
Description of Shapefiles.....	12
GEOLOGIC MAP EXPLANATION	12
ACKNOWLEDGMENTS	16

TABLE

Table 1. Names and brief description of the folders, subfolders, spatial data files, and other selected files included on this compact disc	15
--	----

ABSTRACT

This map on compact disc is a digital version of the 1:500,000-scale *Geologic Map of Utah* compiled by Lehi F. Hintze and published by the Utah Geological (and Mineral) Survey in 1980. In general, the digital map is identical to the 1980 published map; however, it contains some minor revisions. In addition, this digital release supercedes a digital version of the *Geological Map of Utah* completed by the GIS laboratory at Utah State University. The Utah State University version was temporary and incomplete, and map users are encouraged to replace working copies of that digital map with this digital geologic map.

The digital spatial data files that comprise the *Digital Geologic Map of Utah* are provided in both PC ARC/INFO coverage and ArcView GIS shapefiles as well as ArcInfo Import files. The files are organized in several folders and subfolders. In addition to the spatial data files, several program, PDF, text, database, and image files are included to help the user view, evaluate, and utilize the spatial data. The metadata for each coverage or theme are in the respective subfolder that contains the spatial data. The projection of the geospatial data included on this compact disc is UTM zone 12, North American Datum 1927, and spheroid Clarke 1866. The units are in meters.

The spatial data files can only be displayed using Geographic Information System software. Similarly, the Acrobat portable document files can only be viewed using Adobe Acrobat or Acrobat Reader. ArcExplorer 1.1 and Acrobat Reader 4.05 are included on the compact disc for your convenience and must be installed to view the

spatial data and portable document files. It is not necessary to install these programs if Geographic Information System software and Acrobat or Acrobat Reader are already installed on your computer or computer network.

METHODS

This digital geologic map was produced from the 1:500,000-scale *Geologic Map of Utah* compiled by Lehi F. Hintze, published by the Utah Geological (and Mineral) Survey in 1980. This digital release supercedes a digital version of the *Geological Map of Utah* completed by the GIS laboratory at Utah State University. The Utah State University version was temporary and incomplete, and map users are encouraged to replace working copies of that digital map with this digital geologic map.

The digital geologic map is a cooperative project of the Utah Geological Survey (UGS) and the U.S. Geological Survey (USGS). The USGS contracted with Optronics Specialty Company, Inc. (19619 Prairie Street, Northridge, CA 91324) to scan, vectorize, and attribute the geologic map in ArcInfo format. Optronics scanned stable-film positive separates of the original scribed geologic map provided by the UGS. Two separates were used: (1) geologic contacts and faults, and (2) open bodies of water that form boundaries of geologic units or polygons. Original copies of these separates are preserved in archives at the UGS.

Optronics scanned the separates on a high-resolution drum scanner. They then geographically referenced and vectorized the resulting raster images using a published

colored paper copy of the geologic map as a guide, compared the resulting line work with the sources by overlaying copies of the digital and original maps on a light table, and produced map topology and attributes using ArcInfo software. Optronics determined the identity of map polygons for attributing by visually examining the color of the polygons on a published paper map since many polygons do not have text annotations, and no annotation separate was available in UGS archives.

The completed digital map was turned over to the USGS. They digitized line and symbolic features such as volcanic cones, gilsonite veins, and igneous dikes from a paper map since no film positive of these layers was available.

Next, the UGS carefully reviewed a color plot of the digital map to search for errors and unattributed polygons. (The contract arrangement stated that Optronics would not attribute polygons for which they could not be sure of the proper geologic map unit identity or that were in error on the original published map.) The UGS searched original sources to determine the proper identity of unknown or mislabeled polygons. The USGS and UGS made these corrections.

The UGS made a second round of reviews and corrections to the digital map. In addition, the UGS made a few selected revisions to improve it from the 1980 version (see below). The UGS then prepared the digital map files, explanatory materials and files, and supporting documents for public release.

MODIFICATIONS TO THE ORIGINAL MAP

The UGS, USGS, and Optronics made extensive effort to accurately reproduce the published 1980 geologic map. In general, the geologic map was not modified or updated to include new mapping or information acquired since 1980. However, during the course of reviewing the digital map it became apparent that some modifications or revisions were required before the digital map could be completed. For example, missing geologic contacts had to be added to the digital map so polygons could be closed and attributed. Most problems were due to cartographic errors on the published map. We determined the proper or best solution for each revision by consulting the original source maps or other reliable newer maps. The UGS will maintain a file containing a record of these revisions.

These modifications are of the following types:

1. *Broken polygons (missing contacts or faults) on the published map.* Contacts or faults are missing in several places on the published map, resulting in two different adjacent map units that are not separated by a contact or fault (the colors of the units do differ on the published map). The contact or fault had to be added, otherwise the polygons could not be properly attributed.
2. *Mislabeled or miscolored polygons on the published map.* The reviews identified several mislabeled or miscolored polygons. We corrected these errors by checking against original source maps.

3. *Mislabeled contacts on the published map.* Some of the stratigraphic contacts on the published paper map are marker beds, but were not labeled as such. For the digital map, these lines were changed to identify them as marker beds.

4. *Extra or unidentified polygons or contacts on the published map.* The published map has several polygons that are not labeled and not identified by color as different map units. By checking source materials, we determined that some are legitimate map units that were intended to be on the map, but that were missed during cartographic color preparation. These were properly identified and attributed. Others were found to be extra contacts or polygons that had been inadvertently added to the published map (since some parts of the map were compiled from more detailed sources, the compilers occasionally added extra lines). These were removed. Finally, polygons that form perennial and intermittent bodies of water were identified and attributed for the digital map as water and playa. These polygons are on the published paper map as well but are not listed on Plate 2 because they are not stratigraphic units.

5. *Removal of polygons.* At the request of L.F. Hintze, the author of the 1980 map, the UGS removed the map unit “PCi - Precambrian intrusive rock”, from the Beaver Dam Mountains in the southwest corner of the map - this map unit was incorrect.

6. *Incorrect intersection of water boundaries and geologic contacts on the published map.* Open water bodies form the boundaries on one or more sides of many map

polygons. In some cases, the contacts do not match properly with the water bodies on the published map. By contacting the persons who worked on the map, we learned that a newer base map with different water body boundaries was added to the 1980 map late in the compilation process, after many contacts were already drafted. Some of the contacts were revised to match the new base, but some were missed, resulting in contacts drafted within the water bodies, or that end before abutting the water boundaries. This was especially evident around the margins of Lake Powell. In these areas, the lines were modified to match the lake boundaries and to properly close polygons.

7. *Selected updates to the original map.* Much new mapping has been completed in Utah since the 1980 map was compiled from sources available at that time. In general, the UGS chose not to revise or update the digital map from the published paper map. However, though the changes in items 1 through 5 were made to correct cartographic (not geologic) problems, in some cases they may alter the geologic interpretation of the map. In addition, the UGS corrected identifications of a few map polygons that are incorrect on the published map based on the original sources. One change that we did make was to change the labeling of the Glen Canyon Group formations (Wingate, Moenave, Kayenta, and Navajo Formations) and the Nugget Sandstone to reflect a Jurassic age rather than a Triassic/Jurassic age. This map unit is now labeled Jg rather than JTR. The UGS does plan to update the digital and printed maps at an undetermined time in the future.

8. *Modification of state boundary for the digital map.* The boundary delineating the state of Utah was adjusted on the digital version of the geologic map to coincide spatially with the boundary of the 1988 U.S. Geological Survey 1:500,000-scale physiographic map of Utah. The 1988 base is used by the Utah Automated Geographic Reference Center (AGRC) as the standard base to create 1:500,000-scale spatial data.

COMPACT DISC CONTENTS AND ACCESSING THE FILES

The *Digital Geologic Map of Utah* is the Utah Geological Survey's (UGS) first release of Lehi F. Hintze's 1980 *Geologic Map of Utah* in a Geographic Information Systems (GIS) format. This compact disc (CD) contains several spatial data files (ArcInfo coverage files and ArcView GIS shape files) of Utah geology, including map units, faults, marker beds, igneous dikes, volcanic (basaltic) cinder cones, and gilsonite veins. Also included on the CD are image files (*.BMP) that depict Plate 2 of the published paper map. These image files include the stratigraphic columns and cross sections from different regions of Utah. Basic geographic spatial data are also included so the user can display the geologic resource themes or layers with familiar geographic themes such as county boundaries, 1:24,000 and 1:100,000-scale quadrangle map indexes, township and range grid, latitude and longitude grid, and roads using GIS software. Most all geographic spatial data were obtained from the AGRC. Updates of the included spatial data, as well as additional data, are available from AGRC's web site at www.its.state.ut.us/agrc/. More than 400 megabytes of data are included on this CD.

In addition to the spatial data and image files, supporting documents and the software—if needed—to display documents and spatial data are included. In addition to the spatial data files, several program, PDF, text, and database files are included to help the user view and better understand the type and quality of the spatial data the UGS is providing.

The spatial data, associated metadata, and image files are organized into four folders: (1) coverage, (2) e00, (3) images, and (4) shapes. These folders, except e00, are further organized into subfolders where the spatial data reside. The metadata files (*.met) of the geologic theme (or coverage) and most geographic themes are in the subfolders that contain their respective spatial data. These files are briefly described below and are listed in table 1.

Several programs located in the software folder can be installed on your computer to display data and document files. ArcExplorer 1.1 (Aeclient.exe) lets users—who do not already have access to ArcInfo, ArcView GIS, ArcExplorer, or other GIS software—display ArcInfo coverage and ArcView GIS shapefiles. This file is a self-extracting installation file. To use ArcExplorer, the Aeclient.exe file must be installed on your computer. Please read the ArcExplorer 1.1 user guide (Aeuserg.pdf) for information on how to install ArcExplorer. This version of ArcExplorer 1.1 can only be used on computers with Windows 95/98 or Windows NT 4.0 operating systems. The user guide also contains information on how to use the software once it is installed. An import utility file (Import71.exe) is also included. This utility will convert ArcInfo export files "e00" into ArcInfo coverage files. Additional information and help on using ArcExplorer 1.1 or the import utility may be obtained from the Environmental Systems Research Institute, Inc. (ESRI) web site at www.esri.com.

Adobe Acrobat Reader 4.05 for Windows 95/98 (rs405eng.exe) is also included on this CD in the software folder, and is needed to view PDF documents. Users need to install Acrobat Reader on their computers before it can be used. Users with an operating system other than Windows can download the appropriate version of the reader from Adobe's web site at www.adobe.com.

The UGS is providing ArcExplorer, the ArcExplorer Import Utility, and Acrobat Reader as a convenience; this does not imply a product endorsement. In addition, the UGS does not provide any support for this software. Please contact the software companies for help or additional information regarding their products.

Supporting documents such as this document (map179dm.pdf), the ArcExplorer user guide (aeuserg.pdf), and the Acrobat help file (reader.pdf) reside in the docs folder. Other documents needed for the CD menu system also reside in the docs folder.

DESCRIPTION OF DIGITAL FILES

Below is a description of the ArcInfo coverage files. A listing and brief description of the ArcView GIS shapefiles and other selected files are shown in table 1. Metadata files (*.met) are included for most of the spatial datasets and are in the subfolders that contain their respective coverage or theme. Most of the basic geographic spatial data files were obtained from the AGRC and updates of these files may be downloaded from their web site at www.its.state.ut.us/agrc/. The Internet addresses to check for updates are also provided in table 1. The projection of the geospatial data

included on this compact disc is UTM zone 12, North American Datum 1927, and spheroid Clarke 1866. Units are in meters.

Description of ArcInfo Coverage

The coverage folder contains three subfolders: utgeomap, dikes, and vcones. These folders contain the coverage for the *Digital Geologic Map of Utah* (utgeomap folder), igneous dikes (dikes folder), and volcanic cinder cones (vcones folder). Each coverage is in a PC ARC/INFO format. ArcView GIS and ArcExplorer can read this coverage; however, your computer may lock up when ArcExplorer tries to display the coverage. We recommend that you use shapefiles with ArcExplorer.

The e00 folder contains four export files that comprise the ArcInfo coverage of the *Digital Geologic Map of Utah* and selected map labels. These files must be imported, using the Import71.exe application that is included on the CD or other import application, before they can be read by GIS software. The contact.e00 file includes all of the geologic map features except igneous dikes and volcanic cinder cones as a single coverage. The dikes.e00 and vcones.e00 files contain the coverages for igneous dikes and volcanic (basaltic) cinder cones, respectively. The labann.e00 file contains the labels for selected map units. After importing the contact.e00 file, the coverage will contain a polygon attribute table with the following attribute and topological items generated by ArcInfo:

FORMATION: width 5, type C

(map unit codes; see the file in shapes/geology/fm_abbrev.dbf for an explanation of the map units codes)

The coverage from the contacts.e00 file will also contain an arc attribute table with the following items:

L_TYPE: width 12, type C

(contact, fault, marker bed, other, vein)

MODIFIER: width 20, type C

(gilsonite, mapboundary, normal, shoreline, thrust, water boundary)

ACCURACY: width 15, type C

(NA, certain, concealed, inferred)

FAULT_CON: width 4, type C

(NA, Yes, No)

SOURCE: width 2, type I

(0, 2)

LINE_DESCRIP: width 47, type C

(this field is a concatenation of the previous fields)

The labann.e00 file contains text labels for most polygons that have an area larger than 15 square kilometers, as topologically calculated under the UTM zone 12 projection. This annotation coverage was created for use in ArcView, ArcExplorer, or other GIS software.

Description of Shapefiles

ArcView shapefiles that comprise the *Digital Geologic Map of Utah* include line (Arc) and polygon files of the map units, faults, marker beds (the Mahogany Shale of the Green River Formation), and gilsonite veins. Other shapefiles include basic geographic spatial data such as roads, map index, and coordinate grids. These and other selected files are briefly described in table 1. The metadata files also contain information that is helpful to users and are in the subfolders that contain their respective coverage or theme.

GEOLOGIC MAP EXPLANATION

The published (paper) *Geologic Map of Utah* uses 51 different map symbols to denote the various stratigraphic, volcanic, intrusive, and surficial map units (polygons). However, the map is divided into regions such that the same symbol represents different formations or units in different parts of the state. Thus, there are actually several hundred different map units on the map. These units and their variations are explained using an index map showing the regions, and an annotated lithologic column for each region.

This information is provided on the CD in three ways:

1. The explanation plate (Plate 2 of the published paper map) was scanned and color-matched to the digital map. It is included in the images/plate2 folder as high-, medium-, and low-resolution raster bitmap files (PI2_large.bmp, PI2_med.bmp, and PI2_small.bmp), which can be viewed from ArcExplorer or any graphic application that can open BMP files. These graphic files are identical to the paper explanation plate except that the colors have been modified slightly to better match the ArcView colors on the digital map.
2. The complete list of map symbols and the corresponding formation or map unit names are included in a PDF file that is divided by geographic region. Because descriptions are specific to each region, most map symbols (for example, Tov) are shown on the table more than once. This file is titled fm_compl.pdf and can be found in the shapes/geomap folder.
3. The database file fm_abbrev.dbf, located in the shapes/geomap folder, is an abbreviated list of map symbols that can be viewed using software that can read DBF files, and linked to the digital map using ArcInfo or ArcView GIS. This file cannot be viewed or linked to the digital map using ArcExplorer. In this abbreviated version, each map symbol is shown only once, and the description is generic for the entire

state, rather than specific for each region. The user should be aware that these descriptions are abbreviated. Refer to [fm_compl.pdf](#) or view the bitmap file for the complete explanation of each polygon.

Table 1. Names and brief description of the folders, subfolders, spatial data files, and other selected files included on this compact disc. All geospatial data are projected in UTM, Zone 12, NAD27, spheroid Clarke1866; units are in meters. NA = Not applicable, AGRC = Automated Geographic Reference Center, UGS = Utah Geological Survey (Dept. Natural Resources), USCB = U.S. Census Bureau

Folder	Subfolder	File	Description	Scale	Date	Agency	Internet Location for Updates
coverage	dikes	all files	ARC/Info coverage of igneous dikes	1:500,000	12/06/99	UGS	not available
coverage	utgeomap	all files	ARC/Info coverage of geologic map	1:500,000	12/06/99	UGS	not available
coverage	vcones	all files	ARC/Info coverage of volcanic (basaltic) cones	1:500,000	12/06/99	UGS	not available
e00	NA	contacts.e00	ARC/Info export file containing the geologic map	1:500,000	12/06/99	UGS	not available
e00	NA	dikes.e00	ARC/Info export file containing igneous dikes	1:500,000	12/06/99	UGS	not available
e00	NA	labann.e00	ARC/Info export file containing selected map labels	1:500,000	12/06/99	UGS	not available
e00	NA	vcones.e00	ARC/Info export file containing volcanic (basaltic) cones	1:500,000	12/06/99	UGS	not available
images	NA	*.tif	Logos	NA		UGS	not available
images	basemap	statemap	Georeferenced version of the Topographic Map of Utah	1:500,000	12/06/99	UGS	not available
images	plate2	PL2_larg.bmp	High resolution version of plate 2	NA	12/06/99	UGS	not available
images	plate2	PL2_med.bmp	Medium resolution version of plate 2	NA	12/06/99	UGS	not available
images	plate2	PL2_smal.bmp	Low resolution version of plate 2	NA	12/06/99	UGS	not available
images	plate2	plate2.zip	Zip file containing all three versions of plate2	NA	12/06/99	UGS	not available
shapes	cities	utcities	Shapefile of Utah cities and towns	unknown	10/20/98	USCB	http://ftp.census.gov/geo/www/gazetteer/places.html
shapes	contours	hpcon	Shapefile of topography	1:500,000	02/04/99	AGRC	http://www.its.state.ut.us/agrc/
shapes	county	aocbo	Shapefile of county boundaries	1:500,000	07/15/98	AGRC	http://www.its.state.ut.us/agrc/
shapes	county	statebnd	Shapefile of state boundary	1:500,000	12/06/99	UGS	not available
shapes	geomap	fm_abbrev.dbf	Map unit names that can be linked to coverage and themes	NA	12/06/99	UGS	not available
shapes	geomap	fm_compl.pdf	Complete list map unit names	NA	12/06/99	UGS	not available
shapes	geomap	units_colors	Text file of colors values for the geologic map and plate 2	NA	12/06/99	UGS	not available
shapes	geomap	units.avi	ArcView legend file	NA	12/06/99	UGS	not available
shapes	geomap/contacts	contacts	Line shapefile of the map units	1:500,000	12/06/99	UGS	not available
shapes	geomap/dikes	dikes	Line shapefile of igneous dikes	1:500,000	12/06/99	UGS	not available
shapes	geomap/faults	faults	Line shapefile of the faults	1:500,000	12/06/99	UGS	not available
shapes	geomap/faults	thrust_teeth	Line shapefile of the teeth for thrust faults	1:500,000	12/06/99	UGS	not available
shapes	geomap/geolines	geology	Line shapefile of map units, faults, markers, and gilsonite veins	1:500,000	12/06/99	UGS	not available
shapes	geomap/mapunits	mapunits	Polygon shapefile of the map units	1:500,000	12/06/99	UGS	not available
shapes	geomap/markers	markers	Line shapefile of the marker beds (Mahogany Shale)	1:500,000	12/06/99	UGS	not available
shapes	geomap/vcones	vcones	Point shapefile of volcanic (basaltic) cones	1:500,000	12/06/99	UGS	not available
shapes	geomap/veins	vein	Line shapefile of the gilsonite veins	1:500,000	12/06/99	UGS	not available
shapes	lat_long	graticul	Shapefile of Lat-Long tic	1:100,000	12/22/98	UGS	not available
shapes	lat_long	rslal	Shapefile of Lat-long grid	1:500,000	02/25/98	AGRC	http://www.its.state.ut.us/agrc/
shapes	mapindex	index10	Shapefile of 30' x 60' quadrangle index	1:500,000	09/16/98	AGRC	http://www.its.state.ut.us/agrc/
shapes	mapindex	index24	Shapefile of 7.5-minute quadrangle index	1:500,000	09/16/98	AGRC	http://www.its.state.ut.us/agrc/
shapes	plssgrid	rspls	Shapefile of the public land survey system grid w/o sections	1:500,000	09/12/97	AGRC	http://www.its.state.ut.us/agrc/
shapes	plssgrid	secgrid	Shapefile of the public land survey system grid w/ sections	1:500,000	07/10/97	original source unknown	
shapes	roads	mainroad	Shapefile of selected paved and gravel roads	1:100,000	12/06/99	UGS	not available
shapes	roads	trrds	Shapefile of all roads	1:100,000	10/02/98	AGRC	http://www.its.state.ut.us/agrc/

ACKNOWLEDGMENTS

This digital geologic map was produced through a cooperative agreement between the Utah Geological Survey (UGS) and the U.S. Geological Survey (USGS). Grant Willis (UGS Geologic Mapping program manager) and Gary Raines (USGS DIA project chief) developed and directed this project. Ron Goodstein (Optronics Specialty Co. Inc., 19619 Prairie Street, Northridge, CA 91324) managed the scanning, topology, and attributing work on this project through contractual agreement with the USGS. Robert Miller, GIS analyst (USGS), directed the GIS work at the USGS. The UGS Economic Geology Program worked on the Utah Mineral Occurrences Database in a cooperative agreement with the USGS as “in-kind” financial support of this project. Jon K. King, William F. Case, Chris Ditton, and Jim Parker (UGS) reviewed the digital geologic map.

This digital release supercedes a digital version of the *Geological Map of Utah* completed by the GIS laboratory at Utah State University. We gratefully acknowledge the efforts of many faculty and students at Utah State University and of Janine Jarva of the UGS who worked on this previous digital map. The Utah State University version was temporary and incomplete, and map users are encouraged to replace working copies of that digital map with this digital geologic map.

ArcInfo, ArcView GIS, and ArcExplorer are all registered products of Environmental Systems Research Institute, Inc. (ESRI). Acrobat and Acrobat Reader are registered products of Adobe Systems Incorporated. Windows 95/98/NT are registered products of Microsoft Corporation.

**ACQUIRING DIGITAL AND PRINTED PRODUCTS FROM THE UTAH
GEOLOGICAL SURVEY**

Contact the Natural Resources Map & Bookstore at:

1594 W. North Temple

P.O. Box 146100

Salt Lake City, Utah 84114-6100

Bookstore phone: 888-UTAH MAP (888-882-4627)

801-537-3320

Web address: <http://www.maps.state.ut.us>

E-mail address: nrugs.geostore@state.ut.us

UGS receptionist: 801-537-3300

UGS fax: 801-537-3400