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CATAGORY VII (Deposits in and west
of the Rocky Mts.)

UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

URANIUM OCCURRENCES ON THE MERRY WIDOW CLAIM, WHITE SIGNAL DISTRICT, GRANT COUNTY, NEW MEXICO

By

Harry C. Granger and Herman L. Bauer, Jr.

November 1951

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Trace Elements Investigations Report 157

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URANIUM OCCURRENCES ON THE MERRY WIDOW CLAIM, WHITE SIGNAL DISTRICT, GRANT COUNTY, NEW MEXICO

By

Harry C. Granger and Herman L. Bauer, Jr.

ABSTRACT

The Merry Widow claim is near the center of sec. 22, T. 20 S., R. 15 W, New Mexico principal meridian, about 1 mile west of White Signal, Grant County, N. Mex. Secondary uranium minerals were discovered in the White Signal district in the early 1920's although several mines in the district had been worked previously for gold, silver, and copper. The writers mapped the Merry Widow claim in 1950, collected 133 samples, and logged the core from one diamond-drill hole on the Merry Widow claim.

The pre-Cambrian granite that forms much of the country rock in the vicinity of the Merry Widow claim is intruded by numerous dikes that range in composition from basalt to pegmatite. The uranium deposits generally occur in basalt or diabase near one of the many strongly oxidized quartz-pyrite veins that are common in the district. Locally, as in the Merry Widow mine, the uranium minerals torbernite and autunite are in fractured granite or latite adjacent to a quartz-pyrite vein.

A diamond-drill hole located about 400 feet south of the Merry Widow shaft cut the vein at a depth of 520 to 550 feet. Even at this depth the strong veins are completely oxidized; and although secondary uranium minerals and radioactive fracture surfaces were cut throughout the core, no primary uranium minerals were identified.

The surface rocks at fifteen localities on the claim display abnormal radioactivity. Eight of these are in diabase, three in granite, two in latite, and one in basalt; in the Merry Widow mine, diabase, latite, and granite are all uranium-bearing adjacent to the Merry Widow vein.

The close relationship between uranium mineral distribution and the oxidized parts of quartz-pyrite veins, suggests that the unoxidized parts of the veins may contain primary uranium minerals. The generally high phosphate content of the basic intrusive rocks in the district, may account for the localization of phosphate-bearing uranium minerals near the intersections of quartz-pyrite veins with diabase and other sub-silicic rocks. If further prospecting is done, it should be directed along these veins, especially near the intersections with diabase.

INTRODUCTION

Small scattered deposits of secondary uranium minerals occur on the Merry Widow claim and other properties in the White Signal district of New Mexico.

The Merry Widow claim (fig. 1) is near the center of sec. 22, T. 20 S., R. 15 W., New Mexico principal meridian, near White Signal, Grant County, N. Mex. White Signal is 17 miles south of Silver City, on State Highway 180; the Merry Widow claim is 0.7 mile by dirt road northwest from the highway, about 1/2 mile west of White Signal.

The Merry Widow claim, owned by Otto Forster, of Silver City, N. Mex., is under lease and option to A. G. Hill, of Dallas, Tex. It is part of a group of six adjoining claims controlled by Mr. Hill, namely, the Acme and Acme No. 1, Merry Widow and Merry Widow No. 1, Ace-in-the-Hole, and the Duece-in-the-Hole claims.

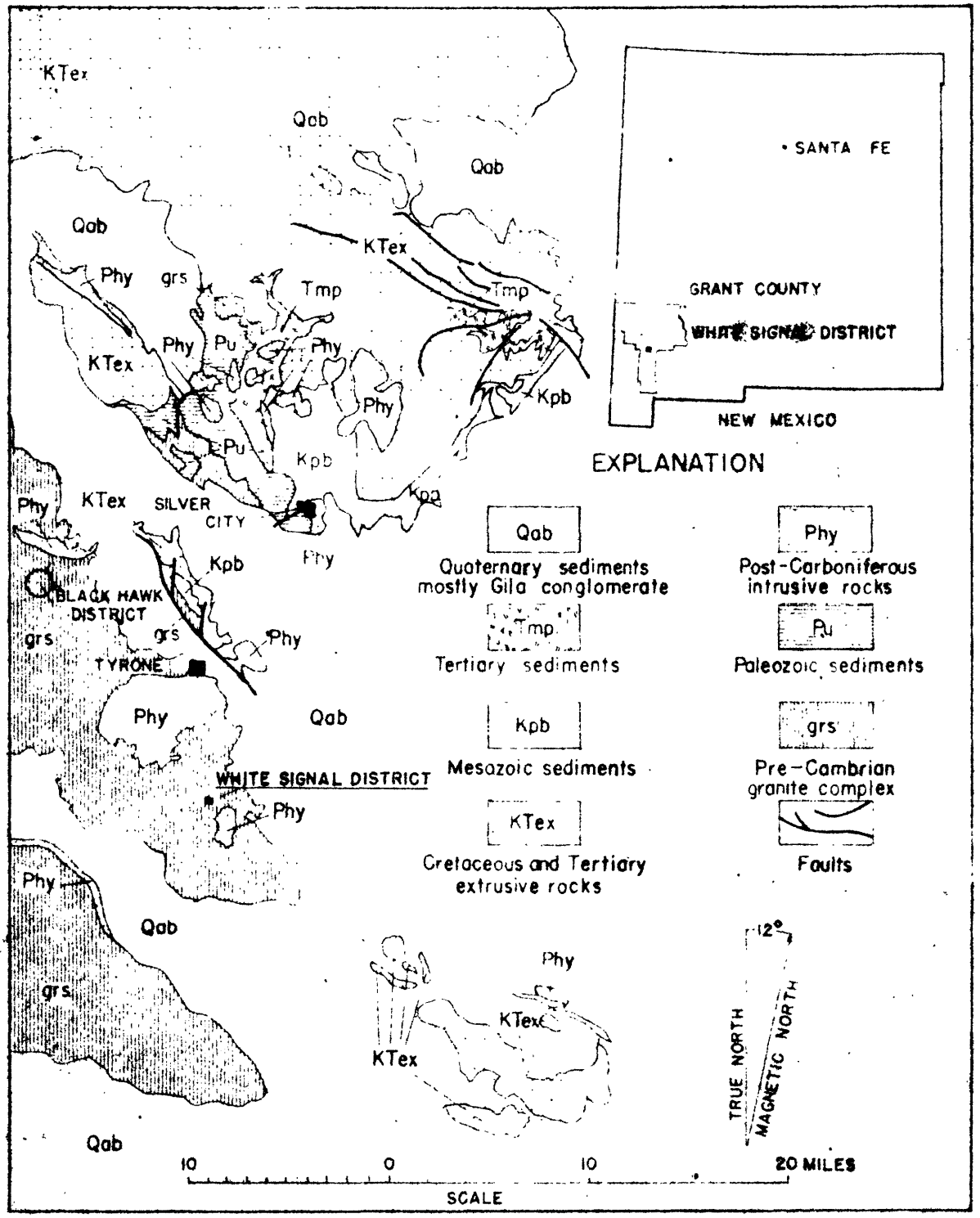

FIGURE 1.— MAP SHOWING THE LOCATION OF THE WHITE SIGNAL DISTRICT, GRANT COUNTY, NEW MEXICO.

The claim is in rolling hills with generally low relief, at an elevation of about 6,000 feet. The climate is mild and dry for most of the year.

Gold, silver, and copper minerals were found in the White Signal district in the late 1800's / and during the subsequent mining activity, gold

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/ Keith, S. B., Report on detailed examination of S-37 occurrences in the White Signal and associated districts, New Mexico: Union Mines Development Corp., Report No. 29-4, July 1945.

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was discovered on the Merry Widow claim. In the early 1900's the richer ores near the surface were mined out and production in the district has been small for the last 40 years. The Merry Widow mine was idle until the 1920's when Mr. A. A. Leach, then mining engineer for Phelps Dodge Company, recognized secondary uranium minerals on old dumps in the district. Offers of $50 per ton for 0.5 to 3 percent uranium ore revived mining activity. The roughly concentrated uranium minerals, autunite and torbernite, were imbedded in plaster plaques to be used in "activating" water for drinking, bathing, and watering plants. Two carloads of torbernite-bearing clay and sericite from the Merry Widow mine were used for the manufacture of radioactive face powder. Neither of these enterprises were successful.

In 1944 and 1945, the Union Mines Development Corporation made two examinations / of the uranium deposits in the White Signal District.

/ Keith, S. B., op. cit., July 1945.

/ Keith, S. B., Preliminary field reconnaissance of reported S-37 occurrences in southwestern New Mexico, (White Signal, Black Hawk, San Lorenzo and Organ Districts): Union Mines Development Corp., Report No. 29-3, April 1944.

The post-war interest in uranium again revived prospecting activity in the White Signal district and the U. S. Geological Survey examined the Merry Widow

and other known uranium-bearing deposits. During February and March 1950, a geologic map on a scale of 1 inch equals 100 feet was made on the Merry Widow claim (fig. 2); five prospecting trenches and the 40- and 60-foot levels in the Merry Widow mine (fig. 5) were mapped on a scale of 1 inch equals 10 feet; and 133 samples were collected. Only the geologic map of Trench No. 1 (fig. 4) has been included in this report inasmuch as the features exposed in Trench No. 1 are typical of the other trenches. During May 1950, 650 feet of core was logged _/ at a diamond-drilling operation on the Merry Widow claim.

_/ Granger, H. C., and Bauer, H. L., Jr., Results of diamond drilling, Merry Widow claim, White Signal, Grant County, New Mexico: Trace Elements Memorandum Rept. 146, July 1950.

C. E. Bazley, engineer in charge of development work for A. G. Hill, was very helpful during the examination of the Merry Widow property. Members of the Geological Survey's office in Silver City, especially Elliot Gillerman, kindly supplied the writers with recent unpublished geologic information. The work was done on behalf of the Division of Raw Materials of the U. S. Atomic Energy Commission.

GEOLOGY

The Merry Widow claim is in an area underlain by a large pre-Cambrian granite mass intruded by numerous dikes that range from basalt to pegmatite. Relative ages were established for only a few of the intrusive rocks as only a small area was mapped.

Pre-Cambrian rocks

Granite

The granite, which forms the country rock in the vicinity of the Merry Widow claim (fig. 2), is typically a leucocratic, commonly biotite-poor, medium-grained rock in which the feldspars are partly argillized. The texture varies considerably; the grain size ranges from medium to coarse, and locally the granite is porphyritic. The exposures are low and rounded and much of the surface is covered with the disintegration products of the granite. Iron-stained granite is more resistant than the unstained rock and forms the more prominent exposures.

Pegmatite and barren quartz veins

Several poorly exposed, highly irregular narrow dikes of quartz-feldspar pegmatite and veins of barren quartz that strike north were observed, but were not mapped. The pegmatite and quartz veins may be pre-Cambrian, for in the northeast part of the area (fig. 2) a small pre-Cambrian (?) basalt dike less than 4 feet long and 6 inches wide has longitudinally intruded the core of a barren quartz vein.

Diabase and basalt

Two prominent diabase dikes (fig. 2) and several narrow basalt dikes (not mapped) of pre-Cambrian (?) _/ age are exposed on the Merry Widow claim. The dikes strike north and dip to the east.

_/ Keith, S. B., op. cit., July 1945.

The diabase dikes are as much as 35 feet thick. The texture ranges from coarse diabasic in the center to a fine-grained, chilled-border facies along the margins. The basalt dikes, on the other hand, are commonly less than 3 feet thick and have a fine-grained texture similar to the margins of the diabase dikes. A thick blanket of dark soil covers the diabase and basalt dikes except where hardened by iron oxides adjacent to a vein. Analyses (table 1), show that these rocks have an abnormally high phosphate content./.

/ Daly, R. A., Igneous rocks and the depths of the earth: 1933, pp. 17, 18.

The similar trends, textures, phosphate content, alteration by iron oxides, and general appearance of the diabase and basalt dikes lead to the conclusion that they are of the same age.

Younger rocks

Latite (?)

Several gray aphanitic dikes designated as latite (?) on figure 2, but which have been almost completely altered to clay minerals, cut both the diabase and the granite on the Merry Widow claim. On the south half of the claim the average strike of the latite (?) dikes is east, whereas they strike northeast on the north half of the claim; possibly the two dike systems are different in age. The dikes are concealed at the surface because the latite (?) weathers rapidly and can be seen only in mine workings and prospect trenches.

Table 1.— Results of sampling, Merry Widow claim, White Signal district, Grant County, New Mexico (see figs. 2, 3, and 4 for location of samples)

Sample number	Material	Type	Length (feet)	eU (percent)	U (percent)	P_2O_5 (percent)
HLB-1-1	Granite.	Channel.	2.7	0.004	0.002	0.13
2	do.	do.	2.9	0.004	0.001	0.13
3	Quartz-pyrite vein, 1".	Grab.	—	0.007	0.006	0.54
4	Diabase.	Channel.	2.0	0.002	0.001	2.61
5	do.	do.	2.5	0.002	0.001	2.69
6	do.	do.	2.5	0.002	0.001	2.60
7	Latite.	do.	0.5	0.003	0.001	0.83
8	Granite, altered.	do.	2.5	0.004	0.001	0.10
9	do.	do.	2.5	0.004	0.001	0.20
10	Granite, altered.	do.	1.5	0.006	0.003	0.09
11	Latite and quartz-pyrite vein.	do.	0.3	0.023	0.019	0.53
12	Granite.	do.	1.5	0.008	0.004	0.10
13	Granite, altered.	do.	1.5	0.005	0.003	0.10
14	do.	do.	2.0	0.009	0.005	0.14
15	Granite, iron-stained.	do.	2.0	0.005	0.003	0.06
16	Quartz-pyrite vein, 3"	Grab.	—	0.005	0.003	0.17
17	Granite, iron-stained.	Channel.	2.0	0.004	0.002	0.10
18	Granite.	do.	2.0	0.007	0.002	0.07
19	Granite, iron-stained.	do.	2.5	0.003	0.002	0.07
20	Quartz-pyrite vein, 20".	do.	2.0	0.009	0.007	0.23
21	Granite, altered.	do.	2.0	0.004	0.003	0.09
22	do.	do.	2.5	0.004	0.003	0.13
23	do.	do.	2.0	0.009	0.009	0.14
24	Diabase autunite.	do.	1.7	0.100	0.11	1.18
25	do.	do.	2.7	0.029	0.025	2.18
26	Diabase.	do.	3.0	0.005	0.004	1.79
27	do.	do.	2.0	0.010	0.009	1.65
28	Granite.	do.	3.0	0.005	0.004	0.18
29	do.	do.	3.0	0.006	0.002	0.12
HLB-2-30	Granite, silicified.	do.	3.0	0.011	0.005	0.08
31	do.	do.	4.1	0.003	0.002	0.06
32	Granite, altered.	do.	3.0	0.008	0.005	0.14
33	Diabase, altered.	do.	3.1	0.006	0.003	0.56

Table 1.—Results of sampling, Merry Widow claim, White Signal district, Grant County, New Mexico—Continued

Sample number	Material	Type	Length (feet)	eU (percent)	U (percent)	P_2O_5 (percent)
HLB-2-34	Diabase, iron-stained.	Channel.	2.5	0.013	0.015	1.42
35	do.	do.	3.0	0.004	0.003	1.70
36	Diabase, altered.	do.	3.0	0.006	0.003	1.62
37	Granite, iron-stained	do.	3.0	0.005	0.003	0.35
38	Granite, altered.	do.	2.5	0.005	0.002	0.04
39	Quartz-pyrite vein.	do.	2.5	0.006	0.005	0.15
40	Granite.	do.	3.3	0.006	0.004	0.11
41	Granite, torbernite.	do.	2.0	0.011	0.008	0.04
42	Quartz-pyrite vein.	do.	3.0	0.008	0.005	0.10
43	Granite.	do.	3.0	0.005	0.003	0.07
44	do.	do.	3.8	0.005	0.003	0.11
45	do.	do.	2.6	0.004	0.002	0.09
46	Granite.	do.	3.0	0.004	0.002	0.06
47	Granite, iron-stained	do.	6.5	0.006	0.007	0.15
HLB-6-48	Diabase, iron-stained.	do.	3.0	0.016	0.010	0.97
HLB-7-49	Diabase, fault gouge.	do.	3.0	0.020	0.010	0.46
HLB-5-50	Diabase.	do.	3.0	0.005	0.004	1.72
51	do.	do.	2.0	0.006	0.004	0.95
52	Granite, altered.	do.	3.0	0.005	0.002	0.08
53	do.	do.	3.0	0.02	0.002	0.08
54	Quartz-pyrite vein.	do.	1.3	0.002	0.002	0.07
55	Granite, altered.	do.	2.0	0.005	0.002	0.07
56	do.	do.	1.7	0.008	0.003	0.06
57	do.	do.	2.0	0.005	0.002	0.04
58	Granite.	do.	2.0	0.004	0.001	0.08
59	do.	do.	1.6	0.008	0.006	0.08
60	Quartz-pyrite vein.	do.	1.0	0.014	0.010	0.13
61	Granite.	do.	2.0	0.007	0.002	0.06
62	Granite, altered.	do.	2.0	0.005	0.002	0.04
63	Granite,	do.	1.5	0.005	0.001	0.07
HLB-3-64	do.	Chip.	2.0	0.004	0.001	0.13
65	Granite, altered.	do.	1.5	0.005	0.001	0.07
66	do.	Channel.	2.5	0.005	0.004	0.22
67	Latite.	do.	0.5	0.005	0.004	0.23

Table 1.—Results of sampling, Merry Widow claim, White Signal district, Grant County, New Mexico—Continued

Sample number	Material	Type	Length (feet)	eU (percent)	U (percent)	P_2O_5 (percent)
HLB-3-68	Diabase, iron-stained	Channel.	2.5	0.009	0.007	1.48
69	Diabase.	Chip.	30.0	0.006	0.005	2.54
70	do.	Channel.	2.5	0.008	0.005	2.31
71	Granite, altered	do.	2.5	0.010	0.007	0.40
72	Quartz-pyrite vein, 1/2".	Grab.	—	0.008	0.004	0.32
73	Granite, altered	Channel.	2.5	0.004	0.002	0.06
74	do.	Chip.	17.0	0.005	0.002	0.06
75	do.	do.	7.0	0.005	0.002	0.07
76	Latite.	Channel.	1.5	0.006	0.006	0.15
77	Granite.	do.	3.0	0.004	0.002	0.13
78	Quartz-pyrite vein, 24"	do.	2.0	0.003	0.001	0.15
79	Granite.	do.	2.5	0.004	0.001	0.08
80	Granite, altered.	Chip.	13.0	0.005	0.002	0.11
81	Granite.	do.	14.0	0.003	0.001	0.08
HLB-8-82	Latite.	Channel.	1.5	0.017	0.020	0.41
83	Diabase.	do.	1.7	0.012	0.015	0.59
HLB-9-84	do.	do.	2.5	0.076	0.067	0.42
HLB-10-85	Diabase, iron-stained.	Chip	2.9	0.010	0.006	2.09
86	do.	Grab.	—	0.021	0.020	1.60
87	Fault gouge.	Channel.	2.5	0.010	0.006	0.26
88	Diabase, altered.	do.	2.5	0.017	0.020	0.66
89	Rhyolite fault breccia.	do.	3.0	0.005	0.003	0.08
90	Quartz monzonite.	Grab.	—	0.003	0.001	0.47
91	Granite.	do.	—	0.005	0.001	0.05
92	Basalt.	do.	—	0.092	0.10	1.56
93	Quartz monzonite.	do.	—	0.002	0.001	0.45
94	Granite.	do.	—	0.005	0.001	0.02
95	Basalt.	do.	—	0.007	0.003	1.14
96	Rhyolite.	do.	—	0.004	0.001	0.06
HLB-11-97	Granite.	Channel.	3.0	0.005	0.001	0.08
98	do.	Grab.	—	0.004	0.001	0.05
99	Quartz-pyrite vein	Channel.	2.5	0.004	0.004	0.58
100	Diabase	do.	2.5	0.005	0.001	2.51
HLB-12-101	Diabase, torbernite.	do.	2.0	0.87	0.092	1.69
102	Diabase	do.	2.0	0.039	0.034	2.11
103	Diabase, torbernite.	do.	2.0	0.098	0.077	1.77

Table 1.—Results of sampling, Merry Widow claim, White Signal district, Grant County, New Mexico—Continued

Sample number	Material	Type	Length (feet)	eU (percent)	U (percent)	P_2O_5 (percent)
HLB-12-104	Diabase.	Channel.	2.0	0.018	0.014	2.11
105	Granite, torbernite.	Grab.	——	0.10	0.070	0.44
HLB-4-106	Granite, altered.	Chip.	17.0	0.004	0.001	0.14
107	Diabase, altered.	Channel.	3.0	0.003	0.001	0.39
108	Granite and diabase.	do.	1.0	0.002	0.001	0.27
109	Granite, altered.	Chip.	4.5	0.004	0.001	0.10
110	Diabase, altered.	do.	26.0	0.002	0.001	0.43
111	Granite.	do.	29.0	0.005	0.001	0.08
112	Diabase.	do.	31.0	0.002	0.001	2.58
113	Granite.	do.	77.0	0.006	0.001	0.04
114	Quartz-monzonite.	do.	9.0	0.003	0.001	0.43
115	Granite.	do.	26.0	0.004	0.001	0.13
116	Diabase.	do.	26.0	0.002	0.001	2.02
117	Granite.	do.	33.0	0.006	0.001	0.03
118	Quartz-pyrite vein.	Channel.	6.0	0.003	0.001	0.10
119	Granite.	Chip.	18.0	0.000	0.001	0.03
120	Quartz-pyrite vein and gouge.	Channel.	0.5	0.005	0.002	0.19
121	Granite.	Chip.	18.0	0.005	0.001	0.06
122	Latite.	Channel.	2.0	0.010	0.008	0.28
123	Granite.	Chip.	9.0	0.005	0.003	0.03
124	Latite.	Channel.	4.0	0.005	0.004	0.30
125	Granite.	Chip.	37.0	0.004	0.001	0.07
126	Latite.	Channel.	6.0	0.007	0.007	0.31
127	Granite.	Chip.	17.0	0.001	0.001	0.08
128	Latite.	Channel.	5.0	0.001	0.001	0.32
129	Granite.	Chip.	24.0	0.001	0.001	0.05
130	Latite.	Channel.	4.0	0.008	0.008	0.36
131	Granite and quartz-pyrite veins.	Chip.	40.0	0.005	0.001	0.07
132	do.	do.	40.0	0.004	0.001	0.04
ss-1	Granite, torbernite.	Selected	——	0.021	0.014	0.07

Quartz monzonite porphyry

Quartz monzonite porphyry (fig. 2), which consists of green-gray groundmass, with scattered quartz phenocrysts as much as 8 mm in diameter, forms prominent northeast-trending dikes in the granite on the north half of the Merry Widow claim. Locally, the quartz monzonite porphyry is more resistant to weathering than the granite and stands as much as 2 to 3 feet above the surrounding surface. The dikes are believed to dip nearly vertically, although the contacts generally are concealed by granitic soil.

Diorite (?)

Three small exposures of a dark, fine-grained rock, tentatively identified as diorite (?) (fig. 2), were observed on the claim. The exposures of the diorite were irregular and discontinuous, and the relationships of the diorite (?) to the other rocks were not determined.

Rhyolite

Aphanitic green rhyolite, believed to be the youngest instrusive rocks on the Merry Widow claim, crop out along a zone that trends eastward (fig.2). Rhyolite dikes in this zone strike northwestward, whereas the rhyolite dikes elsewhere in the White Signal district strike northeastward. Possibly, these dikes are en-echelon apophyses of a larger dike, not yet exposed at the surface, that trends eastward.

Structure

The rocks on the Merry Widow claim have been complexly faulted and fractured. Displacement, however, can be seen only where the larger faults

cut diabase dikes which are offset as much as 60 feet.

The faults are commonly filled with vein materials or dike rocks and are characterized at the surface by limonite, silica, and an altered zone. Many minor faults and joints are so well healed by quartz and minor amounts of limonite that they are barely discernable.

Locally, such as the eastern end of trench No. 4 (fig. 2), the veins show a consistent trend but no general alignment is seen when a broader area is considered except in the southern half of the claim where several veins trend east along faults with steep dips that offset the diabase dikes as much as 60 feet.

Although Keith reported a strong sheeting pattern in the White Signal district, measurements of numerous joints on the Merry Widow claim showed no consistent trend. Locally, a series of joints may strike and dip uniformly but another conflicting set may appear a few feet away. The more persistent joint sets commonly have the same attitude as nearby faults or dike contacts suggesting that they may be minor fractures in a shear zone.

All the pre-Cambrian and many of the younger rocks have been broken by closely spaced irregular joints. Some of these fractures are filled with thin quartz-pyrite or specularite veinlets.

Mineral deposits

Veins

Three distinct types of veins occur on the Merry Widow claim: barren quartz, quartz-specularite, and quartz-pyrite. The barren quartz veins are filled with milky "bull" quartz. They are traceable only by float, as the quartz is highly fractured and does not crop out. Although no feldspar was

seen, the barren quartz veins may grade imperceptibly into the pegmatitic rocks on the Merry Widow claim.

The quartz-specularite type veins are less prominent on the Merry Widow claim than in other parts of the district, but the presence of float confirms their presence here. The vein filling is specularite with quartz and the adjacent wall rocks commonly have been silicified. No ore minerals were seen to be associated with the quartz-specularite veins.

The quartz-pyrite veins have been strongly oxidized near the surface and the pyrite has been altered to a massive, vitreous or a vesicular limonite. Quartz is local and occurs as discrete lenses and blebs, the centers of which rarely contain unoxidized pyrite. Granite wall rock bordering the veins generally has been either silicified or intensely altered to clay minerals and minor sericite, and is stained by hydrous iron oxides. Diabase cut by the veins is usually impregnated with silica and hydrous iron oxides and locally is relatively resistant to weathering.

Ore minerals on the Merry Widow claim are found only in the quartz-pyrite type veins. In the parts of the veins near the surface all the minerals are secondary but increasing amounts of metallic sulfides are found as depth increases in the Merry Widow mine and in the diamond-drill core.

Ore deposits

The ore minerals on the Merry Widow claim are associated with silica and with hydrous iron oxides produced by the oxidation of pyrite and perhaps also of chalcopyrite. The oxidized parts of the quartz-pyrite vein contain a simple suite of minerals. The mineralogy of unoxidized parts of the veins is poorly known, except for the dominance of quartz and pyrite.

Bismite, bismuth trioxide, has been reported _/ from the Merry Widow

_/ Keith, S. B., op. cit., 1945.

mine. The bismite is said to be closely associated with the better gold occurrences and its presence is sometimes used as a guide to gold prospecting.

Some green minerals exposed on the walls in the Merry Widow mine are believed to be copper sulfates. They are similar in appearance to torbernite, and may easily be confused with that mineral.

Secondary uranium minerals occur at several localities on and near the Merry Widow claim. In the field, the flaky yellow fluorescent uranium minerals were called autunite and the flaky or tabular, green, weakly-or non-fluorescent uranium minerals were called torbernite. No distinction was made between torbernite and meta-torbernite. These minerals usually occur in or near the intersection of diabase or basalt dikes with quartz-pyrite veins. Both minerals coat fracture surfaces and project into small cavities in the fractured rocks. The fractures and cavities are also commonly iron-stained. Locally, as in trench No. 2 (Locality R-7) and shaft No. 2, the torbernite crystals are disseminated in the granite and coat altered grains of feldspar. Although autunite is locally predominant in the near-surface parts of the deposits, torbernite is generally predominant a few feet below the surface.

Most of the uranium minerals are localized in or near diabase dikes where they are cut by quartz-pyrite veins. The autunite and torbernite occur in the vein filling and in the adjacent altered and fractured wall rocks. Locally the uranium minerals occur in the veins away from adjacent diabasic rocks, as in the Merry Widow mine, or in fractured granite, as in Trench No. 2.

At fifteen localities, on or adjoining the Merry Widow claim, samples were obtained that contain over 0.01 percent uranium or the field radioactivity indicated an equivalent uranium content of 0.01 percent. This figure was arbitrarily chosen as the minimum grade constituting an abnormal concentration of uranium.

Description of localities

Locality R-1

A small exposure of radioactive basalt less than 3 feet long and 2 feet wide lies within a narrow diabase dike in the north-central part of the area (fig. 2). Scattered torbernite crystals coat fractures a few inches under the weathered surfaces. Hydrous iron-oxides and perhaps some silica have impregnated the radioactive rock and made it more resistant to weathering than diabase farther along the strike. An abrupt offset near the small exposure, and the heavy iron-staining, suggest that the dike may be faulted, instead of changing strike as shown in figure 2. One grab sample containing 0.10 percent uranium was cut from the rock.

Locality R-2

A southeast-trending fault has placed a diabase dike in contact with a rhyolite dike in the northwest part of the area shown on figure 2. The altered diabase along the fault is abnormally radioactive and a fracture surface on one small specimen was coated with a few autunite crystals. The fault gouge between the diabase and rhyolite is very weakly uraniferous and the rhyolite is virtually non-radioactive. A 30-inch channel sample in the highly altered diabase, perpendicular to the strike of the fault, contained

0.020 percent uranium, whereas a 30-inch channel sample in the iron-stained fault gouge contained only 0.006 percent uranium.

Locality R-3

Resistant iron-stained diabase, at two exposures near the same fault that passes through locality R-2, is abnormally radioactive. The exposures are less than 3 feet in diameter and are about 25 feet apart. Although a grab sample from the west exposure contained only 0.006 percent uranium, a similar sample from the east exposure contained 0.020 percent uranium. The iron-stained fracture surfaces were the most radioactive parts of the specimens. No uranium minerals were noted in the samples.

Locality R-4

An east-trending latite (?) dike in the east central part of the area (fig. 2) locally contains 0.015 to 0.020 percent uranium. The dike averages about two feet in thickness; the radioactive zone is less than 30 feet long. Sample HLB-8-83 was taken between the main dike and a short radioactive branch dike (too small to be shown on the map) in rock that has a diabasic texture. This rock may be diabase, which was faulted into this position prior to the intrusion of the latite (?) dike. The size of the body with the diabasic texture could not be determined although it is probably small.

Locality R-5

Near the west-central part of the area (fig. 2) there is a triangular block of diabase, less than 30 feet long and about 3 feet across whose longer sides are bordered by faults and whose shortest side apparently is in normal contact with granite. The source of this block of diabase is not known, as the nearest exposed diabase is more than 300 feet away. The entire block is

radioactive and one 30-inch channel sample assayed 0.067 percent uranium. Fracture surfaces are locally coated with fluorescent hyalite, but no uranium minerals were identified.

Locality R-6

Iron-stained fracture surfaces along the south wall of a prospect pit near trench No. 2 are abnormally radioactive. The fractures are in granite along a vein that dips about 70° S. and that is believed to be an extension of the Merry Widow vein. No samples were taken, but the radioactivity, about 15 divisions on the first scale of a Beckman MX-5 Geiger counter, indicates that selected samples probably would contain about 0.01 percent equivalent uranium.

Locality R-7

Torbernite locally coats fracture surfaces in granite along the south wall of trench No. 2. This is one of the few occurrences of torbernite in granite. The fractures are relatively free from iron-oxide stains, and the torbernite crystals lie with their flat sides parallel to the surfaces. These fractures are within a few feet of the Merry Widow vein, which is exposed in trench No. 2. In further contrast with the usual torbernite occurrence is the low phosphate content, 0.07 percent, of the granite. Generally the rocks containing torbernite contain more than 0.30 percent P_2O_5 (table 1). A sample of selected specimens contained 0.014 percent uranium.

Locality R-8

Two shallow pits between trenches Nos. 1 and 2 expose a radioactive vein in diabase. The vein occupies a northeast-trending fault that offsets a diabase dike a distance of several feet. Where the fault intersects the diabase it changes strike and contains 2 to 3 feet of iron-stained gouge. The gouge, and the bordering diabase, which is heavily iron-stained and weakly silicified, are abnormally radioactive. Channel samples cut across the vein material in each pit, contained 0.01 percent uranium, but no uranium minerals were identified.

Locality R-9

A highly radioactive fracture zone that contains autunite is exposed along the east margin of a diabase dike at the west end of trench No. 1. This zone lies between two northeasterly trending veins that occupy faults, and it is possible that the fracturing resulted from movement along these faults. The uranium content apparently is greatest in the altered diabase adjacent to the contact with granite; it decreases abruptly away from the altered diabase into granite and more gradually into diabase. A 20-inch sample from the contact of the altered diabase contained 0.11 percent uranium. A 33-inch sample cut in the diabase about 20 to 53 inches from the contact contained only 0.025 percent uranium.

Locality R-10

A 30-inch channel sample of diabase in the middle of a dike exposed in trench No. 2 contained 0.015 percent uranium. The diabase is locally iron-stained and fractured by an obscure fault that nearly parallels the trench.

Abnormal radioactivity is traceable for only a few feet; no uranium minerals were identified.

Locality R-11

A 1/2-inch thick quartz-pyrite vein follows the south contact of a 4-inch latite dike with granite in the north wall of trench No. 1. The vein material and an inch or two of adjacent wall rock are abnormally radioactive but no uranium minerals were identified. A grab sample cut in both the vein and the dike contained 0.019 percent uranium. The vein is apparently uranium bearing only locally as it is much less radioactive where exposed on the south wall of trench No. 1.

Locality R-12

The Merry Widow mine consists of a 150-foot shaft inclined from 65° to 72° to the southeast, about 450 feet of workings on four levels, at 40, 60, 90, and 130 feet. In 1950, the mine was inaccessible below the 60-foot level, but both the 40- and 60-foot levels were mapped on a scale of 1 inch equals 10 feet (fig. 5). The mine follows a fault which offsets the diabase dikes about 60 feet on the surface. The fault is intruded by a latite (?) dike that ranges from a fraction of an inch to 5 feet in width. It strikes N. 45°-85° E. and dips 60°-72° SE. Later movements along the latite dike locally have brecciated the dike and nearby wall rocks and provided fractures in which quartz-pyrite veins were deposited.

The appearance of the latite (?) dike varies greatly throughout the mine. Where nearly fresh it is a fine-grained dark-gray rock. Locally it is highly fractured, iron-stained, argillized, or sericitized. The intensely argillized and sericitized rock commonly has the appearance of fault gouge, and

fault gouge may have been mistakenly mapped by the authors as altered latite in parts of the Merry Widow mine. Near the west face of the 40-foot level the dike is nearly white, and is altered to clay and sericite. This is probably the material that was mined for the manufacture of radioactive face powder.

Torbernite occurs throughout the mine on fracture surfaces in altered granite, diabase, and latite. Near the winze on the 40-foot level the latite dike has been argillized and bleached. Many random curved slickenside surfaces, which possibly result from movement caused by an increase in volume during the argillization of the rock, are coated with a film of torbernite, much of which appears to be elongated in the direction of the movements.

The Merry Widow mine was not sampled by the writers, as 182 samples were collected and assayed during Keith's examination in 1944 _/. The uranium con-

_/ Keith, S. B., op. cit., 1945.

tent of these samples was as much as 2.06 percent (table 2). Results of the sampling indicated that, aside from small localized concentrations of uranium minerals, the higher-grade uranium-bearing rock is within 30 feet of the shaft on the 40- and 60-foot levels.

Locality R-13

Shaft No. 2 is about 15 feet deep and is in diabase. The diabase forms a triangular-shaped block about 25 feet by 35 feet by 18 feet that is bordered by two quartz-pyrite veins. The shaft follows the contact of granite and diabase between these veins. Rock within a few inches of the contact is the most radioactive, containing a little less than 0.01 percent uranium. Torbernite crystals coat fractures in both the granite and diabase and extend several feet from the contact into the diabase. Five samples range in grade from 0.014 to 0.092 percent uranium; the lower grades represent material farther

Table 2.—Results of sampling, Merry Widow mine, White Signal district, Grant County, New Mexico 1/

Sample number	Distance from shaft (feet)	Length (feet)	Description (Keith)	Uranium (percent) Rifle, Colo.	Uranium (percent) Tonawanda, N.Y.
40-foot level:					
6557	0 W.	2.1 S.	Back - diabase with altered granite - torbernite.	0.67	0.67
6558		2.0 N.	Back - gouge and FeO.	0.04	0.04
6559	5 W.	2.1 S.	Back - special of 5" contact zone - torbernite.	0.41	0.38
6560		2.8	Back - gouge, diabase, granite, FeO breccia - torbernite.	0.34	0.34
6561		4.0	Back - diabase, FeO, bismite, hyalite.	0.03	0.05
6562		2.0 N.	Back - diabase, bismite, hyalite.	0.08	0.08
6563	10. W.	3.5 S.	Back - Blocky diabase.	0.03	0.11
6564		3.0	Back - gouge, altered granite, FeO - torbernite.	0.43	0.35
6565		3.8 N.	Back - altered diabase, bismite - torbernite.	0.16	0.14
6566	15 W.	4.2	High back - altered granite, FeO, gouge.	0.03	0.06
6567	20 W.	3.7 S.	Back - altered diabase, FeO.	0.06	0.04
6568		5.0 N.	High back - gouge, FeO, altered granite, torbernite.	0.44	0.39
6569	25 W.	2.7	High back - gouge, altered diabase, FeO.	0.07	0.05
6570	30 W.	3.5	High back - gouge, altered diabase, FeO, torbernite.	0.11	0.11
6571	35 W.	2.9	High back - altered diabase, gouge, FeO.	0.07	0.06
6572	40 W.	3.3	High back, gouge, altered diabase, FeO.	0.06	0.05
6573	45 W.	1.9 S.	Back - altered diabase, disseminated torbernite.	0.08	0.08
6574		2.0 N.	Back - strong FeO, gouge, altered diabase.	0.08	0.05

1/ Taken from Keith, S. B., Report on detailed examination of S-37 occurrences in the White Signal and associated districts, New Mexico: Union Mines Development Corp., Report No. 29-4, July 1945. Only samples from 40- and 60-foot levels are tabulated. Keith did not recognize latite in the mine. Part of the diabase and much of the gouge mentioned in the table are probably altered latite.

Table 2.--Results of sampling, Merry Widow mine, White Signal district, Grant County, New Mexico 1/ (continued)

Sample number	Distance from shaft (feet)	Length (feet)	Description (Keith)	Uranium (percent) Rifle, Colo.	Uranium (percent) Tonawanda, N.Y.
40-foot level:					
7500	50 W.	0.8 S.	Back - altered granite.	0.03	0.04
7501		1.5	Back - gouge, altered diabase.	0.14	0.15
7502		1.7 N.	Back - diabase, FeO.	0.03	0.03
7503	55 W.	1.5 S.	Back - altered granite, FeO.	0.05	0.06
7504		1.0 N.	Back - gouge, FeO, altered diabase.	0.03	0.04
7505	60 W.	1.7 S.	Back - altered granite, FeO.	0.02	0.04
7506		0.8 N.	Back - gouge, FeO.	0.04	0.10
7507		2.2	N. Wall - perpendicular to diabase - granite contact, torbernite.	0.48	0.07
7508	5. E.	2.0 S.	Back - altered granite, FeO, torbernite.	0.46	0.40
7509		2.1 N.	Back - gouge FeO.	0.30	0.36
7510	10 E.	1.2 S	Back - altered granite.	0.03	0.04
7511		1.3	Back - altered granite, disseminated torbernite.	0.33	0.29
7512		0.9	Back-gouge, altered diabase, strong torbernite.	1.88	1.71
7513		2.2 N.	Back- altered diabase, gouge, torbernite.	0.66	0.60
7514	15 E.	0.7 S.	Back - gouge, altered diabase.	0.04	0.06
7515		2.2	Back - altered granite, FeO torbernite.	0.32	0.31
7516		1.0	Back - diabase	0.21	0.21
7517		0.4	Back - altered diabase, gouge, strong torbernite.	1.74	2.06
7518		1.4 N.	Back - altered diabase, FeO.	0.06	0.05
7519	20 E.	0.2 S.	Back - gouge.	0.00	0.05
7520		2.4	Back - altered granite, FeO.	0.04	0.04
7521		1.5	Back - altered granite, FeO, disseminated torbernite.	0.35	0.33
7522		2.2	Back - altered diabase.	0.05	0.06
7523		2.3 N.	Back - altered diabase, FeO.	0.03	0.05
7529	25 E.	2.2	Back - altered granite, FeO stringers.	Tr.	0.03
7530	30 E.	3.3	Back - altered granite, gouge - FeO stringers.	0.01	0.03
7524	25 E.	3.4 S.	Back - granite, FeO stringers.	0.04	0.04
7525		0.9 N.	Back - altered diabase.	0.03	0.04
7526	37 E.	3.5 S.	E. Wall - altered granite, FeO stringers.	0.01	0.05

Table 2.--Results of sampling, Merry Widow mine, White Signal district, Grant County, New Mexico 1/ (continued)

Sample number	Distance from shaft (feet)	Length (feet)	Description (Keith)	Uranium (percent) Rifle, Colo.	Uranium (percent) Tonawanda N.Y.
40-foot level:					
7527		3.3	E. wall - altered granite, FeO stringers.	0.01	0.05
7528		3.1 N.	E. wall - altered granite, FeO - gouge vein.	0.01	0.31
7531	25 E.	1.2	N. wall - altered granite, torbernite.	0.26	0.23
7532		0.7	N. wall - altered diabase, torbernite.	0.35	0.37
60-foot level:					
6250	0 W.	1.3 S.	Back - altered diabase, torbernite.	0.14	0.11
6251		2.7	Back - gouge, FeO.	0.03	0.04
6252		1.4 N.	Back - gouge, FeO, weak torbernite	0.05	0.05
6253	5 W.	1.7 S.	Back - brecciated diabase, gouge, torbernite.	0.43	0.36
6254		1.8 N.	Back - gouge, FeO, torbernite.	0.51	0.53
6255	10 W.	1.5 S.	Back - gouge, FeO, torbernite.	0.86	0.80
6257		2.5 N.	Back - FeO, gouge, bismite, torbernite.	0.57	0.45
6258	20 W.	5.0 S.	Back - south cross-cut - altered granite, FeO.	0.02	0.05
6259		2.8	Back - gouge, FeO.	0.05	0.06
6260		3.5	Back - FeO, gouge, torbernite.	0.32	0.26
6261		4.8	E. wall of north cross-cut - diabase, pyrite, FeO, bismite stringers.	0.05	0.06
6262		4.8 N.	E. wall of north cross-cut - diabase, pyrite, FeO bismite stringers.	0.06	0.05
6263	25 W.	0.3 S.	Back - granite, FeO.	0.04	0.03
6264		1.1	Back - gouge, torbernite, hyalite.	0.12	0.13
6265		0.5	Back - FeO, gouge, torbernite, hyalite.	0.12	0.10
6266		0.5 N.	Back - diabase, torbernite.	0.49	0.49
6267	30 W.	1.7 S.	Back - granite, FeO.	0.03	0.06
6268		1.3	Back - gouge, FeO.	0.04	0.03
6269		0.5 N.	Back - diabase	0.07	0.05
6270	35 W.	2.7	E. side raise - 12.5' above rail - gouge FeO, torbernite.	0.12	0.14

Table 2.--Results of sampling, Merry Widow mine, White Signal district, Grant County, New Mexico 1/ (continued)

Sample number	Distance from shaft (feet)	Length (feet)	Description (Keith)	Uranium (percent) Rifle, Colo.	Uranium (percent) Tonawanda, N.Y.
60-foot level:					
6271	40 W.	1.7	W. side raise - 12.6' above rail - gouge, FeO	0.07	0.10
6272	45 W.	0.8 S.	Back - gouge, torbernite.	0.27	0.25
6273		1.1	Back - diabase	0.13	0.11
6274		2.6 N.	Back - altered granite.	0.02	0.03
6275	50 W.	0.9 S.	Back - altered granite, FeO.	0.03	0.09
6276		1.6	Back - gouge, FeO, brecciated diabase.	0.02	0.05
6277		2.6 N.	Back - altered granite.	Tr.	0.04
6278	55 W.	2.2 S.	Back - gouge, FeO.	0.02	0.03
6279		1.7 N.	Back - granite.	0.00	0.03
6280	60 W.	3.3	Back - gouge, FeO.	0.02	0.03
6281	65 W.	2.5 S.	Back - brecciated granite, FeO, gouge.	0.03	0.01
6282		1.8 N.	Back - gouge, altered granite.	0.02	0.03
6283	70 W.	1.7	High back - gouge, FeO.	0.04	0.03
6284	75 W.	1.3	High back - gouge, diabase, granite.	0.03	0.04
6285	80 W.	1.7 S.	Back - granite, FeO.	Tr.	0.03
6286		1.7 N.	Back - altered diabase, gouge, FeO.	0.05	0.08
6287	85 W.	2.2 S.	Back - granite.	0.02	0.06
6288		1.6 N.	Back - altered diabase, gouge, torbernite.	0.20	0.21
6289	90 W.	3.1 S.	Back - granite, hyalite.	0.03	0.05
6290		0.7 N.	Back - gouge, altered diabase, FeO, torbernite.	0.23	0.29
6291	95 W.	2.2 S.	Back - granite.	Tr.	0.03
6292		1.1 N.	Back - altered diabase, gouge.	0.10	0.12
6293	100 W.	1.0 S.	Back - granite, FeO.	0.01	0.04
6294		1.0	Back - altered diabase.	0.09	0.11
6295		1.2 N.	1 Back - FeO, gouge.	0.05	0.08
6296	105 W.	2.5 S.	Back - granite, FeO.	0.03	0.03
6297		1.8 N.	Back - granite, FeO.	0.03	0.04
6298	110 W.	0.9 S.	Back - granite, FeO.	0.02	0.04
6299		0.7	Back - altered diabase, gouge.	0.02	0.04
6300		2.6	Back - granite, FeO.	0.02	0.04
6301		0.6 N.	Back - altered diabase, gouge.	0.21	0.23
6302	115 W.	0.9	Back - altered granite, FeO.	0.02	0.04
6303		0.4	Back - altered diabase, torbernite.	0.33	0.31
6304		2.5	Back - altered granite, FeO.	0.02	0.04
6305		0.5	Back - gouge, altered diabase, FeO.	0.32	0.28

Table 2.--Results of sampling, Merry Widow mine, White Signal district, Grant County, New Mexico 1/ (continued)

Sample number	Distance from shaft (feet)	Length (feet)	Description (Keith)	Uranium (percent) Rifle, Colo.	Tonawanda, N.Y.
60-foot level:					
6306	120 W.	0.6 S.	Back-altered diabase, gouge, torbernite.	0.30	0.27
6307		2.7	Back - granite, FeO.	0.01	0.05
6308	125 W.	0.7	Back - altered diabase gouge.	0.15	0.14
6309		1.1	Back - granite, FeO, gouge.	0.01	0.04
6310	130 W.	0.8	Back - diabase, gouge, torbernite.	0.11	0.14
6311		1.9	Back - granite, FeO.	0.01	0.03
6312	135 W.	0.6	Back - gouge, diabase, FeO, torbernite.	0.12	0.09
6313		2.0	Back - granite, FeO.	0.01	0.04
6314	140 W.	0.6	Back - gouge, FeO.	0.02	0.05
6315		1.0	Back - FeO.	0.01	0.05
6316		2.3	Back - granite, FeO.	0.00	0.03
6317	10 E.	1.6 N.	Back - diabase.	0.08	0.09
6318		2.0	Back - gouge, altered diabase, FeO.	0.04	0.06
6319		1.5 S.	Back - diabase.	0.05	0.07
6320	15 E.	1.8 N.	W. side raise, 10.5' above rail-gouge, altered diabase, torbernite.	0.34	0.38
6321		1.2 S.	W. side raise, 10.5' above rail - diabase.	0.10	0.10
6322	15 E.	3.7 N.	W. wall of cross-cut - diabase, pyrite, bismite.	0.03	0.05
6323		4.3	W. wall of cross-cut,- diabase, pyrite, bismite.	0.03	0.04
6324		1.7 S.	W. wall of cross-cut - diabase, pyrite, bismite.	0.03	0.04
6550	20 E.	4.7 S.	E. wall cross-cut - gouge, brec-ciated diabase, torbernite.	0.26	0.23
6551		3.2	E. wall cross-cut - granite, FeO.	0.01	0.03
6552		2.1 N.	E. wall cross-cut - granite, FeO, diabase.	0.02	0.04
6554	30 E.	1.7	N. wall of raise - granite, diabase, torbernite.	0.21	0.22
6553	25 E.	4.2	Back - diabase, pyrite, FeO.	0.03	0.06
6555	35 E.	1.7	N. wall of raise, torbernite, granite, diabase.	0.43	0.38
6556	40 E.	2.0	N. wall of drift - torbernite, granite, diabase.	0.13	0.11

from the contact. Locality R-13, together with R-8 and R-9, probably represents a more or less continuous deposit that follows the contact between granite and the diabase dike.

Locality R-14

A quartz-pyrite vein about 2 inches wide that strikes north in trench No. 5 is weakly radioactive. The granite wall rock is highly argillized for about 5 inches on either side of the vein and locally is intensely iron-stained. One 12-inch channel sample across the vein and altered rock contained 0.01 percent uranium. Adjoining samples cut in the less altered bordering granite contained 0.006 to 0.002 percent uranium, respectively.

Locality R-15

A narrow vein and associated fractures that form a zone about 4 inches wide in diabase near the south margin of the area shown on figure 2 are abnormally radioactive. Although no samples were taken, it is believed that the radioactivity detected with a Beckman MX-5 Geiger counter, 7 to 15 divisions on the 0.2 scale, indicates an equivalent uranium content of nearly 0.01 percent. The extent of the radioactivity along the strike of the vein could not be traced because of the overburden.

SAMPLING AND GRADE

The five prospect trenches on the Merry Widow claim were sampled in detail (fig. 3) so that variations in uranium and phosphate content among the different types of rocks and veins might be studied. Abnormally radioactive rocks and relatively unaltered rock outside the trenches were also sampled. The uranium content of 133 samples ranged from 0.001 to 0.11 per-

cent. Of these, 19 samples, from 12 different localities, contained more than 0.01 percent uranium.

Results of the sampling suggest that the average uranium content of all the rocks on the Merry Widow claim, where relatively unaffected by alteration other than weathering, is 0.003 percent or less. The phosphate content, on the other hand, differs greatly in the various types of rock. Diabase and basalt show a higher phosphate content than the other rocks but show a wider range among individual samples. Commonly the more highly altered samples contain the least phosphate. Granite is generally very poor in phosphate but samples taken in granite near diabase dikes show an abnormally high phosphate content. The average P_2O_5 content for several rocks on the Merry Widow claim is: Diabase, 1.60 percent (32 assays); basalt, 1.35 percent (2 assays); quartz monzonite, 0.45 percent (3 assays); latite, 0.37 percent (10 assays); granite, 0.10 percent (69 assays); rhyolite, 0.06 percent (2 assays).

Of 19 samples that contained more than 0.01 percent uranium, only two contained less than 0.30 percent P_2O_5. These two samples represent the only samples that were taken more than two feet from diabase, basalt, or latite.

RESULTS OF DIAMOND DRILLING

In May 1950 the lessee of the Merry Widow claim core drilled the Merry Widow vein. The diamond drill hole, which is located about 400 feet south of the Merry Widow shaft /, was cored with an Ax bit on a bearing of N. 60° E., and at an angle of minus 72°. The core cut the vein zone between 520 and

/ Granger, H.C., and Bauer, H. L., Jr., op. cit., 1950.

550 feet, and was continued to a depth of 650 feet. Overall core recovery was nearly 80 percent.

For the most part, the core is medium-grained granite composed of quartz (30 percent), potash feldspar (60 percent), and biotite and other mafic minerals (10 percent). The feldspars have been partly argillized, and are soft and greenish; near the veins they have been moderately sericitized. The granite from 550 to 650 feet is unaltered. Between depths of 72 and 97 feet, a diabase dike was cored. The margins are fine-grained and the inner part is medium-to coarse-grained. The diabase is highly fractured, and the plagioclase has been argillized. Green mafic minerals give the rock a characteristic dull greenish-gray color.

Several quartz-pyrite veins were cut in the core, most of which are less than 1/2 inch thick but a few are 1/2 to 2 inches thick. The veins are abundant but have no consistent orientation. They are completely oxidized to a depth of 80 feet and partly oxidized from 80 to 150 feet. Below 150 feet the pyrite is oxidized only in the wide vein zones. In the Merry Widow vein zone between 520 and 550 feet the pyrite in the veins is oxidized to limonite, and the granite wall rock is intensely altered and iron-stained. A two-inch vein of massive limonite at 528 feet and two one-inch quartz veins at 540 feet are the largest individual veins in this zone. The latite (?) dike that locally parallels the vein in the Merry Widow mine was not identifiable in the core, but the recovery was very poor throughout this zone. Along the border of numerous specularite-bearing veinlets, between 380 and 650 feet, the wall rock is only slightly iron-stained.

Abnormally radioactive zones in the core are limited commonly to narrow fractures less than 1/8 inch thick. Crystals of torbernite were noted in

some of the fractures at depths of 127, 151, 154, 156, 161, and 184 feet. Other radioactive fracture surfaces, showing no torbernite, at 80, 170, 214, 229, 246, 278, 324, 510, 540, and 542 feet, were usually coated with fine-grained green and white clay-like minerals, possibly a mixture of talc and serpentine or sericite.

The Merry Widow vein zone was cored from 520 to 550 feet. The granite is altered and iron-stained throughout, and the core recovery was poor. At 540 feet weak radioactivity occurs in two one-inch thick quartz veins. Two feet below these veins amorphous dark-green and black minerals, that contain about 0.2 percent equivalent uranium, fill a small fracture. Similar black radioactive material was noted at 278 feet and 510 feet, but no uranium minerals were identified.

ORIGIN

Although only secondary uranium minerals have been found in the White Signal district, observations made during this examination suggest that some of the quartz-pyrite veins may contain primary uranium minerals below the zone of oxidation.

The relatively unaltered rocks on the Merry Widow claim commonly have a lower uranium content than the material in quartz-pyrite veins. The large quartz-pyrite vein near the west end of trench No. 1 (fig. 4) contains 0.007 percent uranium, whereas the wall rocks on either side contain 0.003 and 0.002 percent. A narrow quartz-pyrite vein along the contact between granite and diabase in the east end of trench No. 1 contains 0.006 percent uranium, whereas the adjacent granite and diabase contain only 0.001 percent. Similar examples are present in the other trenches suggesting that the quartz-pyrite

veins have played an important part at least in the distribution of secondary uranium minerals.

During exploration of the Merry Widow vein by diamond drilling it was found that the vein material in larger veins had been thoroughly oxidized by circulating meteoric waters to a depth of at least 550 feet. Pitchblende or other primary uranium minerals would probably be unstable in the highly acid waters produced from the oxidation of pyrite so that the lack of recognizable primary uranium minerals in the drill core merely suggests that if these minerals were once present they have since been removed. It is believed that the unoxidized parts of some of the veins may contain primary uranium minerals and that the distribution of secondary uranium minerals in altered rocks has resulted from precipitation of uranium from solution in meteroic waters along fractures in the more favorable host rocks.

There is a possible relationship between the latite (?) dikes and the uranium deposits. Locally, in the Merry Widow mine, the uranium minerals occur in fractures in the latite (?) away from the diabase dikes. At localities R-4 and R-11 the uranium is closely associated with the latite (?). Field relationships suggest that the vein minerals were deposited after the intrusion of the latite (?) and before the intrusion of the rhyolite. Perhaps the mineral-bearing solutions followed closely after the intrusion of the latite (?), and the writers believe that the primary ore-bearing solutions were derived from magma that consolidated to form latite (?).

Apparently the intermediate and basic rocks have been more favorable hosts for the deposition of secondary uranium minerals than have the acid rocks. The reason for this is not entirely clear but may be due in part to

the phosphate content. Certainly, it would seem that a high phosphate content in the host rock would be more conducive to precipitation of phosphate-bearing uranium minerals than would a low phosphate content. Of 19 samples that contained over 0.01 percent uranium, all but 2 contained over 0.30 percent P_2O_5. The average P_2O_5 content of these samples was 1.07 percent.

SUGGESTIONS FOR PROSPECTING

Uranium minerals on the Merry Widow claim, as is true elsewhere in the White Signal district, are found most commonly in or near the intersections of quartz-pyrite veins with intermediate or basic dikes. In a few places the faults and veins are parallel to the dike contacts. If prospecting is done, it should be guided by these criteria but perhaps should not be limited entirely to the intermediate and basic rocks. It is believed that quartz-pyrite veins cutting granite at some distance from basic dikes may be locally uraniferous. This is especially true concerning primary minerals in parts of the veins that are unaffected by oxidation.

PART II

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PART II

RESERVES

The results of sampling done by Keith in 1944 and 1945 _/ and by the present writers in 1950 suggest that the only uranium-bearing rock of present economic grade on the Merry Widow claim lies along the vein within a few score feet of the Merry Widow shaft. Inasmuch as the writers did not attempt to sample the Merry Widow mine, the ore estimates made by Keith, which apparently are reasonable, will be used in this report.

_/ Keith, S. B., op. cit., 1945.

Samples taken by Keith in the Merry Widow mine were cut perpendicular to the vein and the width of ore blocks was determined by the average length of the samples taken, generally about 3 feet. The Merry Widow waste dump was also extensively sampled. Volume was converted to tonnage on the basis of 10 cubic feet per ton of solid rock or 16 cubic feet per ton of broken rock.

The measured uranium-bearing rock in the Merry Widow mine is defined vertically by the surface of the ground and the 130-foot level, and horizontally by the eastern limits of the 40-, 60-, and 130-foot levels and the western limits of the 40- and 130-foot levels. The higher-grade measured rock extends approximately 20 to 30 feet on either side of the shaft from the surface to the 60-foot level.

The indicated reserves of uranium-bearing rock were based on the results of sampling outside the measured blocks and the inferred reserves are based almost entirely on geologic inference.

Only inferred uranium-bearing rock has been calculated for the 14 remaining uraniferous deposits on or bordering the Merry Widow claim. The limits of each deposit were based on geologic inference, length and grade of samples, and the distance between samples where two samples were cut in the same deposit. A factor of 10 cubic feet per ton was used to convert volume to tonnage.

Reserves of the Merry Widow claim, exclusive of the Merry Widow mine, are shown in table 3. Reserves of the Merry Widow mine (locality R-12) are shown in table 4.

Table 3.—Inferred size and grade of uranium deposits on the Merry Widow claim 1/, White Signal district, Grant County, New Mexico

Locality number	Length (feet)	Width (feet)	Inferred depth (feet)	Inferred short tons	Uranium (percent)
R-1	5	1	2.5	1	0.05 to 0.10
R-2	10	2.5	5	12	0.01 to 0.02
R-3	25	2	12.5	63	0.01 to 0.02
R-4	30	2	15	90	0.01 to 0.02
R-5	25	3(triangle)	12.5	47	0.05 to 0.10
R-6	—	—	—	1	0.01 to 0.02
R-7	6	2	3	4	0.01 to 0.02
R-8	30	3	15	135	0.01 to 0.02
R-9	20	4	10	80	0.05 to 0.10
R-10	—	-	—	1	0.01 to 0.02
R-11	—	-	—	1	0.01 to 0.02
R-13	15	4	15	90	0.05 to 0.10
R-14	—	-	—	1	0.01 to 0.02
R-15	—	-	—	1	0.01 to 0.02

1/ Exclusive of the Merry Widow mine.

Table 4.—Uranium reserves of the Merry Widow mine, White Signal district, Grant County, New Mexico 1/

Class	Short tons 2/	Uranium (percent)
Measured	500	0.37
Measured	1900	0.08
Indicated	30	0.35
Indicated	2900 3/	0.08
Inferred	4000	0.08

1/ After Keith, S. B., Report on detailed examination of S-37 occurrences in the White Signal and associated districts, New Mexico: Union Mines Development Corp., Report No. 29-4, July 1945.

2/ Figures rounded

3/ Includes 1300 short tons on waste dump

Note: According to Keith, the average gold and silver content of samples taken in the Merry Widow mine are 0.01 and 0.30 ounces per ton, respectively. Locally, however, the vein may contain as much as 1.5 ounces of gold and 1.4 ounces of silver.