Interim Geologic Map of the Cedar City 30' x 60' Quadrangle, Iron and Washington Counties, Utah

By

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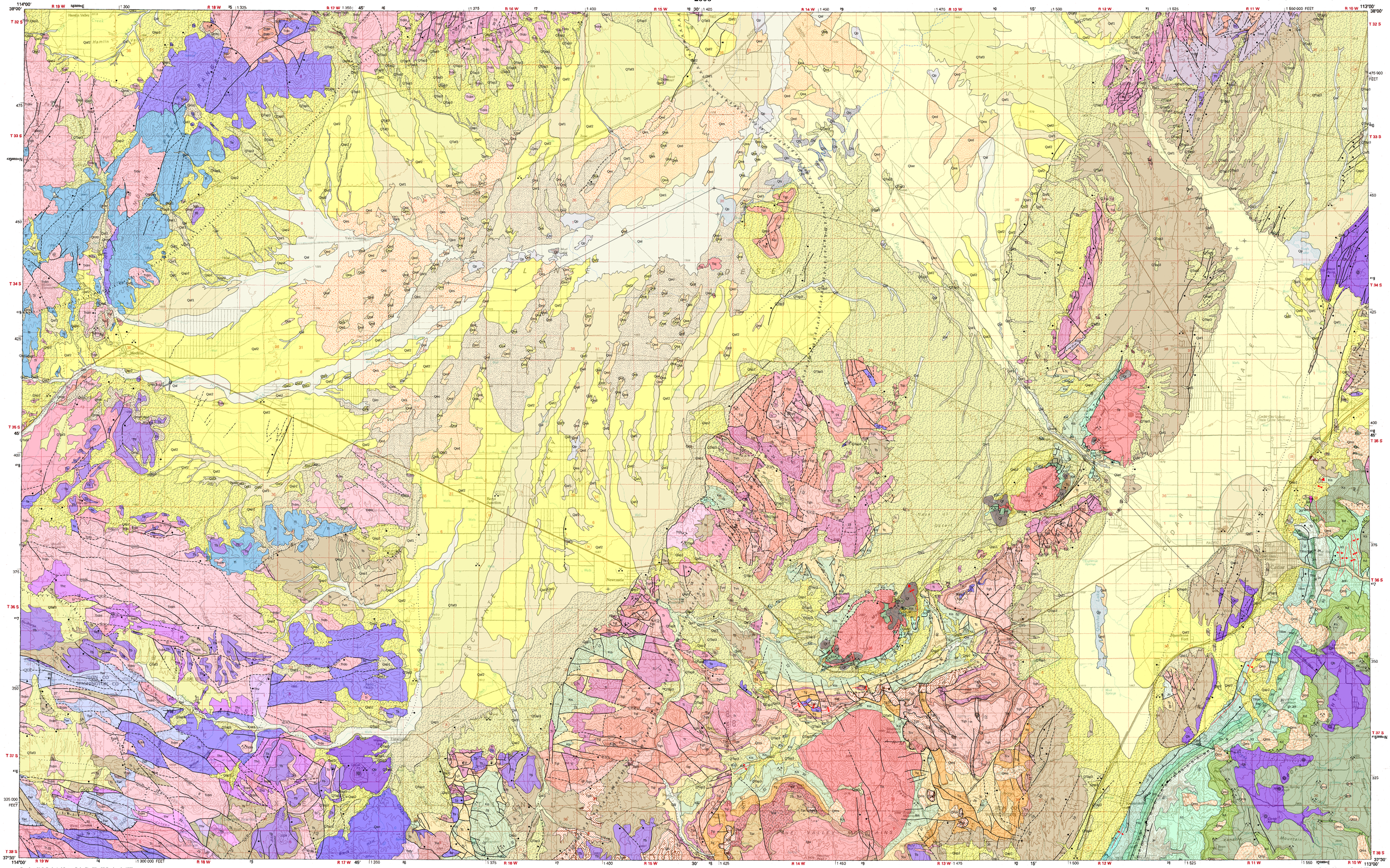
Plate 1
Utah Geological Survey 2006
Open-File Report 476DM
Geologic Map of the Cedar City Quadrangle



Base from U. S. Geological Survey Cedar City 30' x 60' Quadrangle, 1982

This geologic map was funded by the Utah Geological Survey and the U.S. Geological Survey, National Cooperative Geologic Mapping Program through USGS STATEMAP award number 02HQAG0055. The views and conclusions contained in this document are those of the author, and should not be interpreted as necessarily the official policies, either expressed or implied, of the U.S. government.

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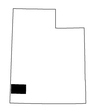
For use at 1:100,000 scale only. The Utah Geological Survey (UGS) does not guarantee accuracy or completeness of data.

SCALE 1:100 000

CONTOUR INTERVAL 50 METERS

3 0 3 6 9 Miles

3 0 3 6 9 Kilometers



APPROXIMATE MEAN DECLINATION, 1982

This open-file report will be superceded by an improved geologic map following completion of reviews.

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CEDAR CITY 30'X60' LITHOLOGIC COLUMN

AGE		MAP SYMBOL	MAP UNIT	THICKNESS Feet	THICKNESS Meters	SCHEMATIC COLUMN	OTHER INFORMATION
QUAT.	Pleistocene -Holocene	Q-various	Alluvial, playa, mass wasting, eolian, lacustrine deposits	0-100	0-30		
		Qan	Andesite of Black Hills	650	200		400,000 years old
		Qb	Basalt lava flows	300	100		1.1-1.3 Ma
		$QTaf_3$, $QTap_3$	Alluvial deposits	0-100	0-30		
	Pl.						Unconformity
TERTIARY	Miocene	Ts	Basin-fill sedimentary rocks	0-2000	0-600		In structural and volcanic basins of several ages As old as 19 Ma
		Trdy	Young rhyolite and dacite lava flows	425-575	130-175		5-8.5 Ma
		Tb	Basalt lava flows	300	100		6-12 Ma
		Trdm	Middle rhyolite and dacite lava flows	400-1400	120-400		10-15 Ma
		Thr	Tuff of Honeycomb Rock	500	150		11.8 Ma
		Tvn	Volcaniclastic rocks of Newcastle Reservoir	1000	300		Pre-Il.6 Ma
		To	Ox Valley Tuff	50	15		About 13.5 Ma From Caliente caldera complex
		Twr	Tuff of White Rocks	600	200		About 16.0 Ma 17.4 Ma
		Thc	Tuff of Horse Canyon	500	150		From Caliente caldera complex
		Tr	Racer Canyon Tuff	1500	450		About 18.7 Ma From Caliente caldera complex
		Tpr	Sedimentary rocks of Page Ranch	200	60		
		Ta	Andesite lava flows	1600	500		From scattered stratovolcanoes
		Tpv	Pine Valley Latite	1100	335		20.5 Ma From Pine Valley laccolith
		Tgb	Gravity-slide breccia	250	75		From de-roofing of intrusions
		Trdo	Old rhyolite and dacite lava flows	1600	500		20-22 Ma
		Tcv	Volcanic rocks of Comanche Canyon	160	50		From Stoddard Mountain intrusion
		Tre	Rencher Formation	1600	500		21.5-21.8 Ma From Bull Valley intrusion
		Tpa	Rocks of Paradise	600	180		From Pinto Peak intrusion
		Tq / Tqh	Harmony Hills Tuff (Quichapa Group)	400	120		22.0 Ma
		Tq / Tqc	Condor Canyon Formation (Quichapa Group)	400	120		22.8 Ma From Caliente caldera complex
		Tq / Tql	Leach Canyon Formation (Quichapa Group)	750	230		23.8 Ma
		Thv	Horse Valley Formation	150	50		
		Tmd	Mount Dutton Formation	1000	300		Stratovolcano deposits of the Marysvale volcanic field
	Oligocene	Tl	Latitic lava flows	1000	300		21.9-22.8 Ma
		Tm	Markagunt Megabreccia	50	15		Gravity-slide breccia
		Tin / Ti	Isom Formation	500	150		About 27 Ma
		Tin / Tn	Needles Range Group	800	240		28-30 Ma From Indian Peak caldera complex
	Eocene	Tc	Claron Formation	1700	500		White in upper part, red in lower Fluvial and lacustrine Unconformity
CRETACEOUS	Upper	Kis	Iron Springs Formation	3000	1000		Gray and tan continental deposits
		Ks	Straight Cliffs Formation	1600	500		Mostly continental deposits Marginal marine
		Kd	Dakota Formation	1100	335		Marginal marine Numerous landslides Continental origin Unconformity
JURASSIC	Mid.	Jct	Carmel and Temple Cap Formations, undivided	600-1300	170-400		Host for iron deposits Unconformity
	Lower	Jn	Navajo Sandstone	2000	600		Red crossbedded eolian sandstone
		Jk	Kayenta Formation	1300	400		Red and purple sandstone
		Jm	Moenave Formation	510	155		Springdale Sandstone Member Unconformity
TRIASSIC	Lower and Middle	Trc	Chinle Formation	420	130		Shinarump Conglomerate Member Unconformity
		Trm	Moenkopi Formation	1830	560		Virgin Limestone Member Unconformity
P.	L.	Pk	Kaibab Formation	300-350	90-105		

Table 1. $^{40}Ar/^{39}Ar$ Age-Spectrum Dates for Samples Shown on the Cedar City 1:100,000 Geologic Map

Sample #	Latitude	Longitude	Unit	Material dated	Preferred age	Comments
1-1-53-68	37°31'12"	114°03'25"	Tb-Trachybasalt	whole rk	12.06±.05	Minor excess ^{40}Ar, isochron age
(same)			(same)	whole rk	12.29±.07	Near plateau; minor excess ^{40}Ar, isochron age
1-1-54-23	37°31'51"	114°05'07"	Thr-Tuff of Honeycomb Rock	sanidine	11.91±.04	Plateau; 62% released ^{39}Ar
1-1-50-16	37°27'19"	114°06'06"	Rhyolite flow over Ox Valley Tuff	sanidine	12.19±.08	Minor excess ^{40}Ar, plateau; 86% released ^{39}Ar
1-1-54-16	37°31'43"	114°06'06"	To-Ox Valley Tuff	sanidine	14.10±.03	Plateau; 93% released ^{39}Ar
92-557c	37°28'09"	113°45'55"	To-Ox Valley Tuff, cooling unit 1	sanidine	13.46±.05	Minor excess ^{40}Ar, plateau; 51% released ^{39}Ar
92-968	37°37'54"	113°53'55"	Thc-Tuff of Dow Mountain (Tuff of Horse Canyon equivalent)	sanidine	17.40±.06	^{40}Ar loss to a plateau; 51% released ^{39}Ar
92-971a	37°37'44"	113°53'32"	Tr-Racer Canyon Tuff	sanidine	--	Disturbed; ^{40}Ar loss
(same)			(same)	biotite	17.10±.03	Plateau; 70% released ^{39}Ar
89-314e	37°29'40"	113°52'13"	Tr-Racer Canyon Tuff	sanidine	18.70±.11	Minor ^{40}Ar loss, plateau; 57% released ^{39}Ar
(same)			(same)	biotite	18.63±.30	Minor excess ^{40}Ar, total-gas age
90-68	37°21'01"	113°35'32"	Pine Valley laccolith-base (compare to Tpv – below)	sanidine	20.47±.04	Plateau; 81% released ^{39}Ar
(same)			(same)	biotite	20.63±.12	Plateau; 78% released ^{39}Ar
90-7	37°20'22"	113°32'01"	500 feet above Pine V. laccolith base	sanidine	20.32±.08	Plateau; 76% released ^{39}Ar
(same)			(same)	biotite	20.46±.05	Plateau; 50% released ^{39}Ar
91-10	37°24'33"	113°28'57"	Tpv-Pine Valley Lat.; dacite lava flow	sanidine	20.44±.06	Plateau; 92% released ^{39}Ar
(same)			(same)	biotite	20.42±.07	Plateau; 86% released ^{39}Ar
91-52	37°27'45"	113°27'45"	Tpv-Pine Valley Lat.; dacite lava flow	biotite	20.44±.07	Plateau; 78% released ^{39}Ar
93-371b	37°30'34"	113°28'28"	Tpa-Rocks of Paradise	hornbl	21.97±.09	Plateau; 95% released ^{39}Ar
(same)			(same)	biotite	21.62±.08	Minor excess ^{40}Ar, isochron age
91-669	37°29'10"	113°29'03"	Tpa-Rocks of Paradise (see comment about Rencher Fm in Tpa text)	biotite	21.75±.30	Minor excess ^{40}Ar, total-gas age
94-365	37°44'34"	113°12'26"	Tit-Three Peaks Intrusion	biotite	21.76±.06	Minor excess ^{40}Ar, plateau; 51% released ^{39}Ar
93-377	37°32'03"	113°25'05"	Tcv-Commanche Canyon Tuff	hornbl	22.72±.07	Minor excess ^{40}Ar, plateau; 87% released ^{39}Ar
(same)			(same)	biotite	21.78±.08	^{40}Ar loss and excess ^{40}Ar; wghtd mean age, 77% ^{39}Ar
94-319	37°33'31"	113°20'16"	Tis-Stoddard Mountain Intrusion	biotite	21.86±.09	Minor excess ^{40}Ar, isochron age
94-1	37°51'31"	114°19'43"	Tqc-Basal Swett Tuff Mbr of Condor Canyon Formation	biotite	23.87±.04	Plateau; 81% released ^{39}Ar

Notes: All samples were heated in a low-blank furnace and analyzed by the step-wise heating method in the U.S. Geological Survey Argon Geochronology Laboratory, Denver, Colorado. Methods used in this laboratory and for these samples are described in Snee (2002). Samples were irradiated in the U.S. Geological Survey TRIGA reactor; standard irradiation details are described in Dalrymple and others (1981). Primary irradiation standard used for these samples is MMhb-1 hornblende with an age of 520.4 Ma (Samson and Alexander, 1987); secondary irradiation standard is FCT sanidine with an internally calibrated age of 27.84 Ma. Constants used are those of Steiger and Jager (1977). Plateaus were defined and plateau dates were calculated according to the method of Fleck and others (1977). Isochron analyses were done by the methods described in York (1969).

MAP SYMBOLS

- CONTACT
- NORMAL FAULT -- Dashed where location inferred; dotted where concealed; bar and ball on downthrown side; arrows show relative movement on cross sections
- STRIKE-SLIP FAULT -- Dashed where location inferred; dotted where concealed; arrows show relative movement on map; T (toward) and A (away) show relative movement on cross sections
- OBLIQUE-SLIP FAULT -- Dashed where location inferred; dotted where concealed; bar and ball on downthrown side and arrows show relative movement on map; arrows and T (toward) and A (away) show relative movemvent on cross sections
- THRUST FAULT -- Dashed where location inferred; dotted where concealed; barbs on upper plate; arrows show relative movement on cross sections
- SURFACE TRACE OF THE BLUE MOUNTAIN THRUST FAULT -- See Steven and others (1990) and Williams (1997) for details
- REVERSE FAULT -- Dashed where location inferred; half circle on downthrown side
- LOW-ANGLE NORMAL FAULT -- Dashed where location inferred; dotted where concealed; hachures on upper plate; arrows show relative movement on cross sections
- GRAVITY-SLIDE SURFACE -- Dashed where location inferred; dotted where concealed; barbs on upper plate; arrows show relative movement on cross sections
- LINEAMENT CUTTING QUATERNARY SEDIMENTS -- Structural feature containing no clear evidence of vertical offset; probably a joint or fault

FOLD AXES -- Arrows on end of axes show plunge; dotted where concealed

- syncline
- anticline

- CALDERA MARGIN -- Dashed where location inferred; dotted where concealed; hachures on downthrown side

STRIKE AND DIP OF BEDDING

- 50 inclined
- 40 overturned

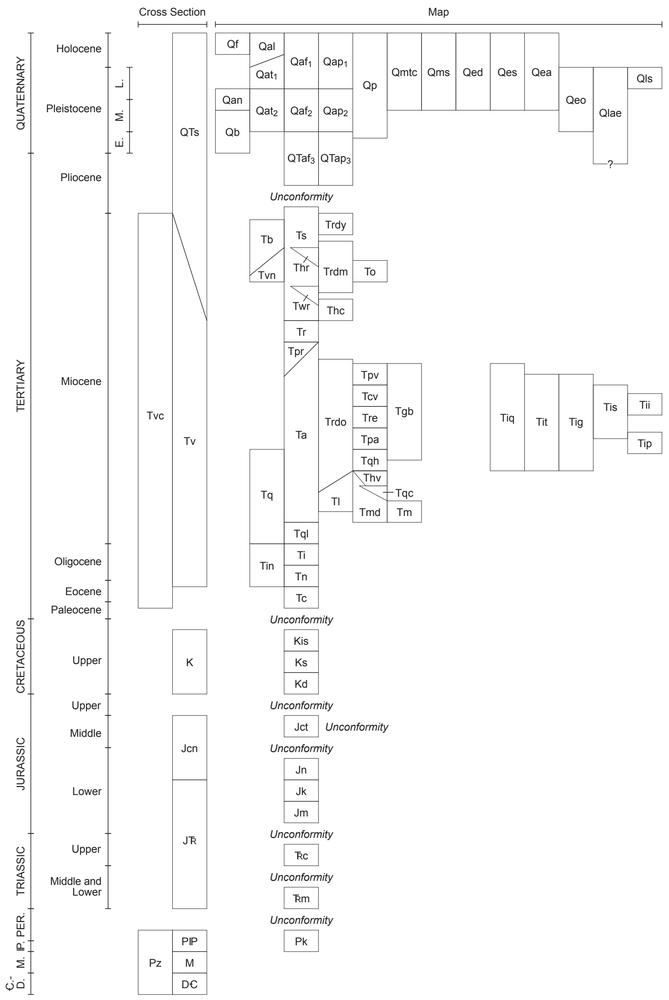
- VOLCANIC VENT
- LAKE BONNEVILLE SHORELINE -- In northcentral part of map; dashed where location projected at elevation of 1,560 m; dotted where concealed

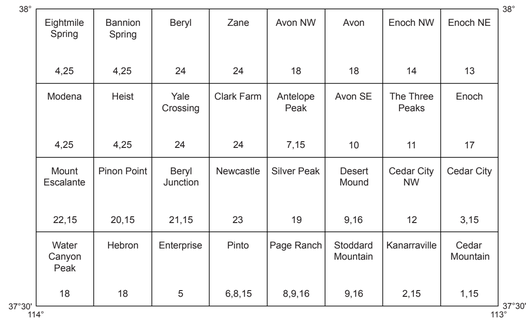
DEEP EXPLORATION WELL

- oil well
- geothermal test
- symbol on cross section

- MINE -- Iron mines in the Iron Springs mining district, silver mines of the Escalante Mine and in the north Antelope Range, and coal mines in the southeast part of the map
- GRAVEL PIT

CEDAR CITY 30'X60' CORRELATION CHART





Index map showing sources of geologic mapping and 7.5-minute quadrangles in the Cedar City 30' x 60' quadrangle.

SOURCE LIST FOR GEOLOGIC MAPPING (Numbers correspond to those on index map)

1. Averitt, Paul, 1962, Geology and coal resources of the Cedar Mountain quadrangle, Iron County, Utah: U.S. Geological Survey Professional Paper 389, 72 p., scale 1:24,000; minor modification by P.D. Rowley, 2003.
2. Averitt, Paul, 1967, Geologic map of the Kanarraville quadrangle, Iron County, Utah: U.S. Geological Survey Geologic Quadrangle Map GQ-694, scale 1;24,000; modified by P.D. Rowley, 2003.
3. Averitt, Paul, and Threet, R.L., 1973, Geologic map of the Cedar City quadrangle, Iron County, Utah: U.S. Geological Survey Geologic Quadrangle Map GQ-1120, scale 1:24,000; modified using Maldonado, Florian, Sable, E.G., and Nealey, L.D., 1997, Cenozoic low-angle faults, thrust faults, and anastomosing high-angle faults, western Markagunt Plateau, southwestern Utah, *in* Maldonado, Florian, and Nealey, L.D., editors, Geologic studies in the Basin and Range-Colorado Plateau transition in southeastern Nevada, southwestern Utah, and northwestern Arizona, 1995: U.S. Geological Survey Bulletin 2153, p. 129-150, plate 1, about 1:150,000.
4. Best, M.G., 1987, Geologic map and sections of the area between Hamlin Valley and Escalante Desert, Iron County, Utah: U.S. Geological Survey Miscellaneous Investigations Series Map I-1774, scale 1:50,000; modified by P.D. Rowley, 2002.
5. Blank, H.R., 1993, Preliminary geologic map of the Enterprise quadrangle, Washington and Iron Counties, Utah: U.S. Geological Survey Open-File Report 93-203, scale 1:24,000.
6. Butler, T.P., Cornell, D.A., Hacker, D.B., and Holm, D.K., 2003, Preliminary geologic map of the Pinto quadrangle, Iron and Washington Counties, Utah: Kent, Ohio, Kent State University, unpublished map, scale 1:24,000.
7. Grant, S.K., and Proctor, P.D., 1988, Geologic map of the Antelope Peak quadrangle, Iron County, Utah: Utah Geological and Mineral Survey Open-File Report 130, scale 1:24,000.
8. Hacker, D.B., 1998, Catastrophic gravity sliding and volcanism associated with the growth of laccoliths—Examples from early Miocene hypabyssal intrusions of the Iron Axis magmatic province, Pine Valley Mountains, southwest Utah: Kent, Ohio, Kent State University, unpublished Ph.D. dissertation, 258 p., scale 1:24,000.
9. Mackin, J.H., 1944-1960, unpublished mapping of bedrock geology, scale 1:24,000.
10. Mackin, J.H., and Rowley, P.D., 1975, Geologic map of the Avon SE quadrangle, Iron County, Utah: U.S. Geological Survey Geologic Quadrangle Map GQ-1294, scale 1:24,000; modified by P.D. Rowley, 2003.
11. Mackin, J.H., and Rowley, P.D., 1976, Geologic map of The Three Peaks quadrangle, Iron County, Utah: U.S. Geological Survey Geologic Quadrangle Map GQ-1297, scale 1:24,000; modified by P.D. Rowley, 2003.
12. Mackin, J.H., Nelson, W.H., and Rowley, P.D., 1976, Geologic map of the Cedar City NW quadrangle, Iron County, Utah: U.S. Geological Survey Geologic Quadrangle Map GQ-1295, scale 1:24,000; modified by P.D. Rowley, 2003.
13. Rowley, P.D., 1975, Geologic map of the Enoch NE quadrangle, Iron County, Utah: U.S. Geological Survey Geologic Quadrangle Map GQ-1301, scale 1:24,000; modified by P.D. Rowley, 2003.
14. Rowley, P.D., 1976, Geologic map of the Enoch NW quadrangle, Iron County, Utah: U.S. Geological Survey Geologic Quadrangle Map GQ-1302, scale 1:24,000; modified by P.D. Rowley, 2003.
15. Rowley, P.D., 2002-2003, unpublished mapping of surficial geology, scale 1:100,000.
16. Rowley, P.D., and Siders, M.A., 1990-1995, unpublished mapping of bedrock and surficial geology, scale 1:24,000.
17. Rowley, P.D., and Threet, R.L., 1976, Geologic map of the Enoch quadrangle, Iron County, Utah: U.S. Geological Survey Geologic Quadrangle Map GQ-1296, scale 1:24,000; modified by P.D. Rowley, 2003.
18. Rowley, P.D., and Vice, G.S., 2002-2003, unpublished mapping of bedrock and surficial geology, scale 1:100,000.
19. Shubat, M.A., and Siders, M.A., 1988, Geologic map of the Silver Peak quadrangle, Iron County, Utah: Utah Geological and Mineral Survey Map 108, 13 p., scale 1:24,000.
20. Siders, M.A., 1985a, Geologic map of the Pinon Point quadrangle, Iron County, Utah: Utah Geological and Mineral Survey Map 84, 12 p., scale 1:24,000; modified by P.D. Rowley, 2002.
21. Siders, M.A., 1985b, Geologic map of the Beryl Junction quadrangle, Iron County, Utah: Utah Geological and Mineral Survey Map 85, 11 p., scale 1:24,000; modified by P.D. Rowley, 2002.
22. Siders, M.A., 1991, Geologic map of the Mount Escalante quadrangle, Iron County, Utah: Utah Geological and Mineral Survey Map 122, 9 p., scale 1:24,000; modified by P.D. Rowley, 2002.
23. Siders, M.A., Rowley, P.D., Shubat, M.A., Christenson, G.E., and Galyardt, G.L., 1990, Geologic map of the Newcastle quadrangle, Iron County, Utah: U.S. Geological Survey Geologic Quadrangle Map GQ-1690, scale 1:24,000.
24. Williams, V.S., 1997, Geologic map of the central Escalante Desert area, Iron County, Utah: U.S. Geological Survey Geologic Investigations Map I-2547, scale 1: 50,000.
25. Williams, V.S. (U.S. Geological Survey), 1990-1995, unpublished mapping of surficial geology, scale 1:50,000.

CEDAR CITY 30'X60' CROSS SECTION

Well logs from Van Kooten (1988) and Williams (1997); interpretation in places after Van Kooten (1988), Williams (1997), and Hurlow (2002). Some faults from interpretation of gravity data (Cook and Hardman, 1967; Pe and Cook, 1980).