YOUR COMMENTS ARE IMPORTANT!

RECEIVED APR 22 2008

PUBLIC COMMENTS
FOR THE
PROPOSED ROSEMONT COPPER PROJECT
ENVIRONMENTAL IMPACT STATEMENT

If you would like to make a comment or be added to our mailing list, please fill out this form and mail it to the following address: USDA Forest Service, Coronado National Forest, 300 West Congress Street, Tucson, AZ 85701, Attention: Beverly Everson. You are also welcome to write a letter or send e-mail to:comments-southwestern-coronado@fs.fed.us. Thank you!

COMMENT: SEE ATTACHED LETTER

PS - The above mail address does not work for me and some others I have talked to.

NAME: Bob Porterfield

EMAIL: bobpvpi@hotmail.com

ADDRESS: 533 E CLARK ASSOBUK COBRIZA
GREEN VALLEY 85614

PLEASE ADD ME TO THE MAILING LIST (circle one): . YES NO

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ROBERT A. PORTERFIELD
533 E. CORTE PASADERA COBRIZO
GREEN VALLEY, AZ 85614

April 20, 2008

USDA Forest Service
Coronado National Forest
300 West Congress Street
Tucson, AZ 85701

Attention: Beverly Everson

Subject: Proposed Rosemont Copper Project

Dear Ms. Everson:

My comments and questions about this project do not fit onto the form that was provided to me so I am attaching this letter to the form. As the Forest Service does its due diligence on behalf of American Citizens and the land your are committed to managing, I am hopeful that common sense will prevail.

As I understand the process, Augusta Resources Corporation has requested the right to use some of the Coronado National Forest land for the purpose of dumping mining tailings, which has gotten to the point of the Forest Service doing an Environmental Impact Study. Once the Forest Service obtains all the solicited impact information I am not sure how the information will be evaluated nor what the threshold is for denying such a request. I don't know if this is just a paperwork exercise and the decision by others in the Forest Service or Dept. of Agriculture has already decided to grant this request as a result of political or lobbyist pressures. However, I have to trust the Forest Service that this is an honest procedure with no hidden agenda.

There are many questions that need to be answered before such a request for the use of public land is granted:

1. What is the water management plan that will prevent the continued depletion of viable drinking water in an arid desert environment that has been in drought condition for many years? Replacing a small percent of the planned usage with non-potable CAP water is not viable or sustainable.
2. What is the plan to prevent water pollution from the mining process that we know will happen based on the mines that are already present in the valley?
3. What will be the impact of less water resources for the plants, animals, and humans in an around the Santa Rita Mountain's?
4. The Santa Rita Mountain Range is a unique, world renown, ecosystem that attracts many scientists, birders, hikers and others. What will be the impact of this mining operation on such areas of interests?

5. Air pollution in the area is already an issue from the current mining operations. What is Augusta's plan to not have any negative impact on air quality caused by the mining process and the transportation of materials within and outside of the mining area?
6. What is Augusta's plan to mitigate noise pollution?
7. Augusta's mining operation plan now includes an operation on the west side of the mountain. Why does their plan keep changing and how can you ever trust what they are saying? How can we believe their core sample analysis results after so many other companies have tried unsuccessfully in the past to mine this area? Augusta Resources is a neophyte when it comes to copper mining—what credibility can their promises actually have?
8. What justification can there possibly be to risk irreparable devastation of the scenic landscapes and view sheds?
9. From an environment impact just how does a large scale copper mine located in a unique mountain range right in the middle of Green Valley, Sahuarita, Vail Tucson, and the ranches on the east side of the mountain fit into a nice environmentally friendly scenario?

Thank you for the opportunity to submit these comments. I sincerely hope that reason and common sense will prevail and the Forest Service will never grant the use of our public lands for such a project. I am part of group that works regularly with the Forest Service on trail building and maintenance in the Santa Rita's. I cannot begin to tell you just how demoralizing it would be if Augusta Resources were permitted to use the public lands they have requested.

Sincerely,

Robert A. Porterfield

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COMMENT: Rosemont's activities of transporting groundwater away from Sahuarita would interfere with the natural balance of the environments ability to maintain critical water levels for the overall development and welfare of the community.

Rosemont's transportation of groundwater from Sahuarita, which is already suffering from a groundwater depletion and land subsidence, may cause a risk to health and safety of residents with undesirable consequences to the community. Rosemont's transportation of our groundwater could dramatically affect any future growth in our community.

Sahuarita heights is a low income community and needs to be included in the NEPA process this may bring an alternative action such as the environmental justice executive order. I request a meeting be held in Sahuarita to inform the community of Rosemont's activities and how it will affect our community.

Rosemont should be made to pay for a hydrologic study for the environmental impact of transporting of groundwater away from Sahuarita heights and how this will affect the land subsidence.

NAME: Jeremiah K McGee

EMAIL: _____

ADDRESS: _____

_____

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NAME: Glenn & Stacey Sprague

EMAIL: SmallblockSR@yahoo.com

ADDRESS: 3605 E Dawson Sahuarita

AZ 85629 – P.O. Box 1361 ← send mail here

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NAME: KEVIN HAWLEY Kevin Hawley

EMAIL: d240man@earthlink.net

ADDRESS: 3637 E. DAWSON RD.

SAHUARITA, AZ. 85629

PLEASE ADD ME TO THE MAILING LIST (circle one): (YES) NO

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NAME: JILL ONGLEY

EMAIL:

ADDRESS: 16231 S. COUNTRY CLUB
SAHUARITA AZ 85629

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NAME: MR. AND MRS. TIM TRIBBLE

EMAIL: TRIBBLESDIAMOND @ EARTHLINK.NET

ADDRESS: PO BOX 235, SAHUARITA, AZ. 85629

physical address: 3611 E. DAWSON RD.

PLEASE ADD ME TO THE MAILING LIST (circle one): YES NO

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NAME: Shaundell Watkins

EMAIL: n/a

ADDRESS: 16351 S. Delgado Rd. #2
Sahuarita, AZ. 85629

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COMMENT:

1. A group of us visited the area recently and were told by subcontractors of Augusta Resources that there is no trespassing, that it is private land. The land they were on was clearly national forest land. Does August Resources have a right to stop the public from enjoying this land? Many people travel to Gunsight Pass daily. Augusta is already constructing new roads, putting up fences and other obstacles to prevent access. Is this legal? THIS IS OUR LAND!
2. Augusta Resources tries to gain public approval of the mine by advertising the jobs and tax revenue for both the state of Arizona and the Fed's. Does the study take into account the loss of tourism dollars and land values?
3. Mine blasting creates sonic booms. What times of day would Rosemont blast? If it effects nearby homes by cracking foundations and stucco, will Augusta pay for improvements that are necessary?

NAME: Chuck Woodford
EMAIL: carwell@wildblue.Net
ADDRESS: P.O. Box 144
Vail, AZ 85641

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COMMENT:

1. The Portland Cement mine approved in the Empire Mountains will also be sending Trucks onto SR83. What will the cumulative effect of Rosemont traffic and Portland's traffic have on safety?
2. The interchange from I-10 onto SR83 is not the safest. It consists of sharp curves, and an intersection of I-10 traffic, frontage road traffic, and old Sonoita highway traffic. It can be a very confusing intersection. Shouldn't this interchange be redesigned to handle the large increase in traffic volume before people die?
3. Is the Arizona Department of Transportation involved in the mine approval process to ensure proper planning to account for the increased SR83 use and safety issues?
4. In Augusta's water plan dated 5/2007 they claim that in 2007 they would recharge 15,000 acre feet in the Santa Cruz Basin. What is the status of this claim?

NAME: Chuck Woodford
EMAIL: Carwell@wildblue.Net
ADDRESS: P.O. Box 144
Vail, Az. 85641

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COMMENT:

1. There are already strains on the water supply coming from the Colorado River to the Central Arizona Project. One look at lake levels along the damn system will verify this. If water allocations are reduced due to lack of water will Augusta Resources guarantee in writing that the reduction in water will be absorbed by them in their allocation and not the public of Green Valley and Sahurita even if that leads to the requirement of shutting down or slowing activity at the mine?
2. If the groundwater in our area becomes polluted like the Green Valley water where, will the water for all of us living in the Sonoita/Patagonia corridor come from and will Augusta Resources guarantee they will pay all related expenses to get it piped directly to our homes?
3. Many residents in this area are on fixed income. If their wells run dry many cannot afford to have them drilled deeper. Proving that the mines are responsible for lower groundwater tables is difficult. If this becomes a problem will Augusta guarantee that they will pay for well improvements necessary to provide water?
4. Is the Cumulative effect of all of the area mines water use and contamination problems being considered in the approval of these mines?

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EMAIL: carwell@wildblue.net

ADDRESS: P.O. Box 144
Vail, AZ 85641

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COMMENT:

1. The School buses are on the road M-F from 6:00AM to 8:30AM, 11:00AM to12:00PM and from 1:00PM to 6:00PM. Will trucks carrying ore or explosive supplies to the mine travel on the road during these hours?
2. Will the I-10 Marsh Station Bridge be updated to eliminate the oversized loads now routed through SR83, or will these loads share this dangerous winding road with Augusta's trucks?
3. Will passing lanes be installed anywhere along SR83 to allow traffic to pass slower moving trucks?
4. How much more frequently will road maintenance be required on SR83 due to the volume of heavy trucks if the Rosemont mine is approved? **Since it is a two lane highway construction has a major impact on travel times and safety.**
5. Can SR83 in its present state support the loads and volume that Augusta has presented?
6. Wouldn't it be better and less intrusive on the current SR83 travelers to improve it before opening the mine so it can handle the additional volume of heavy trucks, perhaps make it a concrete highway in the sections supporting heavy trucks?

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EMAIL: Carwell@Wildblue.Net

ADDRESS: P.O. Box 144

Vail, AZ 85641

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COMMENT:

1. If Augusta pursues the Peach-Elgin, Broadtop Butte, and Copper World prospects in the future how could their development combined with the Rosemont mine not drastically impact the scenic views?
2. If they don't plan to develop these mines in the future then will they donate the Peach-Elgin mine, Broadtop Butte mine, and Copper World mine properties to Pima County for conservation before the Rosemont mine proceeds?
3. The Arizona Department of Transportation has spent a great deal of taxpayer money to perform a Corridor Management Plan for the Sonoita/Patagonia Scenic route on SR83 and SR82. A vast amount of information is available in this report. Is the ADOT consulted during the approval process and the information they have compiled considered in the approval?
4. Augusta resources makes it clear that the people of Green Valley, Tucson, and Vail will not see the Rosemont Mine. If they have future plans for additional mines in the area shouldn't they be fair to the public and inform them of these plans and their impact? The Peach-Elgin mine will clearly be visible to residents of Green Valley.

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EMAIL: Carwell@weldblue.Net

ADDRESS: P.O. Box 144
Vail, AZ 85641

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COMMENT: Second "Open house" meeting attended by me. I feel the same way. NO OPEN Pit in the Santa Rita's. I'm very happy there will be other meeting thanks to Gabby. This is still America and this should be handled in a democatic way. The open houses lack in democracy

It will be a very negative impact for our environment

NAME: Nancy Brown

EMAIL:

ADDRESS: 4919 W Santa Maria
Amado AZ 85645

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Attn: Beverly Everson

USDA Forest Service
Coronado National Forest
300 West Congress Street
Tucson, AZ 85701

Place First Class
Stamp Here

Fold Here

How to Comment Effectively

To be effective, comments should be specific and factual. Remember, the purpose of this scoping is to identify significant issues related to the proposed operation, and issues to be considered in the Environmental Impact Process (EIS).

The format for commenting is up to you to choose. Comment forms are available, but not required. Send comments by mail, email, or hand-deliver to the Forest Service before the public scoping period ends on July 14, 2008.

Below are several tips for making effective comments.

- Be brief so the reviewer won't miss the point of your comment.
- Be specific so the reviewer clearly understands your concerns.
    - Statements such as "I am concerned about the amount of additional traffic this will cause" are useful in generating issues that can be analyzed.
    - Statements such as "Don't do this" or "I like this" are not useful in generating issues that can be analyzed.
- The better you understand the proposal, the more focused and site-specific your comments will be.
- Your comments must be realistic and feasible.
- Remember, this is the time to identify concerns AND opportunities.

The public comment period is the beginning of the EIS process and represents the foundation of the analysis. Your comments are an important input to the analysis of the social and natural environment.

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COMMENT:

The Rosemont mine would be a disaster for the Green Valley - Sahuarita aquifer!

The air, noise and water pollution would be extremely disturbing! The view from Rt 83 would be ugly. The Rosemont company (and Augusta) cannot be trusted. They made false promises about employment and offered free dinner for supporting the company.

Save the beautiful Santa Rita Mountains!

NAME: Rex Appel

EMAIL:

ADDRESS: 306 P. Vista del Rio
Green Valley AZ 85614

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PUBLIC COMMENTS
FOR THE
PROPOSED ROSEMONT COPPER PROJECT
ENVIRONMENTAL IMPACT STATEMENT

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COMMENT: (1) HAS AUGUSTA FULLY EXPLAINED HYDROLOGICAL IMPACTS OF THE PROPOSED ROSEMONT MINE TO THE SATISFACTION OF THE US FOREST SERVICE?

(2) WHAT IS THE RISK OF WELLS THAT SUPPORT MINE HAVING A NEGATIVE IMPACT ON THE AQUIFER OF FOREST SERVICE LANDS THUS IMPACTING WILDLIFE IN THE CORONADO NATIONAL FOREST?

NAME: PATRICK MCKENNA

EMAIL: patrick.mckenna@pima.gov

ADDRESS: 130 W. Congress St.
TUCSON, AZ 85701

PLEASE ADD ME TO THE MAILING LIST (circle one): YES NO

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Attn: Beverly Everson

USDA Forest Service
Coronado National Forest
300 West Congress Street
Tucson, AZ 85701

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COMMENT: (1) WILL THE PROPOSED MINE HAVE ANY PREDICTABLE IMPACTS TO WILDLIFE + SPECIFICALLY BIRDS FROM EXPOSURE TO TOXINS?

(2) WHY SHOULD WE EVEN CONSIDER CHANGING THE CORONADO NATIONAL FOREST MANAGEMENT PLAN TO FACILITATE DESTRUCTION?

NAME: PATRICK MCKENNA
EMAIL: patrick.mckenna@pima.gov
ADDRESS: 130 W. Congress St. 11th Floor
TUCSON, AZ 85701

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COMMENT: I live on Alamo approx 3/4 mile from the well. Have lived there 38 years & never had any water problems - We do not need any problems. Our water will be going down like a sponge - and no amount of CAP water will help that - We are already in a drought - so why let these people bring us more problems? The Mine is not needed but our water supply is -
There is way to much building & using our water supply now -
All this mine is going to do is put money in their pockets & leave us dry.
I really don't think they care.

Please save the Santa Ritas - They are beautiful and need to stay that way.
We have enough mines in our area!

NAME: Shirley Cox

EMAIL:

ADDRESS: 16961 S. Alamo Box 93
Sahuarita, Az 85629

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COMMENT: We need our water supply to remain as such - The mils they are planning on putting in will pump hundreds of gallons an hr and will not stop pumping - They will pump 7 days a week 24 hrs a day - At this rate - we will have no water left.

NAME: Shirley Cox

EMAIL:

ADDRESS: 16961 S. Alvernon
Sahuarita, Az 85629-

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COMMENT:

If there is a trust for the land reclamation, when will it be funded in full?
Why does the Forest Service have the only say on all of the issues?
We are land owners, pay our taxes, and this will take away our scenic beauty, water, history, forests, natural habitat, agriculture, impose light pollution, road conditions and traffic.
If this mine goes in, the travel and tourism-related spending in the region would be an economic loss greater than the annual payroll of the mine!
I don't want my land value going down any more because of another mine to the east of me. To the west is enough.
I use Box Canyon to get to Sonoita Highway and this will be restricted with the mine.
There are so many issues concerning this mine that wants to come in, BIG BUSINESS!
I support all the research done by www.hiltonroad.com

They say and prove it all!

NO MINE

NAME: Rebecca Parton

EMAIL: rebecca_parton@msn.com

ADDRESS: P.O. Box 956
Green Valley AZ 85622

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WHO USES THE GROUND WATER IN OUR BASIN ?

Annual use (EST)	68,000 Acre Feet.	
Pecan Grove	29.800 AF	(began in 1965
Copper Mine	27,000AF	(began 1970)
Golf Courses	4,700AF	
Municipal	6,700AF	(about 6% of the total - Green Valley/Sahuarita)
Sand/Gravel	465 AF	

CURRENT RECHARGE AMOUNT (to try to replenish the 68,000AF used annually)

Total Recharge -	28,000 AF	
Natural Storm Water	19,000AF	
Effluent	2,000AF	
Ground Water RD	650	(replenished in Marana.)

from Georgette Valle

This leaves a deficit of 40,000AF per year

(Say for 5 years 188,000AF loss of Ground Water.)

STEPS TO PROTECT AND PRESERVE OUR BASIN

Water conservation-immediately begin a water conservation program. Say reduce by 25-30% all use of water and water users.

Storm water Capture projects. Try to have projects in place over the next two years.

CAP Water - Extend pipeline from Pima Mine Road to the Canoa Ranch Area. Long-term project that

could take
up to 6 years.

from Georgette Valle

FACT SHEET RELATING TO GREEN VALLEY/SAHAURITA WATER PROBLEMS

This fact sheet has been written to summarize some of our looming water problems, which can have a devastating effect on our valley.

Fact 1 The copper mine and pecan grove were here before serious development of this area took place.

Fact 2 Green Valley has grown from roughly 20,000 people to about 30,000 since 1998. Sahuarita has grown from roughly 3,000 people to over 22,000 since 1998.

Fact 3 In September 1998, an in-depth study was conducted by Malcolm Pirnie Hydrology Consultants and Arizona Department of Water Resources (ADWR). It also included Pima County and all the major Water providers and Water users in this area, to investigate water availability over the next 30 years. It was established that there was a serious overdraft developing that could have serious consequences for the future. Bringing in CAP Water, was discussed and the Only party to secure a water allotment at that time was Community Water Company. No plan was developed, nor implemented.

Mines like our pure ground water

Fact 4. The Copper mine, which has used roughly 506,000 acre feet (AF) of ground water since 1987, (secured by purchasing wells close to Canoa Ranch and using existing state and federal mining laws), declared that they preferred groundwater to CAP water, due to its inconsistency in quality and cost. We wish to point out that CAP water can be cleaned very easily and be re-used, to give the mine the consistency they need. But groundwater is practically free, so why spend the extra money?? And after the ground water is used, it is contaminated and creates a plume of pollution which is moving through Green Valley. Also, the mine has used about 24 millions gallons of pristine groundwater EACH DAY, over the last 10 years. With this heavy use, land subsidence (sinking) and fissures is inevitable and has already occurred at Canoa Ranch. Green Valley has also sunk about 4-6 inches, according to satellite mapping by US Geological Services.

Fact 5. The pecan orchard has also expressed reservations about using CAP water for their trees. And with their grandfather rights to wells, they also save a lot of money by using groundwater.

Fact 6 The seven golf courses here use on the average 600,000 gallons each, or water per day. One or two of them use gray water, but the others use ground water from their wells.

Fact 7. None of these major users of groundwater, who use about 90% of our groundwater, have secured an allotment of CAP water to replenish what they take our of the ground. Because of this heavy use, we are experiencing an annual overdraft of over 40,000AF of water per year. We are facing a potential disaster.

Fact 8 Except for Community Water Company and Green Valley Water Company, none of the other four water companies have bothered to secure a CAP water allotment for their customers.

Fact 9. Pima County, knowing about this serious overdraft since 1998, has allowed developers into this area, claiming that they have a 100 year assured water supply certificate from Arizona Department of Water Resources. We retirees, who moved to this beautiful area, believed this fairy tale. Even today, ADWR issues the 100 year certificates, knowing about this overdraft. Now, when we have become

aware of this suppressed information, Pima County says that they are willing to facilitate a solution to this looming water crisis, but that they are not in the water business, and are not willing to use any tax dollars to bring water into this area. IT IS BORDERING ON CRIMINAL ! !

Fact 10 Pima County, from what we have been able to find out, has collected over $135 million in property taxes from Green Valley in the last 5 years. They have not yet responded to a petition, signed by over 700 citizens and delivered to them August 29, 2007 , plus two reminders, requesting an accounting of how they spent our tax dollars. Their response has been that they could not break out Green Valley specifically from the data base. We estimate that they have an excess of about $90 million that they have spent elsewhere.

What this brings up now is what is the alternative? With no delivery system for CAP water allotment, we all risk losing the available allotment in the near future. There are three steps that have been proposed. The first is water conservation with emphasis on the major users to lead this effort. The second is storm water capture. The Third is bringing in CAP water.

Green Valley is a retirement community. We have invested our retirement money here, in good faith, having been assured that we have a 100 year assured water supply. If we continue our serious overdraft, we will look at no water and serious subsidence.

Given these circumstances, the major water users (90%) have to be told to reduce their consumption of precious groundwater until we know what our true water situation is and together plan of r how our recharge can best be accomplished. We are all in it together and we all have to come to the table and solve this dilemma. WITHOUT WATER, THIS AREA DIES.

The present controversy is the proposed August Mine (Rosemont) . The groundwater cannot support the roughly 6000 they are proposing to use per year initially. That translates to over 4 million gallons a day. About 200-500 private wells close to Augusta's well field will dry up. It is already starting and people there have very limited means to solve their impending loss of water. We expect an increase in their consumption from 6,000AF annually to 20,000-26,000AF per year after 3 years of operation.

This assault on our valley must be addressed by all of us, or our homes will become worthless. So, let us rally together to save our groundwater basin.

message sent by June Wortman, Program Coordinator and volunteer scribe 520-648-5877
Junesrag@cox.net

Georgette Valle
78 N. Cedar Crest Dr.
Green Valley, Arizona

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COMMENT: Rosemont will not put a lining under the tailings. Comments from Georgette Valle
A non porous lining should be placed under the Rosemont Mine tailings. Many mines have not done this - as a result there is a sulfate plume moving towards Green Valley in my area. Phelps Dodge is now digging five wells to siphon the plume.

NAME: Georgette Valle

EMAIL: valle7@juno.com

ADDRESS: 38 N. Cedar Crest Dr.
Green Valley, Az 85614

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COMMENT: The United States & the rest of the world need Copper. Rosemont woud provide Copper and many good Jobs.

The entire Green Valley - Sahuarita area has a water problem. The water Table is going down with our present population.

If the Rosemont mine helps get water from the Southern end of the CAP pipe line at I-19 & Pima Mine Road to the Green Valley - SAHUARITA area I am all in favor of the mine.

NAME: JOHN GAY

EMAIL: —

ADDRESS: 1241 W. Calle de la Plaza
SAHUARITA, Az. 85629

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COMMENT:

THE PUBLIC NEEDS A COMPLETE, COMPREHENSIVE, ACCURATE HYDROLOGY REPORT TO BE RELEASED WITHIN 2 YEARS. ENGINEERING STUDIES NEED TO BE RELEASED SHOWING WATER IMPACTS FOR NEXT 10, 20, 30 YEARS ON MINE WATER ACTIVITY, EFFECT OF CAP RECHARGE WATER, EFFECT OF INCREASED POPULATION WATER DEMANDS IN SAHURITA, GREEN VALLEY AREAS. WHAT % OF CURRENT WATER SUPPLY IS USED BY RESIDENTS, FICO ORCHARDS, EXISTING MINES IN WEST SANTA CRUZ VALLEY, GOLF COURSES. WILL THE SANTA CRUZ ACQUIFER AND WATER SUPPLY BE ADEQUATE TO SERVE CURRENT & FUTURE RESIDENTS IN 20 YEARS? IS ROSEMONT MINE POTENTIALLY A MAJOR IMPACT ON WATER SUPPLY OR A MINOR IMPACT?

NAME: A. CRAIG CAMPBELL

EMAIL: craigcam8@hotmail.com

ADDRESS: 2268 E. DESERT PUEBLO PASS
GREEN VALLEY 85614

PLEASE ADD ME TO THE MAILING LIST (circle one): (YES) NO

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Attn: Beverly Everson

USDA Forest Service
Coronado National Forest
300 West Congress Street
Tucson, AZ 85701

Place First Class
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PUBLIC COMMENTS FOR THE PROPOSED ROSEMONT COPPER PROJECT ENVIRONMENTAL IMPACT STATEMENT

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COMMENT:

With the current drought conditions being talked about in the newspapers, what impact will the mine have on this?

I have heard that the mining company will not be putting a lining under the tailings pile. What impact will that have on the environment?

Where will the mining company get the electricity to run the mine? How will this affect our rates? How much more of the environment will be destroyed by putting in poles and stringing wire?

NAME: Dolores Lowell

EMAIL:

ADDRESS: 880 N. Solar Drive
Vail AZ 85641

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COMMENT:

As you well know the history of mining in the Southwest over the past hundred & more years has been notoriously destructive of flora + fauna. Apparently the Forest Service cannot lobby — or can it? against what is blatantly clear to the men + women who are stewards over the land. You are also well aware given our society + Washington, DC. in particular, that lobbyists are at work, which is legal but does not necessarily represent the best ethical interests. Mining companies, of course, need to exist, need to make profits. However, this is a MAMMOTH proposal which will tap water resources in a state that is already pumping water from another state. The proposal need to be radically sized down even if accepted. Do you really believe that the Rosemont project is motivated by other than pure profit? That is the nature of this kind of business. The proposals, as you read the document, gloss over reclamation efforts; they are weak — dig + hole use millions of gallons of water, discharge slag + then fill it in + plant trees. They've tried this in Cobre County + it is still disastrous.

NAME: Matt Freer, CSW

EMAIL:

ADDRESS: 10 E Camino De Diana
Green Valley, AZ 85614

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COMMENT: Residents of Sahuarita + Green Valley are in constant sight of mountains of mine tailings from older Copper mines. Those mine owners are of the opinion that planting a few trees on miles + miles of man made dirt piles that obstruct ~~the~~ our view of the natural, beautiful mountains, is sufficient land restoration. I would hope that the Forest Service will require that any mines on their land, including the Rosemont Copper Project, will be required to return the material that is left after processing to the pit. ~~The material shou~~ Furthermore, the mines owners should be required to return that material in a manner that will not result in additional water pollution or in any other harm to the land. The Forest Service, protectors of our environment, needs to monitor the restoration after each segment of the mine is closed for enough years to observe whether there has been leaching of toxins into the water supply and whether natural vegetation + wildlife has returned to the land.

NAME: Maddy Urkon (MADDY URKON)

EMAIL: maddy.urkon@gmail.com

ADDRESS: 1104 N Rams Head Rd
Green Valley, AZ 85614

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COMMENT:

I have lived in Sahuarita at the same place with my own well for 36 years. I have a small yard with grass and trees. I also have 2 horses. My well has never been deepened and I have never had any difficulties with it.

I certainly hope that I don't begin to have any water problems, if the mine is allowed to operate. If it occurs, how will my water problems be taken care of?

I really care about having sufficient non contaminated water.

NAME: Burton Tingle

EMAIL: tingle8502@aol.com

ADDRESS: PO Box 36 16330 S. Country Club
Sahuarita, AZ 85629

PLEASE ADD ME TO THE MAILING LIST (circle one): (YES) **NO**

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COMMENT: As a representative of the well owner in the Sahuarita Heights I am vehemintly opposed to the pumping of our ground water to supply the proposed Rosemont mine operation. the Rosemont mine should get their water supply from Cap water, if that is not enough water for their mining operation that is Rosemonts problem.

NAME: David P. Thompson

EMAIL:

ADDRESS: P.O. Box 290
Sahuarita Ariz, 85629

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COMMENT: We just dug a well 810' off Hitton ranch rd 40.000$ our future home is at 4600' off of 83 south the view would be of the mine. The noise of mineng would be disturbing not only to the animals. we are greatly concerned about the mine drying up the well. Not only our drinking water drying up but our and neighbors haveing the toxic waste of mineing seeping into the water we drink and bathe in. the pineapple Cactus? endangerd is its home lesser long nosed bat, Mexican long tongued Bat, Chiricahua Leopard frog, Lowland leopard frog, Giant Spotted Whiptail lizard, Rufous-winged Sparrow, Bell's Vireo and Yellow-billed Cuckoo. these are priority vulnerable Species? One of our floodplains that is used by riparian vegetation mesquite, hackberry, Oak, willow and Walnut Trees, Cottonwood willow forest. No trees bad air no pup-fish no wildlife ruined nature. (1)

NAME: Debra Paul

EMAIL: KenDebl Juno.com

ADDRESS: 3892 S. Evergreen ave.
TSN AZ 85730

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COMMENT:

I AM ADAMANTLY OPPOSED TO THE ROSEMONT MINE PROPOSAL. ENVIRONMENTALLY, ASTHETIC AND WATER MISAPPROPRIATION OF THIS CRITICAL LIFESUPPORT RESOURCE MUST NOT HAPPEN!

NAME: PHILLIP M. LOTZ

EMAIL:

ADDRESS: 4615 S. MOON RIVER PLACE
GREEN VALLEY, AZ 85614

PLEASE ADD ME TO THE MAILING LIST (circle one): YES NO

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COMMENT: I am totally against the Rosemont Mine proposal. I do no support the environmental and water management issues.

NAME: Cheryl A. Dye

EMAIL:

ADDRESS: 435 S. Camino Triunfante
Green Valley, Az 85614

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COMMENT: My opinion of the Rosemont Project is that it will be an excessive draw on the water supply that feeds our area. The 1872 Act is not appropriate for this day and time. Our resources are already stretched thin. Many remarks have been made stating that water will be recycled. This statement will not be the final outcome. If Rosemont has its way, we will all suffer in the end. I am totally against this project!

NAME: Howard Dye

EMAIL: hdye@earthlink.net

ADDRESS: 435 S. Camino Triunfante
Green Valley, Az. 85614

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COMMENT: What can we depend on from a Canadian Company mining in Arizona. In other states they have declared bankruptcy left and contaminated the ground water with arsenic.

At a Vail meeting we heard the results of an impact study that stated that if 5% of the tourism was diminished, it was far more than all the salaries that would be generated by salaries at the mine. We lose all the beauty and are penalized by less income in this county.

Our Sahuarita lot is the last property we will ever own. Our well is 300 ft deep, Rosemont's are 1250 ft. I didn't move out here to drink CAP water. My husband is 76 and I'm 73. How do we start all over?

NAME: Phyllis Serrine

EMAIL:

ADDRESS: 16121 S. Country Club Rd.
Sahuarita, Az. 85629

PLEASE ADD ME TO THE MAILING LIST (circle one): YES NO

Please be advised that comments and personal information associated with them, such as names and addresses, become part of the Administrative Record for this NEPA review. As such, they may be made available to a third-party upon request under the authority of the Freedom of Information Act (FOIA).
Personally identifying information is protected by the Privacy Act. If you do not wish for your personal information to be released under the FOIA, you may choose not to include it with your comments. Alternatively, you may request an exemption from FOIA with your comment submittal. Should you choose the latter, you would be informed by the Forest Service as to whether or not your request qualifies for an exemption. If it does not, you would be afforded the opportunity to resubmit your comments without personal information or to withhold them altogether.

Attn: Beverly Everson

USDA Forest Service
Coronado National Forest
300 West Congress Street
Tucson, AZ 85701

Place First Class
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How to Comment Effectively

To be effective, comments should be specific and factual. Remember, the purpose of this scoping is to identify significant issues related to the proposed operation, and issues to be considered in the Environmental Impact Process (EIS).

The format for commenting is up to you to choose. Comment forms are available, but not required. Send comments by mail, email, or hand-deliver to the Forest Service before the public scoping period ends on July 14, 2008.

Below are several tips for making effective comments.

- Be brief so the reviewer won't miss the point of your comment.
- Be specific so the reviewer clearly understands your concerns.
    - Statements such as "I am concerned about the amount of additional traffic this will cause" are useful in generating issues that can be analyzed.
    - Statements such as "Don't do this" or "I like this" are not useful in generating issues that can be analyzed.
- The better you understand the proposal, the more focused and site-specific your comments will be.
- Your comments must be realistic and feasible.
- Remember, this is the time to identify concerns AND opportunities.

The public comment period is the beginning of the EIS process and represents the foundation of the analysis. Your comments are an important input to the analysis of the social and natural environment.

RECEIVED APR 22 2008

YOUR COMMENTS ARE IMPORTANT!

PUBLIC COMMENTS
FOR THE
PROPOSED ROSEMONT COPPER PROJECT
ENVIRONMENTAL IMPACT STATEMENT

If you would like to make a comment or be added to our mailing list, please fill out this form and hand it to any of our staff or mail it to the address provided. You are also welcome to write a letter or send e-mail to: comments-southwestern-coronado@fs.fed.us. Thank you!

COMMENT:

Open pit mining will be detrimental to the surface and sub-surface soils — Sulfates that seep down to the aquafers are totally detrimental to human consumption.

With the amount of water needed for this proposed project the subsoil moisture will be completely depleted — taking water away from the ground plants, the households and the ranchers.

National Forest land should not be used as a dumping ground for the waste rock material. That is totally against the correct use of Nat'l Forest usage.
I am strongly opposed to the Rosemont Copper Mine Project

NAME: Marjorie Lotz

EMAIL:

ADDRESS: 4615 S. Moon River Place
Green Valley AZ 85614

PLEASE ADD ME TO THE MAILING LIST (circle one): YES ✓ NO

Please be advised that comments and personal information associated with them, such as names and addresses, become part of the Administrative Record for this NEPA review. As such, they may be made available to a third-party upon request under the authority of the Freedom of Information Act (FOIA).
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FOREST SERVICE QUESTIONS

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Augusta has no intentions of stopping with the Rosemont Mine

According to an article in World Mining Stocks from Sept 2007, issue 11 Gil Clausen, president and CEO of Augusta Resource noted that although developing Rosemont is the companies primary focus, three other properties in Augusta's land holdings offered opportunities for **further exploration**. These properties are the **Peach-Elgin, Broadtop Butte, and Copper World prospects**. The article makes it clear that **Augusta has no intentions of stopping with the Rosemont Mine**. Rosemont may be where they plan to start but it looks like they intend on pursuing several future mines along the Sonoita-Patagonia Scenic route, and one on the west side of the Santa Rita's, which will be visible from Green Valley. Augusta is not making it clear to the public what their future intentions are in the Santa Rita's

These are our concerns and some questions we would like answered by the National Forest Service representatives:

General Questions:

1. What type of trust is being established for the land reclamation? When will it be funded in full?
2. What criteria will be used to determine when the Rosemont mine is closed?
3. Who in the forest service actually makes the final decision whether to grant the Rosemont mine the right to use National Forest Service land? What criteria is their decision based upon.

Water Resources;

Questions concerning water resources

1. There are already strains on the water supply coming from the Colorado River to the Central Arizona Project. One look at lake levels along the damn system will verify this. If water allocations are reduced due to lack of water will Augusta Resources guarantee in writing that the reduction in water will be absorbed by them in their allocation and not the public of Green Valley and Sahurita even if that leads to the requirement of shutting down or slowing activity at the mine?
2. If the groundwater in our area becomes polluted like the Green Valley water where, will the water for all of us living in the Sonoita/Patagonia corridor come from and will Augusta Resources guarantee they will pay all related expenses to get it piped directly to our homes?
3. Is there any guarantee that Rosemont mine will not pump groundwater from the East side of the Santa Rita's?
4. What effect on the groundwater table will digging a mile wide 2500 foot deep pit have on the groundwater on the East side of the Santa Ritas. Many residents have wells that are 3 to

4 hundred feet deep. Will they require deeper wells, or will city water have to be provided? Who will pay for this?

5. Many residents in this area are on fixed income. If their wells run dry many cannot afford to have them drilled deeper. Proving that the mines are responsible for lower groundwater tables is difficult. If this becomes a problem will Augusta guarantee that they will pay for well improvements necessary to provide water?
6. Is the Cumulative effect of all of the area mines water use and contamination problems being considered in the approval of these mines?
7. In Augusta's water plan dated 5/2007 they claim that in 2007 they would recharge 15,000 acre feet in the Santa Cruz Basin. What is the status of this claim?

Noise Pollution

1. Mine blasting creates sonic booms. What times of day would Rosemont blast? If it effects nearby homes by cracking foundations and stucco, will Augusta pay for improvements that are necessary?

Light Pollution from night operations;

Questions concerning Light Pollution

1. What will the mine do to assure the light pollution does not adversely impact the observatories on Mt Hopkins?
2. If it is later discovered that the lights do interfere with the Mt Hopkins observatories will Augusta Resources guarantee in writing that they will either reduce the lighting to acceptable levels, or if that is not possible to stop mining during the night? According to Augusta's lighting plan "The project, although not required to do so, will make every attempt to comply with the Pima county Outdoor lighting code. It should be noted, however, that federal and state laws also require Rosemont operations to give utmost attention to the safety of its employees and the public"

Safety on Arizona State Road 83

Augusta Resources estimates approximately 4 trucks per hour 24 hours per day 7 days a week. They also claim that they will not transport material during peak travel times.

Questions concerning SR83 Safety:

1. The School buses are on the road M-F from 6:00AM to 8:30AM, 11:00AM to12:00PM and from 1:00PM to 6:00PM. Will trucks carrying ore or explosive supplies to the mine travel on the road during these hours?
2. Will the I-10 Marsh Station Bridge be updated to eliminate the oversized loads now routed through SR83, or will these loads share this dangerous winding road with Augusta's trucks?

3. Will passing lanes be installed anywhere along SR83 to allow traffic to pass slower moving trucks?
4. How much more frequently will road maintenance be required on SR83 due to the volume of heavy trucks if the Rosemont mine is approved? **Since it is a two lane highway construction has a major impact on travel times and safety.**
5. Can SR83 in its present state support the loads and volume that Augusta has presented?
6. Wouldn't it be better and less intrusive on the current SR83 travelers to improve it before opening the mine so it can handle the additional volume of heavy trucks, perhaps make it a concrete highway in the sections supporting heavy trucks?
7. The Portland Cement mine approved in the Empire Mountains will also be sending Trucks onto SR83. What will the cumulative effect of Rosemont traffic and Portland's traffic have on safety?
8. The interchange from I-10 onto SR83 is not the safest. It consists of sharp curves, and an intersection of I-10 traffic, frontage road traffic, and old Sonoita highway traffic. It can be a very confusing intersection. Shouldn't this interchange be redesigned to handle the large increase in traffic volume before people die?
9. Is the Arizona Department of Transportation involved in the mine approval process to ensure proper planning to account for the increased SR83 use and safety issues?
10. Has the Federal Highway Safety Administration information from the Arizona 2007 Five percent report which outlines the top 5 percent of its locations currently exhibiting the most severe highway safety needs be taken into account when determining SR83 safety?

Loss of Scenic Beauty and Public investment

Questions about scenic impact: I know they want to limit our questions to what they are doing today at Rosemont, but they were very clear in their desire to "explore" Peach-Elgin, Broadtop Butte, and Copper World prospects in the future.

1. If Augusta pursues the Peach-Elgin, Broadtop Butte, and Copper World prospects in the future how could their development combined with the Rosemont mine not drastically impact the scenic views?
2. If they don't plan to develop these mines in the future then will they donate the Peach-Elgin mine, Broadtop Butte mine, and Copper World mine properties to Pima County for conservation before the Rosemont mine proceeds?

Corridor management involves the preparation of a Corridor Management Plan (CMP) which must be completed as part of proposing a scenic byway for national designation. (SR83 was the second scenic road designation in Arizona) The CMP is an inventory of the corridor's existing conditions including the intrinsic qualities that attract visitors to the corridor. The plan outlines goals and strategies for preserving and enhancing the features of the scenic byway.

3. The Arizona Department of Transportation has spent a great deal of taxpayer money to perform a Corridor Management Plan for the Sonoita/Patagonia Scenic route on SR83 and SR82. A vast amount of information is available in this report. Is the ADOT consulted during the approval process and the information they have compiled considered in the approval?

4. Augusta resources makes it clear that the people of Green Valley, Tucson, and Vail will not see the Rosemont Mine. If they have future plans for additional mines in the area shouldn't they be fair to the public and inform them of these plans and their impact? The Peach-Elgin mine will clearly be visible to residents of Green Valley.

5. A group of us visited the area recently and were told by subcontractors of Augusta Resources that there is no trespassing, that it is private land. The land they were on was clearly national forest land. Does August Resources have a right to stop the public from enjoying this land? Many people travel to Gunsight Pass daily. Augusta is already constructing new roads, putting up fences and other obstacles to prevent access. Is this legal? THIS IS OUR LAND!

Economic Impact

On 2/11 2007 the Sonoran Desert Institute released their Final mining study. The study says if the mines displaced only one percent of travel and tourism-related spending in the region, the economic loss would be greater than the entire annual payroll of the mine. Augusta Resources tries to gain public approval of the mine by advertising the jobs and tax revenue for both the state of Arizona and the Fed's. Does the study take into account the loss of tourism dollars and land values?

UTILIZATION OF MUNICIPAL WASTE WATER FOR FROTH FLOTATION OF COPPER AND MOLYBDENUM SULFIDES

by
Walter W. Fisher, Assistant Metallurgist
and
Samuel Rudy, Assistant Metallurgist

THE ARIZONA BUREAU OF MINES
MINERAL TECHNOLOGY BRANCH

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INTRODUCTION

Water is becoming a more and more controversial subject in Arizona. The problem stems from the fact that the amount of water consumed far exceeds the ability of nature to replace it. In order to meet growing agricultural, industrial, mining and municipal demands, water is being mined from groundwater reservoirs at alarming rates. Statistics presented in Phase I of the Arizona State Water Plan recently released by the Arizona Water Commission indicate that for Arizona, taken as a whole, water is being withdrawn from groundwater storage at 1.7 times the rate at which it is being replaced by natural recharge. In Pima County, where essentially all water consumed is drawn from the groundwater supply, the depletion rate is 4.7 times the recharge rate. Such depletion of the groundwater supply cannot go on indefinitely. Alternatives must be found and implemented to narrow the widening gap between water use and water recharge.

One alternative that could result in a significant reduction in groundwater depletion near metropolitan areas is utilization of municipal waste water. This large source of water is presently used to a very limited extent. For example, in Pima County, the City of Tucson discharges about 33 million gallons per day of municipal waste water into the Santa Cruz River. Part of this water percolates into the ground and will ultimately enter the groundwater reservoir to the north of Tucson. However, a large portion of the water evaporates into the atmosphere. The City of Tucson is currently seeking alternative uses for this water. Of the many possibilities, the one that has received the most public exposure is utilization of the waste water by the four copper mining and processing operations located south of Tucson. This alternative would reduce the groundwater depletion in the area and at the same time provide the local copper industry with a reliable, long term source of water.

Municipal waste water is already utilized to a small extent in several copper processing operations in Arizona. However, the amount used is rather small when it is compared with the total water consumed by each operation and the adverse effects attributable to the waste water are not readily observed in these operations.

The proposed use of waste water by the operations near Tucson is considerably different. The water currently used by these operations would be almost completely replaced with waste water. The mineral processing techniques used by these companies are extremely sensitive to chemical contaminants, and therefore, large scale substitution of waste water could have serious detrimental consequences. Because there is not an industrial precedent for this type of municipal waste water utilization and since experimental studies on the effects of waste water in mineral processing have not been reported, there remains a large gap between proposed utilization and commercial acceptance.

The Arizona Bureau of Mines, under the sponsorship of the Office of Water Research and Technology at The University of Arizona, has for the past two years studied the feasibility of utilizing municipal waste water in mineral processing. The laboratory investigation has been aimed at first identifying potential problems, and then, seeking solutions that would be acceptable to the mineral processing industry. Since this work was prompted by a specific problem in the Tucson area, the investigation has been limited to utilizing City of Tucson municipal waste water in the mineral processing operations south of Tucson. The largest use of water in these operations is in the froth flotation recovery of copper and molybdenum sulfide minerals. Consequently, this entire report is devoted to the utilization of sewage effluent in the flotation process.

The work reported in this paper is by no means an exhaustive study of the problem. Rather, it is an exploratory study meant only to define the problem and point out areas for future concentrated investigation.

Background on Copper-Molybdenum Froth Flotation

Froth flotation is the principal process by which sulfide minerals are recovered from ores to form sulfide concentrates. The copper industry relies almost entirely on froth flotation for its feed to smelters and hydrometallurgical refining processes. The success of the flotation process lies in the carefully controlled addition of small quantities of specific chemicals to the processing system at the correct addition point. As a result, froth flotation is extremely sensitive to small amounts of chemical contaminants that may be present in water supplied to the processing system. Foreign chemical contaminants in the process water can have a significant effect on froth flotation metal recovery.

Flotation recovery of copper sulfide minerals and by-product molybdenum sulfide, as practiced in most copper concentrators, consists of many interdependent flotation stages. Raw ore, having been crushed and ground sufficiently fine, is subjected to the rougher flotation stage. A rougher bulk concentrate is produced which contains most of the copper and molybdenum sulfide minerals, along with other impurities. The rougher concentrate is ground finer, and cleaned two or three times by flotation to remove as much non-sulfide material or gangue as possible and produce a high-grade bulk copper-molybdenum concentrate. Molybdenum sulfide is then separated from copper sulfides by chemical treatment and differential flotation to produce a relatively low grade rougher molybdenum sulfide concentrate and a high grade copper concentrate. The rougher molybdenum concentrate is cleaned by several additional stages of flotation to further reject copper sulfides and gangue to produce a high-grade final molybdenum concentrate.

This report is devoted solely to the determination of the effects of sewage effluent on bulk rougher flotation. Therefore, the results presented serve only to identify the gross and most obvious effects of sewage effluent. Determination of the effects of sewage effluent on the integrated copper-molybdenum froth flotation processing scheme is beyond the scope of this report, and in fact, can probably only be determined with certainty in a pilot plant of sufficient size to allow scale up to commercial practice.

EXPERIMENTAL PROCEDURE

Ore, Water and Reagents

The investigation was conducted using an ore obtained from the Cyprus Pima Mining Company open pit mine located south of Tucson. Approximately 800 pounds of ore was collected in the concentrator from conveyors feeding three grinding mills in the primary grinding circuit. The ore was stage crushed in the laboratory to minus 10 mesh, mixed, split into 1000 gram dry test charges, and stored in plastic bags for later use. Since the ore samples were ground in a laboratory ball mill prior to each flotation test to produce an ore pulp containing about 47 percent finer than 200-mesh, oxidation of the sulfides in the minus 10-mesh ore during storage was not considered to be a significant problem. Chemical analysis showed the sample to contain 0.49 percent copper, 4.40 percent iron and 0.011 percent molybdenum. Chalcopyrite, pyrite, and molybdenite were identified microscopically as the main sulfide minerals present.

Demineralized water generated with a high-capacity Barnstead demineralizing column was used for the standard flotation tests. (Use of product or company names in this report is made for identification only and does not serve as an endorsement by the Arizona Bureau of Mines.) Water obtained by this procedure was designated standard water in subsequent flotation tests, and was used to establish a reference flotation response from which direct comparisons of flotation results could be made. Sewage effluent was obtained at the City of Tucson's Roger Road sewage treatment facility from one of the activated sludge units. All samples were collected from the same treatment unit between the hours of 8 and 9 A. M. so that the flow rate through the plant was essentially the same for each sample.

Flotation reagents used throughout the study were standard laboratory chemicals in general use by flotation laboratories. Potassium amyl xanthate (Z-6) and methyl iso-butyl carbanol (MIBC) were used as the primary collector and frother respectively. In some tests, American Cyanamid AERO PROMOTER 3302 was used as the collector. A mixture of 50 percent kerosene and 50 percent Number 2 diesel fuel constituted the fuel oil mixture. Hydrated lime assaying 93 percent $Ca(OH)_2$ was used as the pH modifying agent.

Flotation Procedure

Flotation tests were conducted in the following manner. One thousand grams of ore containing suitable additions of desired reagents were ground at 67 percent solids for 10 minutes in a 7.5 by 8-inch laboratory ball mill containing 30 pounds of steel balls of various sizes. The ground pulp was transferred to a Denver D-1 2.5 liter laboratory flotation cell and diluted to 2.2 liters or about 35 percent solids. The pH of the slurry was determined using a Corning Model 7 pH meter. The slurry was then conditioned for 2 minutes with the air valve of the flotation mechanism in the open position, after which time frother was added and the slurry conditioned another minute without introducing air. The conditioned pulp was subjected to rougher flotation with the impeller of the flotation machine rotating at 1800 RPM. Froth was drawn on 10 second intervals for 8 minutes. The sides of the flotation cell were washed on 2 minute intervals, and the pulp level was adjusted after 4 minutes by adding 100 milliliters of water. Rougher concentrate and rougher tailings were filtered, dried, weighed, and analyzed for copper and molybdenum using an atomic absorption method. Iron determinations were made by a standard volumetric method.

The procedure of conducting a standard flotation test with each series or set of sewage effluent tests was adopted to allow a direct comparison of results of the various test sets.

Experimental Approach

Most of the copper processing operations use complex reagent schedules that have been devised through several years of laboratory evaluation and plant operating experience. In general, each reagent schedule is tailored to fit the ore on which it is used with optimum flotation response as the goal. If an

optimum, multi-component reagent schedule was used in this investigation, some of the effects of sewage effluent might have been masked by the compensating ability of the reagent schedule. Therefore, a very simple reagent schedule was chosen for the initial flotation tests, so that the full effects of sewage effluent would be apparent.

RESULTS AND DISCUSSION

Development of the Standard Flotation Test

The development of a standard laboratory flotation reagent schedule and establishment of a standard flotation response was necessary to provide a basis from which comparisons could be made and metallurgical differences could be determined between sewage effluent and standard demineralized water flotation systems. Adequate liberation of sulfide minerals from host rock was the first consideration. Laboratory grinding studies indicated that a 10 minute grinding time provided adequate liberation and produced a particle size distribution that generally paralled that which mining companies in the area achieve. Table 1 shows the particle size distribution obtained for a 10 minute grind.

Table 1

Screen Analysis of Ground Ore

Tyler Screen Fraction	Weight Percent Retained	Cumulative Weight Percent Retained
+ 35	1.8	1.8
- 35+ 48	4.7	6.5
- 48+ 65	11.9	18.4
- 65+100	11.3	29.7
-100+150	10.4	40.1
-150+200	13.1	53.2
-200	46.8	100.0

Potassium amyl xanthate and methyl iso-butyl carbanol were chosen as the collector and frother respectively, because of their wide use in industry. Figure 1 shows copper and molybdenum recovery as a function of collector dosage at a pH of 11.5 with 0.04 pound per ton of frother. A collector addition level of 0.04 pound per ton was adopted as the standard collector dosage to be held constant throughout the study.

Flotation recovery for copper and molybdenum is shown as a function of pH for standard water and sewage effluent systems in Figures 2 and 3. These figures indicate that a pH in the range of 11.0 to 12.0 is optimum for copper and molybdenum recovery in both standard water and sewage effluent systems. A pH of 11.5 was thus selected as the pH at which the standard test would be conducted. Figures 2 and 3 also show that sewage effluent effects molybdenum recovery far more than it does the recovery of copper.

Iron in the rougher concentrate is contributed by both chalcopyrite and pyrite. Pyrite is generally an undesirable constituent of the concentrate and therefore flotation conditions are adjusted to reject as much pyrite as possible. A decrease in the iron content of the concentrate is an indication of pyrite rejection. Figure 4 shows the effect of flotation pH on the amount of iron contained in rougher concentrate for the standard water and sewage effluent systems. Pyrite depression is substantial but not complete at a pH of 11.5. In practice, a more complete depression of pyrite is generally achieved in the cleaner flotation section.

Table 2 summarizes the standard test reagent schedule developed during the initial stage of the investigation for comparing sewage effluent with standard water.

Table 2

Reagent Schedule for Standard Water and Sewage Effluent Flotation Tests

Addition Point	Reagents, pounds per ton					
	Standard Water			Sewage Effluent		
	Lime	MIBC	Z-6	Lime	MIBC	Z-6
Grind	3.5	----	0.04	4.0	----	0.04
Condition	---	0.04	----	---	0.03	----

The lime requirement necessary to attain a pH of 11.5 was greater for sewage effluent than for standard water. In addition, less frother was required to achieve optimum frothing conditions in the sewage effluent system than in the standard water system.

Standard Water and Sewage Effluent Test Results

Table 3 shows a comparative metallurgical summary for eight standard water and eight sewage effluent flotation tests conducted on different dates over a period of several months. The table illustrates the small but measurable detrimental effect on copper recovery, and a substantially larger detrimental effect on molybdenum recovery when utilizing secondary treated sewage effluent as process water in the systems studied. The percent recovery values have been calculated at the 95 percent confidence level. The magnitude of the losses attributable to sewage effluent can be dramatically reduced by the addition of certain supplemental flotation chemicals to the system, especially in the case of molybdenum.

In addition to the quantitative metallurgical differences between sewage effluent and standard water systems evident from Table 3, a very significant difference in frothing characteristics exists between the two systems. Sewage effluent causes a voluminous, dull grey colored initial froth (without the

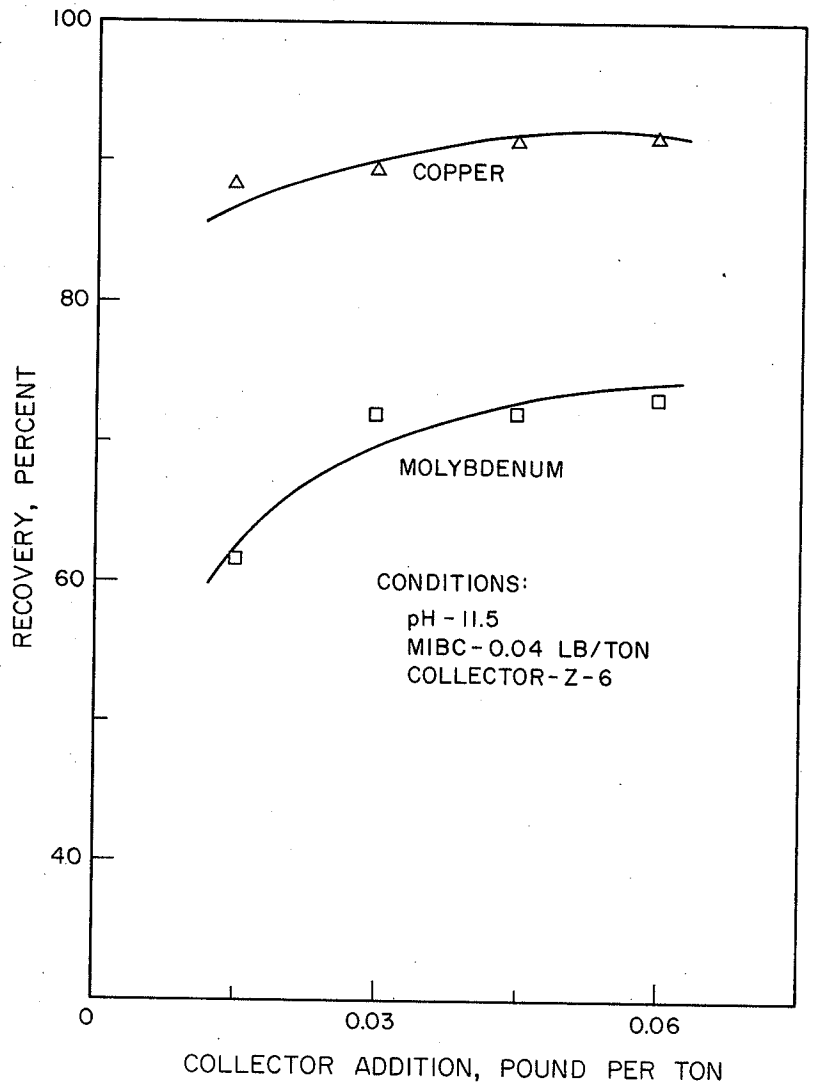

Figure 1. Copper and molybdenum recovery vs. collector addition in demineralized water.

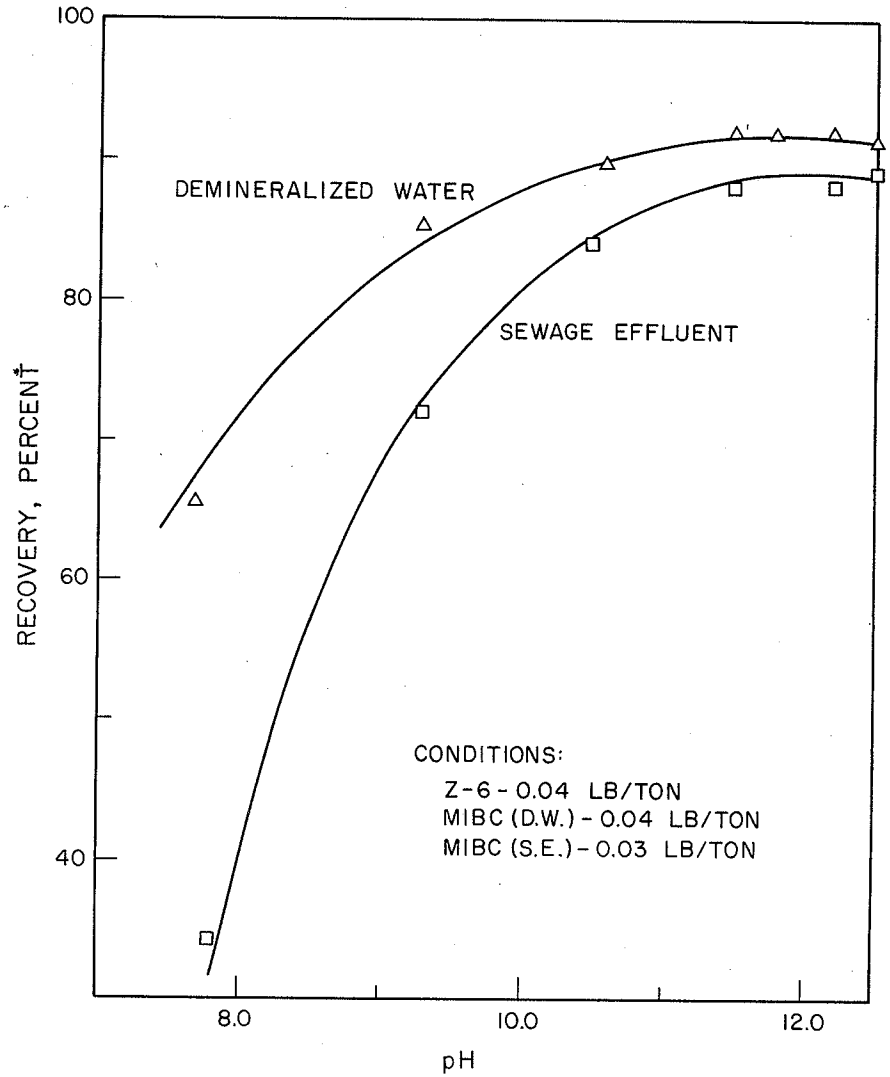

Figure 2. Copper recovery vs. pH for demineralized water (D. W.) and sewage effluent (S. E.).

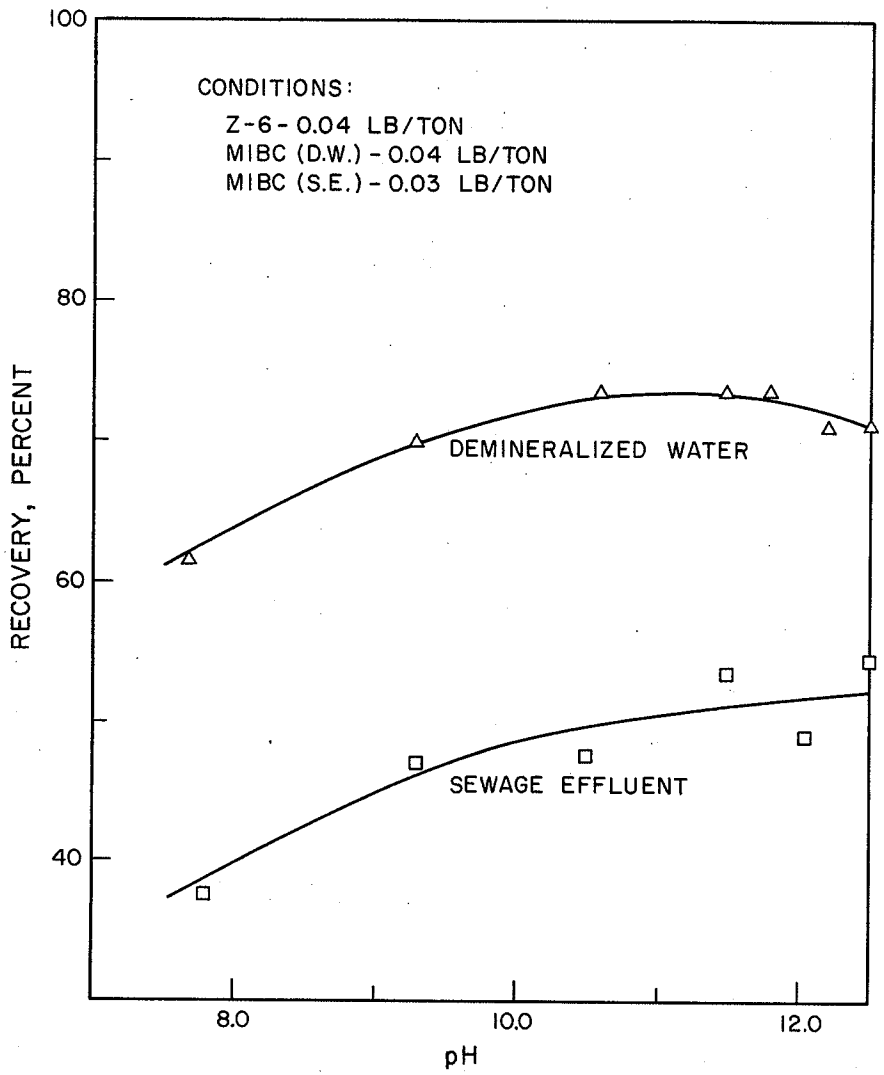

Figure 3. Molybdenum recovery vs. pH for demineralized water (D.W.) and sewage effluent (S.E.).

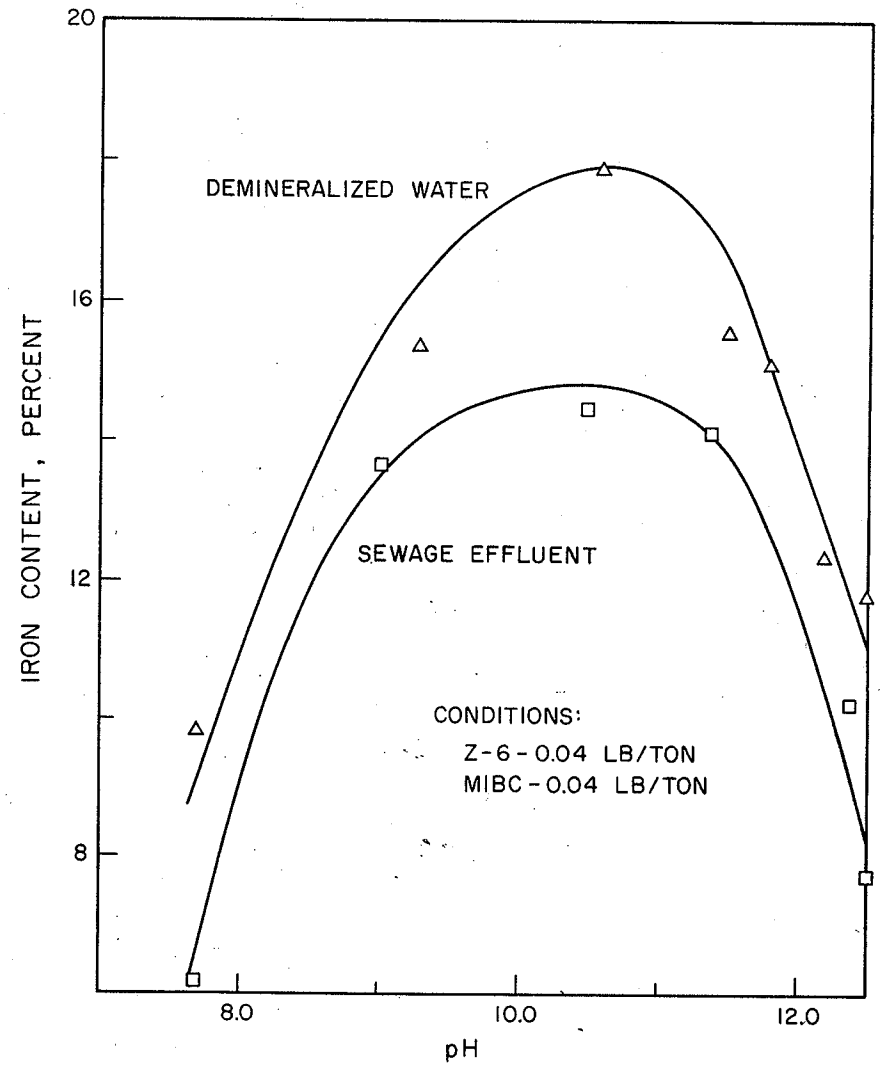

Figure 4. Percent iron in rougher concentrate vs. pH for demineralized water and sewage effluent.

Table 3

Comparative Metallurgical Summary for Standard Water and Sewage Effluent Flotation Systems

Water Type	Concentrate			Tail		% Recovery	
	Wt. %	% Cu	% Mo	% Cu	% Mo	Cu	Mo
Standard	6.8	6.52	0.120	0.055	0.0035	89.7±1.2	71.7±1.0
Sewage	8.5	5.09	0.078	0.069	0.0058	87.3±0.9	55.5±1.7

addition of frother) that has little mineral carrying capability and is difficult to control. The initial froth in the standard test is smaller in volume, and is heavily laden with a coating of bright, brassy chalcopyrite. As the standard test proceeds and the initial froth is removed, it is replaced by a froth of relatively uniform bubble size of smaller diameter than the initial bubbles. Occasionally, the larger bubbles reappear. The frequency of occurrence of the larger bubbles, the size of the smaller uniform bubbles, and the thickness and brightness of the mineral coating all diminish as the test proceeds. As the sewage effluent test proceeds and the initial froth is removed, the same gradual decrease in bubble size and mineral coating occurs. However, toward the end of the test the bubbles in the sewage effluent test give a wet, sudsy appearance and seem to contain more slime particles than the standard froth at the same point.

The first sections of this investigation, in addition to establishing a standard flotation test procedure, served to define the effects that secondary treated sewage effluent has on the flotation process when it is substituted for standard water. First, sewage effluent causes a substantial decrease in molybdenum recovery. It also causes a small but significant decrease in copper recovery. Finally, sewage effluent creates a voluminous froth, even in the absence of frother, that is difficult to control and has little mineral carrying ability. The remainder of this investigation was devoted to determining changes in the reagent schedule to compensate for the effect of sewage effluent and to examining methods of treating sewage effluent to make it more acceptable for flotation.

Dilution of Sewage Effluent with Demineralized Water

In the event that sewage effluent were utilized on a large scale by a copper concentrator, eventually the entire water inventory would be sewage effluent. It is likely, however, that the detrimental constituents of the effluent would be removed from the system by the flotation process. Therefore, the recycled water supply might consist of acceptable water and only sewage effluent added for makeup would create a problem. Consequently, the detrimental effects of sewage effluent under these conditions might not be as severe as those encountered with complete replacement with sewage effluent as practiced in tests previously reported. This possibility was evaluated by performing flotation tests using sewage effluent diluted with demineralized water.

Figure 5 shows the effects on copper and molybdenum recovery of diluting sewage effluent with standard demineralized water. Dilutions were made by mixing measured quantities of the two water types in a plastic container until a well blended solution was obtained. The data indicate a gradual, almost linear, increase in recovery for both copper and molybdenum with increasing percentages of standard demineralized water. In the case of molybdenum, however, small additions of standard water appeared to cause a disproportionate increase in recovery. In general, the improvement in recovery appears to be attributable to simple dilution of the deleterious constituents contained in sewage effluent.

Dilution of Sewage Effluent with Process Tailings Slurry

Process tailings discharged from a flotation concentrator might be used to remove some of the deleterious contaminants contained in sewage effluent. By mixing sewage effluent with process tailings slurry, the relatively high surface area of the ground ore particles might adsorb some of the undesirable contaminants contained in the effluent prior to its contact with fresh ore, and thus eliminate some of the detrimental effects that sewage effluent has on flotation recovery. A test series was conducted to determine the merits of this proposal. The tests involved establishing a reference curve using sewage effluent diluted with various quantities of clear process water, and then combining sewage effluent with samples of process tailings slurry and comparing the results thus obtained with the reference curve at the appropriate dilution. Samples used for these experiments were obtained from the Cyprus Pima concentrator. Tailings thickener overflow water was used where required, and tailings thickener underflow slurry was used where dilutions with slurry were required. Figure 6 shows the effects on copper and molybdenum recovery of diluting sewage effluent with clear process water

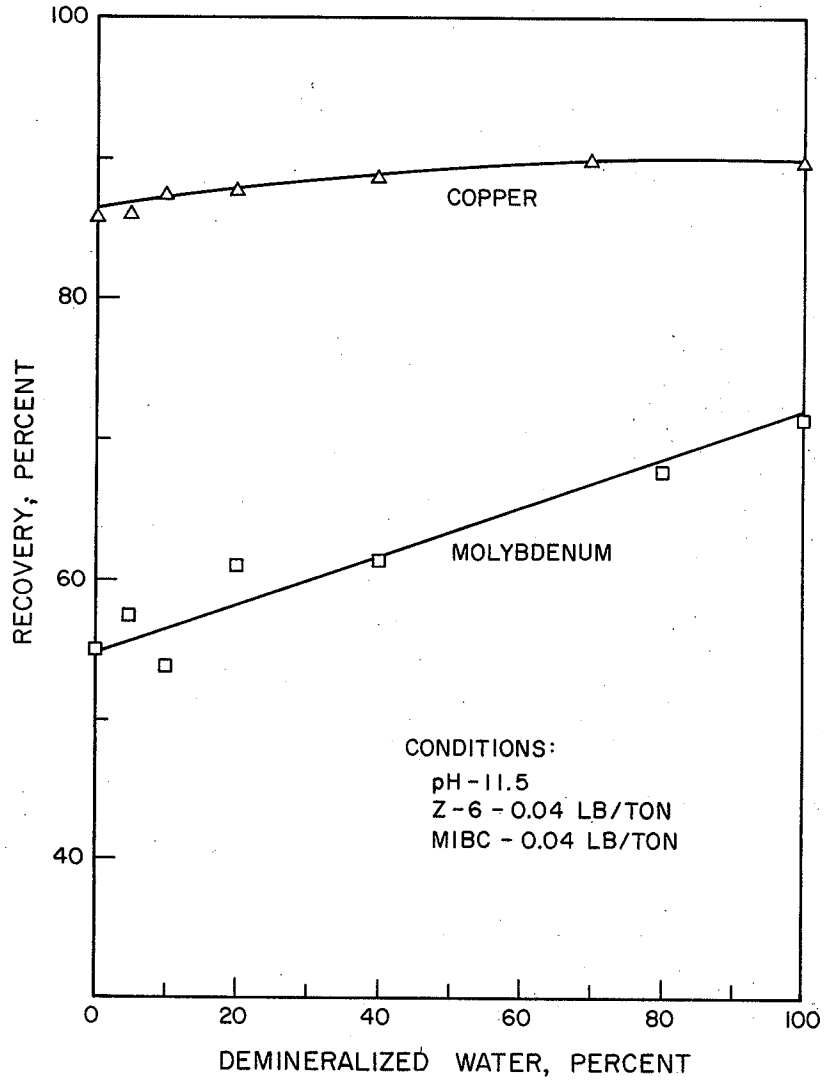

Figure 5. The effect of diluting sewage effluent with demineralized water.

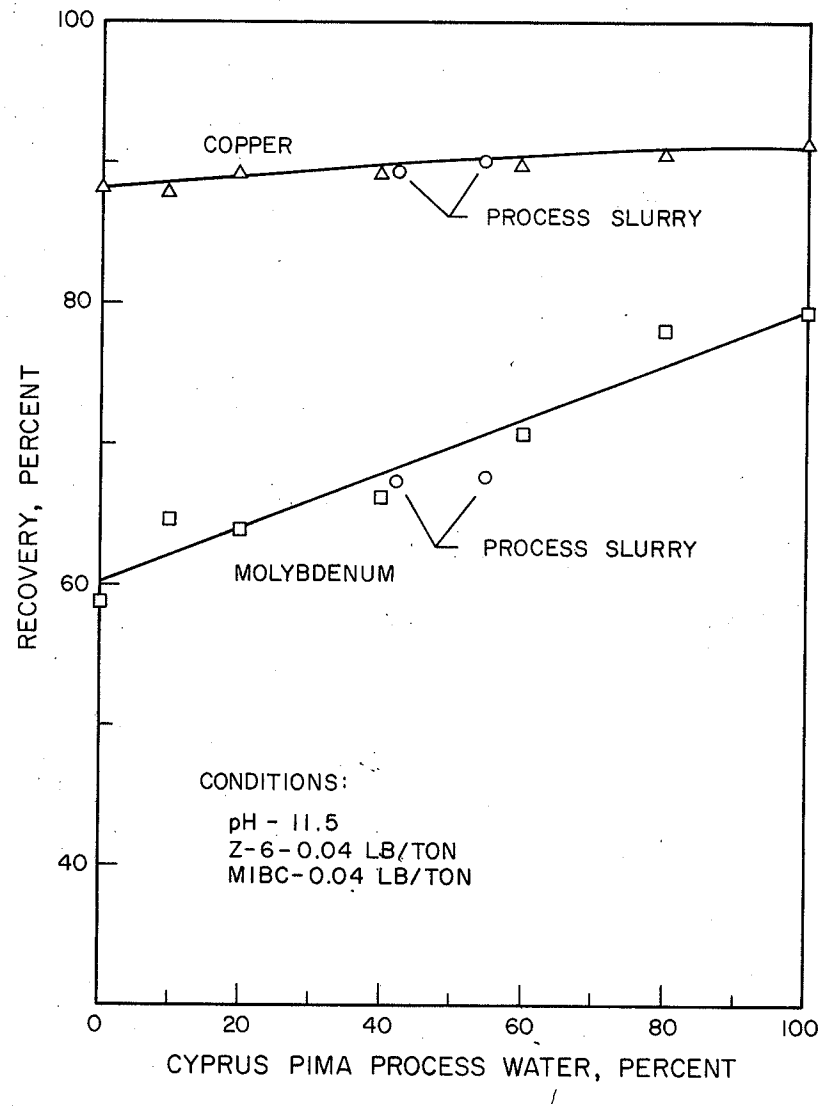

Figure 6. The effect of diluting sewage effluent with Cyprus Pima process water and process slurry.

Table 4

South Tahoe Public Utility District
Estimated Overall Plant Efficiency

Quality Parameter	Raw Waste Water Influent	Activated Sludge Effluent	Reclamation Plant: Separation Bed Effluent	Reclamation Plant: Chlorinated Carbon Column Effluent
BOD, mg/1	200-400	20-100	1	1
COD, mg/1	400-600	80-160	30-60	3-16
Suspended solids, mg/1	160-350	5- 20	0.5	0.5
Turbidity, units	50-150	20- 60	0.5	0.5
Phosphate, mg/1	15- 35	10- 30	0.4-2.0	0.2-1.0
Chlorine Demand, mg/1	Over 50	10- 50	5-10	1-3
Odor	Odor	Odor	Odor	Odorless

and process slurry. The addition of process tailings slurry to sewage effluent had no beneficial effect on flotation recovery, and the deleterious constituents contained in sewage effluent apparently do not adsorb on the surface of ground ore particles to any measurable extent. Furthermore, aging the slurry-sewage effluent solution for 2 days had no effect on water quality in terms of flotation response.

Activated Carbon Treatment of Sewage Effluent

A method sometimes employed to improve the quality of industrial and municipal waste waters is treatment with activated carbon. Granular activated carbon treatment of large quantities of waste water began in the early 1960s (Hager, 1974). The development of granular activated carbon with the capability of regeneration and reuse made adsorption an economic alternative for removal of dissolved organics and other contaminants from waste water. At Lake Tahoe, California, the South Tahoe Public Utility District uses activated carbon for tertiary treatment of more than 2.5 mgd of activated sludge effluent prior to discharge to the environment (McDonald, 1965). The water discharged from the plant has been characterized as being colorless, odorless, and crystal clear. The water reclamation plant's estimated overall plant efficiency is summarized in Table 4 (McDonald, 1965).

A laboratory activated carbon column was constructed and operated to determine the effect of activated carbon treatment of sewage effluent on flotation recovery. Table 5 summarizes the column operating conditions. Sewage effluent was pumped upward through the column at a controlled rate with a contact time of 2 minutes. No attempt was made to maximize the efficiency of the column and no chemical analysis of column influent or effluent was performed.

Figures 7 and 8 show the effect on copper and molybdenum recovery of treating sewage effluent with activated carbon. The results indicate a significant increase for both copper and molybdenum recovery when sewage effluent is treated with granular activated carbon. Further improvements in sewage effluent quality may be obtained with longer carbon contact times. Indeed, mining company personnel have indicated that they have generated water from sewage effluent using activated carbon treatment that is of a quality equal to their standard process water in terms of flotation response (Khan, 1975).

Table 5

Activated Carbon Column Operating Conditions

Carbon Description	6X16 mesh Pittsburgh Activated Carbon
Column Diameter, ft.	0.125
Area, sq. ft.	0.0123
Carbon Weight, lb.	0.77
Bed Depth, ft.	2.3
Flow Rate, gpm	0.074
Residence Time, min.	2.0

The detrimental frothing characteristics associated with sewage effluent appeared to be significantly reduced by activated carbon treatment. The initial froth generated on conditioning without frother was not as voluminous and unmanageable as with untreated sewage effluent. However, there did

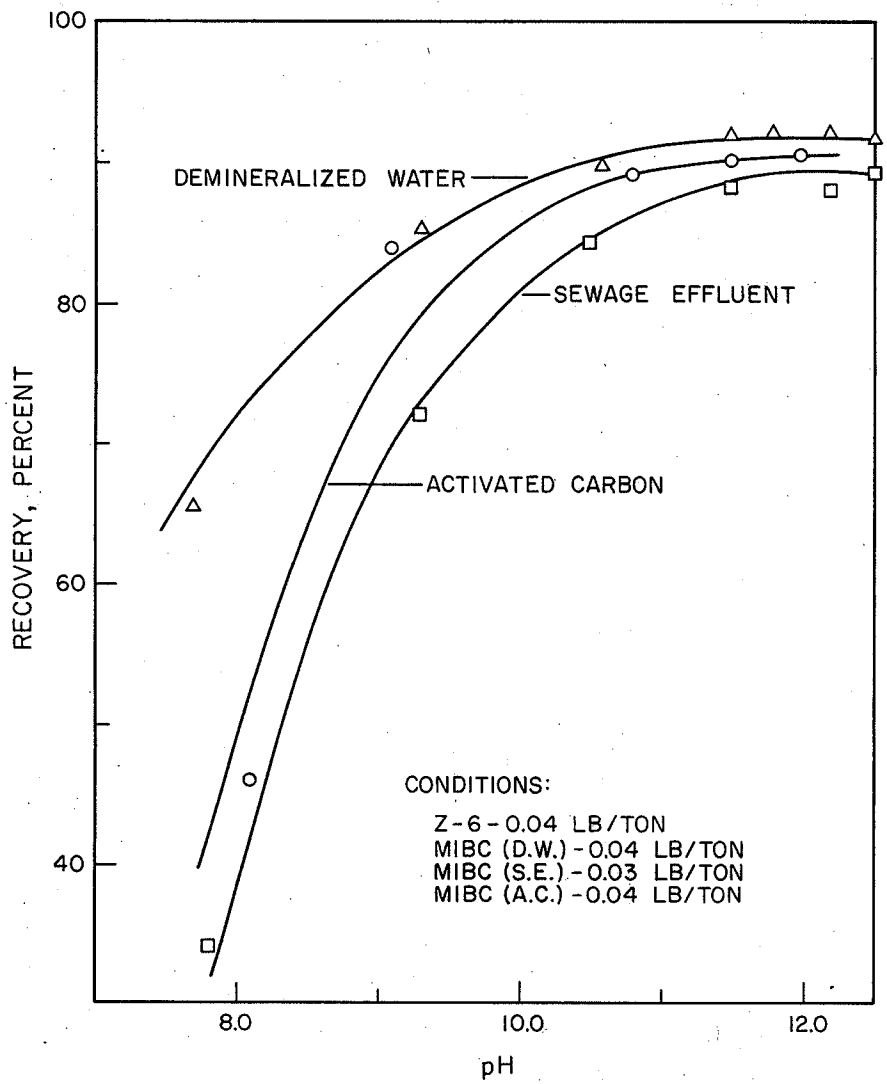

Figure 7. Copper recovery vs. pH for demineralized water (D.W.), sewage effluent (S.E.), and activated carbon (A.C.) treated sewage effluent.

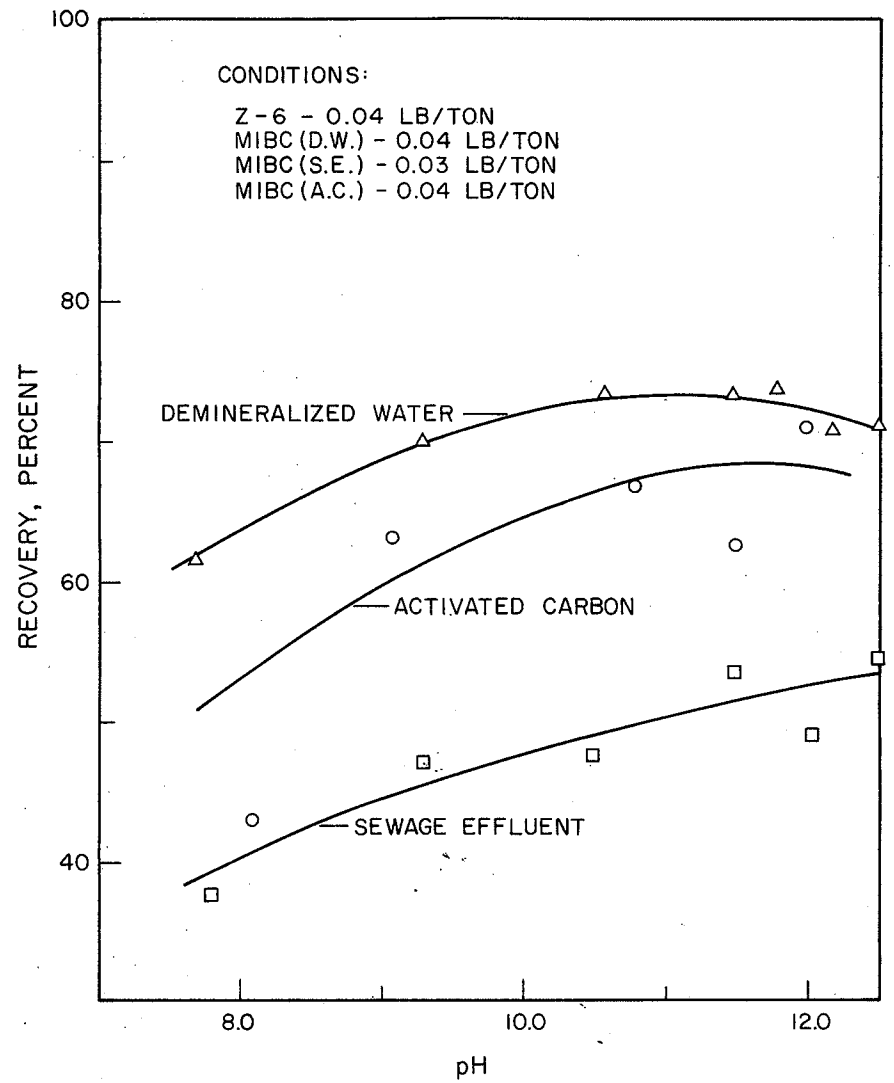

Figure 8. Molybdenum recovery vs. pH for demineralized water (D.W.), sewage effluent (S.E.), and activated carbon (A.C.) treated sewage effluent.

Table 6

Analysis of Plant Number 3 Effluent
for Fiscal Year 1974-75

Quality Parameter	Concentration, PPM	Quality Parameter	Concentration, PPM
Total Solids	656	NH_3-N	18.9
Suspended Solids	36	NO_2-N	0.2
Dissolved Solids	620	NO_3-N	0.5
Fixed Residue	469	Organic N	8.2
Volatile Residue	151	Calcium	66
Total Alkalinity ($CaCO_3$)	277	Magnesium	17
pH	7.7	Hardness	325
BOD	28	Chloride	92
COD	68	Bicarbonate	338
MBAS	0.9	Phosphate, ortho	28
Grease	9	Sulfate	146
		Sodium and Potassium	116

appear to be some minor residual frothing characteristics that are associated with untreated sewage effluent. A longer carbon contact time might eliminate most of the detrimental frothing characteristics associated with sewage effluent.

Ion Exchange Removal of Contaminants in Sewage Effluent

The number and variety of contaminants contained in sewage effluent is large. This fact is evident from viewing the typical sewage effluent analyses presented in Table 6 for plant Number 3 of the City of Tucson Roger Road treatment facility for fiscal year 1974-75 (Trueblood, 1975).

In an attempt to determine whether the deleterious constituent or constituents present in sewage effluent are cations, anions, or neutral molecules, a series of ion exchange tests were performed on sewage effluent samples. Amberlite 200, a cationic exchange resin with a sulfonic acid functional group, was loaded in the acid form and used to exchange cations in sewage effluent. Sewage effluent samples were first filtered through Whatman No. 50 filter paper, and then agitated with 250 milliliters of resin for 30 minutes in a 4 liter pyrex beaker. After cation exchange, the pH of the resulting solution was adjusted from 2.8 to 7.5 with sodium hydroxide. The water thus generated was then used in laboratory flotation tests to determine the effect of cation removal on flotation recovery. In a similar procedure, anions were removed from filtered sewage effluent using Amberlite IRA 900, an anion exchange resin with a quaternary ammonium functional group loaded in the hydroxide form. The pH of the anion exchanged sewage effluent was adjusted from 11.5 to 7.6 with sulfuric acid and the resulting effluent solution was used in laboratory flotation tests. Exchange of both cations and anions was accomplished by first exchanging cations with Amberlite 200, and then exchanging anions with Amberlite IRA 900. The pH of the resulting solution was adjusted from 10.7 to 6.7 with sulfuric acid. Table 7 shows a comparative metallurgical summary of the flotation results obtained with water generated by the foregoing procedures. Flotation results of ion exchanged sewage effluent are compared with standard water, as received sewage effluent, and filtered sewage effluent.

Table 7 illustrates that a significant increase in both copper and molybdenum recovery can be achieved by removing the anions from sewage effluent. Whether the deleterious ionic species is a simple inorganic ion, a more complex organic derivative, or a combination of both has not been determined.

Foam Fractionation of Sewage Effluent

Foam fractionation has been employed in a number of engineering applications (Kobe and McKetta, 1962 and Schoen, 1962). In one instance, alkyl benzene sulfonate and other organics analyzed as chemical oxygen demand have been removed from secondary sewage effluent (Rubin, 1963). The process of foam fractionation utilized the tendency of surfactants to accumulate at the air-aqueous interfaces formed when bubbles are generated in a liquid. This process deals with a two phase system; that is, a gas and a liquid, in contrast to froth flotation which deals with a three phase system involving one or more solid constituents.

A series of flotation tests utilizing foam fractionated sewage effluent was conducted to determine the effect on flotation of foam fractionation. Sewage

Table 7

Comparative Metallurgical Summary for Ion Exchange Test Series

	Concentrate			Tails		% Recovery	
	Wt. %	% Cu	% Mo	% Cu	% Mo	Cu	Mo
Standard Water	6.8	6.52	0.120	0.055	0.0035	89.7	71.7
Sewage Effluent	7.5	5.80	0.085	0.069	0.0053	87.2	56.5
Filtered Effluent	6.7	6.40	0.091	0.068	0.0051	87.2	56.3
Cationic Exchange	6.6	6.58	0.115	0.067	0.0044	87.5	64.9
Anionic Exchange	7.5	5.90	0.111	0.056	0.0035	89.5	71.9
Cationic-Anionic Exchange	6.6	6.95	0.117	0.059	0.0036	89.2	69.6

Table 8

Comparative Metallurgical Summary for Foam Fractionation Test Series

Water	Concentrate			Tails		% Recovery	
	Wt. %	% Cu	% Mo	% Cu	% Mo	Cu	Mo
Standard Water	6.8	6.52	0.120	0.055	0.0035	89.7	71.7
Sewage Effluent	7.4	5.86	0.093	0.065	0.0060	87.8	55.4
Foam Fractionated Sewage Effluent	7.2	5.96	0.098	0.060	0.0060	88.4	55.8

effluent was foam fractionated for 10 minutes in a laboratory flotation cell without frother. Table 8 shows a comparison of flotation results obtained for standard water, sewage effluent and foam fractionated sewage effluent.

The results indicate that foam fractionation did not improve the quality of sewage effluent in terms of flotation metal recovery. There was, however, a noticeable improvement of frothing qualities. The voluminous, unmanageable froth associated with sewage effluent appeared to be significantly reduced. Foam fractionation could be employed as one approach to froth control when utilizing sewage effluent.

Substitution of an Alternate Collector for Potassium Amyl Xanthate

A collector frequently employed in copper and molybdenum flotation is the allyl ester of amyl xanthate (S-3302). This water insoluble, oily collector is sometimes used in combination with a xanthate, fuel oil, and a frother, to give optimum copper and molybdenum rougher flotation results. Because this type of collector is also in wide use in industry, a series of flotation tests were conducted using the same procedure previously described with the exception that 0.04 pound per ton of S-3302 was added to the grinding mill in place of 0.04 pound per ton of Z-6. Figures 9 and 10 show the effect on copper and molybdenum recovery, respectively, of substituting S-3302 for Z-6 in demineralized water and sewage effluent flotation systems. Figure 9 indicates that copper recovery with S-3302 is less sensitive to pH change than is Z-6 in both standard demineralized water and sewage effluent. Above a pH of about 9 to 9.5, copper recovery is adversely affected by the substitution of S-3302 for Z-6 in both standard water and sewage effluent systems. Figure 10, on the other hand, shows that molybdenum recovery is increased dramatically over the entire pH range studied for both demineralized water and sewage effluent systems. In fact, the recovery versus pH curve for S-3302 in the sewage effluent system lies almost directly on the recovery versus pH curve for Z-6 in standard demineralized water. Figure 11 shows a comparison of the percent of iron contained in the rougher concentrate for Z-6 and S-3302 in demineralized water. Since S-3302 is already widely used by industry, the results of this test series are of fundamental interest.

Fuel Oil in Combination with Potassium Amyl Xanthate

A study of this nature could not be complete without determining the effect of fuel oil addition on molybdenum recovery in both the sewage effluent and demineralized water flotation systems. Fuel oil is almost universally used in commercial molybdenum flotation as a molybdenum promoter. Table 9 summarizes the results of a test series (using Z-6 as the collector) to determine the effect of fuel oil addition on copper and molybdenum recovery.

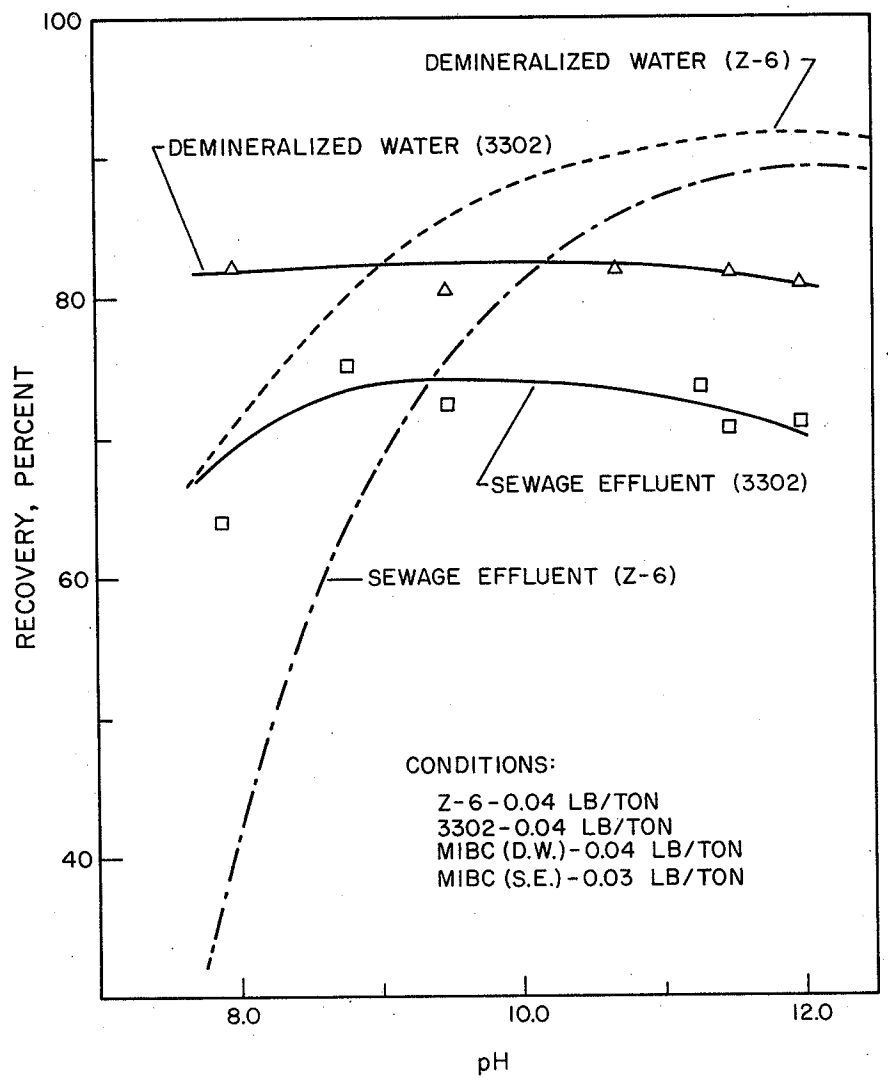

Figure 9. Comparison of copper recovery vs. pH for demineralized water (D.W.) and sewage effluent (S.E.) using Z-6 and 3302 as collectors.

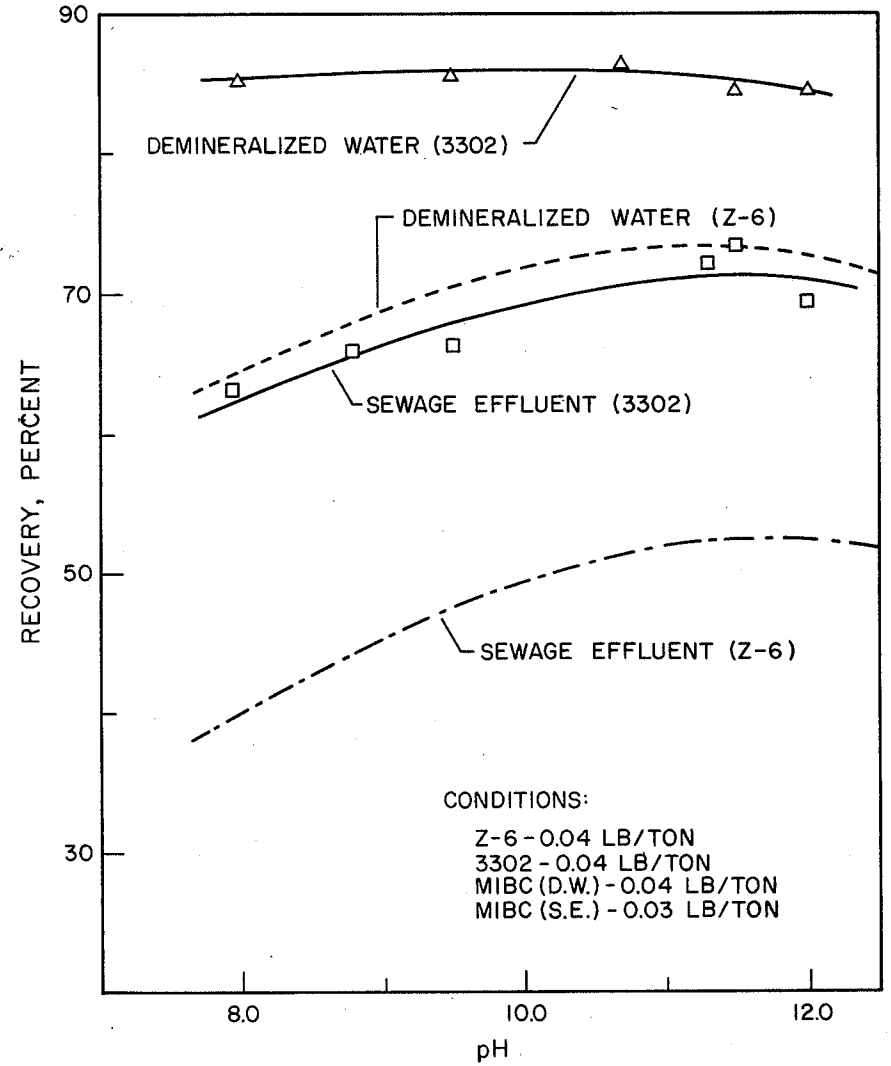

Figure 10. Comparison of molybdenum recovery vs. pH for demineralized water (D.W.) and sewage effluent (S.E.) using Z-6 and 3302 as collectors.

Table 9

Effect of Fuel Oil Addition on Copper and Molybdenum Recovery in Demineralized Water and Sewage Effluent Flotation Systems

Fuel Oil, Lb/Ton	Water Type: Demineralized % Recovery Cu	Demineralized % Recovery Mo	Sewage Effluent % Recovery Cu	Sewage Effluent % Recovery Mo
0	89.2	68.7	89.1	52.8
0.025	89.7	70.8	90.3	59.5
0.05	90.0	75.7	88.8	63.1
0.10	90.0	78.4	89.0	68.3
0.20	91.2	81.0	90.2	73.9
0.40	--	--	89.9	69.3

This table clearly indicates the beneficial effect of fuel oil addition on molybdenum flotation in both standard water and sewage effluent systems. The magnitude of molybdenum losses attributed to sewage effluent are substantially reduced by the addition of fuel oil to the system. However, the molybdenum losses attributable to sewage effluent are still significant. There appears to be no appreciable effect on copper recovery by the addition of fuel oil to the systems studied.

A Multicomponent Reagent Schedule

Most concentrators in the vicinity of Tucson employ a flotation reagent combination consisting of a primary collector, a supplemental collector, fuel oil, and a frother for the recovery of copper and molybdenum sulfides. A single "optimum" reagent combination that works equally well for all copper-molybdenum ores does not exist, and consequently, reagent schedules differ from concentrator to concentrator. The metallurgical staff for a particular operation may have invested years developing and refining a reagent combination that satisfies their operating requirements most of the time. With the foregoing in mind, an attempt was made to establish the effect of sewage effluent on copper and molybdenum recovery using a multicomponent reagent system. The emphasis in this test series was placed on reducing the large detrimental effect that sewage effluent has on molybdenum recovery.

Table 10

Multicomponent Reagent Schedule

Reagent	Quantity, Lb / Ton
Z-6	0.013
S-3302	0.027
Fuel Oil	0.025
MIBC	0.03

Previous testwork in which S-3302 was substituted for Z-6 established that a very significant increase in molybdenum recovery could be obtained by using S-3302. Since this reagent is widely used by the copper industry, it was chosen as the supplemental collector.

In the development of the multicomponent reagent schedule, the effect of S-3302 addition level on flotation response was determined. Figure 12 shows the results obtained from a test series devoted to this end. The most significant features of this figure are the large increases in molybdenum recovery accompanied by corresponding decreases in copper recovery.

To determine the interaction of Z-6 and S-3302 when both are used simultaneously as collectors, a series of tests using various combinations of these flotation reagents was conducted. The results of this series are shown in Figure 13. All tests were carried out in standard water at a pH of 11.5, with 0.04 pound per ton total collector addition, using MIBC as the frothing agent at a level of 0.04 pound per ton. Since the objective of this section of the study was to increase molybdenum recovery, a ratio of S-3302 to Z-6 of 2:1 was chosen as an acceptable collector combination. This choice was obviously a compromise between the desired higher molybdenum recovery and reduced, but reasonable, copper recovery.

The reagent schedule listed in Table 10 was selected on the basis of the cumulative experience gained in this investigation with the emphasis on minimizing molybdenum losses.

Table 11

The Effect of Sewage Effluent on Copper and Molybdenum Recovery in a Simple Reagent System and a Complex Multicomponent Reagent System

Water Type	% Recovery: Simple System Cu	Simple System Mo	Cu	Mo
Standard	89.7 ± 1.2	71.7 ± 1.0	83.1 ± 0.6	77.3 ± 1.2
Sewage	87.3 ± 0.9	55.5 ± 1.7	80.1 ± 1.0	71.9 ± 1.3

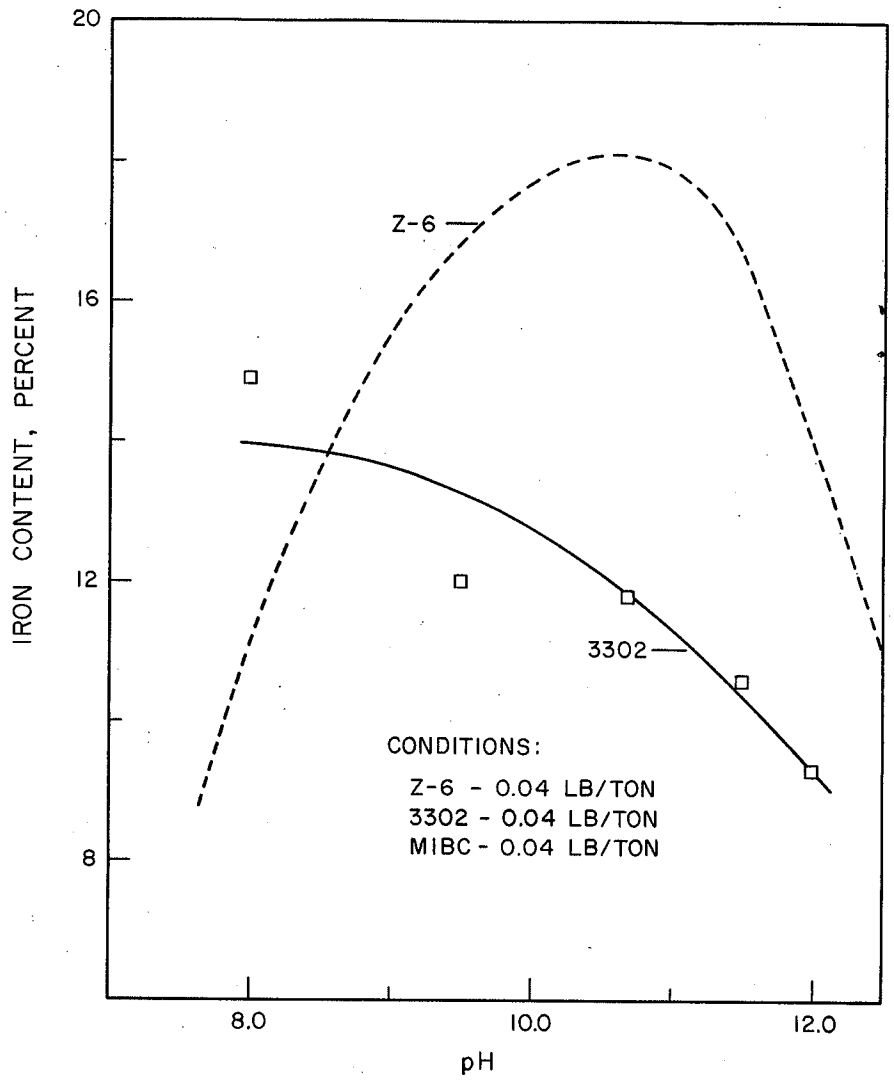

Figure 11. Comparison of percent iron in rougher concentrate vs. pH for demineralized water using Z-6 and 3302 as collectors.

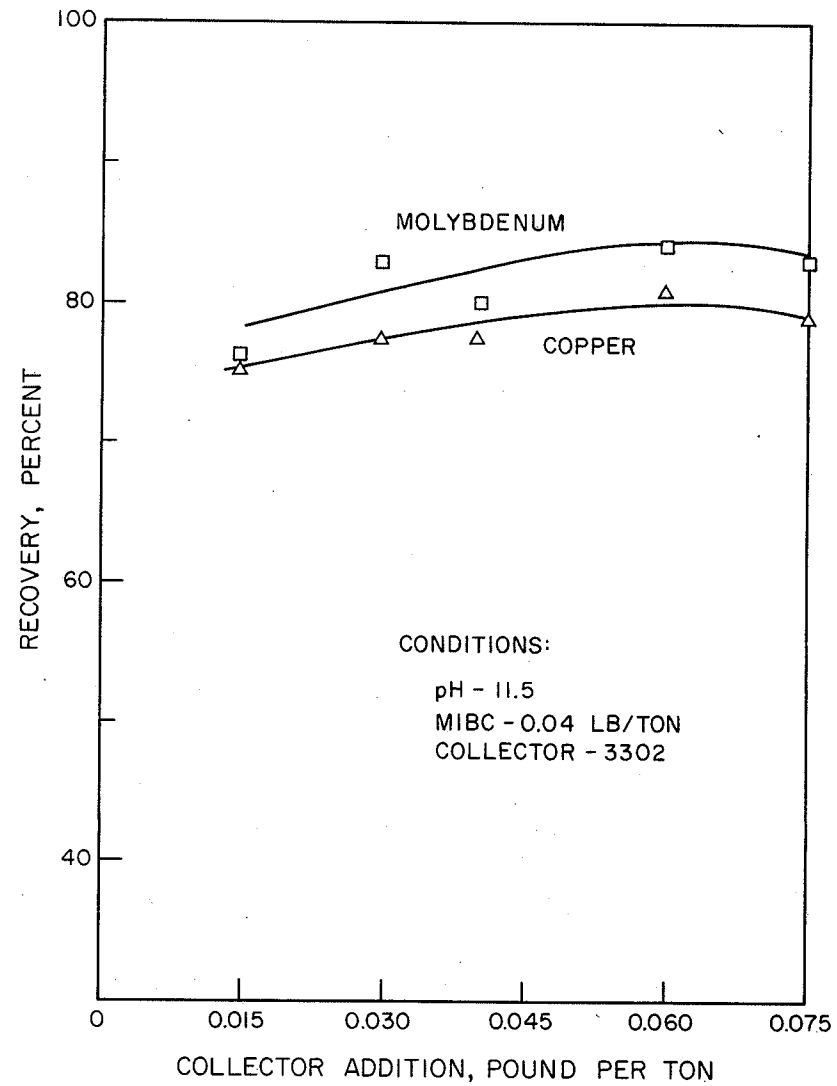

Figure 12. Copper and Molybdenum recovery vs. collector addition in demineralized water.

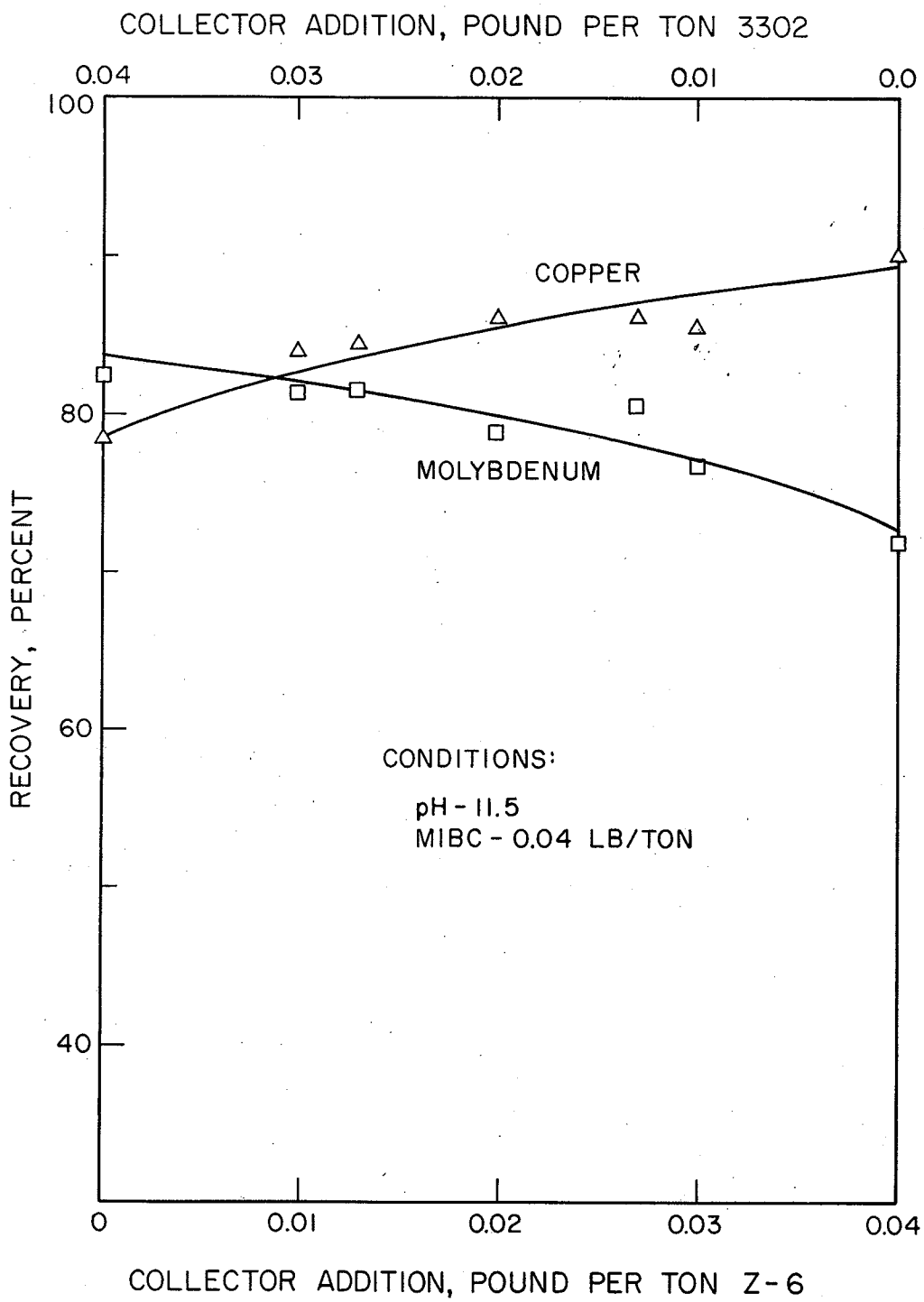

Figure 13. Copper and molybdenum recovery as a function of combined Z-6 and S-3302 at a total collector addition of 0.04 lb/Ton.

Table 11 shows a comparison of recoveries at the 95 percent confidence level obtained in standard water and sewage effluent systems for the simple Z-6 reagent schedule and the multicomponent reagent schedule described above. All tests were conducted at a pH of 11.5. Although the multicomponent reagent schedule is effective in improving molybdenum recovery, the loss of molybdenum in the sewage effluent system remains significant and the reduction in copper recovery is unacceptable.

CONCLUSIONS

The conclusions drawn from this study are intended to serve as a guideline and reference from which future investigations can proceed. They are not intended to serve as a definitive prediction of operating results for commercial scale utilization of City of Tucson sewage effluent in mineral processing. The following conclusions can be drawn from the experimental results generated in this investigation.

1. Secondary treated sewage effluent caused a small but measurable decrease in copper recovery and a substantially larger decrease in molybdenum recovery when used in place of demineralized water. In the simple reagent system used as a basis for this study, sewage effluent caused a reduction in recovery on the order of 2.4 and 16.2 percentage units respectively for copper and molybdenum.
2. Secondary treated sewage effluent creates a voluminous froth, in the absence of frother, that is difficult to control and has a reduced capacity to carry minerals.
3. Dilution of sewage effluent with demineralized water results in a proportionate reduction of the detrimental effects associated with the effluent.
4. Combining process tailings slurry with sewage effluent has no beneficial effect on sewage effluent quality in terms of flotation metal recovery. Deleterious constituents contained in sewage effluent are apparently not adsorbed on particles of ground ore.
5. Tertiary treatment of sewage effluent by activated carbon results in a significant improvement in water quality measured in terms of flotation metal recovery. Detrimental foaming characteristics of sewage effluent are significantly reduced by activated carbon treatment.
6. Ion exchange removal of anions contained in sewage effluent results in a significant improvement in water quality in terms of both copper and molybdenum recovery. In addition, the foaming attributed to sewage effluent is significantly reduced. This result indicates that the species detrimental to metal recovery are anions.
7. Foam fractionation does not improve the quality of sewage effluent in terms of flotation metal recovery. There is, however, an improvement in the deleterious frothing characteristics associated with the effluent.
8. Use of a multicomponent reagent schedule results in a significant improvement in molybdenum recovery using both demineralized water and sewage effluent. However, this reagent system causes an unacceptable loss in copper recovery.

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THE ARIZONA BUREAU OF MINES

The Arizona Bureau of Mines was created in 1915 and placed under the authority of the Arizona Board of Regents by an act of the State legislature. Under the functions mandated by the enabling legislation, the Bureau regularly provides wide ranging-service in the fields of geology, metallurgy, and mining in response to both public inquiries and requirements of the management agencies of State government. In order to carry out these diverse functions, two basic operational subdivisions have been established in the Bureau.

GEOLOGICAL SURVEY BRANCH

This branch is charged with the responsibility of acquiring, disseminating, and applying basic geologic and mineralogic history and to assist in determining the short and long range influence these have on human activity and the relative merits of alternative land use plans, and (b) assist in developing an understanding of the important controls influencing the location of both metallic and nonmetallic mineral resources and mineral fuels in Arizona.

MINERAL TECHNOLOGY BRANCH

This branch conducts research and investigations into, and provides information about, the development of Arizona's mineral resources, including the extraction, refinement, and utilization of metallic and nonmetallic mineral deposits. These activities are directed toward the efficient recovery of Arizona's mineral resources as well as insuring that the recovery methods will be compatible with the environmental aspects of the state.

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