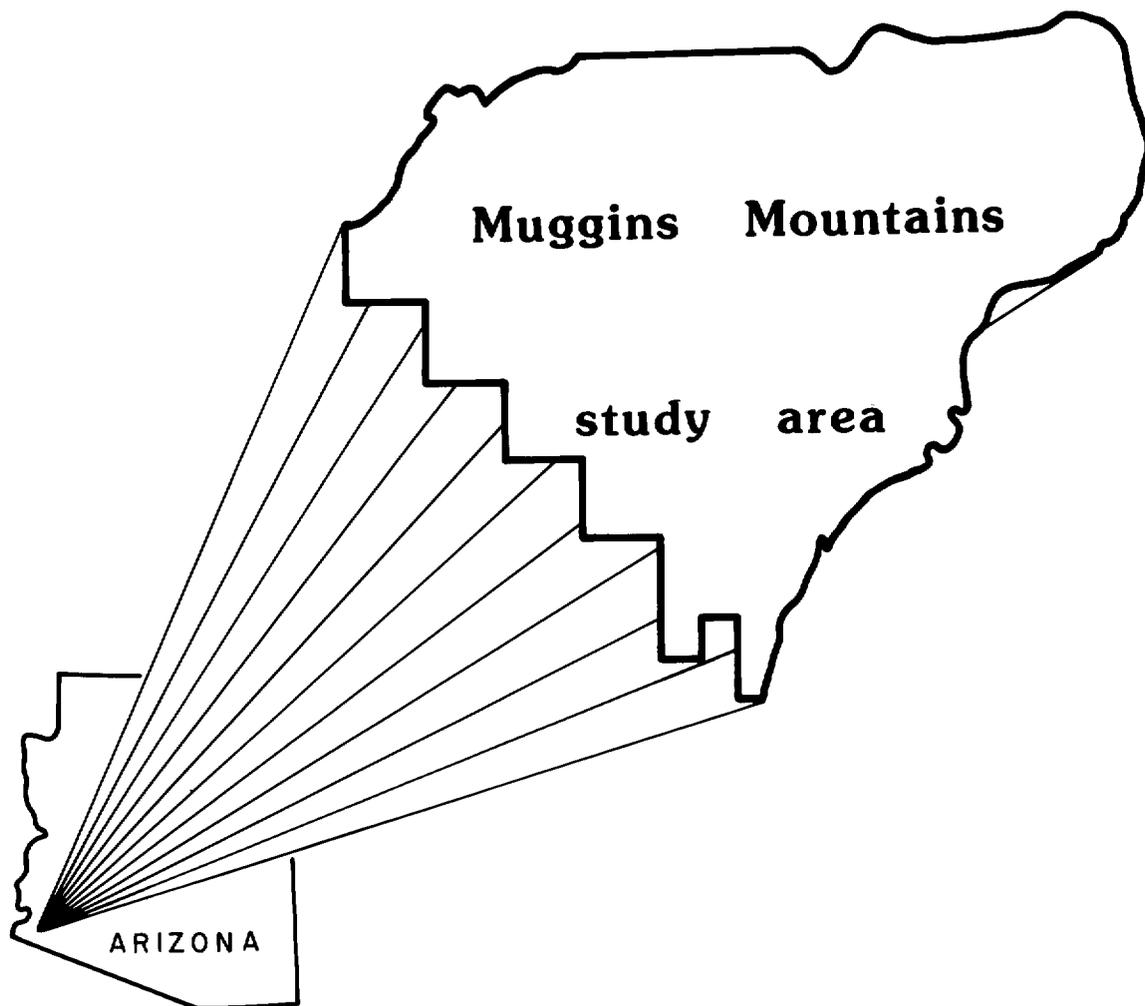


**MLA** 11-88

Mineral Land Assessment  
Open File Report/1988

**Mineral Resources of a Part of the Muggins  
Mountains Wilderness Study Area (AZ-050-053A),  
Yuma County, Arizona**



**BUREAU OF MINES  
UNITED STATES DEPARTMENT OF THE INTERIOR**

MINERAL RESOURCES OF A PART OF THE MUGGINS MOUNTAINS  
WILDERNESS STUDY AREA (AZ-050-053A), YUMA COUNTY, ARIZONA

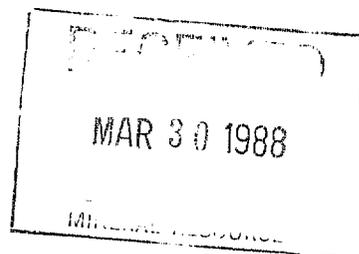
*abstracted KAP 5-1-90*

*Abstracted to  
SW Muggins Mtn Placers  
(Yuma 832) KAP*

by

Robert H. Wood, II

MLA 11-88  
1988



Intermountain Field Operations Center  
Denver, Colorado

UNITED STATES DEPARTMENT OF THE INTERIOR  
Donald P. Hodel, Secretary

BUREAU OF MINES  
David S. Brown, Acting Director

## PREFACE

The Federal Land Policy and Management Act of 1976 (Public Law 94-579) requires the U.S. Geological Survey and the U.S. Bureau of Mines to conduct mineral surveys on certain areas to determine the mineral values, if any, that may be present. Results must be made available to the public and be submitted to the President and the Congress. This report presents the results of a mineral survey of a part of the Muggins Mountains Wilderness Study Area (AZ-050-053A), Yuma County, Arizona.

This open-file report summarizes the results of a Bureau of Mines wilderness study. The report is preliminary and has not been edited or reviewed for conformity with the Bureau of Mines editorial standards. This study was conducted by personnel from the Branch of Mineral Land Assessment (MLA), Intermountain Field Operations Center, P.O. Box 25086, Denver Federal Center, Denver, CO 80225.

## CONTENTS

	<u>Page</u>
Summary.....	1
Introduction.....	2
Geographic setting.....	3
Previous investigations.....	3
Methods of investigation.....	5
Geologic setting.....	7
Mining and leasing activity.....	7
Results of investigation.....	9
Gold.....	9
Uranium.....	12
Sand and gravel.....	13
Conclusions.....	13
References.....	14

## ILLUSTRATIONS

Figure 1.	Index map of the Muggins Mountains study area.....	4
2.	Sample locality map of the Muggins Mountains study area.....	6
3.	Photograph of a small placer gold operation along Muggins Wash near sample sites 6 and 7.....	8
4.	Map of oil and gas leases in and near the Muggins Mountains study area, Yuma County, Arizona.....	10

## TABLES

Table 1.	Data for panned concentrate samples from in and near the Muggins Mountains study area.....	15
2.	Data for samples 19-23 from the Red Knob prospect near the Muggins Mountains study area.....	17

UNIT OF MEASURE ABBREVIATIONS USED IN THIS REPORT

yd <sup>3</sup>	cubic yard
ft	foot
g	gram
in.	inch
mi	mile
mm	millimeter
pan/yd <sup>3</sup>	pan per cubic yard
ppm	part per million
%	percent
oz	troy ounce
oz/st	troy ounce per short ton

MINERAL RESOURCES OF A PART OF THE MUGGINS MOUNTAINS  
WILDERNESS STUDY AREA (AZ-050-053A), YUMA COUNTY, ARIZONA

by

Robert H. Wood, II, Bureau of Mines

SUMMARY

In February 1987, the Bureau of Mines conducted a mineral investigation of a part of the Muggins Mountains Wilderness Study Area, Yuma County, Arizona, on land administered by the Bureau of Land Management. The wilderness study area comprises 14,455 acres; the Bureau studied the 8,855 acres deemed preliminarily suitable for inclusion in the National Wilderness Preservation System. The mineral investigation was requested by the Bureau of Land Management and authorized by the Federal Land Policy and Management Act of 1976 (Public Law 94-579).

The region is in the Sonoran Desert section of the Basin and Range physiographic province. Exposed rocks in the study area are predominantly Tertiary- to Quaternary-age volcanic, volcanoclastic, and clastic sedimentary rocks. Low- to high-angle normal faults in the area are related to Tertiary extensional tectonics.

The study area is within the Muggins mining district. Recorded production from the district prior to 1942 was 2,748 ounces of placer gold and about 500 ounces of silver. The Muggins Mountains, which include the study area, were withdrawn for military use from 1942-1981. Production after 1981, when the military withdrawal ended, is not recorded; however, results of recent placer mining are evident, and about half of the study area is covered with unpatented mining claims.

Placer gold was found in four drainages in the study area. Gold values ranged as high as \$33.90 per cubic yard (at \$500 per ounce gold price) of

screened minus-1/2-inch gravel; however, most sample gold values were less than \$.75 per cubic yard. The high gold values were in samples from the heads of two of the drainages where the gravel deposits are narrow, shallow, and appear unworked. The higher gold concentrations might support a 2- to 3-man placer operation; however, the amount of gold in both drainages probably would be no more than 25 ounces, based on the small volume of gravels present. This would not be sufficient gold for a commercial operation. The irregular distribution of the gold in the study area drainages, removal of gold by previous work, locally thick alluvial cover preventing sampling near bedrock, and generally low gold concentrations preclude quantifying a gold resource in the study area.

A low-grade uranium occurrence, containing by-product lead and vanadium, is about 1/2 mile east of the study area, in the lower member of the Miocene-age Kinter Formation. Inside the study area, this mineralized member does not crop out and drilling would be required to test for uranium in this formation. No uranium resources were identified in the study area.

There are inferred subeconomic resources of common variety sand and gravel in the study area; the sand and gravel has no unique qualities to make them more valuable than the vast quantities in the surrounding area.

The oil and gas potential is rated low by USGS because the rocks are considered unfavorable for the generation and entrapment of significant volumes of hydrocarbons. Over 1/3 of the study area is under lease for oil and gas, but the area is untested.

#### INTRODUCTION

In February 1987, the Bureau of Mines, in a cooperative program with the U.S. Geological Survey (USGS), conducted a mineral investigation of a part of

the Muggins Mountains Wilderness Study Area (WSA), Yuma County, Arizona, on lands administered by the Bureau of Land Management (BLM). The WSA comprises 14,455 acres; the Bureau studied the 8,855 acres deemed preliminarily suitable for inclusion in the National Wilderness Preservation System. "Study area" as used in this report refers only to the smaller area. The Bureau surveys and studies mines, prospects, and mineralized areas to appraise reserves and identified subeconomic resources. The USGS assesses the potential for undiscovered mineral resources based on regional geological, geochemical, and geophysical surveys. This report presents the results of the Bureau of Mines study. The USGS will publish the results of their studies. A joint USGS-Bureau report, to be published by the USGS, will integrate and summarize the results of both surveys.

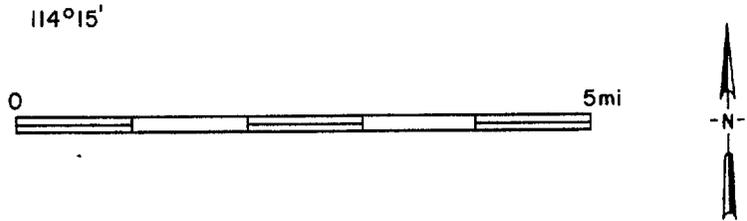
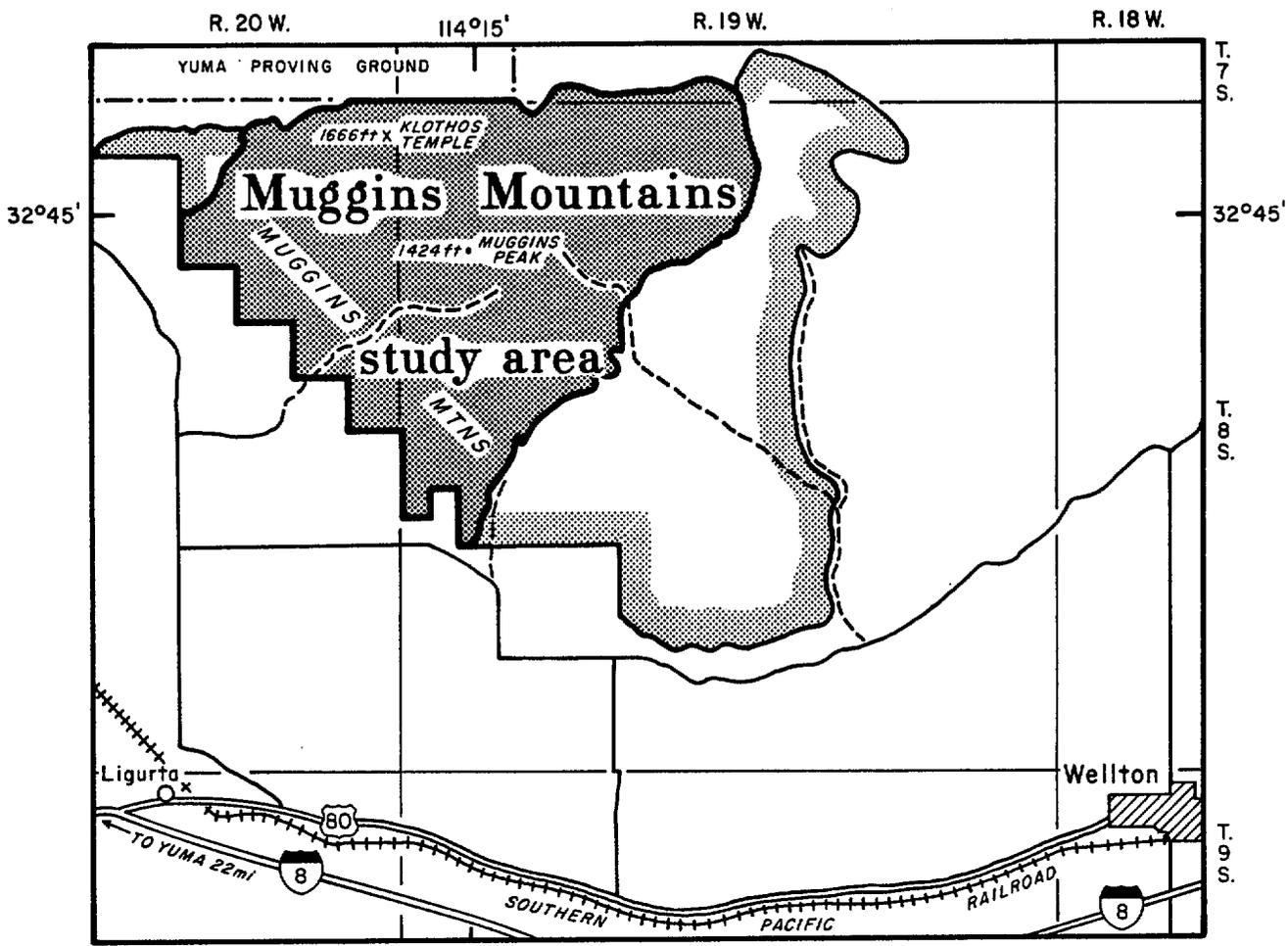
#### Geographic setting

The Muggins Mountains study area is in southwestern Arizona, about 6 mi northwest of Wellton and 25 mi east of Yuma, Arizona (fig. 1). A portion of the northern boundary is adjacent to the U.S. Army's Yuma Proving Ground. Secondary roads from U.S. Highway 80 provide access to unpaved roads or trails, which provide limited access to the area.

The study area is in the Sonoran Desert section of the Basin and Range physiographic province. Elevations range from approximately 200 ft above sea level along the southern boundary to 1,666 ft at the summit of Klothos Temple (fig. 1). Intermittent streams have dissected the area into a pattern of rounded hills, flat mesas, and deep, steep-walled arroyos.

#### Previous investigations

The geology and mineral assessment of the Muggins Mountains Wilderness Study Area was done by Smith and others (1984). Reports that include the gold



- EXPLANATION
- APPROXIMATE BOUNDARY OF THE MUGGINS MOUNTAINS WILDERNESS STUDY AREA
  - INTERSTATE HIGHWAY      U.S. HIGHWAY
  - IMPROVED ROAD      UNPAVED ROAD OR TRAIL
  - 1666ft x* CHECKED SPOT ELEVATION--Showing feet above sea level
  - 1424ft\** UNCHECKED SPOT ELEVATION--Showing feet above sea level

Figure 1.--Index map of the Muggins Mountains study area, Yuma County, Arizona.

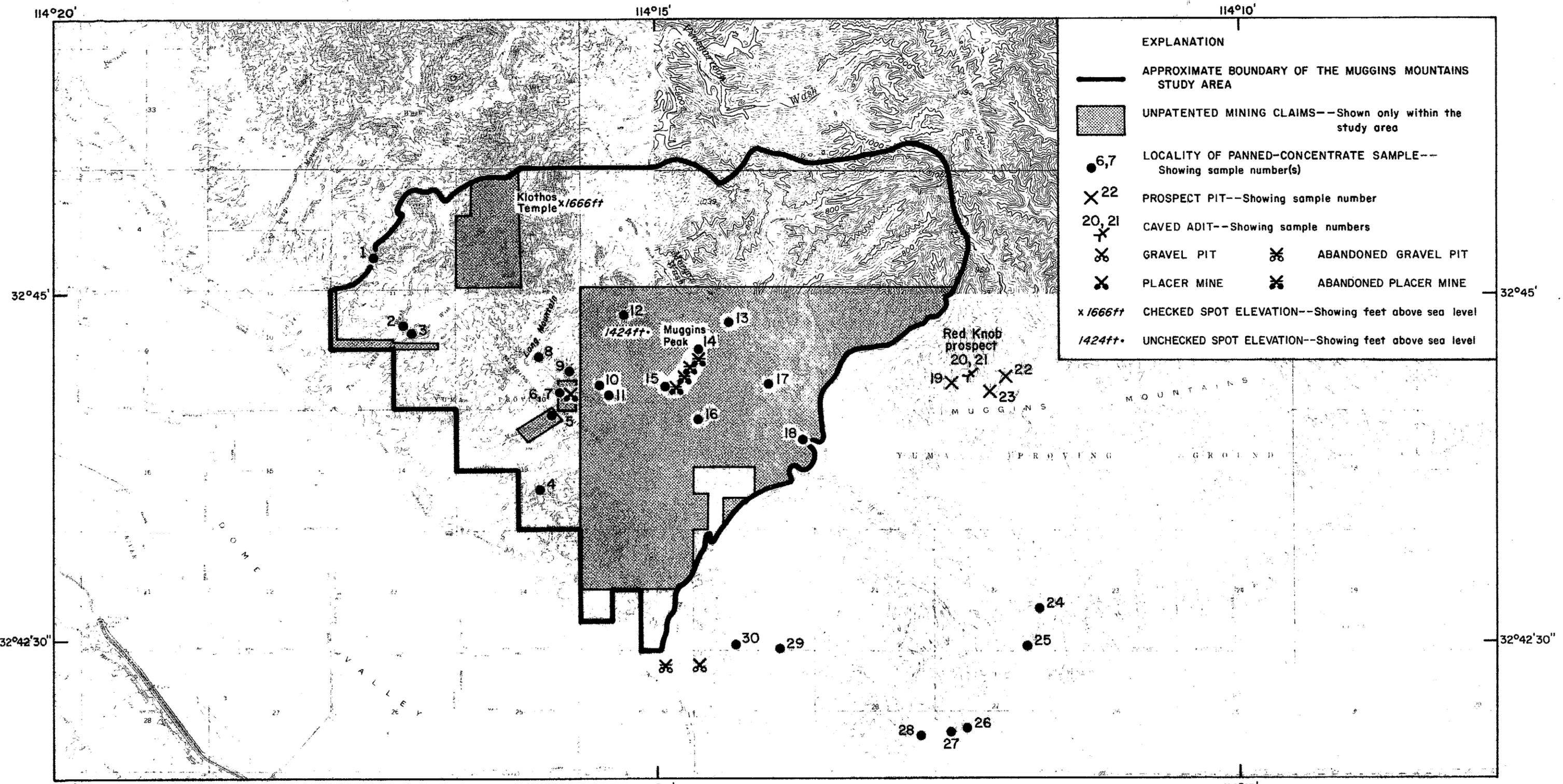
placers in the Muggins Mountains were done by Wilson (1933a, b; 1961), Johnson (1972), and Keith (1978).

#### Methods of investigation

Bureau personnel reviewed various sources of minerals information including published and unpublished literature. Mining claim and oil and gas lease information, current as of January 1987, was obtained from the BLM State Office in Phoenix, Arizona.

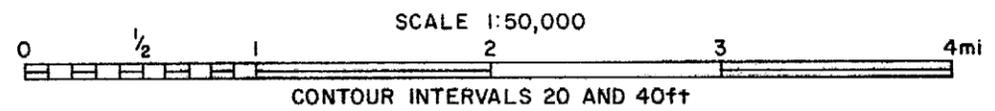
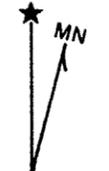
The Bureau's field study concentrated on the examination of known mines, prospects, and mineralized areas inside and within 1 mi of the WSA boundary; peripheral mineral occurrences were examined to determine whether they might extend into, or are similar to those within, the study area. A total of 16 employee-days was spent doing field work.

Thirty samples, 5 outcrop and 25 panned concentrates, were taken for analysis (fig. 2). Rock samples were taken from prospects. Panned-concentrate samples, consisting of a concentration of heavy minerals from a heaped 16-in. gold pan of minus-1/2-in. material, were collected from major drainages in and within 3 mi of the study area. The five rock samples were analyzed for lead, molybdenum, silver, and vanadium by atomic absorption (AA), and for uranium by fluorimetry. Twenty panned-concentrate samples were analysed by fire assay for gold and silver by the Bureau's research center in Reno, Nevada; the 5 remaining panned-concentrate samples contained visible gold and were sent to Bondar-Clegg Inc., Lakewood, Colorado, for gold amalgamation. To determine fineness, some of the large flakes of visible gold were removed prior to amalgamation and were weighed separately and were analyzed spectrographically by the USGS. Complete analytical data are available for inspection at the U.S. Bureau of Mines, Intermountain Field Operations Center, Building 20, Denver Federal Center, Denver, Colorado.



EXPLANATION			
	APPROXIMATE BOUNDARY OF THE MUGGINS MOUNTAINS STUDY AREA		
	UNPATENTED MINING CLAIMS--Shown only within the study area		
	LOCALITY OF PANNED-CONCENTRATE SAMPLE--Showing sample number(s)		
	PROSPECT PIT--Showing sample number		
	CAVED ADIT--Showing sample numbers		
	GRAVEL PIT		ABANDONED GRAVEL PIT
	PLACER MINE		ABANDONED PLACER MINE
	CHECKED SPOT ELEVATION--Showing feet above sea level		
	UNCHECKED SPOT ELEVATION--Showing feet above sea level		

Base from the U.S. Geological Survey, 1:24,000 Dome, 1965; Ligurta, 1965; and Wellton, 1965 Red Bluff Mountain, 1955, 1:62,500



Field work completed in 1987 by Robert H. Wood II; assisted by Clay M. Martin and Steven E. Tuffin.

Figure 2.--Sample locality map of the Muggins Mountains study area, Yuma County, Arizona.

### Geologic setting

The oldest rocks in the study area, metamorphic and granitic rocks along the northwestern boundary, are thought to be Precambrian in age. Tertiary-age volcanic, volcanoclastic, and clastic sedimentary rocks; Tertiary(?) - and Quaternary-age conglomerate and sandstone; and unconsolidated Quaternary gravel, sand, and silt are the predominant outcrops in the study area. (See Smith and others, 1984, p. 9-16.)

Tectonism in the area was coincident with and followed the episodes of Tertiary volcanism and is related to late Oligocene- and early Miocene-age regional extension, which included the formation of low-angle normal faults. Breccia in the northwestern corner of the area suggests a major low-angle normal fault. Northwest- and northeast-trending high-angle normal faults in the area also are related to this same period of extensional tectonics. (See Smith and others, 1984, p. 16.)

### Mining and leasing activity

The study area is in the Muggins mining district which includes the Muggins Mountains. The total district production of placer gold and silver, until the area was withdrawn for military purposes in 1942, was 2,748 oz of gold and about 500 oz of silver. Production data are not available after 1981 when the study area was again opened to mining; however, evidence of recent placer mining is present inside the study area (fig. 3). In the region, gold placer deposits were mined in two general areas: Vinegarroon Wash north of the study area, and in washes draining southward from Muggins Peak, Klothos Temple, and Long Mountain (fig. 2). Quartz veins in Precambrian metamorphic and igneous rocks north of the study area have been mined for gold, silver, and copper. This type of lode deposit has not been reported in the study area.

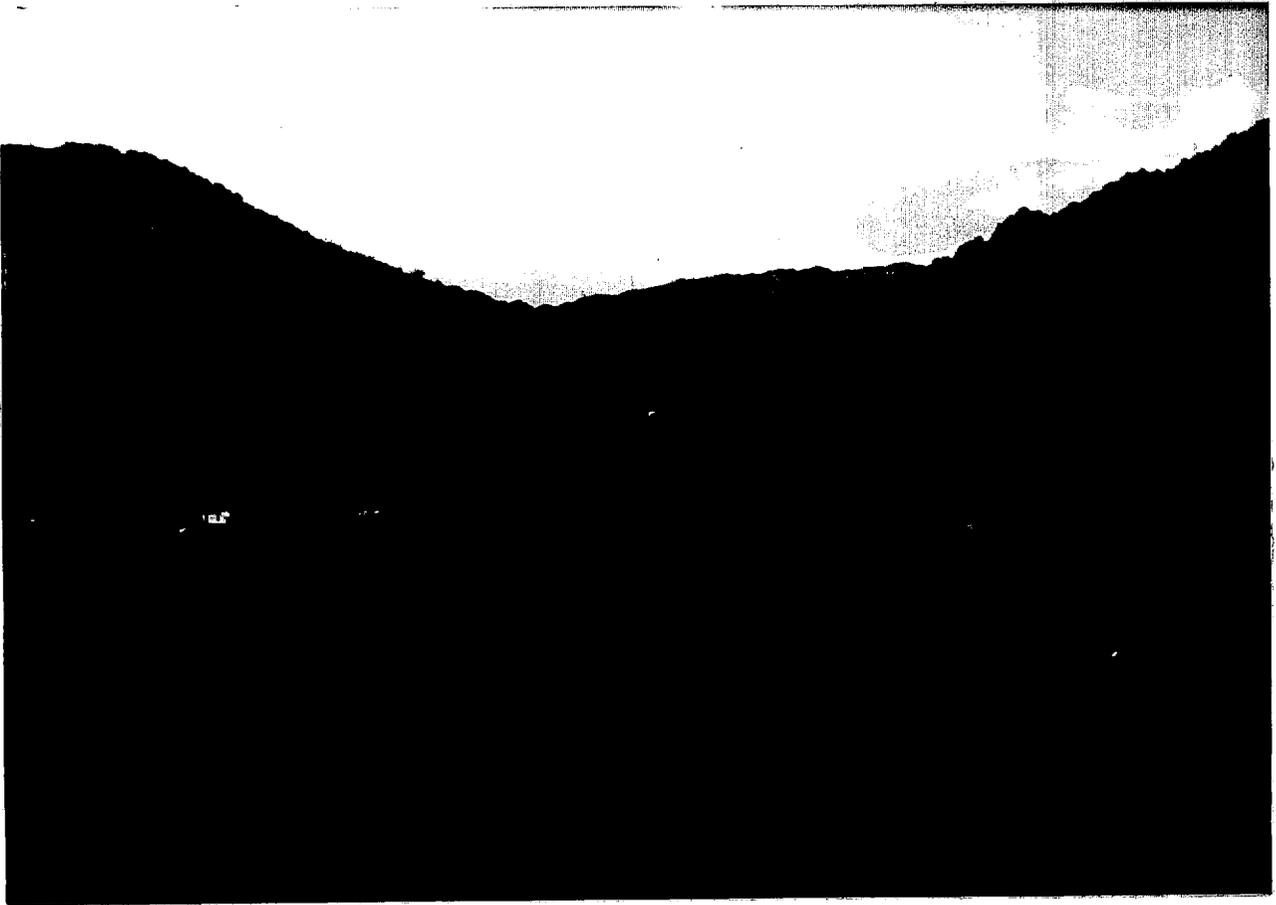


Figure 3.--Small placer gold operation along Muggins Wash near sample sites 6 and 7.

Uranium is the only other element of economic interest reported in the Muggins mining district, although no uranium production has been reported. The nearest known uranium occurrence, the Red Knob prospect, is a stratabound occurrence about 1/2 mi east of the study area (fig. 2). (See Peirce and others, 1970, p. 257.)

According to BLM records, as of October 1987, nearly 50% of the study area was covered by unpatented mining claims (fig. 2). There are no patented mining claims in the study area.

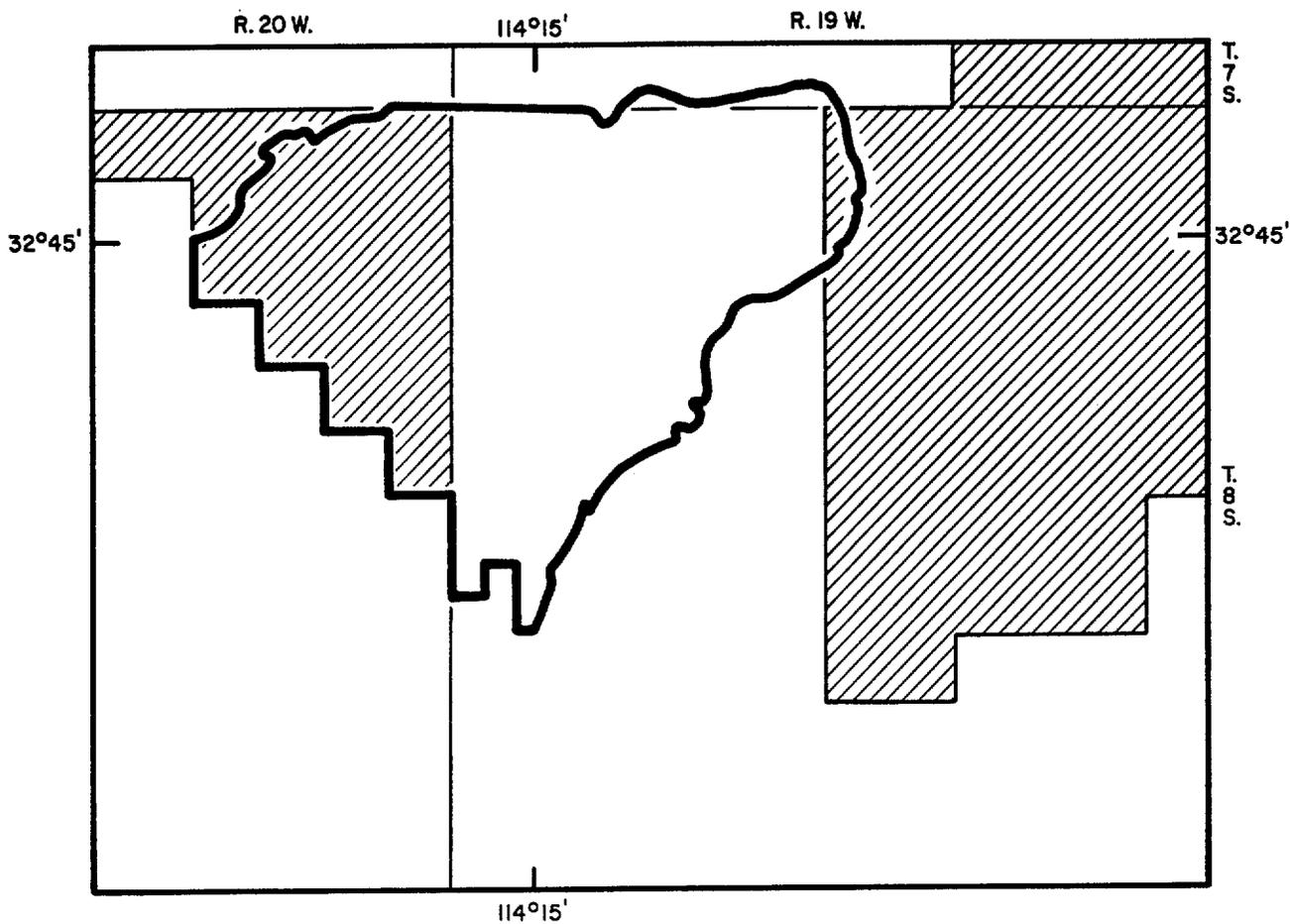
The study area is in the Gila trough, which contains up to 6,000 ft of Tertiary sedimentary rocks. Elsewhere minor oil shows have been reported from holes drilled in the Gila trough. The petroleum potential of the Gila trough is considered low because "the organic richness, reservoir quality, and thermal history of the rocks are probably unfavorable to the generation and entrapment of significant volumes of hydrocarbons." (See Ryder, 1983, p. 19.) As of January 1987, over 1/3 of the study area was under lease for oil and gas (fig. 4). Because of a lack of exploration data, the oil and gas resources in the study area are not known.

#### RESULTS OF INVESTIGATION

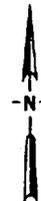
The literature search indicated that placer gold, uranium, and sand and gravel resources may occur in the study area. Stream beds were investigated for placer gold, silicified mudstones were investigated for uranium, and sand and gravel was investigated for unique qualities.

##### Gold

Gold placers have been reported in washes and canyons draining southward from Muggins Peak, Klothos Temple, and Long Mountain. The gold occurs as small particles, as large as 0.15 in. in diameter, probably derived from gold-



Oil and gas lease information from the Bureau of Land Management; current as of January 1987.



EXPLANATION

-  APPROXIMATE BOUNDARY OF THE MUGGINS MOUNTAINS STUDY AREA
-  OIL AND GAS LEASES

Figure 4.--Oil and gas leases in and near the Muggins Mountains study area, Yuma County, Arizona.

bearing quartz veins in the Precambrian gneisses, schists, and granites that crop out in the northern part of the Muggins Mountains. (See Keith, 1978, p. 60; Wilson, 1933b, p. 21.) Conglomerates and alluvium in the study area contain gneiss and granite pebbles derived from the Precambrian rocks.

Gold was detected in panned-concentrate samples from four of the drainages sampled inside the study area and two drainages to the southeast. Of the samples containing gold, the concentrations ranged from a trace to 0.230 oz/ton in the panned concentrate, equivalent to about \$.75/yd<sup>3</sup> of screened material. Two of the samples, however, contained appreciable gold; the values in samples 14 and 16 were calculated to be about \$26.25/yd<sup>3</sup> and \$33.90/yd<sup>3</sup>, respectively (table 1). Gold values were determined at the current price of \$500/oz (December 15, 1987) and were based on a screened (minus-1/2 in.) yd<sup>3</sup> of gravel, estimated to represent between 25% and 50% of the gravel in place. Gold particles, up to 0.08 in. in length, were found in the Bureau's samples. Calculations from semiquantitative optical emission spectrographic analyses of the larger gold grains indicate that the average fineness for gold is 948 and for silver is 48.

The drainages containing gold in the study area are small. Samples 14 and 16, that yielded the highest gold values, were from the shallow (up to about 1 ft deep), narrow (up to about 12 ft wide) gravel deposits near the heads of the drainages (fig. 2). Low gold concentrations, detected in the generally wider and thicker gravels deposited downstream, probably reflect partial gold depletion by past placer operations. In some areas, a thicker alluvial cover prevented sampling at bed rock, where gold commonly is more concentrated. The higher gold concentrations in gravels near the heads of the drainages might be profitable for small, 2- to 3-man placer operations; these

small quantities of gravel could not support a large mining operation. Based on a sample taken at each of the two locations where high gold values were indicated, it is estimated that less than 20 oz of gold are contained in about 550 yd<sup>3</sup> of gravel in the vicinity of sample site 14 and less than 5 oz of gold in about 50 yd<sup>3</sup> of gravel around sample site 16.

#### Uranium

The Red Knob prospect, about 1/2 mi east of the study area, is the nearest known uranium occurrence (fig. 2). According to Smith and others (1984, p. 18), this prospect occurs in the lower member of the Kinter Formation associated with a northwest-trending normal fault near an intruded rhyolite dome. A 1 1/2-ft-thick silicified mudstone bed is exposed along a 15-ft-long trench at the portal of a collapsed and partly filled adit at least 35-ft long. Weeksite, a rare uranium silicate (Outerbridge and others, 1960), calcite, chalcedony, mimetite, and vanadinite occur in the silicified mudstone bed. Rock samples contained up to 1,150 ppm lead, 295 ppm vanadium, 41 ppm uranium, 25 ppm molybdenum, and 1.8 ppm (0.05 oz/st) silver (table 2). These concentrations are of geochemical and not of economic interest. The higher concentrations were from samples in the silicified mudstone bed at the Red Knob prospect and lower concentrations in unsilicified mudstones away from the Red Knob prospect. The Kinter Formation occurs in the study area, but the lower member is not exposed. Geochemical studies by Smith and others (1984, p. 25 and 26) indicate a drainage basin inside the study area near the southeastern boundary and about 1/4 mi southwest of sample 18 that may contain a uranium occurrence similar to the Red Knob prospect. Scintillometer readings taken along traverses in the drainage basin did not detect readings above background levels. No uranium occurrences or resources were identified in the study area.

## Sand and gravel

The study-area drainages and alluvial fans contain inferred subeconomic resources of common variety sand and gravel. Sand and gravel were being mined, possibly as local road surfacing material, near the southern tip of the area at the time of the Bureau's field investigation (fig. 2). Sand and gravel in the study area has no unique qualities to make it more valuable than the vast quantities available in the surrounding area.

## CONCLUSIONS

Placer gold was found in four of the study area drainages. High gold concentrations identified at the heads of two of the drainages might be profitable for small, 2- to 3-man placer operations; however, the amount of gold in both drainages probably would be less than 25 oz. This would not be sufficient gold for a commercial operation. The irregular distribution of the gold, the removal of gold by past placer mining activities, locally thick alluvial cover preventing sampling near bedrock, and generally low values preclude quantifying a gold resource in the study area without considerable additional work.

A low-grade uranium occurrence, containing by-product uneconomic concentrations of lead and vanadium, is associated with faulting in the lower member of the Kinter Formation about 1/2 mi east of the study area. This member underlies the study area but is not exposed, and no uranium resources were identified in the area.

There are inferred subeconomic resources of common variety sand and gravel in the study area, but the sand and gravel has no unique qualities to make them more valuable than the vast quantities in the surrounding area.

The oil and gas potential is untested.

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Table 1.--Data for panned-concentrate samples from in and near the Muggins Mountains study area, Yuma County, Arizona.

[Gold concentrations determined by fire assay except where indicated; gold was converted from oz/st or g to  $\$/\text{yd}^3$  using a pan factor of 150 pans/ $\text{yd}^3$ , and a gold price of  $\$500.00/\text{oz}$ ; tr, trace; xx, not assayed; na, not applicable; <, less than.]

No.	Sample		Au $\$/\text{yd}^3$	Remarks
	Type	Depth (ft)		
1	Channel	0-1	0	Dry wash, 10-ft wide.
*2	do.	do.	xx	Dry wash, 50-ft wide; fine gold (<1 mm), three particles; sample lost during amalgamation process.
3	do.	0-2	0	Dry wash, 8-ft wide.
4	do.	0-1	0.105	Dry wash, 35-ft wide.
5	do.	0-2.5	0	Dry wash, 22-ft wide.
*6	do.	0-2	.745	Dry wash, 27-ft wide; fine gold (<1 mm), two particles.
*7	do.	2-3	.385	Below sample no. 6; lower 1 ft to bedrock; fine gold (<1 mm), one particle.
8	do.	0-2	0	Dry wash, 6-ft wide.
9	do.	0-1.5	0	Dry wash, 15-ft wide.
10	do.	0-2.5	tr	Dry wash, 16-ft wide.
11	do.	0-2	tr	Dry wash, 160-ft wide.
12	Grab	na	0	Dry wash, 12-ft wide.
13	do.	do.	0	Dry wash, 25-ft wide.

Table 1.--Data for panned-concentrate samples from in and near the Muggins Mountains study area,  
Yuma County, Arizona--Continued

No.	Sample		Au \$/yd <sup>3</sup>	Remarks
	Type	Depth (ft)		
*14	Channel	0-1	26.25	Dry wash, 12-ft wide; sample to bedrock; fine gold (<1 mm), several particles.
15	do.	0-5	tr	Sample at portal of 18-ft-long adit in older stream terrace above active wash; adit dug by Chinese in early 1900's (George Corley, Yuma, Arizona, miner, oral communication, 1987).
*16	do.	0-0.5	33.90	Dry wash, 10-ft wide; sample to bedrock; fine gold (<2 mm), several particles.
17	Grab	na	0	Dry wash, 15-ft wide.
18	do.	do.	0	Do.
24	do.	do.	0	Dry wash, 25-ft wide.
25	Channel	0-1	0	Dry wash, 18-ft wide.
26	do.	0-1.5	tr	Dry wash, 40-ft wide.
27	Grab		tr	Dry wash, 50-ft wide.
28	Channel	0-1	0	Dry wash, 120-ft wide.
29	Grab	na	0	Dry wash, 30-ft wide.
30	Channel	0-1.5	0	Do.

\*Gold concentrations determined by amalgamation process.

Table 2.--Data for samples 19-23 from the Red Knob prospect area near the Muggins Mountains study area, Yuma County, Arizona.

[Detection limits: Ag, 0.1 ppm; Mo, V, 1 ppm; Pb, 2 ppm; U, 0.2 ppm; --, not detected.]

Sample No.	Chip length (ft)	Analytical data					Description
		Ag	Mo	Pb ppm	V	U	
19	3	--	4	6	36	2.0	Mudstone with 1-in.-thick sandstone and siltstone beds; beds strike N. 20° W., dip 20° SW.
20	1.5	--	4	260	165	41.0	Silicified mudstone; chert, weeksite mimetite.
21	1	1.8	25	1,150	295	31.0	Silicified mudstone; chert, weeksite, vanadinite mimetite.
22	3.5	--	3	109	48	6.0	Mudstone with 1-in.-thick siltstone beds; beds strike N. 45° E., dip 7° NW.
23	3	--	5	31	33	5.0	Mudstone with flat lying siltstone and sandstone beds.