<table>
<thead>
<tr>
<th>Well</th>
<th>Av. Pump Rate (gpm)</th>
<th>Static Level (ft)</th>
<th>Draw Down (ft)</th>
<th>Transmit. Speed (ft/hr)</th>
<th>Spd/Hdg Capacity</th>
<th>T.D. (gpm/1000')</th>
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</thead>
<tbody>
<tr>
<td>E-9</td>
<td>330</td>
<td>61</td>
<td>43 to 124</td>
<td>12,000</td>
<td>5.1</td>
<td>14 12/1000'</td>
</tr>
<tr>
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<td>10 3/4' to 20'</td>
</tr>
<tr>
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<td></td>
<td>9 3/8' to 500'</td>
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<td>42</td>
<td>80 to 124</td>
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<td>10 3/4' to 20'</td>
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<td></td>
<td>10 3/8' to 500'</td>
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<tr>
<td>E-12</td>
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<td>8 5/8' to 500' 100'</td>
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<td>8 5/8' to 500' 100'</td>
</tr>
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<td>E-13</td>
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<td>142</td>
<td>51 to 195</td>
<td>11,000</td>
<td>2.0</td>
<td>20 00/1000'</td>
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<tr>
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<td>10 3/4' to 20 ft</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
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<td>8 5/8' to 500' 100'</td>
</tr>
</tbody>
</table>

© WILSON JONES COMPANY 07208 GREEN 7208 BUFF
MADE IN U.S.A.
January 17, 1975

Mr. J. L. Kelly
Chief Geologist
ANAMAX MINING COMPANY
Twin Buttes Operations
P. O. Box 127
Sahuarita, Arizona 85629

Dear Mr. Kelly:

The following Stevens Type F water level recorders have been obtained with the help of Mr. Art Braden:

<table>
<thead>
<tr>
<th>Number</th>
<th>Serial No.</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>42816-66</td>
</tr>
<tr>
<td>2</td>
<td>25842-58</td>
</tr>
</tbody>
</table>

In addition, recorder no. 2 carries an Arizona Department of Game and Fish tag no. 02965.

Recorder no. 1 was removed from GAC Test Well no. 6 by David Hargis, and recorder no. 2 was obtained by Mr. Art Braden from a storage shed on ANAMAX property.

We have dis-assembled, cleaned, and re-assembled both of these recorders and are now operating them for a few days to check the clock mechanisms. It appears that these instruments will be adequate for our immediate needs in the shallow observation well near the weir site and in the observation well (E-13) near the pilot production well. However, some spare parts and additional miscellaneous gears, charts, etc., will be ordered by our office in order to properly equip these instruments for future use.

Sincerely,

[Signature]

John W. Harshbarger

JWH/vb
ANAMAX MINING COMPANY
TWIN BUTTES MINE
P.O. BOX 127, SAHUARITA, ARIZONA 85629

June 5, 1974

INTER-OFFICE CORRESPONDENCE

TO:       Paul Hodges
FROM:     J. L. Kelly

SUBJECT: Drilling Two Test Water Wells in the Helvetia-Greaterville Area

Two sites for test water wells have been recommended by Dr. John Harshbarger at:

1. SE¼SE¼SE¼ Sec. 34, T18S, R16E. This is on U.S. Forest property covered by Anamax mining claims and is about 4 miles east of the East Helvetia orebody.

2. SE¼SE¼NE¼ Sec. 33, T19S, R16E. This is at the far east side of the Anamax Greaterville property and about 7 miles southeast of the East Helvetia orebody.

With management approval we would like to drill a test water well at each site, each hole to be drilled to 1000 ft. at 7½-inch diameter followed by geophysical probing of each hole by an outside water well probing firm. Estimated cost of each hole including drilling and probing is $25,000 for a total cost of $50,000.

Further test water well drilling and/or drilling of production wells will hinge on the results of the initial two test wells, and proposals and estimated costs of additional water investigation or development for the Helvetia project will be submitted at that time.

J.L. Kelly

JLK: jc
pc: E.J.E.
J.J.C.
C.E.S., Jr.

Gat E - 1
TO: Paul Hodges

FROM: J. L. Kelly

SUBJECT: Investigation of Possible Water Supply for a Helvetia Operation

To initiate an investigation of possible sources of water in sufficient quantity for a mining operation at Helvetia, we are preparing a hydrology base map covering the Cienega Wash and Sonoita Creek basins east and southeast of the Anamax Helvetia property. These gravel-filled basins are surrounded by the Santa Rita and Empire Mountains on west and north, the Whetstone Mountains on the east and the Canelo Hills on the south.

The base map will show general geology, existing water wells and other data pertinent to the hydrology of the area as well as land ownership and other physical features. The map scale is 1 inch = 2000 feet and it covers 16 miles east-west by 18 miles north-south.

We also are assembling gravity geophysical data, and existing information, reports and maps on the hydrology in this area from the U.S.G.S., State of Arizona agencies and other sources.

Promising target areas for groundwater prospecting may be indicated by a review and study of all of this data by John Harshbarger, our hydrological consultant. This could be followed by land options or acquisitions and test well drilling for water.

J. L. Kelly

JLK: jc
Scale 1" = 8 mi.
Contour Interval - 5 milligals
Stadia traverse
Line between S328534
T14S R16E G+3R B. & M.
Surveyed June 6, 1974
Choice
TO: Charles E. Stott, Jr.
FROM: Dale F. Kittel
SUBJECT: Visit to Empire Ranch

Yesterday I visited the Steve Boice family at the Empire Ranch headquarters for the purpose of acquainting them with our proposed plans for completing claim location requirements on the eastern part of the Max claims.

Mr. Boice was quite agreeable to Anamax surveyors putting a north-south endline across a portion of Empire Section 2, even though the claims area in Section 2 is not valid because that section is State land.

The Boices repeated their very earnest desire to retain grazing rights on the Empire Ranch in the event it is purchased by Anamax. He also asked if it would be possible for him to negotiate an agreement with Anamax whereby the test wells now being drilled by Anamax could be made available to him after testing of them is completed. He would want the test holes complete with their casing, which he would purchase from Anamax. I told him I would pass this request on for Company consideration.

Dale F. Kittel

DFK: jc

pc: J. L. Kelly
Depth (m)
H2O Level
East Haheke
Contour
Interval is 100'
MEMO TO: Mr. J. L. Kelly
Chief Geologist
ANAMAX COMPANY
Twin Buttes Operations
P. O. Box 127
Sahuarita, Arizona 85629

Dear Mr. Kelly:

Please find enclosed a copy of the Preliminary Draft on Potential Water Development on Empire Ranch Lands.

Sincerely,

John W. Harshbarger

Enclosure
MEMORANDUM TO: Mr. Charles Stott  
Legal Counsel  
ANAMAX MINING COMPANY  
Twin Buttes Operations  
P. O. Box 127  
Sahuarita, Arizona  85629

REGARDING: Preliminary Draft

POTENTIAL WATER DEVELOPMENT  
ON EMPIRE RANCH LANDS

In accordance with your request, we have prepared this preliminary analysis with conclusions on the availability of groundwater in the Empire Ranch area.

GEOLOGIC FRAMEWORK

The Empire Ranch water exploration area is located in the Cienega Creek drainage basin and is a tributary of the Santa Cruz Basin in southern Arizona. This basin is bordered on the north by the Empire Mountains, on the west by the Santa Rita Mountains, on the south by the Canelo Hills, and on the east by the Whetstone and Mustang Mountains. The geology of the Empire Ranch water exploration area comprises a complex intercalation of unconsolidated to semi-consolidated basin fill underlain by Tertiary (?) indurated sediments and sandstone and shale of Cretaceous age. Recent unconsolidated sand and gravel occur in the floodplains of Cienega Creek and its major tributary washes. Compaction of the basin-fill deposits increases with depth and tends to obscure the contact between the basin-fill and the Tertiary (?) indurated sediments.
The Recent sands and gravels are probably no more than several tens of feet thick. The basin-fill deposits range from about 250 feet to more than 1,500 feet thick in the Empire Ranch area. The contact between the basin-fill deposits and the consolidated Tertiary (?) sediments is gradational, and cannot be determined with certainty from drill-cuttings and electric logs.

**HYDROGEOLOGIC FEATURES**

Groundwater occurs in the Recent sands and gravels along the Cienega Creek, in the basin-fill deposits and in the Tertiary (?) indurated sediments. Groundwater in the Recent sands and gravels is unconfined and occurs only a few feet beneath the land surface. This shallow groundwater supports a substantial growth of phreatophytes along Cienega Creek and its major tributary washes. Water flows at all times of the year in Cienega Creek in the reach downstream from section 3, T 19 S, R 17 E, where the channel of the creek intersects the water table. A portion of this streamflow is diverted for irrigation use on the Cienega Ranch in section 35, T 18 S, R 17 E.

Groundwater also occurs in the basin-fill deposits, probably under confined conditions in the Empire Ranch exploration area. The interbedded sand, gravel, and clay layers comprise a thick sequence of water-bearing sediments that exceeds 1,500 feet in thickness over much of the area. Groundwater occurs in the Tertiary (?) indurated sediments but zones of significant permeability are found only in fracture zones. Groundwater in the indurated sediments probably occurs under confined conditions.
Water level measurements were collected in all available wells on the Empire Ranch in September and October, 1974. These water levels are shown on the water level contour map of the Empire Ranch exploration area. These contours represent two groundwater systems: an unconfined system in the Recent sands and gravels and unconsolidated basin-fill deposits, and a confined system in the lower semi-consolidated portions of the basin-fill deposits and fractured zones in the Tertiary (?) indurated sediments.

In some areas, the piezometric surface of the confined system is higher than the water table surface; in other areas the piezometric surface is lower than the unconfined water level. The water level data are not adequate to clearly define the levels of the two groundwater systems. The Anamax exploration wells were generally constructed with slotted casing from one or two hundred feet below land surface, and open hole below the casing to their total depth. Thus the water levels measured in these holes represent composite levels of both the confined and unconfined groundwater systems. Construction details on almost all of the measured stock and domestic wells are lacking, but most of them probably penetrate only the shallow unconfined aquifer.

The water level contour map indicates that recharge to the groundwater system in the Empire Ranch area is mainly from the foothills of the Santa Rita Mountains in the west and southwest. The water level contours are widely spaced in a zone several miles wide along Gardner Canyon which has a northeasterly trend; and in a zone two to three miles wide along the western margin of Cienega Creek basin. These widely spaced water-level contours indicate areas of relatively high transmissivity in the aquifer system.
The baseflow in Cienega Creek in section 3, T 19 S, R 17 E, indicates that the aquifer is overflowing and natural recharge presently exceeds the water usage in the basin. The baseflow in this reach of Cienega Creek was estimated to be 2 to 3 cubic feet per second in September, 1974.

PUMP TEST RESULTS

Preliminary results of the pumping tests of eight exploration wells are summarized in Table 1 and indicate that the transmissivity (T) of the aquifer sequence ranges from several hundred to about 35,000 gpd/ft (gallons per day per foot width of aquifer). The transmissivity of an aquifer is a measure of the ability of the aquifer to transmit water. The transmissivity is expressed as a volume of water per unit time flowing through a vertical strip of the aquifer one foot wide, under a unit hydraulic gradient. The specific capacity is a measure of well performance, and includes such factors as aquifer transmissivity and well efficiency. The specific capacity is an index of well yield; in gallons per minute per foot of drawdown.

Exploration wells E-7 and E-8 exhibited transmissivities of about 35,000 gpd/ft. The pump test of E-5 indicated a T of about 25,000 gpd/ft. These T values are associated with the greatest thickness of basin-fill deposits in a zone several miles wide along the western margin of Cienega Creek. In general, the aquifer material penetrated by these wells comprises relatively clean, coarse sands and gravels. This preliminary assessment indicates that properly constructed wells in this area would yield on the order of 1,500 gpm (gallons per minute). However, data from the exploration wells are not adequate to define the magnitude and extent of the impact of
such large wells on the groundwater system. Of particular concern is the possibility of reduction of the baseflow in Cienega Creek. A pilot production well should be drilled and pump tested in the high-T zone to assess the response of the aquifer system to high-rate pumping.

Exploration wells E-8 and E-7 had transmissivities of 35,000 gpd/ft and specific capacities of 5.4 and 7.6 gpm/ft (gallons per minute per foot), respectively. Exploration well E-2 had a T of 15,000 gpd/ft and a specific capacity of 4.3 gpm/ft, which is significantly greater than exploration wells E-6 and E-4 in the same area (Table 1). It is believed that the relatively high T at well E-2 is related to a fracture zone in the Tertiary (?) indurated sediments in that area. Pumping tests of exploration wells E-1, E-3, E-4, and E-6 indicate that sustained well yields of 100 to 200 gpm are tenable from the aquifer sequence in these areas.

CHEMICAL QUALITY OF WATER

Chemical analyses of groundwater samples collected during the pump tests of the exploration wells indicate that, in general, the groundwater is of excellent chemical quality with a total dissolved solids content of less than 400 mg/l (milligrams per liter) and a hardness suitable for most industrial and domestic uses. However, groundwater with a total dissolved solids content of up to 1,000 mg/l occurs in the areas of lower aquifer transmissivity.

PRELIMINARY CONCLUSIONS

A preliminary assessment of the exploration drilling program on the Empire Ranch indicates that a substantial groundwater reservoir exists in the basin-fill deposits in a zone 2 to
3 miles wide along the western side of Cienega Creek. The average transmissivity of the aquifer in this area is probably on the order of 35,000 gpd/ft, indicating that well yields on the order of 1,500 gpm are tenable. However, present data are inadequate to assess the impact on the groundwater reservoir of pumping at high rates. A large-diameter pilot production well should be drilled and tested at a sustained rate of 1,500 gpm for at least 10 days in order to better assess the hydraulic properties of the aquifer, and the potential effects on the baseflow in Cienega Creek.

A preliminary estimate based on the available data indicates that approximately 5,000 acre-feet per year of groundwater underflow moves northward from the Empire Ranch. This groundwater underflow could be harvested for beneficial use by a properly constructed well field. The volume of recoverable water within GAC fee land in the upper 1,000 feet of aquifer material is approximately 1.5 million acre-feet. If future mining needs are about 10,000 acre-feet per year, then half of the required water could be obtained by harvesting groundwater underflow that presently leaves the area. The other 50 percent of the water requirement could be withdrawn from storage. Assuming that 5,000 acre-feet per year would be withdrawn from storage for industrial use, the upper 1,000 feet of aquifer contains enough recoverable groundwater for about 300 years of sustained withdrawal.

Respectfully submitted,

[Signature]

John W. Harshbarger

cc: J. Kelly
R. Lynn
TABLE 1.—SUMMARY OF PUMPING TEST RESULTS OF EXPLORATION WELLS,
EMPIRE RANCH

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<tr>
<th>EXPLORATION WELL</th>
<th>TRANSMISSIVITY (GPD/FT)</th>
<th>SPECIFIC CAPACITY (GPM/FT)</th>
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<td>600</td>
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<td>0.6(^3/)</td>
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<tr>
<td>E-7</td>
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<td>E-8</td>
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<td>E-9</td>
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1/ Gallons per day per foot width of aquifer

2/ Gallons per minute per foot of drawdown based on approximately 48 hours of pumping

3/ Based on 24 hours of pumping