REGIONAL STRUCTURE IN SOUTHWESTERN UTAH

Utah Geological Association Publication 3. p. 27-32.

Gary W. Crosby – 1973
Department of Geology
University of Montana
Missoula, Montana 59801

Introduction

The structural geology in an area of southwestern Utah centered at Milford (Fig. 1) includes several features that depart from the simpler pattern to the north.

1. South of the north end of the Mineral Range the cratonward edge of the fold and thrust belt includes a wide and fairly well defined disturbed belt east of the major thrust(s); northward the leading, or erosional, edge of the major thrusts generally are the easternmost structures of the fold and thrust belt.
2. Basin and Range block fault trends are subparallel to fold and thrust belt structures of Sevier orogeny vintage north of Black Rock, but are diagonal for more than 100 kms to the south.
3. North of the Mineral Range normal faults marked by major displacements occur at or west of the cratonward edge of the fold and thrust belt, whereas for some distance south major normal faults invade the shelf. This is particularly true for those faults that are associated with grabens deeply filled with Cenozoic sediments.
4. Milford lies in a transverse igneous zone that extends westward from the Tushar Mountains across both the Basin and Range and fold and thrust belt structures into and across southern Nevada. The zone is defined by thick Tertiary silicious volcanics. This zone is probably structurally controlled and includes quartz monzonite and granodiorite stocks with associated mineralization.
5. Finally, the intermountain seismic belt, which coincides with the Wasatch line at the eastern edge of the overthrust belt and Basin and Range province to the north, turns westward in the vicinity of Milford and extends across Nevada.

The above generalizations are subject to modification as details are assembled into a regional picture. The several features, however, seem to point to the conclusion that the Milford area is critical to the understanding of past and present regional tectonics at the eastern edge of the Great Basin.

Prominent Structural Features

Disturbed Belt. – The disturbed belt is a transition zone between the undeformed strata of the shelf, the plains and plateau provinces, and the severely deformed rocks of the fold and thrust belt. In southwestern Utah the boundary between the disturbed belt and the main fold and thrust belt may be defined as the trace of the easternmost thrust which places Cambrian or Eocambrian rocks over younger strata. The width of the disturbed belt varies from near zero to many tens of kms. There appears to be a correlation between the width of the belt and the occurrence of a stratigraphic section marked by strong mechanical anisotropy, for example, the coincidence in the Appalachians of the wide disturbed belt in the Pennsylvanian salient and the distribution of Salina Salt (Frey, 1973).

North of the Mineral Range a major thrust in the Pavant Range places Lower Cambrian Prospect Mountain Quartzite over Jurassic Navajo Sandstone. Navajo is exposed in a window formed in the tilted up western edge of the range (Hickcox, 1971). The leading edge of the thrust is, however, covered by latest Cretaceous and Cenozoic deposits, but must lie somewhere beneath the eastern flank of the Pavant Range or beneath Sevier Valley; deformation genetically related to fold and thrust belt development is not observed at the western edge of the Fish Lake Plateau bordering Sevier Valley on the east. Thus, the maximum width of the disturbed belt is 18 kms. A geometric reconstruction suggests to Hickcox (1971) that the eastern edge of the Pavant thrust is in the order of 10 kms east of the Upper Cretaceous overlap. Any disturbed belt development must occur in a narrow band.

The eastern edge of the fold and thrust belt is offset westward between the south end of the Pavant Range and the San Francisco Mountains, where Prospect Mountain and Eocambrian quartzites are thrust over Upper Cambrian limestones (East, 1966). This major thrust(s) wherein the Prospect Mountain structurally overlies rocks as young as Pennsylvanian can be traced southwestward through the southern Wah Wah Mountains (Miller, 1966), and beyond into southeastern Nevada. The sole of the thrust plate persists at a shaly zone near the base of the Prospect Mountain Quartzite throughout this extent, as well as in the Pavant Range. The constancy of this stratigraphic zone at the sole of the thrust plate, together with the large stratigraphic offset across the fault(s), marks this structure as the eastern edge of major overthrusting.

Southward from the offset zone, scattered outcrops of deformed Paleozoic and Mesozoic rocks express a wide disturbed belt. Disturbed belt rocks are observed in the Beaver Lake Mountains (Barosh, 1960), the Rocky Range, the Star Range (Baer, 1962), the Southern San Francisco Mountains, southern Wah Wah Range, Blue Mountain, the Mineral Mountains (Earll, 1957), northcentral Black Mountains, the Iron Springs mining district west of Cedar City (Mackin, 1947), and in the Bull Valley district. Exposed rocks are generally Upper Paleozoic and Mesozoic in age and exhibit folds and thrusts, and merely tilted sections where the outcrop is areally limited. The exception is at Blue Mountain where

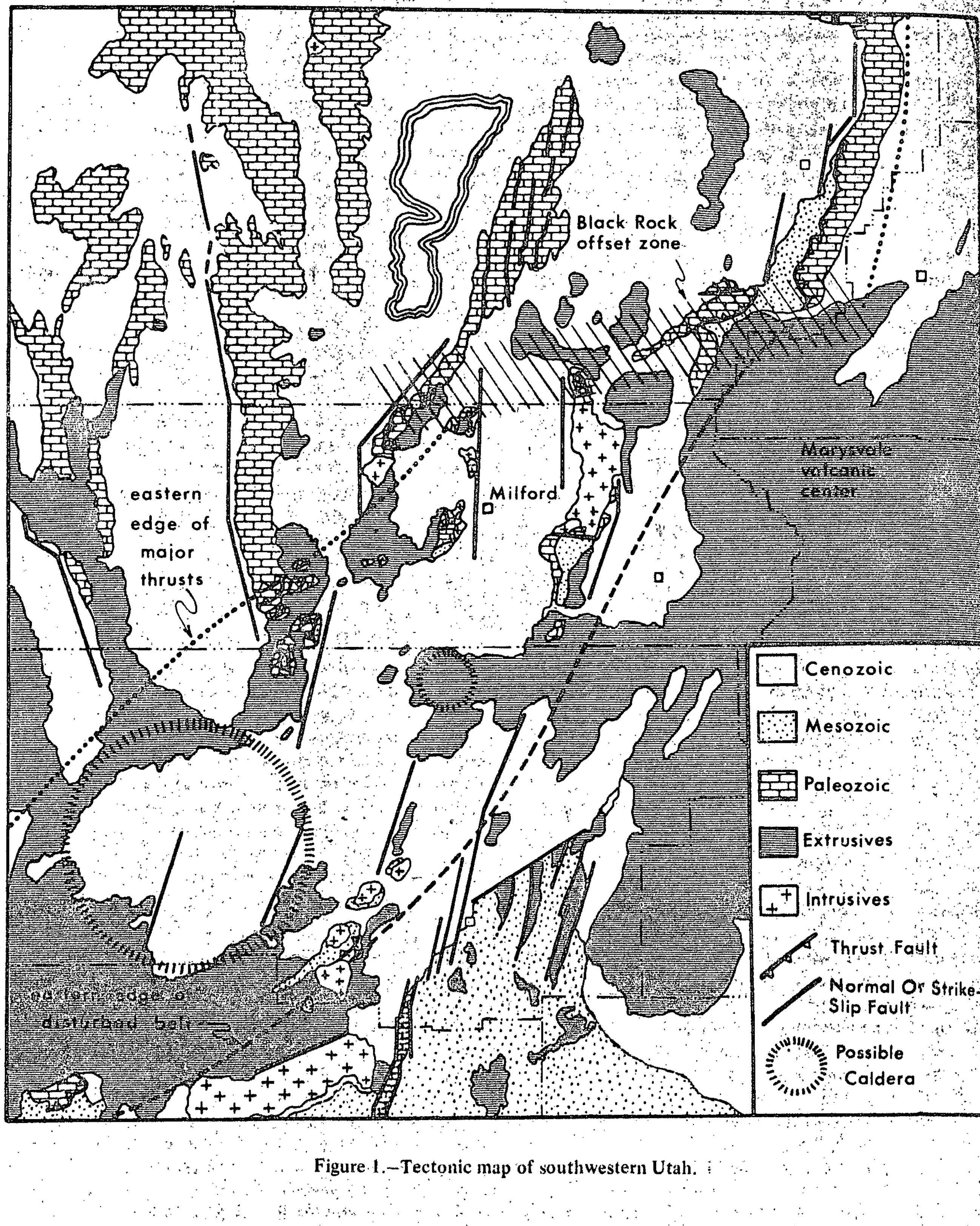
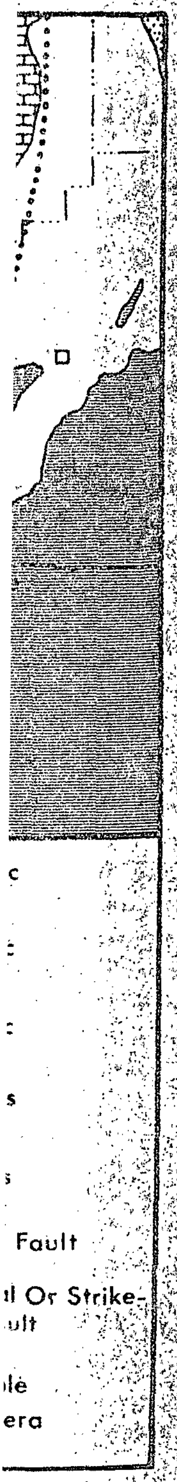


Figure 1.—Tectonic map of southwestern Utah.

...as old
...ajo Sands
...it might
...ozoic str
...Mineral
...veral poin
...contact,
...utheast fla
...arll, 1957
...ather than
...uthward i
...f the Mine
...ut of the a
...end with t
Deforma
...er typica
...bricate t
...rust and
with undefo
Wah Wahs,
...rates the
the observe
feature typ
formed boo
tion near
deformed s
cratonward
Wah Moun
the sole of
from Midd
involved in
are restricte
Navajo San
Width c
and the ea
65 kms.

Divergence
Mineral R
thrusts are
the Pavant
thrusts pat
ally displa
major nor
with reaso
flanks blo
Cricket M
mountains
exposed r
as the exp
in the Sa
exposed.
In con
trace of t



Strata as old as Middle Cambrian are thrust over Jurassic Navajo Sandstone (Miller, 1966).

It might be argued that the upturned Late Paleozoic and Mesozoic strata observed on both the east and west flanks of the Mineral Range pluton resulted from forceful intrusion. Several points may be advanced against this argument. First, the contact between igneous and sedimentary rocks along the southeast flank of the Mineral Mountains is clearly discordant (Earll, 1957). Condie (1960) develops a case for granitization rather than magmatic injection. Structural trends continue southward in unbroken exposures into the southernmost end of the Mineral Range and the north-central Black Mountains, east of the area of the pluton. Finally, these structures are on trend with the thrusted fold in the Iron Springs district.

Deformation within this zone shows the transitional character typical of disturbed belts with close folding and complex imbricate thrusting immediately beneath the leading major thrust and grading to gentler deformation at the boundary with undeformed shelf strata. A section through the southern Wah Wahs, Blue Mountain, and the Iron Springs district illustrates the transitional nature of the deformation. Moreover, the observed structures may be reconciled with another feature typical of disturbed belts, namely a wedge-shaped deformed body wherein a thick section is involved in deformation near the major thrusts and wedges out to only a thin deformed section, comprised of the youngest rocks, at the cratonward edge. The exposed section in the southern Wah Wah Mountains, beneath the Prospect Mountain Quartzite at the sole of the major thrust, includes strata that range in age from Middle Cambrian through Jurassic, whereas the rocks involved in thrusting and folding in the Iron Springs district are restricted to the Cretaceous and Jurassic section above the Navajo Sandstone (Mackin, 1947).

Width of the disturbed belt between the Wah Wah thrust and the eastern edge of the Iron Springs district is more than 65 kms.

Divergence of Thrusts and Normal Faults. – North of the Mineral Range the traces of major normal faults and overthrusts are subparallel. This relationship is well illustrated in the Pavant and Canyon Ranges where traces of the major overthrusts parallel the range axes. Thrust fault traces are dramatically displayed in these ranges, and while the traces of the major normal faults are rarely exposed, it may be assumed with reasonable assurance that major normal faults at the flanks block out the mountains. Similarly, fold axes in the Cricket Mountains parallel normal faults that segment the mountains. Presumably a major thrust fault underlies the exposed rocks in the Cricket Hills at shallow depths inasmuch as the exposures are continuous through the Beaver Mountains to the San Francisco Mountains where the major thrust is exposed.

In contrast, major normal fault trends diverge from the trace of the major thrust(s) by about 35° south of the Mineral Range. The trace of the major thrust(s) through the Beaver Lake-San Francisco-south Wah Wah Mountains is approximately northeast-southwest. Divergence of the normal fault trends is most obvious at the flanks of the Mineral Range and the Hurricane fault from Cedar City south to northwestern Arizona. Other arealy limited fault line scarps and particularly gravity gradient zones (Cook and Hardman, 1967) indicate that the divergence of major normal faults and overthrust fault trends is the regional structural motif south of Milford.

Grabens on the Shelf. – The sedimentary section exposed in virtually all of Washington County in southwestern Utah has strong affinities to the shelf section to the east (Cook, 1960), although the area west of the Hurricane fault has been lowered relative to the high plateaus. A further ramification of the divergence of major normal faults relative to major thrusts is that these normal faults invade the shelf. This is particularly true when normal faults are considered that border grabens which are deeply filled with Cenozoic valley-fill deposits. The Enterprise graben extends from the Escalante Desert in Iron County into the Bull Valley area of Washington County. This graben, however, is at least in part, if not wholly, within the disturbed belt. The Parowan and Cedar Valley grabens, however, are clearly within the shelf province. Cook and Hardman (1967) estimate, on the basis of gravity calculations, that approximately 1200 m of valley-fill underlie Cedar Valley.

North of the Mineral Range, by way of contrast, the Black Rock Desert and the Juab Valley are the easternmost grabens that contain deep valley fill, and the Pavant and Nebo-Charleston thrusts, respectively, are exposed east of these valleys.

Transverse Igneous Belt. – The Marysvale volcanic pile, up to 3000 m thick (Kerr and others, 1957), is centered just south of the Pavant Range where the cratonward edge of the fold and thrust belt is offset westward. A line trending west-southwest from the Marysvale volcanic pile coincides with a depositional thick of silicious volcanics which extends across southern Nevada. These rocks are predominantly ignimbrites and tuffs, and in the main range in composition from rhyolite to latite (Mackin, 1960). The age of the bulk of the volcanics is Oligocene and Miocene; however, later volcanics occur centered along the same line, but in a wider zone. The Quaternary volcanics are largely basalts, but scattered rhyolitic cones are known (Leise, 1957).

Plutonic rocks occur in abundance within the transverse igneous belt, including Utah's largest exposed intrusive body in the Mineral Range. Much mineralization accompanied these intrusive events, spawning an extractive industry that is still active after three quarters of a century. Mineralization occurs along the entire belt; however, a large percentage of the mining activity in the Utah portion is concentrated within a 25 km radius of Milford. The intrusives, largely granodiorites and quartz monzonites, are contemporary with the deposition of the bulk of the silicious volcanics (Whelan, 1970).

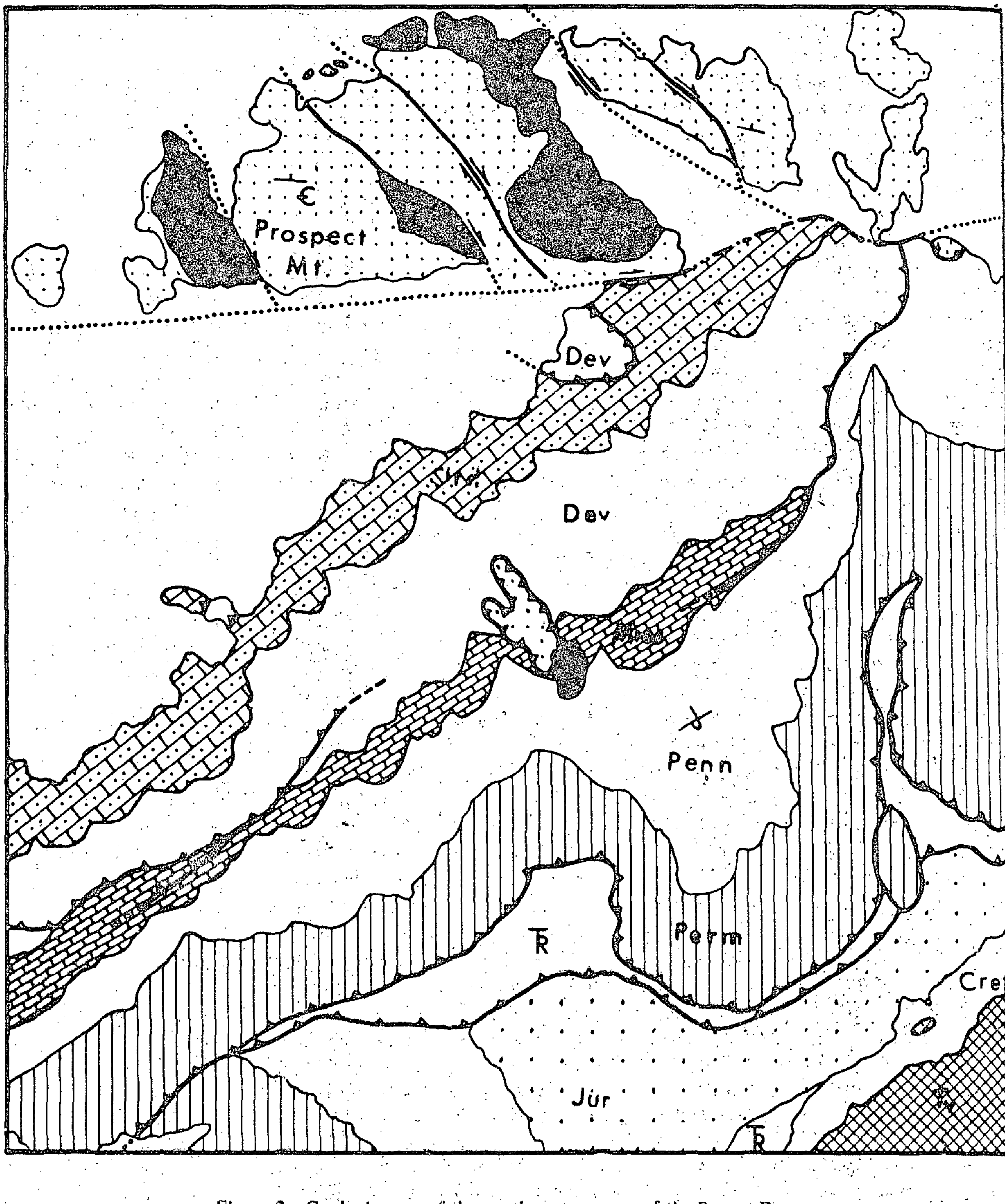
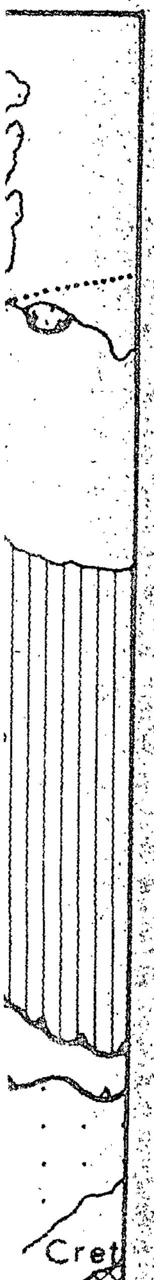


Figure 2.–Geologic map of the southwestern spur of the Pavant Range.



Several calderas have been mapped within the zone, four in Nevada and two probable calderas in Utah. The largest of the latter two is located in west-central Iron County at the westernmost extension of the Escalante Desert. The eastern rim of this probable caldera is downfaulted and covered by valley fill deposits of the Escalante Desert. The other probable caldera is located in the Horse Valley area at the west end of the Black Hills. The rim rock geometry, faulted central depression, alteration, silica-filled fractures, and a thermal spring are suggestive of a caldera.

A high concentration of thermal springs is closely associated with the transverse igneous belt (Heylmun, 1966), and copper mineralization is correlated with the belt (Schmitt, 1966).

Southern Boundary of the Intermountain Seismic Belt. – The Intermountain seismic belt extends southward from Flathead Lake in Montana, through the Hebgen Lake-Yellowstone area, southeastern Idaho, and along the Wasatch front in Utah to the Beaver-Cedar City area. At this point the zone of seismicity bends abruptly and extends west-southwest across southern Nevada (Baranzangi and Dorman, 1969). The westward trend coincides with the depositional thick of the ignimbrites.

Focal depths of the earthquakes in this zone are shallow, virtually all ranging from the surface to 20 km. Earthquake swarms are known to occur in the zone, the most notable being the 1971 swarm centered just north of Enoch, Utah. Up to 300 events per day were recorded with a local seismometer array by Smith and Trimble (personal communication). Focal mechanisms within the belt include both normal and strike-slip displacements (Smith and Sbar, 1973).

The Black Rock Offset

A regionally significant structural zone occurs between the south end of the Pavant Range and the north end of the Beaver Lake Mountains. The most obvious effect of this zone is the westward offset of the leading or erosional edge of the major thrust(s) south of this zone. Because the Black Rock volcano near Kanosh and the Black Rock community on the Union Pacific Railroad lie within this zone, it may conveniently be called the *Black Rock offset*. Its west-southwest trend is similar to the Leamington fault which farther north offsets the Canyon Range overthrust westward from the Nebo thrust (Shepard and Morris, 1969).

The Black Rock offset is located at the northern edge of the transverse igneous belt and the southern end of the intermountain seismic belt. Moreover, it marks the boundary between the two areas of contrast as discussed above in terms of the disturbed belt, divergence of the major thrust(s) and normal faults, and the graben-overthrust spatial relationship. Despite the obvious importance of this zone in the regional structure, little is known of its detailed structure owing to masking by Cenozoic sediments and volcanics. Meager evidence indicates that strike-slip faulting is important within the complex zone.

Near Corn Creek at the south end of the Pavant Range, the Pavant thrust begins to climb section in the allochthon. Furthermore, fold axes and traces of imbricate thrusts trend approximately east-west, in marked contrast to the north-northeast structural trends in the Pavant thrust plate persistent for many tens of kms to the north. This change in geometry may be reconciled with an interpretation wherein the southern end of the thrust plate is near the southernmost exposures, and does not continue south beneath the Late Cretaceous-Cenozoic overlap. Crosby (1959) has mapped an anticline in authochthonous Permian Kaibab Limestone trending east-west in Middle Canyon 3 kms south of Corn Creek.

The southwesternmost spur of the Pavant Range is held up by an overturned section of Paleozoic rock which is thrusted over various Triassic and Jurassic formations (Crosby, 1959) (Fig. 2). Mapping by Zimmerman (1961) demonstrates that the overturned section is exposed in the low hills west of Interstate 15 for another 10 kms. Immediately north of the overturned section are some areally limited exposures of Cambrian Prospect Mountain and Pioche Shale that are deformed but in normal attitude. An east-trending, steeply dipping fault, exhibiting diagonal striations, separates these rocks from the overturned section. Several relatively minor faults repeat the Prospect Mountain-Ophir contact. These faults trend northwest-southeast and striations on the fault surface indicate that at least the final movements had a strong strikeslip component. A small outlier of Prospect Mountain rests on the overturned section.

The next westward exposure of the offset structural zone is at the north end of the Mineral Range. Here Prospect Mountain Quartzite is in thrust position over Upper Cambrian limestones (Leise, 1957). The thrust fault has a domed configuration and distribution of metamorphic facies suggests that the structural attitudes reflect a shallow intrusive, perhaps satellitic to the main Mineral Range pluton. It is not known if the Upper Cambrian limestones are normal, or overturned like the section in the southwest Pavant Range with which they line up.

At the northernmost tip of the Beaver Lake Mountains Cambrian Prospect Mountain Quartzite is observed to be thrusted onto several Lower Paleozoic formations (Barosh, 1960). The next pre-Cenozoic exposures to the west are in the San Francisco Mountains where the offset is here connected with the main line of faulting defined by the major thrust(s) in the Wah Wahs, San Francisco, and Beaver Mountains.

The fact that Lower Cambrian-Eocambrian quartzites rest in thrust relation on Paleozoics in all of these "lined up" exposures between the south end of the Pavant Range and the San Francisco Mountains suggest that each is part of a structural entity. The limited exposures of the east-west diagonal fault, in the southwest spur of the Pavant Range, shows indications of strong strike-slip motion, and together with the overall structural geometry of the zone suggests that right lateral strike-slip faulting predominates in the Black Rock offset zone. The minor northwest-southeast trending faults north of the diagonal fault in the southwestern Pavants are second order "extensional" faults by this interpretation.

REFERENCES CITED

Baer, J. L., 1962, Geology of the Star Range, Beaver County, Utah: BYU Geol. Studies, v. 9, pt. 2, p. 29-52.

Baranzangi, M., and J. Dorman, 1969, World seismicity maps compiled from ESSA, Coast and Geodetic Survey, epicenter data, 1961-1967: Seismol. Soc. America Bull., v. 59, p. 369.

Barosh, P. J., 1960, Beaver Lake Mountains, Beaver County, Utah: Utah Geol. and Min. Survey Bull. 68, 89 p.

Condie, K. C., 1960, Petrogenesis of the Mineral Range pluton, southwestern Utah: unpubl. M.A. thesis, Univ. Utah, 94 p.

Cook, E. F., 1960, Geologic atlas of Utah, Washington County: Utah Geol. and Min. Survey Bull. 70, 119 p.

Cook, K. L., and E. Hardman, 1967, Regional gravity survey of the Hurricane fault area and Iron Springs district, Utah: Geol. Soc. America Bull., v. 78, p. 1063-1076.

Crosby, G. W., 1959, Geology of the south Pavant Range, Millard and Sevier counties, Utah: BYU Geol. Studies, v. 6, no. 3, 59 p.

Earll, F., 1957, Geology of the central Mineral Range: unpubl. Ph.D. thesis, Univ. Utah.

East, E. H., 1966, Structure and stratigraphy of San Francisco Mountains: Am. Assoc. Petroleum Geologists Bull., v. 50, p. 901-920.

Frey, M. G., 1973, Influence of Salina salt on structure in Ne Pennsylvania part of Appalachian Plateau: Am. Assoc. Pe Geologists Bull., v. 57, p. 1027-1037.

Heylmun, E. B., 1966, Geothermal power potential in Utah: Ut and Min. Survey Spec. Studies 14, 28 p.

Hickcox, C. W., 1971, The geology of a portion of the Pavant allochthon, Millard County, Utah: unpubl. Rice University thesis, 67 p.

Kerr, P. F., G. P. Brophy, M. Dahl, J. Green, and L. E. Wollard, Marysvale, Utah, uranium area: Geol. Soc. America Spec. 64, 211 p.

Leise, H. C., 1957, Geology of the northern Mineral Range, Millard Beaver counties, Utah: unpubl. M.S. thesis, Univ. Utah, 88 p.

Mackin, J. H., 1947, Some structural features of the intrusions in Iron Springs district (Utah): Utah Geol. Soc. Guidebook 2, 6

———, 1960, Structural significance of Tertiary volcanic rocks southwestern Utah: Am. Jour. Sci., v. 258, p. 81-131.

Miller, G. M., 1966, Structure and stratigraphy of southern part of Wa Wah Mountains, southwest Utah: Am. Assoc. Petroleum Geo gists Bull., v. 50, p. 858-900.

Schmitt, H. A., 1966, The porphyry copper deposits in their regi setting, *in* Geology of the porphyry copper deposits: ed. Titley a Hicks, Univ. Arizona Press, p. 17-33.

Shepard, W. M., H. T. Morris, and D. R. Cook, 1969, Geology and deposition of East Tintic Mining District, Utah, in Guidebook Northern Utah: Utah Geol. and Min. Survey Bull. 82, p. 215-2

Smith, R. B., and M. L. Sbar, 1973, Contemporary tectonics seismicity of the western United States with emphasis on the mi mountain seismic belt: submitted to Geol. Soc. America Bull.

Whelan, J. A., 1970, Radioactive and isotopic age determinations Utah rocks: Utah Geol. and Min. Survey Bull. 81, 75 p.

Zimmerman, J. T., 1961, Geology of the Cove Creek area, Millard a Beaver counties, Utah: unpubl. M.S. thesis, Univ. Utah, 91 p.

UTAH - ATTRACTIVE WELLS
PI & UGMS LOGS

BOX ELDER CO

Sec 17, T8N-R7W E-Log #1
61.1°C @ 1067 m

CARBON

Sec 7, T13S-R17E, PI # 96
118.3°C @ 392 m

Sec 11, T13S-R16E E-Log # 5
51.7°C @ 962 m

Sec 31, T12S-R16E E-Log # 12
46.1 @ 699 m

DAVIS 0

DAGGETT 0

DUCHESNE 0

EMERY

Sec 25, T16S-R14E E-Log # 10
40.0°C @ 300 m

GARFIELD

Sec 22, T35S-R2W E-Log # 11
41.1°C @ 983 m

GRAND

Sec 2, T 16S-R24E — PI# 104

82.2°C @ 986 m

Sec 36, T19S-R18E — E-LOG # 5

41.1°C @ 690 m

Sec 16, T 20S-R 21E — E-LOG # 12

40.0°C @ 829 m

Sec 36, T 20S-R21E — E-LOG # 14

46.1°C @ 769 m

Sec 23, T21S-R18E — E-LOG # 25

40.6°C @ 923 m

Sec 20, T21S-R23E — E-LOG # 32

50.6°C @ 1161 m

Sec 22, T 22S-R19E — E-LOG # 37

45.6°C @ 890 m

Sec 10, T25S-R18E — E-LOG # 51

58.3°C @ 1277 m

Sec 13, T16S-R25E — E-LOG # 73

44.4 @ 469 m

GRAND (CONT)

Sec 12, T17S-R25E E-LOG # 94
47.2°C @ 913 m

Sec 15, T 17S-R25E E-LOG # 95
51.7°C @ 1162 m

Sec 7, T17S-R26E E-LOG # 97
56.1°C @ 1135 m

Sec 16, T18S-R24E E-LOG #106
42.2 @ 1000 m

Sec 21, T18S-R24E E-LOG #108
41.1°C @ 879 m

Sec 29, T20S-R22E UNITED ENERGY CORP
72.8°C @ 897 m

UTAH COUNTY 0

KANE 0 JUAB 0

MILLARD 0

PIUTE 0

RICH

Sec 1, T6N-R7E E-LOG # 2
40.0°C @ 914 m

SAN JUAN

Sec 33, T 28S-R 25E PI# 154
51.7°C @ 796 m

Sec 12, T30S-R24E E-LOG# 31
40.6°C @ 962 m

Sec 20, T41S-R24E E-LOG# 238
47.8°C @ 477 m

Sec 15, T42S-R25E E-LOG# 293 (REPEAT)
47.8°C at 176 m

SANPETE 0
SUMMIT 0
TOOELE 0
DAVIS 0
UINTAH

Sec 8, T9S-R20E PI# 86
51.1 °C @ 995 m

Sec. 18, T 9S-R 24E PI# 91
61.1 °C @ 893

Sec 21, T4S-R20E E-LOG #2
41.7 °C @ 653 m

UINTAH (CONT)

Sec 28, T4S- R20E E-LOG #3

54.4 °C @ 1181 m

Sec 14, T 10S - R 24E E-LOG # 78

40.0 °C @ 1011 m

Sec 10, T 11S - R 23E E-LOG # 88 (REPEAT)

53.3 °C @ 160 m

UTAH 0

WASATCH 0

WASHINGTON 0

WAYNE 0

SEVIER 0

UTAH

WELL No	Location (SLB+M except as noted) S	T	R	TEMP °C	DEPTH m	GRADIENT °C/Km
1	17	8N	7W	61.1	1067	48.4
2	31	11N	7E	65.6	1416	42.0
3	14	3N	16E	71.1	1257	51.7
4	25	3N	24E	84.4	1801	43.5
5	34	4S (UINTA)	11W	52.2	1066	43.2
6	11	11S	7E	70.6	1656	38.9
7	10	9S	17E	85.0	1707	45.6
8	28	4S	20E	54.4	1181	40.0
9	8	9S	20E	51.1	995	44.1
10	18	9S	24E	61.1	893	60.4
11	8	11S	21E	92.2	1869	45.5
12	10	11S	23E	53.4	160	288.8
13	32	10S	24E	66.7	1368	43.5
14	24	10S	24E	62.8	1294	43.0
15	11	12S	14E	68.3	1499	40.8
16	11	13S	16E	51.7	962	46.2
17	7	13S	17E	62.8	392	141.8
18	27	15S	19E	93.3	1664	49.7
19	22	14S	25E	93.3	2124	38.9
20	33	15½S	23E	103.9	2624	35.6
21	29	16S	24E	84.4	1838	40.2
22	2	16S	24E	82.2	986	72.6
23	23	16S	25E	70.0	1690	35.1
24	24	16S	25E	67.2	1510	37.5

WELL No	LOCATION S	T	R	TEMP. °C	DEPTH m	GRADIENT °C/km
25	25	16S	25E	70.0	1505	39.5
26	26	16S	25E	77.8	1770	38.0
27	15	17S	25E	51.7	1162	35.4
28	7	17S	26E	56.1	1135	40.1
29	2	24S	4E	52.2	1191	36.4
30	8	25S	4E	52.2	1216	35.6
31	29	20S	22E	72.8	897	69.3
32	10	25S	18E	58.3	1277	37.4
33	27	35S	2W	86.7	1993	39.0
34	33	28S	25E	51.7	796	51.7
35	4	40S	23E	81.1	1719	41.0

TO ACCOMPANY "COMPARISON"

ANOMALOUS GRADS. CALC. FROM BHTs > 50°C

UINTA BASIN

	API No	COORD		DEPTH (FT) RANGE		BHT °F	FORMATION	OVERLAPS	
1.	30228	F	1	6787-6860	6824	118	WSTC		✓
2	30378	E	1	9310-9377	9344	140	GRRV		✓
				10880-11008	10944	185	GRRV		✓
				11013-11100	11056	190	GRRV		✓
3	30379	E	1	16453	16453	212	WSTC		✓
4	10494	E	1	7493-7517	7505	160	GRRV		✓
				7577-7619	7598	179	GRRV		✓
				7786-7817	7802	184	GRRV		✓
				7971-7995	7983	190	GRRV		✓
				8513-8626	8570	197	GRRV		✓
				9140-9195	9168	198	GRRV		✓
				9220-9253	9236	198	GRRV		✓
				9613-9744	9678	200	GRRV		✓
5	30015	D	1	9899-9927	9913	126	TRTR		✓
9	30037	E	1	10265-10495	10380	192	GRRV		✓
				10495-10534	10514	185	GRRV		✓
				10872-10975	10924	192	GRRV		✓
10	30390	E	1	15450	15450	230	WSTC		✓
11	30018	E	1	10002-10228	10115	172	GRRV		✓
				10230-10485	10358	177			✓
				10346-10468	10407	174			✓
				11072-11143	11108	182			✓
				11162-11250	11206	195			✓
				11254-11372	11313	185			✓
				11365-11483	11424	190			

UINTA BASIN

	API No	COORD		DEPTH RANGE		BHT °F	FORMATION	OVERLAPS	
12	30026	E	1	10250-10420	10335	181	GRRV		✓
				10429-10486	10458	183	↓		✓
				10538-10586	10562	176			✓
				10729-10882	10806	180			✓
				10917-11083	11000	185			✓
13	30041	E	1	10275-10492	10384	190			✓
				10496-10556	10526	173			✓
				11000-11114	11057	190			✓
14	30027	E	1	9760-9876	9818	164			✓
				10034-10300	10167	182			✓
				10288-10360	10324	190			✓
				10560-10660	10610	193			✓
15	30030	E	1	10022-10300	10161	180			✓
				10299-10420	10360	180			✓
				10444-10539	10492	184			✓
				10813-11000	10906	190			✓
				11002-11222	11112	194	↓		✓
16	30369	E	1	14300	14300	225	WSTC		✓
17	30001	E	1	9029-9106	9068	187	GRRV		✓
				10400-10525	10462	180	↓		✓
18	30011	E	1	10368-10490	10429	163			✓
				10518-10580	10549	164			✓
				10578-10625	10602	164			✓
				10625-10670	10648	179			✓
				10700-10735	10718	165			✓
				10811-10928	10870	177	↓		✓

UINTA BASIN

	API No			DEPTH		BHT	FM		
	30011 (cont)	E	1	11065-11165	11115	187	GRRV		✓
				11372-11387	11380	178			✓
				11364-11434	11399	165			✓
19	30025	E	1	8743-8900	8821	163			✓
				9767-9917	9842	170			✓
				10808-10958	10883	174			✓
				10913-11083	10998	184			✓
				11085-11168	11126	182			✓
				11172-11248	11210	179			✓
				11255-11374	11314	183			✓
				11378-11519	11448	186			✓
				11490-11519	11504	190			✓
				11537-11658	11598	188			✓
				11667-11860	11764	185			✓
20	30012	E	1	9246-9303	9274	158	MGMK		✓
				10167-10287	10227	163			✓
				10289-10409	10349	163			✓
				10410-10444	10427	188			✓
				10422-10494	10458	165			✓
				10495-10534	10514	168			✓
				10594-10628	10611	190			✓
				10751-10783	10767	188			✓
	DEEPEN 30012	E	1	13360-13517	13438	232	WSTC		✓
21	20255	E	1	6835-6849	6842	118	GRRV		✓
				7028-7105	7066	123	"		✓
				8843-8945	8894	152	"		✓

UINTA BASIN

	API No			DEPTH		BHT	FM	
	20255 (CONT)	E	1	9037-9071	9054	152	GRRV	✓
				9080-9200	9140	157		✓
22	30013	E	1	9333-9451	9392	172		✓
				10278-10410	10344	173		✓
				10409-10461	10435	183		✓
				10464-10496	10480	185		✓
				10497-10531	10514	191		✓
				10536-10567	10552	197		✓
				10932-11044	10988	198		✓
	DEEPEN 30013	E	1	12282-12433	12358	218		✓
23	30031	E	1	10190-10480	10335	181		✓
				10482-10584	10533	182		✓
				10581-10630	10606	190		✓
				10995-11285	11140	184		✓
				10628-10828	10728	186		✓
				11475-11745	11610	198		✓
24	30024	E	1	10058-10275	10166	164		✓
				10261-10329	10295	158		✓
				10352-10385	10368	186		✓
				10390-10475	10432	185		✓
				10400-10437	10418	170		✓
				10724-10885	10804	178		✓
				10915-10992	10954	183	↓	✓
25	30086	E	1	12120-12308	12214	225	WSTC	✓
				12575-12699	12637	203	"	
						25		

UINTA BASIN

	API No.			DEPTH		BHT	FM	
26	30123	E	1	10459-10625	10542	208	GRRV	✓
				12596-12755	12676	204	"	✓
27	30099	E	1	13591-13692	13642	242	WSTC	✓
28	30147	E	1	13220-13398	13309	198	"	✓
				13809-13904	13856	224	"	✓
29	30169	E	1	11519-11675	11597	186	GRRV	✓
30	30401	E	1	13719	13719	226	WSTC	✓
31	30301	D	1	11929-12110	12020	183	GRRV	✓
32	30275	D	1	12586-12651	12618	168	?	✓
33	30054	D	1	11473-11705	11589	172	GRRV	✓
				11831-11961	11896	175	"	✓
				12820-12890	12855	176	WSTC	✓
				14063-14193	14128	200	"	✓
				15410-15640	15525	212	"	✓
				15850-16300	16075	229	"	✓
34	30198	F	1	12606	12606	243	WSTC	✓
35	30194	E	1	11000-11143	11072	222	"	✓
				11517-11594	11556	224	"	✓
36	30315	F	1	1945-2170	2058	92	GRRV	✓
37	30311	E	1	10010-10107	10058	185	"	✓
38	30339	E	1	9223-9230	9226	163	GRRV	✓
39	30048	D	1	10600-10770	10685	199	↓	✓
				12031-12114	12072	210		✓
				12244-12349	12296	189		✓
40	30052	D	1	6502-6908	6705	118		✓
				11028-11089	11058	219		✓

UINTA BASIN

	API No			DEPTH		BHT	FM		
	30052 (cont)	D	1	11826-11878	11852	202	WSTC		✓
				11970-12055	12012	210	↓		✓
				12363-12476	12420	209			✓
				14630-14770	14700	246			✓
				15318-17766	16542	274			✓
41	30051	D	1	7100-7493	7296	130	GRRV		✓
				8227-8572	8400	156	↓		✓
				8565-8934	8750	160			✓
42	30058	D	1	9709-9860	9784	174			✓
				9985-10040	10012	165			✓
				11426-11583	11504	192	WSTC		✓
				11690-11752	11721	190	↓		✓
				12498-12545	12522	192			✓
43	30049	D	1	4970-5170	5070	109	GRRV		✓
				6299-6474	6386	123	↓		✓
				6928-7081	7004	134			✓
				9316-9393	9354	176			✓
				9598-9816	9707	161			✓
				11155-11212	11184	230			✓
				11155-11222	11188	197			✓
				11820-11995	11908	204			✓
				12002-12140	12071	214			✓
				13251-13442	13346	248			✓
44	30420	C	1	13825	x13825	210	TRTR		✗
45	30065	D	1	12682-12695	12688	248	WSTC		✓
46	30382	D	2	10000	10000	198	"		✓

26

UINTA BASIN

	API No			DEPTH		BHT	FM		
47	30078	D	2	8349-8986	8668	158	WSTC		✓
48	05146	C	2	4641-4679	4660	90	GRRV		✓
				5295-5315	5305	106	↓		✓
				5110-5130	5120	108			✓
				4680-4722	4701	103			✓
				4224-4256	4240	98			✓
				4040-4082	4061	96			✓
				2405-2435	2420	80			✓
49	30033	C	2	2152-2252	2202	75			✓
				2371-2391	2381	70			✓
				6932-7041	6986	161			✓
				7568-7700	7634	152	↓		✓
				8502-8540	8521	177	WSTC	✓	2 HRS
				9486-9607	9546	212	↓	✓	7 HRS
				8592-8680	8636	200		✓	28 HRS
50	05145	C	2	10550-11674	11112	189		✓	4 HRS
				SAME 10550-11674	11112	194		✓	16 HR 17 MI
51	30022	D	2	7965-8100	8032	192		✓	
52	20179	D	2	7834-7856	8845	185		✓	
				8150-8350	8250	187	↓	✓	
53	30003	B	2	4020-4154	X 4087	104	GRRV	X	
T↓R LOCATION WRONG (54) X	30181	F	5	5435-5480	X 5458	200	DRCK	X	
				10865-11060	X 10962	180	WSTC	X	
				11135-11362	X 11248	199	"	X	
55	20309	G	1	7370-7432	7401	131	GRRV	✓	

UINTA BASIN

	API			DEPTH		BHT	FM		
56	05868	H	1	5384-5430	[illegible]	117	RSRP	✓	outside Basin but use
				5438-5460	[illegible]	123	"	✓	
57	05677	H	1	1665-1688	[illegible]	100	MRSN		
				2058-2069	[illegible]	110	ENRD	✓	
58	03246	H	1	3295-3315	[illegible]	98	SLWS?	✓	
59	05817	H	1	2198-2226	[illegible]	80	WEBR	✓	
60	20302	E	2	5345-5470	x5408	128	DGCK	X	
61	05061	A	2	2723-2779	x2751	74	UNKN	X	
				4260-4310	4285	107	GRRV	X	
62	30080	F	1	5110-5157	5134	91	UINT	✓	
				5425-5480	5453	108	GRRV	✓	
63	30426	D	3	5692	x5692	121	WSTC	X	
				5692	x5692	121	"	X	
64	30185	G	2	8002-8188	8095	162	GRRV	✓	
				8201-8302	8252	160	↓	✓	
65	05606	G	2	3738-3764	3751	97	↓	✓	
				4885-4915	4900	129	↓	✓	
				6245-6257	6251	120	↓	✓	
				6680-6710	6695	139	↓	✓	
				6975-6988	6982	138	↓	✓	
66	05347	H	2	6064-6086	6075	121	↓	✓	
				5911-5933	5922	123	↓	✓	
				5178-5200	5189	120	↓	o	
67	30101	H	2	5847-5866	5856	120	↓	✓	
				5535-5566	5550	117	↓	✓	
				5466-5480	5473	116	↓	✓	

UINTA BASIN

	API No			DEPTH		BHT	FM	
68	20280	H	2	5712-5773	5742	122	GRRV	✓
				5637-5711	5674	122	↓	✓
				5385-5430	5408	115	↓	✓
69	30281	H	2	5634	5634	115	↓	✓
70	30282	H	2	5821	5821	112	↓	✓
71	30249	H	2	5737	5737	108	WSTC	✓
72	30082	I	2	4437-4525	x4481	113	GRRV	✗
73	30394	E	2	6231-6380	x6306	150	TRSZ	✗
				7047-7127	x7087	168	WSTC	✗
74	05229	G	2	3556-3602	3579	102	GRRV	✓
				4213-4226	4220	118	↓	✓
75	30077	G	2	5060-5160	5110	123	↓	✓
76	30053	G	2	3548-3595	3572	119	↓	✓
77	30230	H	2	8096-8232	8164	106	TRTR	✓
78	20222	I	2	4248-4280	x4264	110	GRRV	✗
79	20174	I	2	4497-4520	x4508	120	↓	✗
80	407-30066	I	2	3002-3023	x3012	94	↓	✗
				6105-6130	x6118	105	MVRD	✗
81	013-30066	E	2	3968-3999	x3984	112	DGCK	✗
82	05148	F	2	2759-2799	2779	104	GRRV	✓
X				4940-4966	4953	158	↓	✓
X				5593-5612	5602	185	↓	✓
83	05040	E	2	2380-2418	x2399	84	RCCK	✗
84	05030	E	3	4065-4122	x4094	114	GRRV	✗
				4389-4394	x4392	108	↓	✗
				4551-4600	x4576	112	↓	✗

UINTA BASIN

	API No			DEPTH		BHT	FM	
	05030 (Cont)	E	3	5448-5496	x5472	120	GRRV ✓	x
85	05290	F	2	4705-4720	4712	132	↓	✓
86 X	05199	G	2	3190-3340	3265	124	PCCK	✓
				4211-4244	4228	113	DGCK	✓
87	05202	G	2	2800-2857	2828	95	PCCK	✓
				3870-4020	3945	112	GDGC	✓
88	30262	G	2	3577-3596	3586	108	GRRV	✓
89	30275	H	2	6520	6520	142	WSTC	✓
90	30274	H	2	6637	6637	142	"	✓
91	30124	H	2	1065-1130	1098	102	GRRV	✓
				1560-1800	1680	100	↓	✓
X				2810-3050	2930	142 ✓	↓	✓
X				4775-4880	4828	160 ✓	WSTC	✓
X				5335-5395	5365	162	"	✓
X				6789-6850	6820	202 ✓	MVRD	✓
X				7377-7450	7414	208 ✓	"	✓
X				7452-7639	7546	208 ✓	"	✓
X				8224-8470	8347	218	CSLG	✓
92	30223	F	3	10780	10780	180	MNCS	✓
93	30280	I	3	6378-6509	x6444	168	MVRD	x
94 X	30189	G	3	6082-6184	x6132	198	?	x
95 X	30014	D	3	4184-4243	x4213	130	WSTC	x
X				4906-4933	x4920	155		x
X				5847-5870	x5858	158		x
X				5992-6025	x6008	160	↓	x

UINTA BASIN

	API No			DEPTH			FM	OVERLAPS	
96 X	30039	E	4	1260-1312	X 1286	145	TRTR	X STRY	*
X				1316-1342	X 1329	132	STRY X	GRRV	
97	30143	G	4	2465-2550	X 2508	103	WSTC	X	
				9613-9710	X 9662	223	MNCS X	DKOT	
98	30165	H	4	5648-5670	X 5659	130	MVRD	X	
				10754-10820	X 10787	176	DKOT	X	
				11300-11330	X 11315	180	MRSN	X	
outside Basin 99	20225	B	4	3198-3368		101	UNKN		outside Basin
				3390-3544		101	FRRN		
				3544-3633		102	"		
				3633-3740		102	"		
				4061-4172		104	DKOT		
				4675-4756		106	BCKR		
100	30135	H	4	4602-4714	X 4658	105	MVRD	X	
101	~~30006~~			~~10382-10563~~		~~106~~	~~PSPR~~	~~DNDY~~	Sanpete Co
outside Basin 102	20190	B	5	6370-6429		130	KIBB		outside Basin
103	30022	E	5	3692-3706	X 3699	97	MVRD	X	
				8386-8487	X 8436	168	DKOT	X MNCS	
104	30241	I	5	7250	X 7250	106	MRSN	X	
X				3220-3250	X 3235	180	CSLG	X	*
outside Basin 105	30013	B	5	4048-4060		120	SNAD		outside Basin
				4440-4495		120	KIBB		
107	~~30046~~			~~1544-1665~~		~~94~~	~~FRRN~~		
				~~6340-6429~~		~~140~~	~~CHNL~~		