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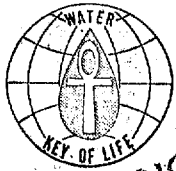
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Water Development Corporation

CONSULTANTS IN WATER RESOURCES J.E.H.

T.E.S.

MAY 12 1975

MAY 21 1975

May 8, 1975

CABLE: WADEVCO, TUCSON
PHONE: 602-326-1133

MEMORANDUM FOR THE FILE

Subject: Pump for Well at Shaft, Sacaton Unit

Jack Smith called and informed us that a 380 gpm pump set at the bottom of the well would cost about \$ 65,000. would shut off at about 300 gpm, and would not be guaranteed. If input from the well turned out to be less than 300 gpm the pump would have to be operated cyclically. Jack asked if we could recommend a pump with a lower discharge.

The data from the drilling and the preliminary testing indicated the following:

- a) The air-lift test at the 1,798-foot depth produced 108 gpm with 483 feet of drawdown, indicating a specific capacity of 0.22 gpm per foot of drawdown. However, the water level was still declining at the end of the test and had not yet stabilized. Therefore, the specific capacity at equilibrium may be less than 0.22 gpm per foot of drawdown.
- b) To avoid danger of underdesign, we extrapolated the 0.22 gpm per foot of drawdown to a pumping lift from a depth of 1,700 feet and computed the well yield to be 319 gpm (p. 20 of report).
- c) The drilling data indicated most of the water was entering the well in the zone between 1,100 and 1,250 feet (p. 22 of report).
- d) If the pump lift were to be from 1,350 feet and the pump bowls were to be set at 1,350 feet, the computed discharge would be 242 gpm based on a specific capacity of 0.22 gpm per foot of drawdown.

By telephone today I recommended to Jack Smith that he ask for quotations on a 250-gpm pumping unit set with the top of the bowls no shallower than 1,350 feet and with a design lift from a pumping level of 1,350 feet. It is hoped that the cost will be substantially less than \$ 65,000. If, after shaft construction has progressed beyond a depth of about 1,300

Memo for the File
May 8, 1975
Page 2

and it becomes desirable to set the pump lower in the well, a drift could be cut from the shaft to the well in hard rock somewhere above a depth of 1,100 feet, and a booster pump set in it. The pump in the well could be lowered to 1,700 or 1,750 feet, the line from the pump could be fed into the booster pump and thence back into the well and the additional required lift could thereby be provided. Based on the present \$ 65,000 bid price for a deep pump setting, the plan suggested herein should be less expensive even if a drift and booster become necessary.

The data clearly indicate that the proposed 250 gpm pump set at 1,350 feet will dewater the major zone at 1,100 - 1,250 feet.

Leonard C. Halpenny

LCH/cm

cc: Jack Smith
Tom Edwards
R.B. Meen

1274

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

October 8, 1968

J. H. C
OCT 7 1968

TO: Mr. J.H. Courtright

FROM: Mr. S.E. Zelenkov

Sacaton Project
Pump Test

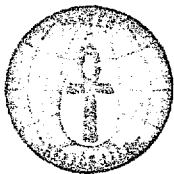
There will be a charge of \$1.04 per hour for the fuel and oil used by the 600 CFM compressor that Mr. J.O. Barnes is renting to us.

S.E. Zelenkov

S.E. Zelenkov

SEZ:ir
cc: NPWhaley

OK *JAC*



Water Development Corporation

CONSULTANTS IN WATER RESOURCES

3938 SANTA BARBARA AVENUE
TUCSON, ARIZONA 85711

PHONE: 602-326-1133
CABLE: WADEVCO, TUCSON

May 29, 1968

Mr. R. B. Meen, Manager
American Smelting and Refining Company
Southwestern Mining Department
P. O. Box 5795
Tucson, Arizona 85703

Dear Mr. Meen:

Re: Progress on Water Investigation,
Sacaton Project

As of this date twelve old drill holes have been opened for determination of depth to fluid level and collection of fluid sample for analysis. Fluid levels were determined in nine holes; the other three were bridged or partially stopped up with mud and provided inconclusive data. Fluid samples were collected from seven old holes; the fluid from one was oil from drilling and could not be analyzed.

Hole No. S-54 is 8 inches in diameter and we recommend that it be tested by air lift method. The time to do this is after Mr. Barnes, the contract well driller, returns to the project. I enclose a copy of a pencil rough sketch outlining materials required and recommended hookup. If the test is successful in terms of producing water, we believe it would be worth while to test Nos. S-64 and S-69. Although none of these three holes are over the deep ore body they afford opportunity to collect data on the extent of water yield from the conglomerate, the underlying hard rocks, and fault systems.

While the above work is going on, we believe six holes should be resampled using a deep-well sample collector which we can borrow from the U. S. Geological Survey.

Core drilling of new test holes is now in progress. Arrangements have already been made to clean out the new holes upon completion and test them for water production. It is considered desirable that the suggested air-lift tests on Nos. 54, 64, and 69 be coordinated with the completion of the new holes (Nos. 98, 99, and 100). We are keeping in touch with Messrs. Wojcik and Whaley with respect to coordination of work.

May 29, 1968

If the suggested test of No. 54 is approved, we recommend that steps be taken to collect the necessary pipe, fittings, and compressor so that all will be in readiness when the new test holes are nearly ready and Mr. Barnes' rig is available.

Sincerely yours,

Leonard C. Halpenny

cc: Mr. Courtright ✓
Mr. Wojcik
Mr. Whaley

Criteria for air lifting water from #S-54

Use 3" water line and 1" air line

Submergence needed on air line = 6690

Static water level = 170'

Bottom of air line = $3 \times 170 = 510' \pm 10'$

Submergence needed on water line =

100' deeper than air line = $610' \pm 10'$

Kick-off pressure needed = $170 \times 1.434 = 75 \text{ psi}$

Estimated pressure needed while lifting
= 120 psi

Compressor cfm needed @ lift 80 gpm
= 100 - 150 cfm

Approximate yield (if well capable of
producing) = 60-80 gpm

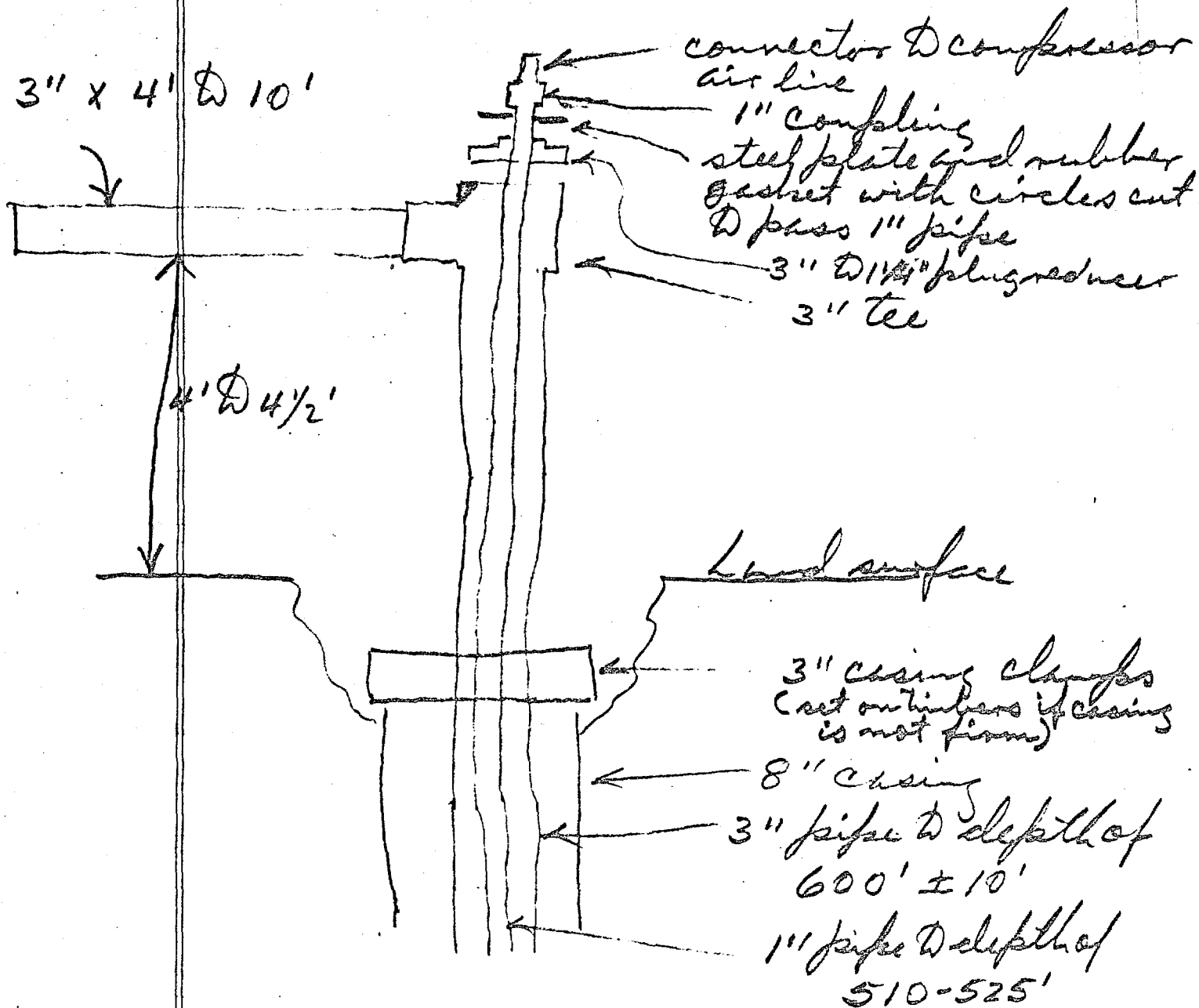
Can measure well yield by weir in ditch

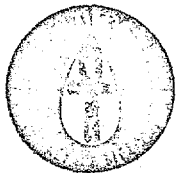
Can measure water level during recovery
and possibly during drawdown

Can determine coefficient of transmissibility

Can determine specific conductance
of water periodically during test and
collect a sample (for analysis) at time
conductivity becomes constant

Sketch of hook-up to air lift # 5-54





Water Development Corporation

CONSULTANTS IN WATER RESOURCES

See also:
Ga 16A.3.1913

J.H.C

APR 25 1968

3938 SANTA BARBARA AVENUE
TUCSON, ARIZONA 85711

PHONE: 602-326-1133
CABLE: WADEVCO. TUCSON

April 25, 1968

F.B.M.
APR 25 1968

Mr. R. B. Mean, Manager
American Smelting and Refining Company
Southwestern Mining Department
P. C. Box 5795
Tucson, Arizona 85703

Sacaton

Dear Mr. Mean:

The purpose of this letter is to keep you informed of the progress to date under Item 1 of our letter of April 8.

On April 18 I met Mr. Wojcik in Casa Grande to conduct preliminary field work. We removed the concrete plugs from drill holes 32, 49, and 53 and measured fluid levels with a sounder. Based on the results obtained I recommended to Mr. Wojcik that the plugs be removed from additional holes in the area of immediate interest in which, based on drilling and casing data, he thought there might be a chance of obtaining fluid levels. We also discussed coring the conglomerate and Mr. Wojcik suggested that the next hole to be drilled (No. 98) would be at a good location for this. Accordingly, I recommended that spot core runs be made in this hole at each bit change. This is now being done.

On April 23 Dr. John Harshbarger and myself visited the area to measure fluid levels in the additional drill holes which had been opened up. The results of the measurements on this trip and the previous trip are given in tabular form attached to this letter.

There are several additional holes, including No. 69 and No. 37, in which we feel fluid level measurements should be obtained, and Mr. Wojcik is having these opened. The holes presently being drilled will be washed after drilling is completed and fluid levels should be measured in these every few days until the level has stabilized. If possible, Mr. Wojcik or someone from the exploration staff could make these periodic checks on the new holes.

April 25, 1968

The water samples which we collected from the existing holes will have to be filtered before we can have them analyzed, and it is possible that chemicals which were added to the mud during drilling are still present. If so, the results might be erroneous. The new holes are to be cleaned and should provide much better water samples when the fluid level has stabilized. We plan to collect samples for analysis from these drill holes.

Based on the relatively shallow fluid levels and the fact that relatively clear water samples were collected from several of the holes, we believe that it will be imperative to construct a water well and conduct a pump test. The employment of nearby drill holes as observation wells will permit a more definitive analysis of potential water yield in conjunction with the test data.

Dr. Harshbarger and myself are going to Toquepala, Peru, for about one month on April 26. Mr. Halpenny is presently in Venezuela and will return May 6. On his return he will contact you and Mr. Wojcik and follow through on the necessary field work to complete Item 1 of our letter.

Very truly yours,

Donald K. Greene
Donald K. Greene

1168

Xcc - JHCourtright✓

FLUID LEVEL DATA
ASARCO SACATON PROJECT

Hole	Fluid Level (ft)	Date	Casing Depth (ft)	Depth to Bedrock (ft)	Location	Remarks
77	193.0	4-23-68	840	830	Horst in Sec. 25	Fair reading. Indicates mud present.
64	211.5	4-23-68	1,204	?	"	Good reading. Collected water sample. Temperature 78° F. Hole penetrated thrust fault.
66	283.5	4-23-68	1,318	1,245	"	Good reading. Indicates water. Casing is parted and hole is probably open to conglomerate. Hole penetrated thrust fault.
32	130.0	4-18-68	1,757 ?	?	Graben in Sec. 25	Heavy mud. Electrode would not penetrate. Hole penetrated thrust fault.
31	196.0	4-23-68	882 ?	930	Deep ore body block	Good reading. Collected water sample. Temperature 80° F. Hole is open to conglomerate.
42	174.0	4-23-68	1,807	1,825	"	Good reading. Hole is open to conglomerate.
49	226.0	4-18-68	1,508	1,500	"	Poor reading. Indicates mud present.
53	246.5	4-18-68	1,140	1,090-1,100	"	Good reading. Collected water sample 4-23-68. Temperature 80° F.
58	215.0	4-23-68	1,453	?	"	Good reading. Collected water sample. Temperature 77° F.

JHC
J.H.C.

APR 12 1968

Sacaton

April 12, 1968

Mr. Leonard C. Halpenny
Water Development Corporation
3938 Santa Barbara Avenue
Tucson, Arizona 85711

Dear Mr. Halpenny:

Your proposal as outlined in your letter of April 8, 1968, was received. The program is satisfactory, and I believe we agreed in our previous discussion that if sufficient data are accumulated at any one stage, the remainder of the program would be cancelled.

We assume that you are progressing with Item #1. Harold Courtright has advised me that his staff is cleaning the holes as they progress with their drilling program.

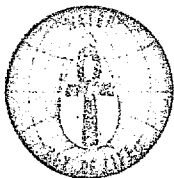
We wish to thank you for your prompt presentation of this proposal, as well as your brochure and professional record.

Very truly yours,

ORIGINAL SIGNED BY
R. B. MEEN
R. B. MEEN
Manager

RBM:js

cc: JHCourtright
CENelson
TASnedden



Water Development Corporation

CONSULTANTS IN WATER RESOURCES

APR 12 1968

APR 10 1968

MINING DEPT.

3938 SANTA BARBARA AVENUE
TUCSON, ARIZONA 85711

APR 10 1968

April 8, 1968

TUCSON

J.H.C.

PHONE: 602-326-1133
CABLE: WADEVCO. TUCSON

APR 12 1968

Mr. R. B. Meen
American Smelting and Refining Co.
1150 North Seventh Avenue
Tucson, Arizona

Dear Mr. Meen:

This letter has been prepared following preliminary meetings on April 3 and April 8, 1968, on the subject of ground-water investigations relating to possible development of the Sacaton deep orebody in Pinal County, Arizona.

Two principal factors require consideration. First, what is the likelihood that the materials overlying and within the orebody are sufficiently permeable to yield ground water in substantial quantities if and when underground mining is done? Second, if ground water is pumped for water supply and for mine drainage in the vicinity of the orebody, what will be the effect, if any, upon water levels and well yields of irrigation wells in the adjacent areas?

Other factors requiring consideration are as follows:

A. The area purchased for a well field comprises 320 acres in Sec. 34, T.5 S., R.6 E. The required water supply is estimated to be 900 to 1,000 gpm (gallons per minute). Information is needed as to the adequacy of this area to supply the requirement and as to the effect of this withdrawal of ground water upon water levels and yields of other wells.

B. Plans are for the tailings dam to be in Sec. 3, T.6 S., R.5 E., about 2 miles south of the mine workings. An estimated 800 gpm of water will be discharged in this area. Information is needed as to the effect of this discharge, if any, upon the mine workings.

A program of drilling five additional core holes into the orebody is about to begin, and you have requested that we make recommendations as to what modifications are desirable to make it possible to obtain ground-water information from these holes.

The program we recommend is as follows:

1. That the ground-water consultants should review presently available geological and ground-water information for that part of the Casa Grande area within approximately 10 miles of the orebody, based on records and reports of the U. S. Geological Survey, the State Land Department, and the core drilling done by your company. This work would include measuring water levels in old core holes if possible. A preliminary report should be prepared which should include a summarization of existing information pertinent to the problem, a list of additional data if found to be necessary, and preliminary conclusions.
2. For the core drilling program which is about to begin, we suggest that the holes be cased to bedrock with 3-inch pipe as has been done heretofore. Depending upon the results obtained in measuring water levels in old core holes it may be desirable to core the conglomerate from static water level to bedrock in one of the new core holes. We also suggest that the drilling mud be kept as thin as possible while these holes are being drilled, and that upon completion the holes should be washed clean insofar as possible. Following completion of these holes we suggest that they be perforated by gun perforating or by some other feasible means, in order that they may serve as observation holes for measurement of depth to static ground-water level. If the holes can be perforated by the driller, the work can be done on each hole following completion of coring and before moving to the next site. If it is necessary for perforations to be made by gun perforating, it would be less expensive to perforate all at the same time. The preliminary review described under Item 1 may indicate that perforating of a few additional old core holes may also be desirable.
3. Upon completion of the test drilling program and perforation of the well casings, it will be desirable to measure depth to water in the holes several times during a period of about 2 weeks to insure that the water levels in the holes have reached stability and truly reflect fluid level or pressure level in the adjacent materials. If feasible, a small-yield pumping test should be made at one of these holes.
4. Upon completion of collecting water level data from the observation holes, we believe the consultant should review the data for the purpose of determining whether or not it will be necessary to drill a larger diameter well for the purpose of conducting an aquifer performance test. We believe that a very brief report is warranted at this stage.
5. If it becomes necessary to drill a water well at the orebody to determine the transmissibility of the aquifer, we consider that your own personnel should supervise the work, and that the consultant be used to review the results and, if desired, to aid in making the pumping test.

6. Upon completion of all the above described work it will be possible to assemble all the data in a final report which will contain final conclusions relating to the questions of mine drainage and effect upon water levels and yield of wells in the adjacent area.

Our estimate of costs for the program outlined herein is based on our standard schedule of charges, a copy of which is enclosed, and is as follows:

Item 1. A report in five copies, \$1,500.

Item 2. We assume the data collection would be done by your own staff and that our services would be needed only for occasional consultation. We estimate the time requirement during this phase to be of the order of 3 days plus a nominal amount for vehicle expense. For budgeting purposes we estimate this cost to be \$650.

Item 3. For the work under this item we assume your own personnel will collect most of the data. We estimate one field day of consultant time may be required, not to exceed \$225 including vehicle expense.

Item 4. A report in five copies, \$750.

Item 5. Consultant costs for this item depend upon the extent consultant personnel are required. For a pumping test lasting 72 hours we estimate 6 man-days at \$150 plus field expense, \$1,000.

Item 6. A report in five copies, \$1,500.

If actual time spent on any phase is less than estimated we will bill only for actual work done.

Summary of Cost Estimate

\$5,625

On timing, we can complete the report under Item 1 within 30 days of date of authorization. Timing for Items 2 and 3 is dependent upon rate of drilling. The brief report under Item 4 can be completed within 15 days of completion of work under Item 3. If a water well and test are required, timing is dependent upon rate of drilling. The final report can be completed within 20 days of receipt of data from the Item 5 test.

The maps which we borrowed from your office are being held in our files pending further instructions.

Mr. R. B. Meen

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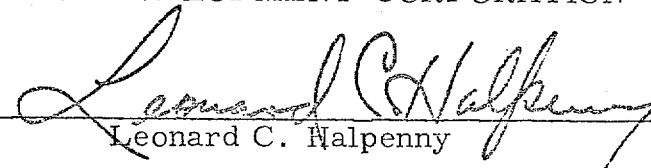
April 8, 1968

We also enclose with this letter copies of our brochure and professional record.

Respectfully submitted,

WATER DEVELOPMENT CORPORATION

By


Leonard C. Walpenny

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

Aa 16A.3.19B

January 5, 1968

S. I. B.

APR 3 1968

Mr. J. J. Collins, Chief Geologist
ASARCO - New York Office

Sacaton Water

Dear Sir:

Reference is made to your letter of December 29, 1967, regarding ground water that might be encountered in block-cave mining at Sacaton.

In view of the geological environment, the possibility of a large flow being encountered is considered remote. The deposit is overlain by several hundred feet of conglomerate which is essentially impermeable. The host rocks containing the copper mineralization, altered schists, granites and porphyries, are also relatively impermeable (relative to unaltered igneous rocks, limestones and quartzites). In the basins to the southwest and to the east, aquifers composed of valley fill produce large volumes of water for irrigation; however, these are underlain by the conglomerates which extend without interruption over the copper deposit.

Under these conditions, only seepage water can be expected in mining and this probably restricted to a depth below 1600', as above this level abundant antlerite (copper sulphate) is present.

There appears to be no likelihood that mine pumping could affect the water supplies in adjacent basins. However, some seepage water can be expected in the deeper mine workings and to determine the amount, one or more test wells will be required. These tests could be carried on concurrently with the exploration drilling and coordinated in such a way as to utilize plus or minus 1000' of rotary hole for both coring and pumping tests.

I believe we should have the advice of a consultant and recommend The Water Development Corp. (Halpenny and Harshbarger) as they are located here in Tucson and have had considerable experience in the area.

We expect to defer drilling until the Mining Department has optioned the additional land required for mining operations.

Yours very truly,

J. H. Courtright
J. H. Courtright

JHC:1mi

cc: CENelson
TASnedden
RBMeen

J. R. Wojcik
A. E. Long



AMERICAN SMELTING AND REFINING COMPANY
EXPLORATION DEPARTMENT
120 BROADWAY, NEW YORK, N.Y. 10005

JOHN J. COLLINS
CHIEF GEOLOGIST

Air Mail

WES
J. H. C.
JAN 3 - 1968

S. I. B.
APR 3 1968

December 29, 1967

Mr. Harold Courtright
Tucson Office

Sacaton Water

Dear Harold:

The 1964 report on the ore reserves at Sacaton has a section dealing with the ground-water supply for a mill. At this time, Mr. Nelson would like you to consider as a mining cost the amount of ground-water that might be encountered in mining operations at Sacaton. Could the planned drilling program be utilized to conduct pumping tests? Would you recommend that the Mining Department employ a ground-water consultant to appraise this subject concurrently with your drilling program?

Mr. Nelson wants to learn: (a) what amount of water might be expected in a mining operation; (b) the effect that the removal of this water would have on the supply utilized by adjacent farmers; (c) how State water regulations affect this mining proposal. Your advice will be appreciated.

Very truly yours,

John J. Collins

CC: CENelson
TASnedden
RBMeen