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James Doyle Sell Mining Collection

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ASARCO

Exploration Department
Southwestern United States Division

January 9, 1991

Dr. P.H. Nelson
U.S. Geological Survey
1527 Cole Blvd.
Denver West Building 2
Room 110
Golden, CO 80401

Dear Phil:

Here is the Santa Cruz in situ leach poster for use at the McKelvy Forum. If you think it needs more information or any changes, please let me know. Please note that the perforated intervals in the test wells are over extended in the poster drawings. The perforated interval in each well is a 200 foot interval from 1570' to 1770'.

Also enclosed are a half dozen maps and cross sections that I find handy to use in discussions.

Under separate heading you will receive some handouts. If you need more, let me know.

Sincerely yours,



H.G. Kreis

HGK:mek
encs.

cc: A.R. Raihl (w/o enc.)
F.T. Graybeal (w/o enc.)
W.L. Kurtz (w/o enc.)
J.D. Sell (w/o enc.)

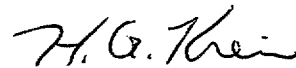
February 15, 1991

A.R. Raihl

H.G. Kreis
Monthly Report
January 1991

During the month of January my work on the in situ portion of the Santa Cruz Project consisted of the following:

- preparing and giving a talk to Congressional Staff of DeConcini, Udall, McCain, and Kolbe;
- preparing and giving a talk to the Casa Grande Economic Development Foundation;
- researching subsidence information in the general area of the test site; and
- reviewing a joint USBM-Asarco-Cyprus publication on in situ leaching.



H.G. Kreis

HGK:mek

cc: R.L. Brown
F.T. Graybeal
W.L. Kurtz
J.D. Sell

February 19, 1991

R.L. Brown
New York Office

H.G. Kreis
Monthly Report
January 1991

General Exploration

Work on the USBM-industry sulfide in situ leach proposal continued during the month of January. Plans for a USBM-industry-UofA meeting in January were cancelled, and the meeting was rescheduled for February 12th. A report was written on the results of the DOE-USBM-industry meeting held in Washington last month.

Santa Cruz Joint Venture

Some work was done on Santa Cruz land and on expenditures made during 1990. Arrangements were made to have each and every old drill hole and water well examined and, if necessary, brought into compliance with state requirements for water proof, tamper resistant steel caps.

Santa Cruz In Situ Leach

My work on the oxide in situ leach test is described in my memo to Mr. Raihl, and you are designated to receive a copy of that memo.



H.G. Kreis

HGK:mek

cc: W.L. Kurtz
J.D. Sell
A.R. Raihl

ASARCO

Southwestern Exploration Division

February 26, 1991

R.L. Brown

H.G. Kreis
Monthly Report
February 1991

General Exploration

During the month substantial progress was made on achieving a DOE proposal and a management structure that are acceptable to both USBM and CIPRA. A mutually agreeable DOE proposal is expected to be finished for review by CIPRA in early March. This progress was the result of a CIPRA meeting, a joint USBM-CIPRA-UofA meeting, and a USBM-CIPRA meeting, all held in February. CIPRA representatives met with Mr. Brent Hiskey and toured the UofA Copper Research Center facilities on February 8th.

Santa Cruz Joint Venture

During the month work was done on the Santa Cruz ore potential, the budget, and the land status in preparation for a SCJV Operating Committee meeting. The SCJV Operating Committee meeting was held on February 5th in Asarco's New York office.

Prior to opening the Operating Committee meeting, several topics were discussed. Topics of discussion included land offers, land acquisition priorities, the feasibility of constructing the SX-EW pilot plant prior to obtaining the aquifer protection permit, and the proposed 1991 Santa Cruz Project budget. During the SCJV Operating Committee meeting a motion was passed to accept a \$344,000 budget for 1991 (includes the \$44,000 Parks-Salyer land payment).

All of the Santa Cruz drill holes and water wells, with the exception of six drill holes with plastic casing, are in compliance with Arizona State regulations requiring water proof, tamper resistant steel caps. The six remaining drill holes with plastic casing will be capped with steel covers in March; and, once this is done, all the holes will be in compliance. This includes all the drill holes and water wells acquired with the acquisition of the Santa Cruz South deposit.


Santa Cruz In Situ Leach

During the month of February my work on the in situ portion of the Santa Cruz Project consisted of the following:

- provided services to Montgomery and Assoc. on bedrock contour map;

- gave UofA Copper Research Center pieces of 4" core for leaching studies;
- arranged for CSAMT survey of the test site by Zonge Engineering;
- worked on arrangements for telephone service to test site;
- designed signs and arranged for construction at test site;
- obtained building permit for installation of electric power at the test site;
- obtained assignment of street address for test site;
- replaced equipment stolen from core shed.

HGK:mek



H. G. Kreis

cc: F.T. Graybeal
W.L. Kurtz
J.D. Sell
A.R. Raihl

April 10, 1991

R.L. Brown
New York Office

H.G. Kreis
Monthly Report
March 1991

Santa Cruz Joint Venture

Texaco's 1088 acre parcel of land was evaluated during March. Information on private lots, subdivision deplatting, land use, water rights, water companies, royalty agreements, environmental aspects, underlying obligations, and other agreements were obtained and reviewed. The results of this evaluation were reported in several memoranda.

Santa Cruz In Situ Leach Project

Lorin Redden and Alan Isaacson of the USBM Salt Lake Research Center visited the test site and gave a presentation on the results of leach tests on Santa Cruz atacamite samples.

The salt tracer test began on March 14th and will continue through April. Most of my time is, and will continue to be, spent overseeing the on-site activities.

General Exploration

The sulfide in situ leach proposal has been temporarily shelved. Magma has serious reservations about entering into a field test program with a Government Agency on any of Magma's mining properties. Nonetheless, Magma is still interested in sulfide in situ leaching. It may take Magma several weeks to determine what, if anything, Magma will do on sulfide in situ leaching.

During late March I attended the Exploration Department meeting in Denver, Colorado.

H. G. Kreis /mek

H. G. Kreis

HGK:mek

cc: F.T. Graybeal
W.L. Kurtz
J.D. Sell
A.R. Raihl

ASARCO

Exploration Department
Southwestern United States Division

VIA UPS

April 23, 1991

Mr. Tim O'Neil
8307 Shaffer Parkway
Littleton, Colorado 80127

Dear Tim:

We enjoyed your visit to our Santa Cruz in situ test site. As a reminder of your visit you will find enclosed a sample of our atacamite copper mineralization hosted in Precambrian granite.

Also enclosed are two video cassettes which describe the research project. One cassette is for your use and the other is for the Colorado Mineral Information Institute.

If you have any questions or need additional information, please feel free to call me.

Sincerely,



HGK:mek
Encs.

Henry G. Kreis
Site Manager

bl.cc: F.T. Graybeal
W.L. Kurtz
J.D. Sell
A.R. Raihl



April 24, 1991

R.L. Brown
New York Office

H.G. Kreis
Monthly Report
April 1991

Santa Cruz Joint Venture

Other than minor routine work, no significant amount of effort was spent on S.C.J.V. matters.

Santa Cruz In Situ Leach Project

The salt tracer test, started on March 14th, continues to run smoothly. Salt tracer solution continues to be injected at a rate of 23 gpm with a surface pump pressure of 230 to 290 psi. The rate of recovery is generally about 24 gpm. The recovered solution shows slowly increasing salt concentrations in three of the four recovery wells. The fourth recovery well, T-1, has yet to show any indication of the injected tracer salts.

There has been only one significant mechanical failure since the salt tracer test was started. This failure occurred because of corrosion in the steel fittings of T-5. The T-5 pump was pulled, the fittings replaced, and another pump was reinstalled.

Presentations and tours were given to the Arizona Department of Environmental Quality (ADEQ), Tim O'Neil of Mining Engineering Magazine, Tim Johnson and Rolf von Oppenfeld of Fennemore Craig, and selected Casa Grande residents.

General Exploration

There has been no change in the status of the sulfide in situ leach proposal.

H.G. Kreis

HGK:mek

cc: F.T. Graybeal
W.L. Kurtz
J.D. Sell
A.R. Raihl

April 26, 1991

File

Presentations and Tours
Santa Cruz In Situ Leach

The following were given presentations and tours of the Santa Cruz In Situ Copper Mining Research Project:

- April 16th (AM): Ron Miller, Skip Hellerud, Roger Kennett, Abigail Myers, and Tim Dubois, all of the ADEQ.
- April 16th (PM): Tim O'Neil, Mining Engineering Magazine.
- April 17th (AM): Jeffrey Fairman, Mr. & Mrs. Tom Caywood, David Snider, and Ralph West, all are active in the Casa Grande community.
- April 17th (PM): Tim Johnson and Ralph von Oppenfeld, both of Fennemore Craig.

HGK:mek



Henry G. Kreis

cc: A.R. Raihl
F.T. Graybeal
W.L. Kurtz
J.D. Sell



Southwestern Exploration Division

April 29, 1991

A.R. Raihl

AIPG Visit to
Test Site

Several months ago you and Steve Swan verbally agreed to a test site visit by the American Institute of Professional Geologists (AIPG). The date for this visit is set for October 26, 1991.

HGK:mek

A handwritten signature in cursive script that reads "Henry G. Kreis" followed by a small "mek" in the lower right corner of the signature.

Henry G. Kreis

cc: F.T. Graybeal
S. Swan
W.L. Kurtz
J.D. Sell

ASARCO

Exploration Department
Southwestern United States Division

May 9, 1991

Mr. Walter E. McCulloch
Freeport Mining Company
P.O. Box 61520
New Orleans, Louisiana 70161

Dear Walt:

Enclosed is a copy of Transamerica Title Report No. 64039740 and a copy of Mr. B. Apker's March 22, 1991 letter on "Cimarron Ranch Community Land Use Plan, Pinal County, Arizona."

The Transamerica Title report is a budget priced (\$750) update of an older Transamerica Title report. It is suitable for our current level of interest in the Texaco property, but nothing more. A title report suitable for acquiring the Texaco property, if this should ever happen, will cost about \$20,000 and require two months of time for preparation.

Sincerely,



Henry G. Kreis

HGK:mek
enc.

cc: F.T. Graybeal (w/o enc.)
W.L. Kurtz (" ")
J.D. Sell (" ")
W.D. Gay (" ")

J.D.S.

ASARCO

Exploration Department
Southwestern United States Division

May 20, 1991

Ms. Laura Stone
Casa Grande Historical Society
110 W. Florence Blvd.
Casa Grande, AZ 85222

Dear Laura,

On behalf of ASARCO Incorporated, Tom Scartaccini, General Manager of the Southwest Mining Department, is pleased to present the Casa Grande Historical Society and Museum copper bearing rocks from ASARCO's Sacaton Mine. The rocks may be used as you see fit, including putting them up for sale in the museum gift shop.

The copper mineralization is dominantly chrysocolla (blue color) with minor amounts of atacamite (green). The rocks hosting the copper mineralization are granite, porphyry, and brecciated varieties of both types.

If I can be of further assistance, please let me know.

Sincerely Yours,



Henry G. Kreis
Site Manager
Santa Cruz Project

HGK:da

Blind copy: T.E.S.
F.T.G.
W.L.K.
J.D.S.
A.R.R.

ASARCO Incorporated

MAY 22 1991

SW Exploration

May 30, 1991

R. L. Brown

H.G. Kreis
Monthly Report
May 1991Santa Cruz In Situ Leach Project

As before the salt tracer test continues to run smoothly, and the salt content of the recovered solution continues to increase slowly in three of the four recovery wells. There still is no salt being recovered in T-1, and the chances of this happening are decreasing with time. There are several possible explanations for the lack of salt recovery in T-1; but there is no way, at this time, to identify the exact cause.

The salt tracer test will continue until the middle of June. At such time a decision will be made as to whether or not to do additional salt tracer test work.

On May 23th, Manny Garcia Productions from Phoenix video taped the various the aspects of the salt tracer test. The video tape of the salt tracer test will be stored in raw form since there are no plans for this videotape at this time.

On May 28th a Ray Manley photographer made still photographs of the salt tracer test.

On May 23th T. Scartacinni and the undersigned donated copper oxide rocks from the Sacaton Mine to the Casa Grande Historical Society and Museum. The presentation of the rocks was photographed by the Casa Grande Dispatch and Manny Garcia Productions. It was explained to the historical society the copper oxide mineralization is not typical of the Sacaton Mine ore, but is typical of the Santa Cruz deposit from which the Sacaton Deposit originated.

Presentations and tours were given to local Casa Grande people, and to two Codelco geologists accompanied by Clark Arnold.

A CASMT and TEM geophysical survey of the test site will be performed during the week of June 17th. The purpose of the survey is to see if the injected salt tracer solution can be detected by surface geophysical techniques.

Santa Cruz Joint Venture

The quarterly meeting of the Santa Cruz Joint Venture was held on May 16th via a telephone conference call. There was no new or old business, and the next quarterly meeting will be held in August in Tucson or Casa Grande. Robin Hickson and Walt McCulloch will visit the test site during the week of June 17th.

All of the water wells and exploration drill holes have steel caps that are in compliance with Arizona law.

The piles of trash from wildcat dumpers on SCJV land on the north edge of Desert Carmel (SW/4 Section 5, T6S, R5E) have been hauled off to the local dump. To deter the wildcat dumpers, the blockades on the access roads have been rebuilt.

The abandoned SCJV farm house at the South quarter corner of Section 13 (T6S, R4E) is being demolished and hauled to the local dump.

GENERAL EXPLORATION

Magma is still rethinking the DOE sulfide in situ leach proposal, and has not yet come up with a firm "no".

I talked with Bill Obenchain of the DOE, and the DOE wants to have some kind of research proposal from the copper industry. Money for this year is still available. The DOE would be happy to have a proposal submitted by a single company as long as the proposal would benefit the copper industry as a whole.

H. G. Kreis

H. G. Kreis

cc: F.T. Graybeal
W.L. Kurtz
J.D. Sell
A.R. Raihl

ASARCO

Exploration Department
Southwestern United States Division

May 30, 1991

Mrs. Kay Bendict
Casa Grande Historical Society
110 W. Florence Blvd.
Casa Grande, AZ 85222

Dear Kay:

Tom Scartaccini and I enjoyed meeting with you and Sammy Caywood and presenting the Sacaton rocks to your museum. To commemorate our visit, I have enclosed a copy of the video tape that was filmed at that time.

The video tape is for the museum. It shows the outside of the museum, the mining display, and, of course, the presentation of the Sacaton rocks.

I was sorry that Laura Stone was sick and unable to attend our meeting. I think she will enjoy seeing the video tape.

Sincerely yours,



Henry G. Kreis
Site Manager
Santa Cruz Project

HGK:mek
enc.

cc: F.T. Graybeal
W.L. Kurtz
A.R. Raihl
T.E. Scartaccini
J.D. Sell

July 1, 1991

R.L. Brown
New York Office

H.G. Kreis
Monthly Report
June 1991

Santa Cruz In Situ Leach Project

The salt tracer test continued during the month of June with the exception of a three day period when the injection and recovery wells were shut down. The wells were shut down from June 19th through June 21st while the CSAMT survey was being run.

The CSAMT survey obtained good field data. The field data is in the process of being analyzed to see if the salt solution was detected by the survey.

The bromide slug test was started on June 24 and will continue until July 1st. The bromide slug test injection solution contains sodium chloride levels at the same level of concentration as before the bromide slug test was started. The sodium bromide concentration is about 1.8 gpl Br compared to 0.2 gpl Br before the bromide slug test was initiated.

The undersigned gave a presentation to the Advisory Council of the Pinal AMA, an active water management area of the Arizona DWR, on the evening of June 27th. Also in attendance were Roger Hooper, the new representative to the state legislature, and Susan Wootten, a reporter for the Casa Grande Dispatch.

John Ahlness, USBM, gave a talk on the Santa Cruz In Situ Copper Mining Research Project to the Tucson AIME subsection on June 12th.

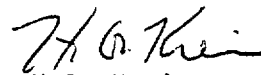
Bill Larson and John Ahlness visited the test site and were given a tour of the Sacaton Mine during the week of June 10th. Robin Hickson, Walt McCulloch, and Fred Graybeal visited the site during the week of June 17th; and you visited the test site on June 26, 1991.

Local Casa Grande people, invited by Priscilla Robinson, were given a presentation and tour of the test site on June 14th.

Santa Cruz Joint Venture

This year's assessment work for the Santa Cruz Project unpatented mining claims has been completed. The work consisted of drilling one hole on each of the three groups of unpatented mining claims.

HGK:mek


H.G. Kreis

cc: F.T. Graybeal
W.L. Kurtz

J.D. Sell
A.R. Raihl

July 25, 1991

R.L. Brown
New York Office

H.G. Kreis
Monthly Report
July 1991

Santa Cruz In Situ Leach Project

The five spot tracer test which has run for over four months was terminated at midnight on July 23th. At that time, the tracer test was converted to a four spot tracer test. The four spot tracer test consists of continuing to inject 23 gpm salt tracer solution (3 gpl Cl and 0.2 gpl Br) in T-3 and recovering salt solution in T-2, T-4, and T-5. The four spot tracer test is expected to be terminated in early August, 2 to 3 weeks after it was initiated.

During the month of July all the test equipment continued to run smoothly without substantial down time. The longest down time was experienced in test well T-2. Test well T-2 was down for a day for pump repairs.

Preliminary CSAMT survey results show apparent increases in conductivity in local areas. Although the apparent increase in conductivity might possibly reflect the salt solution, the apparent increase in conductivity is thought to be due to electrical noise. More interpretive work is in progress, and a final report is expected in mid August.

The in situ test team gave several presentations and tours at the test site. Noteworthy guests included a large number of people from the DWR and Roger Hooper, the new representative to the state legislature. Jim Magner and Page Whitaker attended one of the presentations and tours.

In early July a favorable article on the in situ leach test was published in the Casa Grande Dispatch. Later in the month, a reporter from the Casa Grande Dispatch, Ms. Susan Wootten, spent an afternoon with the in situ test team. Ms. Wootten is preparing a detailed article on the in situ leach test, and this article will be published in Tri Valley, a local Casa Grande area publication.

An evening presentation by the undersigned was given to the Maricopa Rotary Club. The meeting was attended by 20 people.

A talk by the undersigned for the Intermountain Section of AIME has been prepared and will be presented in early August. An abstract for a talk on the geology of Santa Cruz Deposit has been submitted to AIME. The talk will be given by Mr. Graybeal and the undersigned at the 1992 annual AIME meeting.

R.L. Brown

July 25, 1991
Page 2

Santa Cruz Joint Venture

A real estate appraisal of SCJV land south of Route 84 and of the five sections of land owned by Cimarron Farms is being prepared by Mr. Jeff Patch. A final report on the appraisal is expected in mid August.

A meeting of the SCJV will be held at Asarco's Tucson Office on August 6th.

H.G. Kreis / mek
H.G. Kreis

cc: F.T. Graybeal
W.L. Kurtz
J.D. Sell
A.R. Raihl

ASARCO

Southwestern Exploration Division

September 3, 1991

R.L. Brown
New York Office

H.G. Kreis
Monthly Report
August 1991

Santa Cruz In Situ Leach Project

The four spot tracer test which started on July 24th was terminated at midnight on August 6th. The recovery pumping of salt solution from test wells T-2, T-3, T-4, and T-5 began on August 7th. The recovery pumping from these four wells was done at a combined rate of 34,000 gal./day. All the recovered solution was put into the evaporation pond for disposal by evaporation. The recovery pumping was terminated on August 28th when the evaporation pond reached its maximum safe capacity. A total of 733,000 gallons of salt solution was recovered during this 21 day period of recovery pumping. No more injection and/or recovery of any type is planned at this time.

The test site is being put on a standby basis, and will remain on standby until the acid leach test is initiated. All of the pumps from the test wells are being pulled, rehabilitated, and stored for future use. Likewise, the fiberglass tubing is being cleaned and stored. In a week or so, work at the test site will be for purposes of repair, maintenance, and security. This test site work will be done by a workforce of five people from the local temporary employment agency. For security purposes, someone will be at the site 24 hours a day.

Arrangements are being made for USBM people to visit SX-EW plants in Arizona during the week of September 23rd. Visits are tentatively planned for Ray Mines, Cyprus Miami, Cyprus Casa Grande, Magma Miami, and Magma San Manuel.

The in situ team, under the direction of Priscilla Robinson, gave a presentation and tour to a group of local people. The next presentation and tour for local people is tentatively scheduled for late October. On August 8, I gave a half hour talk to the Intermountain Section of AIME in Colorado.

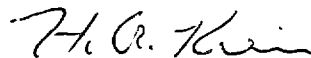
A. Raihl is on a month long vacation, and I am filling in for him during his absence from the project.

Santa Cruz Joint Venture

Representatives of the SCJV, Steve Van Nort, Priscilla Robinson, and the undersigned, presented a \$2500 check to the Casa Grande Valley Historical Society. The presentation was publicized in an article and accompanying photograph in the Casa Grande Dispatch.

Appraisal work was done by Patch and Associates on SCJV land south of Route 84 and on Cimarron Farm's five sections of farm land west of the SCJV's Santa Cruz land.

HGK:mek



H.G. Kreis

cc: F.T. Graybeal
W.L. Kurtz
J.D. Sell
A.R. Raihl

September 30, 1991

R.L. Brown
New York Office

H.G. Kreis
Monthly Report
September 1991

Santa Cruz In Situ Leach Project

The test site is on a standby basis. Maintenance, repair, and security work is done by the on site work force. The work force was reduced from five to four people, all from the local employment agency.

An article on the In Situ Copper Mining Research Project was published in the "Tri Valley Dispatch" section of the "Casa Grande Dispatch" on September 18, 1991. In general, the contents of the article were favorably received by Asarco, Freeport-McMoRan, the USBM, and our consultants.

A short article on the In Situ Copper Mining Research Project appeared in "American Metal Market" during the month.

On September 23rd a meeting on fluid flow modeling was held at Asarco's Tucson Office. During the meeting Ron Lance of Intera described the results of Intera's fluid flow modeling, and plans were made for geochemical modeling of acid attenuation. Attending the meeting were Don Davidson, Steve Swan, Diane Marozas, Perry Jones, Priscilla Robinson, Walt McCulloch, Wade Sanders, Ron Lance, Charlie Barter, Dan Weber, Al Raihl, and the undersigned.

A report on a proposed subsidence monitoring program and a report on used oil disposal were issued during the month.

There are tentative plans for a Priscilla Robinson presentation and test site tour for local people on October 25th.

On October 26th the Arizona Section of the American Institute of Professional Geologists will be given a presentation and tour of the test site.

On September 24th, 25th, and 26th the undersigned took Jon Ahlness, Dan Millenacker, and Joe Pugliese, all from the USBM, to visit SX-EW plants at Ray Mine, Cyprus Miami, Cyprus Casa Grande, Magma Miami, and Magma San Manuel.

The Casa Grande Downtown Association has asked the SCJV to donate funds to its Main Street Program. This request is being given due consideration.

HGK:mek


H.G. Kreis

cc: FT Graybeal, WL Kurtz, JD Sell, AR Raihl



Southwestern Exploration Division

November 1, 1991

R.L. Brown
New York Office

H.G. Kreis
Monthly Report
October 1991

Santa Cruz In Situ Leach Project

The test site continues to be on a standby basis as work on the aquifer protection permit application continues. The work force was reduced from four people to one person.

Valuable test site equipment is being moved to the Sacaton Mine for safe storage.

A presentation and tour was given to members of the Arizona Section of AIPG on October 26th.

A presentation on the 1991 salt tracer test results was prepared, but not presented, for the the Exploration Department Meeting in Denver.

Santa Cruz Joint Venture

A tentatively proposed 1992 Santa Cruz budget was prepared for the benefit of Freeport's budgeting needs.

Some support work was done for the benefit of possible land acquisitions and trades.

Miscellaneous

Two weeks of vacation were taken during the month of October.

A handwritten signature in black ink, appearing to read "H.G. Kreis".

H.G. Kreis

HGK:mek

cc: F.T. Graybeal
W.L. Kurtz
J.D. Sell
A.R. Raihl

December 16, 1991

R.L. Brown
New York Office

H.G. Kreis
Monthly Report
December 1991

Santa Cruz In Situ Leach Project

Work in support of the Phase I and II report continued during the month of December. The USBM said the quality of the organization, editing, etc. of the Phase I and II report should be the same as that exhibited in the May 15, 1991 draft of the Phase I and II report.

A briefing on the results of the salt tracer test and other aspects of the project was given to the Santa Cruz Joint Venture at its quarterly meeting.

Mr. Jerry Simmons is no longer concerned about the thought of the sodium in his soil being from the salt tracer test. This concern was resolved at a meeting between his people and our people in our core shed on December 11th. Mr. Simmons' soil consultant told him and everyone else at the meeting the sodium content of his soil was lower than what would be expected in his area, and there was no way the salt used in the tracer test could have affected his soil. The soil consultant concluded by telling Mr. Simmons about all the tons of sodium chloride added to each irrigated acre every year from his irrigation water.

The video tape on the Santa Cruz Copper Mining Research Project is in the process of being updated, and the updated version is expected to be available by the end of February.

On December 9th personnel from the USBM Salt Lake City Research Center gave a presentation to us on the results of their atacamite leaching studies. In addition to giving the presentation, they were seeking support for the USBM SLCRC to study methods of suppressing or decreasing the chloride content of the raffinate.

Santa Cruz Joint Venture

The quarterly meeting of the Operating Committee of the Santa Cruz Joint Venture was held at Asarco's Tucson Office on December 10, 1991. A 1992 SCJV budget for \$280,000 was approved.

The environmental aspects of Texaco's 1088 acres parcel of land were reviewed in the field. Wade Sanders, Walt McCulloch, Greg Knapp (an Asarco environmental scientist), and the undersigned visited the land, reviewed the

H.G. Kreis - Monthly Report

December 16, 1991

previous environmental reports about the land and are in the process of making recommendations for further environmental work costing about \$10,000.

The USBM Reno Metallurgical Research Center requested samples of chalcopryite mineralized core for leaching of chalcopryite studies. Samples of such core from Santa Cruz South were given to the USBM.

HGK:mek


H.G. Kreis

cc: F.T. Graybeal
W.L. Kurtz
J.D. Sell
A.R. Raihl

January 27, 1992

G.D. Van Voorhis
New York OfficeH.G. Kreis
Monthly Report
January 1992Santa Cruz In Situ Leach Project

Work on the Phase I and II report continued during January. Work is proceeding on schedule, and a preliminary rough draft for Asarco's review will be available in mid February. SAIC was requested to write a well-written, comprehensive executive summary of the Phase I and II report. The executive summary is important because the Phase I and II report with abundant appendix material will be too lengthy for most people to read.

Work on the subsidence monument survey network continued during the month. The USBM has requested the addition of two more monuments on the test site and surveying techniques using a second order of leveling precision. These requests will be incorporated into the survey network. Cost estimates for constructing the survey monuments were obtained from contractors, and Cissell Drilling of Casa Grande was chosen to do the work.

Several USBM reports were received and reviewed. These reports included a documentation report on the salt tracer test and draft copies of open file reports.

Water pumping records on the Santa Cruz Project were reviewed, and the amount of groundwater pumped during 1991 was determined for reporting to the DWR.

Santa Cruz Joint Venture

Work in support of the SCJV acquisition of Texaco's 1088 acre parcel of land continued during the month of January. A plan for evaluating the environmental aspects of the land has been formulated; and it is available for use, if and when needed.

The Santa Cruz land status map is being updated to reflect land ownership changes in the area of the Santa Cruz Project.

Additional samples of Santa Cruz chalcopryite core were collected, described, and shipped to the USBM (Reno) for USBM leaching of chalcopryite studies. This USBM work is being done at no cost to Asarco or the Santa Cruz Joint Venture.

Other than time/effort

Work in support of updating the Santa Cruz in situ video tape was done during the month. An updated version of the video tape for Asarco review is expected to be out by early February.

A Santa Cruz geology talk with slides is being prepared for the February national AIME meeting in Phoenix.

General Exploration

A packet of information on the Santa Cruz Project and the Parks-Salyer copper ore target was prepared for J.D. Sell for briefing purposes.

Arrangements were made for Roger Kugel, a professor at Saint Mary's College in Minnesota, to visit Ray Mines Complex on February 18, 1992.

HGK:mek


H.G. Kreis

cc: F.T. Graybeal
W.L. Kurtz
J.D. Sell
A.R. Raihl

March 3, 1992

G.D. Van Voorhis
New York Office

H.G. Kreis
Monthly Report
February 1992

Santa Cruz In Situ Leach Project

Earlier in the month the undersigned met with Mr. Hugh Cothran and Mr. John Nicol, both of SAIC, to discuss the preparation of the Phase I and II report. Work on the Phase I and II report is proceeding as planned. As of this date, SAIC has received all the text and appendix material needed to complete the Phase I and II report. Mr. Nicol expects a copy of the Phase I and II report will be given to Asarco for review in the middle of March.

Construction of the six subsidence survey monuments will begin as soon as approval for this construction expenditure is received from Mr. Dave Askin of the USBM. Information on Federal Government subsidence surveys in the Casa Grande area was obtained from the National Geodetic Survey in Washington, D.C.

Purchase orders for suppliers of goods and services to the In Situ Copper Mining Research Project during 1992 have been issued.

A timer was installed on the process water well, PW-1. The timer was installed to prevent the PW-1 pump from being left on accidentally and, thus, overfilling the evaporation pond.

A new set of presentation slides on the In Situ Copper Mining Research Project were prepared for use in future presentations.

Santa Cruz Joint Venture

Work in support of the SCJV acquisition of Simmons-Devcor's (Cimarron Ranch) 528 acre parcel of land continued during the month. Mr. Gregory Knapp has reviewed previous environmental assessments of the subject land and has evaluated the land in the field. He concluded no further environmental work is needed on the subject land. A copy of his report will be forwarded to Freeport-McMoRan for review and comment.

Mr. Apker is talking to Mr. Jerry Simmons about the possibility of the SCJV acquiring about five acres of land under and around the SCJV core storage buildings. If Mr. Simmons is agreeable to selling this land to the SCJV, permission for the sale will have to be obtained from the Resolution Trust Corporation.

The situation of the active sewerage pond on Texaco's 1088 acre parcel of land was investigated. As determined by a brunton-tape survey the north edge of the sewerage pond enclosure is on land belonging to the SCJV. The remainder of the pond is on Texaco land. A meeting was held with Mr. Mike Whites, the manager of DC Properties, and Mr. John Humphry, the President of DC Properties, to discuss the sewerage pond. Both Mr. Whites and Mr. Humphry clearly stated DC Properties desire (need) to acquire ownership of the sewerage pond land, either from Texaco or any new owner of the property.

The undersigned met with Mr. Don Noyes, Mr. Carl Rutan, and a representative of Henninger Video to discuss revisions to the In Situ Copper Mining Research Project video tape. Revised copies of the video tape will be in hand next week.

A talk on the geology of the Santa Cruz Porphyry Copper Deposit was given to a session of geologists at the annual SME-SEG meeting in Phoenix.

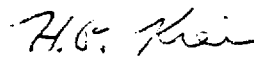
Presentations on the In Situ Copper Mining Research project were given to a group of Freeport Indonesia personnel and to representatives of Henkel Corporation.

General Exploration

A talk on the Santa Cruz In Situ Copper Mining Research Project was given to security analysts visiting Asarco mines.

The undersigned accompanied Mr. Roger Vogel of St. Mary's College (Minnesota) on a tour of Ray Mines.

HGK:mek


H.G. Kreis

cc: F.T. Graybeal
W.L. Kurtz
J.D. Sell
A.R. Raihl

March 30, 1992

G.D. Van Voorhis
New York OfficeH.G. Kreis
Monthly Report
March 1992Santa Cruz In Situ Leach Project

SAIC has issued a copy of the Phase I and II Report, complete with appendix material, to Asarco. After reviewing the report's executive summary with those involved, including the USBM, it was decided to rewrite the executive summary. The USBM said the delivery of the Phase I and II Report to the USBM could follow the oral presentation to the USBM which is tentatively scheduled in June 1992.

The USBM Open File Report (OFR) on the petrography of Santa Cruz rocks before and after leaching was reviewed in detail and found to be in need of improvement. The undersigned met with one of the two authors of the OFR and their supervisors in Minneapolis to review the contents of the OFR. Suggestions for improvement were well received, and it is expected that a substantial portion of the OFR will be rewritten.

Portions of the USBM OFR on the geology of the in situ test site are also being rewritten to incorporate suggestions by Mr. Graybeal and to broaden the area of discussion to include geology up to 1,000 feet from the five spot pattern.

Some consideration was given to chloride in groundwater and to chloride isotopes during the month. A former USBM employee has stated in the past that chloride from Santa Cruz atacamite was causing an "up welling of chloride in the groundwater about two miles north of the Santa Cruz deposit." From the information on hand it is readily apparent the chloride source is near the Casa Grande ridge and is probably from salt in basin-fill and/or conglomerate units. A request for atacamite and groundwater samples for chloride isotope work by the UofA has been denied.

Santa Cruz Joint Venture

The Santa Cruz Joint Venture held its quarterly meeting at Asarco's Tucson Office on March 17th. The next quarterly meeting is scheduled for June 8th.

Work in association with the Texaco land acquisition and the Simmons-Devcor land acquisition continued during the month.

Mr. John Stone was given permission to use a geophysical log and four geologic summary logs from Santa Cruz South. This information will be used in a short course he is preparing.

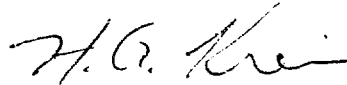
Speakers for the Santa Cruz session at the Engineering Foundation were obtained during the month.

G.D. Van Voorhis

March 30, 1992
Page 2

Revised video tapes on the Santa Cruz In Situ Copper Mining Research Project have been issued to those needing revised copies.

A storage rack at the Santa Cruz warehouse was collapsing, and it is being repaired by a temporary laborer.



H.G. Kreis

HGK:mek

cc: F.T. Graybeal
W.L. Kurtz
J.D. Sell
A.R. Raihl



Southwestern Exploration Division

April 27, 1992

G.D. Van Voorhis
New York Office

H.G. Kreis
Monthly Report
April 1992

Santa Cruz Joint Venture

Work continued on the acquisition of Texaco's 1088 acre parcel. This work included reviewing the Purchase and Sale Agreement and looking into various environmental matters. This work will continue in May.

Santa Cruz In Situ Mining Project

An outline for use in writing the executive summary for the Phase I and II report has been prepared by the undersigned.

All six of the subsidence survey monuments at and about the test site have been constructed.

Work was done preparing for public education presentations.

A comprehensive technical presentation on the Santa Cruz In Situ Copper Mining Research Project was given to representatives of CANMET and USBM on April 15th. An informal presentation was given to Mark Kerrigan of SAIC on March 27th.

General Exploration

Dave Readett of Mount Isa Mines met with Sal Anzalone and the undersigned. He was given a presentation on the Santa Cruz in situ project and a tour of the present and proposed leaching operations at Silverbell.

HGK:mek


H.G. Kreis

cc: F.T. Graybeal
W.L. Kurtz
J.D. Sell
A.R. Raihl

May 29, 1992

G.D. Van Voorhis
New York Office

H.G. Kreis
Monthly Report
May 1992

Santa Cruz Joint Venture

A special meeting of the Santa Cruz Joint Venture Operating Committee was held on May 4th via telephone. The committee gave approval for the SCJV to acquire the Texas/Getty 1,088 acre parcel and the CP Water Company for a purchase price of \$817,500.00. Approval was also given to the SCJV to acquire the 528 acre Simmons Devcor/RTC parcel for a purchase price of up to \$396,000.

The RTC auction of the Simmons Devcor 528 acre parcel was changed from May 29th to June 26th.

Work in support of the Texaco 1088 acre acquisition continued during May. Talks are being held with DC Properties to determine how much land at the DC Properties' sewer pond will be conveyed to DC Properties when the SCJV acquires the Texaco 1088 acre parcel.

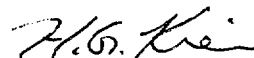
1992 Budget projections were made for Asarco's contributions to the Santa Cruz Project exclusive of the in situ research project.

Santa Cruz In Situ Mining Project

A. Raihl, C. Barter, and the undersigned are working with P. Robinson to prepare updated information, handouts, and presentations addressing environmental concerns associated with the permit application process.

The executive summary of the Phase I and II report has been written in rough draft form and will be technically reviewed during June by participating writers of the Phase I and II report before being issued in final form.

A. Raihl, Steve Swan (USBM), Mark Kerrigan (SAIC) and the undersigned visited the DOE Hot Rocks energy recovery program at Los Alamos. The DOE has developed some micro seismic geophysical techniques to define the size and location of the circulating fluids. The DOE was not able to recover injected fluids until the geophysical techniques showed where the recovery well had to be drilled (redrilled) to intercept the flow of injected water. The DOE is injecting and recovering 100 to 115 gpm in granitic and gneissic rocks at a depth of 12,000 feet. The rocks are said to have no porosity, no natural permeability, and no contained water. The circulation of water through these rocks requires a well head pressure of 3800 psi. A 10% water loss is experienced because of a minor problem in the well's construction.



H. G. Kreis

HGK:mek

cc: F.T. Graybeal
A.R. Raihl

W.L. Kurtz
J.D. Sell

June 30, 1992

G.D. Van Voorhis
New York Office

H.G. Kreis
Monthly Report
June 1992

Santa Cruz Joint Venture

The RTC auction of the Simmons Devcor 528 acre parcel was changed from June 26th to July 31st. No reason for the change was given. Arrangements have been made to handle SCJV bidding at the auction and, in the event SCJV is the successful bidder, the payment to acquire the Simmons Devcor parcel. A title report on this property is being reviewed.

DC Properties (DCP) has been asked to take possession of the 1.8 acres of land occupied by the sewerage oxidation pond when SCJV acquires the Texaco 1088 acre parcel. DCP said it prefers to have title to the 1.8 acres transferred directly to DCLQA, but will take title if so requested by SCJV. According to DCP, DCLQA will take title to the 1.8 acres willingly, regardless of whether it comes directly from SCJV or is passed through DCP. Efforts will be made to have DCP take title to the 1.8 acres.

The Santa Cruz Joint Venture Operating Committee held a routine quarterly meeting on June 25th at the Asarco Tucson Office. During the informal meeting, a number of items were discussed: the acquisition of Texaco's land, the Simmons/RTC auction, property tax reduction (from \$144,000 to \$106,000), 1992 and 1993 budgets, donations to the Casa Grande community, test work considerations for Santa Cruz South, appropriation lobbying efforts, in situ budget matters, need for a weather station, and permitting status. During the formal meeting there was no new or old business.

Santa Cruz In Situ Mining Project

A rough draft of the executive summary of the "Phase I and II Technical Report" has been prepared and has been submitted for technical review by project staff.

A fact sheet of the aquifer protection permit application has been prepared by Priscilla Robinson for distribution, if necessary, to reporters or other interested people. A cross section illustration suitable for newspaper printing has also been prepared.

A technical review was made of a USBM Open File Report, "Fracture Systems of the Santa Cruz Porphyry Copper Deposit as They Relate to the In Situ Copper Mining Research Project" by Linda Dahl.

G.D. Van Voorhis

June 30, 1992
Page 2

Errol Montgomery gave a talk to the Arizona Geological Society on June 2nd. The talk was entitled "Ground Water Protection Measures Santa Cruz In Situ Mining Research Project, Pinal County, Arizona."

On May 28th a briefing on the Santa Cruz In Situ Copper Mining Research Project was given to you and Mr. Graybeal at the Tucson Office.



H.G. Kreis

HGK:mek

cc: F.T. Graybeal
W.L. Kurtz
J.D. Sell
A.R. Raihl



Southwestern Exploration Division

VIA FAX

July 28, 1992

F.T. Graybeal
New York Office

Land Status
Santa Cruz Project

The RTC foreclosure sale on the Simmons parcel has been changed from July 28th to August 28th (1:30 PM). AM&G Asset Management Company says the RTC is still working on its environmental investigation of the Simmons parcel.

A 790 acre parcel of farm land adjoining the south boundary of the Simmons parcel will be sold to the highest bidder at a trustee sale on August 18, 1992 (SE/4 Section 30 and Section 31, T6S, R5E).

Mr. Apker has received a revised copy of the SCJV-Getty agreement from Getty. Mr. Apker says there are a couple of changes which appear to be minor, but he will give them further thought. He thinks an agreement satisfactory to all parties is imminent.

A handwritten signature in dark ink, appearing to read "H.G. Kreis".

H.G. Kreis

HGK:mek

cc: W.L. Kurtz
J.D. Sell
A.R. Raihl
W.E. McCulloch (FAX)



Southwestern Exploration Division

August 26, 1992

G.D. Van Voorhis
New York Office

H.G. Kreis
Monthly Report
August 1992

Santa Cruz Joint Venture

The RTC foreclosure sale of the Simmons Devcor parcel scheduled for August 28 has been postponed until September 25. The RTC has not yet finished its environmental evaluation of the property. The RTC recently requested access to the SCJV core storage building for purposes of environmental evaluation. The SCJV responded with an offer to buy 5 acres of land under and about the buildings and to release the RTC of any environmental liability occurring on the 5 acre parcel. The RTC has not responded to this offer.

Notices of foreclosure sales on land in the general area of the Santa Cruz Project occur regularly in the Casa Grande Dispatch newspaper. Several parcels of land greater than 300 acres in size and within two miles of SCJV land are scheduled for foreclosure sale by the end of September (includes the above Simmons Devcor parcel).

The annual assessment work on the Santa Cruz Project unpatented mining claims has been completed. The work consisted of exploration drilling on each of the three claim groups.

Santa Cruz In Situ Mining Project

The executive summary of the "Phase I and II Technical Report" is being reviewed by Asarco, Freeport-McMoRan, and USBM management.

A "Safety and Procedure Manual" is being prepared for use on the Project.

The Stanfield Fire Department (SFD) has been contacted to determine if an agreement can be made in which SFD will provide fire protection services to the Project.

A weather station is being installed at the test site, and water and sewer service are being installed for the field office.

A review was made of Linda Dahl's manuscript entitled "Joint System Characterization for In Situ Mining." It will appear in an Engineering Foundation publication.

The daily "Casa Grande Dispatch" newspaper continues to be checked for news items of interest to the Project.

Miscellaneous

Seven days of vacation were taken by the undersigned.

HGK:mek



H. G. Kreis

cc: W.L. Kurtz
J.D. Sell

October 1, 1992

G.D. Van Voorhis
New York Office

H.G. Kreis
Monthly Report
September 1992

Santa Cruz Joint Venture

A proposed SCJV budget for 1993 was prepared. It will be presented at the SCJV Operating Committee quarterly meeting scheduled for October 8th.

The RTC foreclosure sale of the Simmons Devcor parcel is scheduled for November 13, 1992. The RTC has expressed its concern about environmental liability associated with the Simmons Devcor property and its willingness to release the Simmons Devcor parcel for \$250,000 (approximately \$500 per acre). The RTC is being given access to the SCJV core storage buildings so the RTC can finish its environmental evaluation and proceed with the foreclosure sale.

Miscellaneous SCJV land work was done regarding SCJV land, the Texaco land, and the Simmons Devcor land. The agreement for the Texaco land is nearing completion, and a plan for action for the 45 day inspection/rescission period was issued.

Consideration was given to possible in situ test work on Santa Cruz South. Several possible test sites were selected, and a cost estimate for test work was prepared.

Santa Cruz In Situ Mining Project

The undersigned is chairman of a session on the Santa Cruz In Situ Copper Mining Research Project at the Engineering Foundation Conference on in situ leaching (October 26 to 30, 1992) and is preparing a talk and a paper which will be published by the Engineering Foundation.

An updated project presentation is being prepared for use in the Community Education program. The presentation will be given at the above-mentioned SCJV meeting to several Freeport-McMoRan vice presidents by Mr. Raihl, Mr. Barter, Ms. Robinson, and the undersigned.

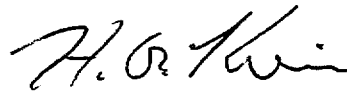
General Exploration

A USBM/industry meeting in Phoenix was attended. At the meeting, the USBM gave presentations on current USBM research projects of interest to the copper industry. The USBM solicited industry comments on USBM research and on research needed by industry. The USBM provided Asarco with results

of leach test work on chalcopyrite concentrate from Mission.

A memo on industry/U.S. Government cost share programs was written.

HGK:mek



H.G. Kreis

cc: F.T. Graybeal
W.L. Kurtz
J.D. Sell
A.R. Raihl

November 25, 1992

G.D. Van Voorhis
New York Office

H.G. Kreis
Monthly Report
November 1992

Santa Cruz Joint Venture

The RTC foreclosure sale of the Simmons Devcor property has been set for January 8, 1993.

One final, minor detail in the Texaco written agreement has yet to be accepted by Texaco. Once it is accepted by Texaco, the written agreement will be completed.

Texaco has supplied the SCJV with a complete set of environmental reports on Texaco's 1088 acre parcel. These reports were reviewed by the undersigned, and copies were forwarded to Mr. Knapp of Asarco Environmental Services for his review. Most of the information in these reports duplicates information in our files, and information that is new is not expected to alter the SCJV's environmental assessment of the property and recommendations for additional work.

Work has been initiated to make more detailed evaluations and recommendations for in situ leach test work on the Santa Cruz South Deposit. The consulting services of Mr. Ray Huff of Huff and Associates are being utilized, and during November Mr. Huff spent two days in the Tucson Office on this matter. A proposal for test work on Santa Cruz South will be presented at the December 8th SCJV Operating Committee meeting.

Property taxes on SCJV land have been reduced to \$31,800. Consequently, in 1992 the SCJV will spend \$94,200 less than the 1992 budget amount of \$126,000 for property taxes. The proposed 1993 budget amount of \$106,000 for property taxes will be reduced to \$31,800.

Santa Cruz In Situ Mining Project

The undersigned attended meetings on air quality permits at Lewis and Roca in Phoenix and at Pinal County offices in Florence.

A meeting was held by Mr. Raihl, Ms. Robinson, Mr. Barter, and the undersigned to discuss the community education program and other matters relating to the in situ mining project.

A presentation and tour of the in situ mining project was given to six visitors from Finland. Video tapes of the project were sent to Michigan Tech and to Southern Illinois University at Carbondale. Consideration is being given to presenting a paper on the Santa Cruz In Situ Copper Mining Research Project at the National Ground Water Association's Outdoor Action Conference in May 1993.

A weather station was installed at the test site to collect base line information.

A draft copy of the USBM's open file report on subsidence at the test site was reviewed and returned to the USBM with comments.

General Exploration

A memo on ammonia leaching of Escondida concentrate was written and distributed.


H.G. Kreis

HGK:mek

cc: F.T. Graybeal
W.L. Kurtz
J.D. Sell
A.R. Raihl

JDS



Southwestern Exploration Division

December 23, 1992

G.D. Van Voorhis
New York Office

H.G. Kreis
Monthly Report
December 1992

Santa Cruz Joint Venture

Texaco (Getty) is preparing a corporate resolution for the sale of its 1088 acre parcel to the SCJV. A signed copy of the agreement will be delivered to Asarco shortly.

Mr. Jim Fricke of Asarco Environmental Services was shown the Texaco land and the Simmons/RTC land in the field. Mr. Fricke will conduct the field work for the SCJV environmental evaluation of the Texaco land. The field work will commence immediately after the Getty-SCJV agreement is signed.

The SCJV Operating Committee held its Fourth Quarter 1992 meeting on December 8, 1992. In attendance were Mr. Muth, Mr. Graybeal, Mr. Raihl, Mr. Russell, Mr. Hickson, Mr. Nelson, Ms. Robinson, Mr. Quick, and the undersigned.

Proposals to do planning work for in situ test work on Santa Cruz South were discussed at the SCJV Quarterly Meeting. No formal plans were made, but such work is being taken under consideration.

A 1993 budget for the SCJV Santa Cruz Project (exclusive of the in situ research portion of the project) in the amount of \$252,000 was approved by the SCJV Operating Committee at the quarterly meeting. An additional \$140,000 may be spent, subject to scope of work determinations and corporate approval, by the SCJV for Washington representation and for Santa Cruz South in situ evaluations.

Following the quarterly meeting, Mr. Russell was given a presentation on the geology, copper reserves, and exploration potential of the Santa Cruz deposit.

A preliminary evaluation was made for entering all Santa Cruz geologic information into a computer data base. In conjunction with this work, some old Hanna-Getty computer tapes were read by special equipment at the Ray mine and put into the Tucson office data base for future use.

Santa Cruz In Situ Mining Project

The undersigned and other project team members worked with USBM personnel to make needed corrections to the USBM's Environmental Assessment.

The USBM was presented with information on groundwater withdrawal related subsidence in the general area of the Santa Cruz Project. The USBM will use this information in its Open File Report on subsidence related to in situ leaching at the test site.

Miscellaneous work was done in regard to security, maintenance, and repair work at the test site.

General Exploration

Preparations were made for our Kamchatka guests and Mr. Grynberg to visit the Ray Complex, the Mission Mine, and the Tucson Office (for presentations on the Santa Cruz In Situ Copper Mining Research Project and the metallurgy of silver extraction from manganese bearing ores). The visitors were hosted, during their Arizona visit, by the undersigned.

HGK:mek



H.G. Kreis

cc: F.T. Graybeal
W.L. Kurtz
J.D. Sell
A.R. Raihl

HGK transferred to Mining Dept.

JDS no longer receives copies of reports/memo's.