

HYDROLOGIC INVESTIGATION  
OF THE  
TUNGSTONA WELLS

for  
Cyprus Bagdad Copper Company

by  
Paul A. Manera, P.E.

May 19, 1975



## INTRODUCTION

### Location

The Tungstona Wells are located in Warm Spring Wash approximately five air miles northeast of Bagdad, Arizona. The legal description of the Tungstona Wells is the NE $\frac{1}{4}$  NE $\frac{1}{4}$  NE $\frac{1}{4}$  Section 24, T. 15 N., R. 9 W., as shown on Figure 1.

## GEOLOGY

### General

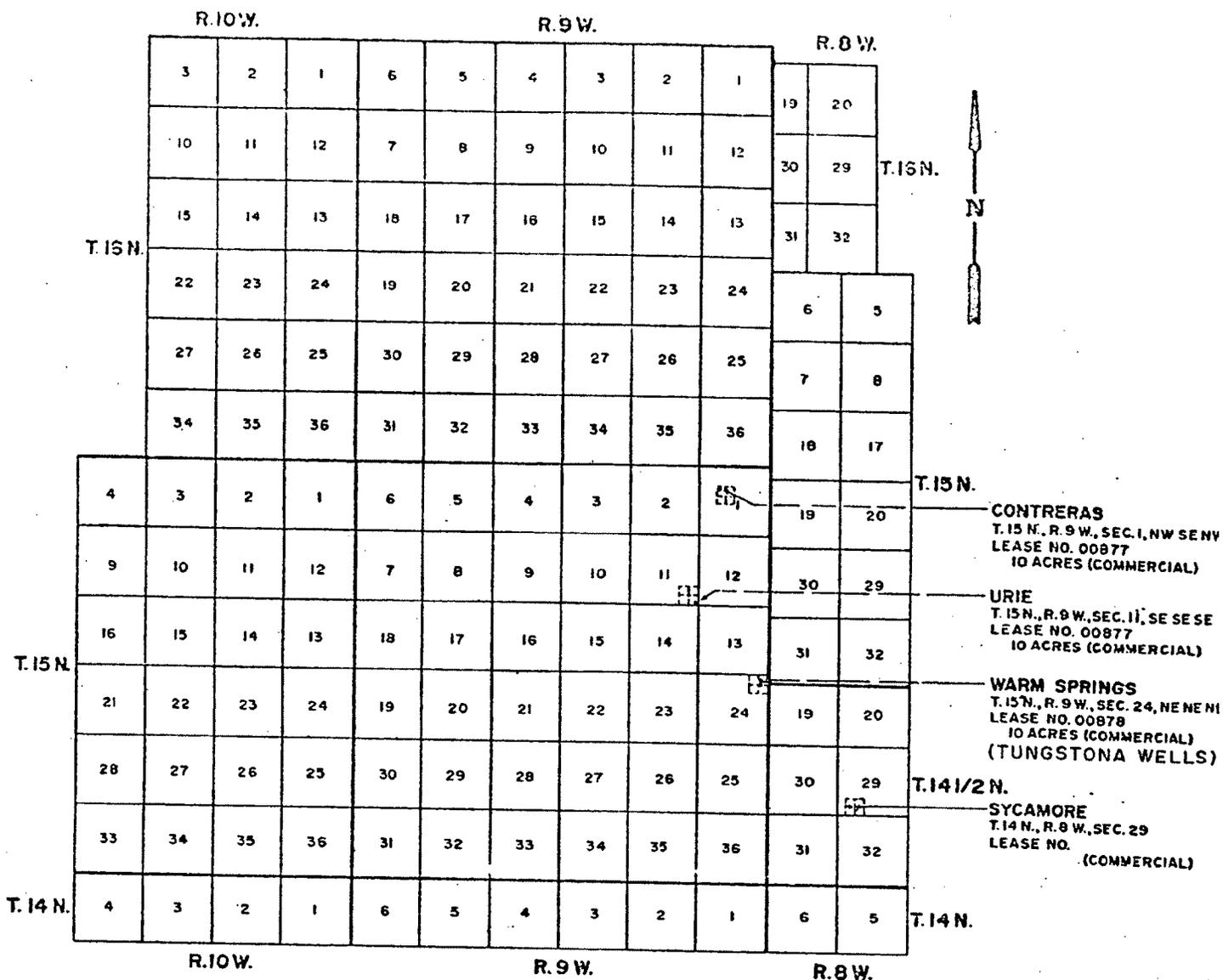
Warm Spring Creek is an entrenched stream cut into the Lawler Peak granite. Warm Spring Creek is a relatively short stream of approximately one mile in reach. In the upper half of the stream reach the Lawler Peak granite on each side of the creek is covered by the Gila conglomerate or the Sanders basalt.

### Structure

A fault cuts across Warm Spring Creek near the northeast corner of Section 24, T. 15 N., R. 9 W. The strike of the fault is N 23<sup>0</sup> W with a dip of 79<sup>0</sup> to 85<sup>0</sup> south. The primary fault is shown on Figures 2 and 3. Above the fault, i.e. northeast of the fault, the granite is relatively solid with few fractures. Downstream from the primary fault is a large crush zone with numerous parallel secondary faults and fractures.

An electrical resistivity survey run down the streambed indicated that the secondary faulting and fracture crush zone extends downstream in excess of 500 feet.





CYPRUS - BAGDAD COPPER COMPANY  
WATER WELL SITES

FIGURE 1

## HYDROLOGY

### Warm Springs

Warm Springs issue from the fault and fracture crush zone downstream from the primary fault. The springs were actually a series of seeps which continuously added to the flow of Warm Springs Creek. The fracture zone is the hydraulic conduit supplying the springs and the wells.

### Wells

Three wells were drilled downstream from the primary fault with Tungstona Well 1 nearest the fault and Tungstona Well 3 furthest downstream. The well schedules and drillers' logs are included in the appendix.

### Well Yield

Table 1 shows that characteristics of the Tungstona Wells.

Table 1

Tungstona Well No.	Total Depth (feet)	Original Production (gpm)	Drawdown (feet)	Date	Production, gpm 1971 and thereafter
1	228	280	38	5/13/60	Abandoned
2	250	195	134	ca12/65	65
3	522	540	55	8/14/62	290



Originally, Well 1 produced 280 gpm. When Well 2 was put into production the yield of Well 1 decreased and when Well 3 was completed, Well 1 was abandoned.

Well 3 can be pumped continuously at the rate of 280 gpm without fluctuation. Well 2 can be pumped at a rate of 200 gpm for eight hours every 24 hours. However, if Well 3 is not pumping, Well 2 can be continuously pumped at the rate of 200 gpm.

During the period 1971 - 1974 the withdrawal from the Tungstona Wells was:

Table 2

Year	Total Gallons	Withdrawal acre-feet (rounded)	Average gpm
1971	148,816,000	457	283
1972	45,026,000	138	86
1973	37,176,000	114	71
1974	65,931,000	202	125

#### CONCLUSION

Actual withdrawal extends back to 1958. The historical continuity of production indicates that a continued withdrawal of 340 gpm is a pragmatic projection of the water supply available from Tungstona Wells 2 and 3.



The decline in the withdrawal rate shown in Table 2 is a result of less demand rather than a decline in yield of the Tungstona Wells. The construction of the pipeline from Francis Spring and the large volume of water available has temporarily reduced the demand on the Tungstona Wells, Urie Well and Contreras Well.

The projected longevity of the supply is of long, but unknown, duration. It is believed that twenty years is a minimum longevity.



APPENDIX A  
Well Schedule and Logs



WELL SCHEDULE

WELL No. (B-15-9)24aaa

Tungstona Well 1

Recorded by BB Source of data SLD Date 7-20 19 71

State Arizona County Yavapai Topographic Map Bagdad 15'

T. 15 N 8 R. 9 E W Section 24 NE 1/4 NE 1/4 NE 1/4 G. & S.R. B&M

Owner Bagdad Copper Corp. Address Bagdad, Arizona

Driller Roscoe G. Jarvis Address \_\_\_\_\_

Surface Method  
Altitude \_\_\_\_\_ Drilled Cable Rotary Reverse Rotary Air Rotary

Total Depth 228 ft. Measured, Reported, Date drilled 5-13 19 60

Date well deepened \_\_\_\_\_ 19 \_\_\_\_\_ Total Depth \_\_\_\_\_ ft.

Casing Diameter 10 inches 0 to 228 ft inches to ft in to ft.

Perforations 30 to 228 ft to ft to ft.

Size opening 1/2" x 12" Cuts per foot 4

Major Aquifer \_\_\_\_\_ Minor Aquifer \_\_\_\_\_

Projects \_\_\_\_\_

PUMPING DATA

Date	when drid.	5/13/60											
Source data	SLD	SLD											
SWL	218	10											
Altitude WL													
Discharge gpm	280	280											
Drawdown feet		38											
Specific Capacity													
Perforated Interval													
Formation Coefficient													

CHEMICAL ANALYSES

Date													
Source data													
Conductivity													
Total Soluble salts													
Total Hardness													
Calcium													
Magnesium													
Sodium computed													
Carbonates													
Bicarbonates													
Chlorides													
Sulfates													
Nitrates													
Fluorides													
Boron													
Chromium													



DRILLER'S LOG

Bagdad Copper Corporation

NE $\frac{1}{4}$  NE $\frac{1}{4}$  NE $\frac{1}{4}$  Section 24, T. 15 N., R. 9 W.

0 - 20feet	decomposed granite - soft
20 - 37	decomposed granite - soft - water
37 - 62	(increased water) soft caving
62 - 65	granite - hard
65 - 80	decomposed granite - soft
80 - 110	granite - hard with narrow soft seams
110 - 117	decomposed granite - soft and sandy (increased water)
117 - 146	granite - hard with soft seams
146 - 148	decomposed granite - soft and sandy
148 - 170	granite - hard
170 - 175	decomposed granite - soft
175 - 180	granite - hard
180 - 212	decomposed granite - soft and sandy
212 - 228	granite - hard

Hole drilled in granite fault zone





DRILLER'S LOG

Bagdad Copper Corporation

NE $\frac{1}{2}$  NE $\frac{1}{2}$  NE $\frac{1}{2}$  Section 24, T. 15 N., R. 9 W.

0 - 250feet decomposed granite



WELL SCHEDULE

WELL No. (B-15-9)24aaa

Tungstona Well 3

Recorded by BB Source of data SLD Date 7-20 19 71

State Arizona County Yavapai Topographic Map Bagdad 15'

T. 15 N 8 R. 9 W Section 24 NE 1/4 NE 1/4 NE 1/4

Owner Bagdad Copper Corp. Address Bagdad, Arizona B&M

Driller Bagdad Copper Corp. Address Bagdad, Arizona

Surface Method churn  
 Altitude 3870 Drilled Cable Rotary Reverse Rotary Air Rotary

Total Depth 522 ft. Measured, Reported, Date drilled 8-10 1962

Date well deepened \_\_\_\_\_ 19 \_\_\_\_\_ Total Depth \_\_\_\_\_ ft.

Casing Diameter 12 inches 0 to 504 ft inches to ft in to ft.

Perforations 0 to 504 ft to ft to ft.

Size opening 1/4 x 4 Cuts per foot 6

Major Aquifer \_\_\_\_\_ Minor Aquifer \_\_\_\_\_

Projects \_\_\_\_\_

PUMPING DATA

Date	when drld.	8/14/62							
Source data	SLD	SLD							
SWL	492	30							
Altitude WL									
Discharge gpm		540							
Drawdown feet		55							
Specific Capacity									
Perforated Interval									
Formation Coefficient									

CHEMICAL ANALYSES

Date									
Source data									
Conductivity									
Total Soluble salts									
Total Hardness									
Calcium									
Magnesium									
Sodium computed									
Carbonates									
Bicarbonates									
Chlorides									
Sulfates									
Nitrates									
Fluorides									
Boron									
Chromium									



DRILLER'S LOG

Bagdad Copper Corporation

NE $\frac{1}{4}$  NE $\frac{1}{4}$  NE $\frac{1}{4}$  Section 24, T. 15 N., R. 9 W.

0 - 45feet	soft decomposed granite
45 - 88	soft decomposed granite, boulders, cavey
88 - 134	soft decomposed granite
134 - 138	soft decomposed granite - sand
138 - 170	soft decomposed granite
170 - 175	clay and sand
175 - 185	sand - cavey
185 - 190	boulders and sand
190 - 194	hard granite
194 - 202	sand
202 - 210	hard granite
210 - 215	sand
215 - 221	sand and boulders
221 - 232	hard granite
232 - 237	soft decomposed granite
237 - 270	hard granite
270 - 290	soft decomposed granite
290 - 332	hard granite
332 - 360	hard and soft seams
360 - 397	soft decomposed granite
397 - 415	hard granite
415 - 522	soft decomposed granite