Sonoran Desert Museum does have river otters from desert regions among its live animal specimens. You may need two such biologists, one for fishes and lower vertebrates, and one for birds and mammals. Given the low level of regard for many people who do EIS preparation in some circles, I would expect that all biologist appointments have thorough taxonomy training with their ecology training, even to the point of requiring museum experience. It is necessary to test this capability specifically and directly with prospective appointments.

(d) A GS-12 air quality specialist, with at least five years of NEPA experience in air quality. What exactly do you have in mind here? Some air quality specialists are strictly meteorology and "fate and transport types," others deal monitoring systems. Industrial development in the vicinity of national forests calls for experience in both air pollution "fate and transport" and monitoring. The air quality legislation calls for two kinds of air pollution controls, primary controls based on human health, and second controls based on welfare and environmental considerations. The latter is the "visibility" and scenic vista concern, but nothing in any of this covers the former, public health. The copper mine is a potential emitter of "Priority Pollutants," several of which are on the EPA list of 129 because of their adverse health effects. Air pollution specialists who can handle these materials are often much more experienced than the GS-12 level person you have called for.

(e) **Notably absent from the list are the following: human health specialists in epidemiology, cancer risk assessment, pulmonary physiology, occupational safety and health, exposure analysis, advanced statistics. Since the geochemistry of the region shows that airborne carcinogens will be emitted from the mining project, the absence of these specialties in the EIS committee is immediate grounds to reject any acceptance of the EIS and any decision approving the project.**

(f) **Notably absent is a chemical engineer, GS-13 or equivalent, to review the material and energy balance calculations for all the mining processes, and point out the points of emission and loss of materials, pollution discharge opportunities, process limitations for closed loop technologies, and evaluation of their effects.** Further such a specialist is probably better able to communicate with the other team members with respect to air quality issues. For reasons I have never understood, air quality is primarily in chemical engineering, and water quality is primarily in civil engineering. I make no comments about modern curricula in "environmental engineering."

(g) The proposed post-project monitoring as given in a consultant report from Westland Resources (also briefly discussed in a later item) talks about a "flow and solute model." Who produces this? What experience does that person have with large computer models of groundwater? Is a standard model to be adapted to the Rosemont Copper Mine situation? If so, it will depend on the comprehensiveness and appropriateness of the groundwater monitoring plan and the monitoring data, and who comments on the design of this plan in the EIS? And even, there are problems in adapting "off the shelf" computer models in hydrology.

3. Public Documents Available at the Green Valley Branch of the Pima County Library: On April 11, 2008, I reviewed the Plan of Operation document for the proposed Rosemont Mine prepared by the Westland Resources Company, dated July 31, 2006. This was the only document on the project deposited with the library. If there are others, they were missing.

My concerns with the document were the environmental issues, including various kinds of monitoring. The entire environmental section of interest was less than ten pages. The document lists a relatively complete listing of possible regulatory needs for this project, but it is short on specifics and full of platitudes about appropriate plans and considerations to occur down the road without any indication that anybody really knows anything about such considerations. The information provided on "sustainable principles" is laughable. I am not going to worry about the problems of paper clips when I need to examine closed-loop technologies.

The document did not address the needs listed below, and I hope the documents to be provided in the reading rooms do address these issues.

(a) Air pollution. The major discussion was control of fugitive emissions. There was no indication that air emissions related to the mining operations or processing of ores or other activities were considered.

(b) Human health aspects of air pollution. Many of the trace materials in the strata of mines in Pima County, when exposed through a mining operation and released airborne are established human and animal CARCINOGENS, notably nickel, cadmium, arsenic, beryllium, and under some special conditions iron oxides and cobalt oxides. Nickel, cadmium arsenic and beryllium are Priority Pollutants under the Toxic Substances Control Act. No consideration of the health impacts of other trace constituents present, notably lead and tungsten, were discussed either. Lead is a well known neurological and developmental toxicants.

(c) Risk assessment methodologies. When dealing with carcinogens and neurotoxins, the regulations use a risk assessment paradigm. The science of risk assessment for toxic chemicals has evolved considerably since first proposed in 1974 by then Administrator of EPA, Russell Train. No provision for a risk assessment of a single carcinogen is present in the planning document, and now one has to consider the risk assessment possibilities of multiple air pollutants because of the nature of the materials being processed. It is this situation which puts me in personal jeopardy with respect to health and welfare.

(d) Groundwater recharge waters. The plan contains a laudable idea of recharging some of the groundwater to mitigate the water losses of the aquifer. However, the quality of the recharge requires some very careful considerations with respect to the chemical and microbiological parameters. The origins of recharge water are not quite clear, but if they are from Colorado River as one apocryphal comment suggests, then there is a question of agricultural return flows causing this recharge water to be high in salinity, nitrates, and pesticides.

Nitrates can pass through the soil and sand strata untouched. Salinity will depend on the ability of the soil strata to act as a kind of ion-exchange resin to remove its excess levels, and pesticides are their special problems for groundwater.

(e) In the discussion of groundwater, there is a comment about a "flow and solute model" that will delineate DIA for the mine and demonstrate environmental compliance at selected POCs. How? Beyond the meaningless alphabet soup of acronyms, I never trust a computer model without a ground truth component. Computer models can generate artifacts and go unstable if the computer codes do not consider the effects of certain ranges and sensitivities of certain critical parameters in the model. There is no ground truth component, and by the time one realizes that non-compliance has occurred, it may be too late.

(f) Groundwater monitoring is very difficult. The Forest Service recognized that it when requested more detailed information on the groundwater monitoring proposals from the mining company. I have no idea what their response was, but it would be very appropriate to include that response in the public documents for the reading room.

In closing, I feel that the information that I have given you is so important, that I have sent it by certified mail with proof of receipt, and made it an attachment to an email to you, and I have sent copies of it to numerous people on my mailing list, including town officials of Sahuarita, and Congresswoman Gabrielle Gifford's office in Tucson..

Sincerely yours,

Joel L. Fisher (PhD)

imation
CD-R
DISC
Recordable

ERROL L. MONTGOMERY & ASSOCIATES, INC.
CONSULTANTS IN HYDROGEOLOGY

1550 EAST PRINCE ROAD
TUCSON, ARIZONA 85719 (520) 881-4912
FAX: (520) 881-1609
www.elmontgomery.com
E-MAIL: info@elmontgomery.com

ERROL L. MONTGOMERY, P.G.
WILLIAM R. VICTOR, P.G.
RONALD H. DEWITT, P.G.
MARK M. CROSS, P.G.
DENNIS G. HALL, P.G.
TODD KEAY, P.G.
JAMES S. DAVIS, P.G.
MICHAEL J. ROSKO, P.G.
DANIEL S. WEBER, P.G.
LESLIE T. KATZ, P.G.
DENNIS H. SHIRLEY, P.G.
THOMAS W. ANDERSON (1940-2005)
JEFFREY J. MEYER
JANIS K. BLAINER-FLEMING
HALE W. BARTER

FACSIMILE TRANSMITTAL FORM

DATE/TIME: April 10, 2008 @ 13:55 PROJECT NO: 1232.07

OF PAGES (INCLUDING TRANSMITTAL FORM): 3

TO: Beverly A. Everson
U.S. FOREST SERVICE
FAX #: (520)388-8305

FROM: James S. Davis FAX #: (520) 881-1609
SENT BY: JSD PHONE #: (520) 881-4912

REMARKS:

Bev,

Attached is a description and diagram of the well numbering system used by ADWR, BLM, USGS, and other agencies. I think this will explain the system better than I could do it over the telephone. Please look it over and let me know if you have any questions.

Thanks,
Jim Davis

APPENDIX A

WELL NUMBERING SYSTEM

The well numbers used in this report are in accordance with the Bureau of Land Management's system of land subdivision. The land survey in Arizona is based on the Gila and Salt River meridian and base line, which divide the State into four quadrants. These quadrants are designated, counter- clockwise, by capital letters A, B, C, and D. All land northeast of the point of origin is in quadrant A; all land northwest of the origin is in quadrant B; all land southwest is in quadrant C; and all land southeast is in quadrant D. The first digit of a well number indicates the township, the second digit the range, and the third digit the section in which the well is located. The lowercase letters a, b, c, and d after the section number indicate the well location within the section. The first letter denotes a particular 160-acre tract or quarter section; the second letter denotes the 40-acre tract or quarter-quarter section; and the third letter denotes the 10-acre tract or quarter-quarter-quarter section. These letters are also assigned in a counter-clockwise direction, beginning in the northeast quarter. As **Figure A-1** shows, well number (A-11-29)28dbc designates the well as being in the SW1/4 of the NW1/4 of the SE1/4, section 28, Township 11 North, Range 29 East. Where more than one well is within a 10-acre tract, consecutive numbers beginning with "1" are added as suffixes. For this investigation, additional well identifiers, enclosed in brackets, are added as suffixes to identify Springerville Generating Station exploration water wells, production water wells, and monitor wells.

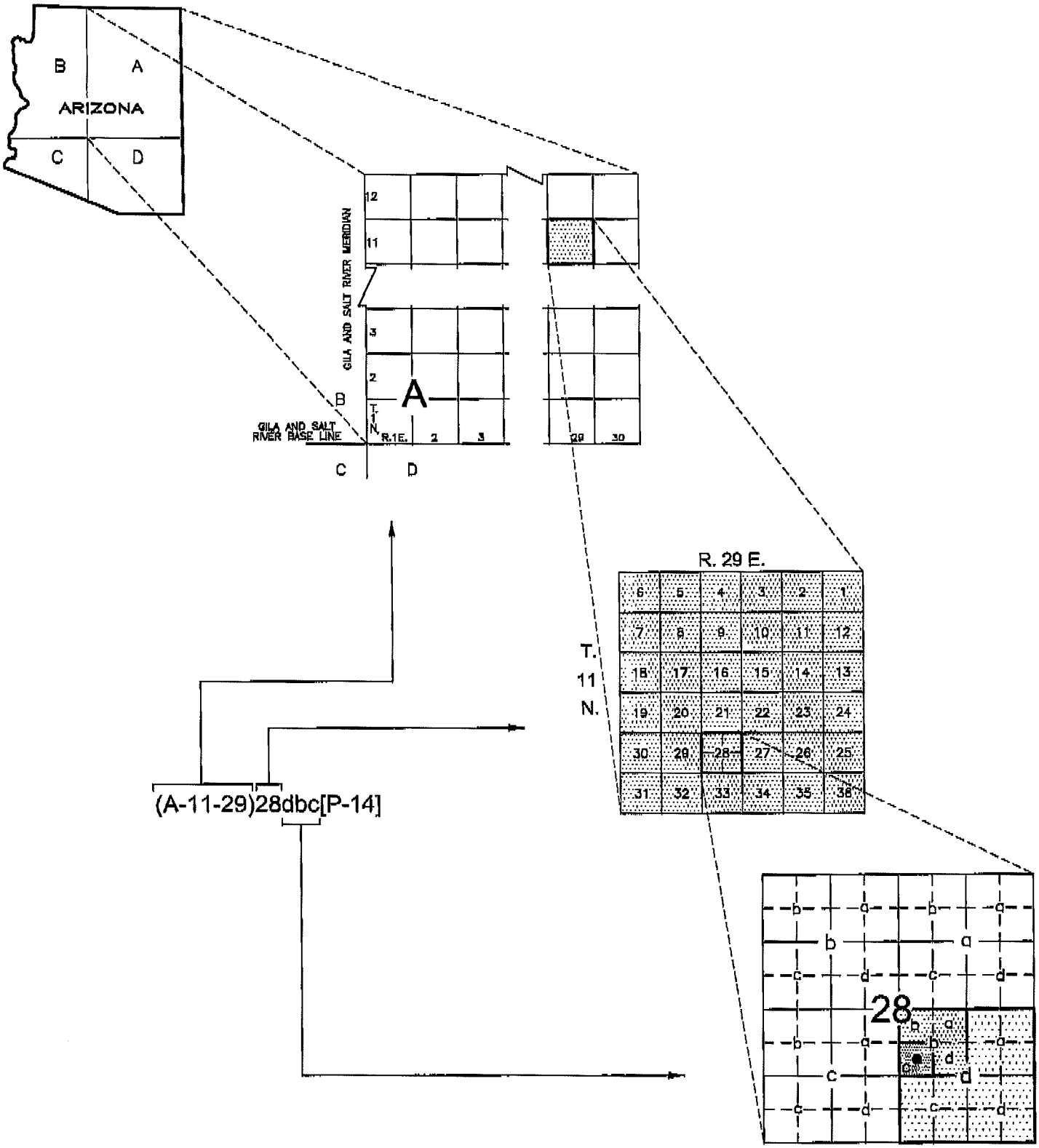

FIGURE A-1. WELL NUMBERING DIAGRAM

ERROL L. MONTGOMERY & ASSOCIATES, INC.

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:

SEE 2 PAGE ATTACHED COMMENTS REGARDING THE POTENTIAL IMPACT OF THE PROPOSED COPPER PROJECT ON OUR WELLS.

NAME: LEE M. & JUDITH W. HYDEMAN

EMAIL: hydemanaz @ hotmail.com

ADDRESS: 85 HOG CANYON DRIVE
SONOITA AZ 85637
PO BOX 623

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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Lee M. & Judith W. Hydeman
P. O. Box 623
Sonoita, AZ 85637

Rosemont Copper Project EIS
Coronado National Forest
300 W. Congress Street
Tucson, AZ 85701

Re: Impact of Proposed Rosemont Mine on our Wells

We have three wells on our property which provide water for our home, our guest house and for our horses and cattle that graze from time to time under a grazing lease we have with the Crown C Ranch.

We have three ~~questions~~ areas of concern regarding the impact of the proposed Rosemont Mine on our wells.

First. What will be the impact of the proposed Rosemont Mine operation on the level of water from these wells? Can we expect the water table to be lowered? If so, will my well run dry during any time of the year or is it likely to run dry over the proposed 20 years of operation of the mine? If so, who will pay to get water to my home and water tanks for our animals? What do you estimate the future ground water table to be during the 20 year proposed operation of the mine? Have you calculated the level of the water table given the recent history of the increasing drought conditions in our area in determining the impact of the proposed mine on the water table? If so, what have you calculated as the combined impact of these two factors?

Second. What pollution may occur, if any, on those domestic water resources from the mining and processing operations as proposed by the applicant or any possible changes in those operations over the anticipated 20 years of operation of the mine? What conditions will be imposed on the applicant to cover the potential for pollution of our water resources to assure that we and our animals are protected from personal injury and potential loss and replacement of safe drinking water

The three wells on our property are as follows:

1. Well registration no. 55-87830
2. Well registration no. 55-086801
3. Well registration no. 55-646145

Third. Will you require a bond backed by secure financial resources from the applicant to cover the cost of delivering adequate water to us, if our well or wells do go dry during the proposed 20 years of operation of the mine? How will you determine the amount of the bond to assure it will adequately cover this matter for the areas affected, so that we will have adequate protection for the delivery of water to us?

Sincerely,

Lee M. & Judith W. Hydeman

May 2, 2008

LEE M HYDEMAN
JUDITH W HYDEMAN
PO BOX 623
SONOITA, AZ 85637 0623

Class Stamp Here

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

Attn: Beverly Everson

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How to Comment Effectively

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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 April 18, 2008.

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- 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.
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- Your comments must be realistic and feasible.
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YOUR COMMENTS ARE IMPORTANT!

PUBLIC COMMENTS FOR THE PROPOSED ROSEMONT COPPER PROJECT ENVIRONMENTAL IMPACT STATEMENT

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COMMENT: NEVER MIND THAT: The mining companies have a dreadful record of what they do to the environment and the broken promises of reclamation (see Flux Canyon outside Patagonia for one); The Rosemont Mine will be located in a critical watershed for our whole area - the Santa Ritas; The lakes which supply the Colorado River are below half full and THAT affects the CAP which the mines expect to suck dry in the midst of a long period of serious drought in this area; The habitat will be forever affected for the brief extraction and cash related value of ounces of ore for tons of waste rock;The constant convoy of mine trucks will create clouds of dust, stirring up Valley Fever spores and other dangerous allergens; The 24 hour operation will require lights which will compromise the dark skies needed by the nearby ~~xxxxxxxxxxxx~~ observatories, all built at considerable expense in our area since so few dark skies are still left(are they not an important part of AZ's economy?);The income which will be lost to AZ's tourism industry is equated in the billions whereas the money, if any, paid to the state for the mining privileges is rated in the millions; The plans to contain waste toxins and other debris is no different than other mining operations and we will have the same run-off and death of streams and land we always get with mining; The Tucson Water Co. has shut down many of its wells & converted to the CAP to stop the subsidence of the entire city by pumping out the aquifer - how much will AZ pay to rebuild Tucson - from the pennies paid us by the mining companies?- Good luck; The blasting the mining companies say they will be using will surely disrupt a huge area of livestock operations, let alone people living here; All these negatives argue against this whole idea. But the biggest negative of all: WATER. As a 1992 political slogan said, paraphrased: "It's the Water Dummy". Arizona cannot, shouldnot give away its most precious resource and in the process destroy a huge swath of its environment. Even considering the idea is madness in this day of squandering what little REAL resources we have left.

NAME: Sue Hey

EMAIL: N/A

ADDRESS: Box 4 Sonoita, AZ 85637

Sue Hey

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

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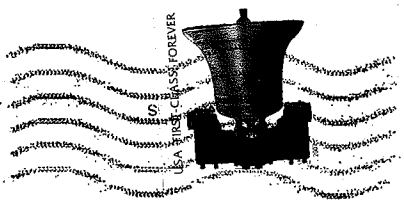
Attn: Beverly Everson

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



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FOR THE
PROPOSED ROSEMONT COPPER PROJECT
ENVIRONMENTAL IMPACT STATEMENT

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COMMENT:

This is a beautiful area used by my family since we came to Arizona in 1951, used for hunting & other outdoor recreation. It's a crucial wildlife habitat & migration corridor that links the Santa Ritas, Davidson Canyon, Cienega Creek and Rincon Mountains. With new mining activity water resources would be depleted adding to our continuing drought problems. Not to mention the eye sore, dust & tailings contamination in the area.

NAME: D. Thomas Calvin JR

EMAIL: Tcalvin65c@aol.com

ADDRESS: 1861 W. Vista Lejos
Tucson, Az. 85704

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

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TUCSON AZ 857

07 MAY 2008 PM 1 L

G. THOMAS CALVIN
1861 W. Vista Lejos
Tucson, AZ 85704

Place Class Here

USA FIRST-CLASS FOREVER

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

Attn: Beverly Everson

Tucson, AZ Service Center
Received
MAY 08 2008
Coronado National Forest

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COMMENT: A. I have been on a well in the past, not now. This would significantly drop the water levels for nearby neighbors and perhaps cause land to subside. B. we do not have enough H_2O in this area - taking from A and giving to B is not an answer. C. the damage to the area for ~~the~~ such a short mining period (app 20+ yrs) leave the community with lower water levels, dust & tailings NO place

NAME: DAVE MAHER

EMAIL: KKRISTINA845@AOL.COM

ADDRESS: 1845 VIA DEL RECOTO
GV, AZ 85614

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

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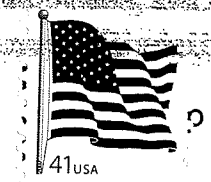

USDA Forest Service
Coronado National Forest
300 West Congress Street
Tucson, AZ 85701

Tucson, AZ 85701
Received
MAY 0? 2008
Coronado National Forest

Attn: Beverly Everson

85701+1331

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Rosemont Copper Project EIS
Coronado National Forest
300 W. Congress St
Tucson, AZ 85641

Hi,

My water is pumped from well number 55-519879. I would like to know what impact the Rosemont mine will have on my well. Can I expect the water table to be lowered? If so will my well run dry? If my well runs dry, who will pay to get water to my home? What do you estimate the future groundwater table depth to be?

Thank you for answering these questions.

Sincerely

Chuck Woodford
P. O. Box 144
Vail, AZ 85641

Rosemont Copper Project EIS
Coronado National Forest
300 W. Congress St
Tucson, AZ 85701

Hi,

My water is pumped from well number 55-519879. I would like to know what impact the Rosemont mine will have on my well. Can I expect the water table to be lowered? If so will my well run dry? If my well runs dry, who will pay to get water to my home? What do you estimate the future groundwater table depth to be? What guarantees do we have, if My wells go dry or is polluted as an indirect impact of the mine? What will Augusta do to guarantee I have water, and how long will the guarantee last. If the mine closes are there going to be funds put in a trust to cover the expense of having a well dug deeper, if the well no longer produces water is Augusta going to pipe or truck water to me, and what quality will the water be because right now I have EXCELLENT water. My home is worthless if I don't have water. Where will the water come from if they agree to supply me. How will they determine the amount of money that would be set aside in case this occurs.

Thank you for answering these questions.

Sincerely

Chuck Woodford
P. O. Box 144
Vail, AZ 85641

Jeanine Derby

Bev
for the record

Mailroom R3 Coronado
Sent by: Karina Montez

03/21/2008 08:48 AM

To Jeanine Derby/R3/USDAFS@FSNOTES
cc
bcc
Subject Re: Email for Jeanine Derby

"Alison Bunting" <abunting@sunncast.net>

"Alison Bunting" <abunting@sunncast.net>

03/20/2008 10:55 PM

To: <mailroom_r3_coronado@fs.fed.us>
cc:
Subject: Email for Jeanine Derby

I write to report my dismay at the actions taken by Coronado National Forest personnel at the "open house" to discuss the development of the environmental impact statement on the proposed Augusta Resource Rosemont Mine on Thursday, March 20, 2008 in Patagonia. When citizens in attendance expressed a concern about the format of the meeting and requested an opportunity to speak and be heard the Forest Service personnel left the meeting, 30 minutes after it started.

According your own press release the open house was "designed to allow attendees to view informational displays and ask specialists about the Rosemont Copper Project and the environmental impact statement (EIS) process, and 2) to submit written or oral comments onsite." With over 100 individuals in attendance, the small number of personnel present was not able to either answer questions or hear from even a fraction of those who wanted to receive or give information. When a change in format for the meeting was requested they did not even deign to discuss it; they just packed up and left.

Prior to the "open house" there was already strong concern that the Forest Service is just paying lip service to their responsibility to obtain public comment since the times and dates of the meeting were announced only a week in advance. I feel strongly that our rights as citizens to speak on this important issue have been seriously abridged and urge you to provide meaningful opportunities for citizen comments with a minimum of 30 days advance notice of any meetings.

Alison Bunting
P. O. Box 310
Sonoita, AZ 85637

Attn: Rosemont Team Leader
520/388-8305

YOUR COMMENTS ARE IMPORTANT!

PUBLIC COMMENTS
FOR THE
PROPOSED ROSEMONT COPPER PROJECT
ENVIRONMENTAL IMPACT STATEMENT

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5/9/2008

COMMENT:

Due Diligence. This company is a startup and has never produced revenue and as they admit in their SEC filings, they may never produce revenue.
Because so many mining operations go bankrupt before they start, finish the reclamation process, the company should have a thorough investigation before they are allowed to proceed.
The due diligence process should focus on the corporate structure of this company and in particular the owner Richard Walker and his manipulation of this and his other holdings and how they inter-relate.

NAME: Judith Hyderman

EMAIL: HydermanAz@Hotmail.Com

ADDRESS: P.O. Box 623
Sonoita, AZ 85637

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

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May 2, 2008

Re: Rosemont Copper Project EIS

Please no mining or exploration in Eastern Santa Cruz County.

I came here sick from pollution and noise in the city. Some places on this earth need to be quiet & free of pollution.

Marianne Shana
P.O. Box 946
Patagonia
AZ 85624

Shannon
Box 946
Pat, AZ 85624

TUCSON AZ 857

05 MAY 2008 PM 4 L

Forest Service
300. W. Congress
Tucson, AZ 85701

Re: Rosemont
Copper Project
EIS

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

6 May 2008

Dear Sir or Madam,

I was somewhat disillusioned and very disappointed after attending the Open House Forum on 23 April 2008 at the Elgin Elementary School concerning the proposed Rosemont Copper Project Mine Plan of Operation. At the Open House, too often questions were left either unanswered or insufficiently answered. I believe many of these questions could have been more completely addressed had an environmental impact study been completed beforehand. It seems odd to me that the Open House Forums are being held before completing the necessary studies.

It also seems peculiar to me that the National Forest Service is advocating construction of the mine. The Coronado National Forest is owned by the constituents of the United States of America – the National Forest is simply the agency assigned the duty of administering the use of the land and I do not believe exploitation is (or should be) one of their goals. The thought of the National Forest Service approving construction of a mine against the will of the people most directly and adversely affected by it, is absurd. As the name implies, the Forest Service is charged with the task of servicing forest lands, not foreign investment companies or foreign countries.

The key player in the proposed mine is Augusta Resource Corporation, which is headquartered out of Vancouver, British Columbia, and specializes in mining exploration and development. Since they are an investment company, they have the most to gain from constructing the mine and virtually nothing to lose from it. The local NBC television station in Tucson recently reported that Augusta Resource Corporation has already sold $150 million in silver futures from the proposed mine. This seems a bit premature since the forums were only recently completed and, according to the Coronado National Forest Service spokesperson present at the Elgin Forum, there is still a rather lengthy process that must be completed before the National Forest Service renders its final decision.

At the Elgin forum, I heard several people ask a ranking Rosemont Mining Company employee where the ore from the mine was going and their response was that it really did not matter as it had nothing to do with the mine or its operation. However, it does matter to some of us. The thought of a foreign investment company exploiting our country's natural resources is appalling, especially if the final destination for the minerals extracted from the mine is another foreign country.

There are several additional issues pertaining to the proposed Rosemont Copper Project Mine Plan that I would like to address: water, traffic and housing, pollution, and scenery.

Water – The proposed site of the mine is very near a large metropolitan area that is already water challenged. Extracting 5000 to 8000 acre-feet of water from an already water depressed water table is ludicrous. It does not take a hydrological engineer to determine the water table will suffer severe consequences, which means the people of Tucson as well as the residents of Sonoita, Elgin, Canelo, and Patagonia will also suffer. Santa Cruz County, which shares a common

watershed with the proposed mine site, is considering a referendum requiring land owners prove a 100-year supply of water before issuing a building permit. It doesn't sound like there is enough water available for both the people in the area and the mine and apparently the National Forest Service thinks the mine is more important than the people.

Traffic and Housing – It is estimated that the mine will employ 500 full time employees. Where will they come from? The residents of the Sonoita/Elgin area are comprised primarily of three types of people: 1) ranchers whose families in many cases have lived in the area for generations, 2) college educated professionals who are either retired or already have good jobs in Tucson, Sierra Vista, or Fort Huachuca, and 3) highly motivated and very successful contractors, who are intelligent, self-educated individuals. I doubt very seriously that any of these people are interested in employment at the mine. Consequently, where will the employees come from, where will they live, and how will they travel to and from the mine? Since there is very little housing available in the Sonoita/Elgin area affordable to people making $59,000 per year; either low-income high-density housing would have to be built in the area or the employees would have to commute from Tucson. If adequate housing were constructed in Sonoita, what would happen to the residents and the facilities after the mine closes in 20 years? Route 83 was not built for high-density traffic and 500 employees would certainly produce significant traffic. In addition, there would be 40 or more large ore-laden trucks traveling from the mine each day and then returning later the same day. Can you imagine the traffic dilemma this will produce on Route 83?

Pollution – There are several active open-pit copper mines in Arizona and numerous others that are now closed. The dust produced from the massive earth-moving equipment and transport trucks necessary to operate an open pit mine is enormous. The debris, when combined with the prevailing winds prevalent in the area, would surely produce a perpetual dust bowl. How do the mine operators or the National Forest Service plan to control the air quality? In addition, the acid used in the leach fields characteristically found around copper mining activities could eventually result in health concerns for those living nearby and an environmental hazard lasting for centuries.

Scenery – The Rosemont Mine would cover a vast area along the east side of the Rosemont Mountain Range totally destroying the splendid view and certainly adversely affecting the local habitat. The mine extends east to within a half mile of State Route 83, and a large portion of the proposed mine site is at a lower elevation than the road and will be clearly visible from the highway. From the maps presented at the Elgin Forum, it appears that most (if not all) of the actual open pit will be on private land and most (if not all) of the tailings would be dumped on public National Forest land. In addition, State Route 83 is designated a scenic highway; however, I suppose it could be reclassified as not-so-scenic (or even ugly) after construction begins since I doubt that very many people consider

the tailings from an open-pit copper mine particularly scenic? The Rosemont Mine contingency showed an interesting time-lapse projection of what the mine site will look like over the next 20 to 25 years. The final slide showed an unscathed landscape other than the open pit itself. The grass in the area will probably reclaim itself within a few years: however, I fail to see how the slow-growing oak and mesquite trees are going to miraculously reappear and reach full growth within five years of the mine shutting down?

It seems rather obvious to everyone who will be directly affected by the mine that the people involved in the initial planning have their own agenda and are concerned only with their personal selfish interests. Apparently the Rosemont Mine and Coronado National Forest management teams believe they are dealing with a group of complacent and illiterate locals, which is rather insulting in itself. They have certainly neglected to take the needs, concerns, and well-being of the people living in the area into consideration.

Respectfully Submitted,

Wayne F Tomasi

Wayne F. and Cheryl F. Tomasi
HC1 Box 35
107 Blue Sky Lane
Elgin, Arizona 85611
520-455-9278
wayne.tomasi@gmail.com

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: See attached letter

NAME: Wayne Tomasi

EMAIL: wayne.tomasi@gmail.com

ADDRESS: 107 Blue Sky Lane HC1 Box 35
Elgin Az 85611

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

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The public comment period is the important input to the analysis of

Wayne Tomasi
HC 1 box 35
Elgin, AZ 85611

TUCSON AZ 857

05 MAY 2008 PM 3 T

Attn: Beverly Everson

USDA Forest Service
Coronado National Forest
300 W. Congress Street
Tucson Az 85701

85701+1371

Ms. Everson, Please include the following in the EIS process for the Rosemount Mine.
Sincerely, Mike Rantz mike_rantz@yahoo.com

Rosemont Mine Notes

Water reclamation, who monitors it?
Runoff who monitors that?
Is land reclamation guaranteed by a performance bond?
I feel Auguesta's reclamation plan is inadequate at best.
How will air, dust and light pollution be mitigated?
How will the safety and the extra wear and tear on Hwy 83 are addressed?
What about possible Native American archaeological sites?

Mike Rantz
929 S. Los Opalos
Green Valley, AZ 85614

TUCSON AZ 857

05 MAY 2008 PM 1 T

Coronado National Forest
Supervisor's Office
Bev Everson
300 W. Congress St.
Tucson, AZ 85701

85701$1371

DeAngeli
5459 N. Agave Drive
Tucson, Arizona 85704
ejdeangeli@earthlink.net
520-690-1107

Team Leader Rosemont Copper Project
Coronado National Forest
300 W. Congress St.
Tucson, Arizona 85701

Re: Augusta Resource Rosemont Mine

Dear Sir,

I am writing to state my opposition to the Rosemont Mine in the Santa Rita Mountains. My opposition is based on the following objections:

- Depletion and destruction of our most precious resource – water. Not only are large volumes of water required for the mining process, but the byproducts of mining will pollute and disturb the watershed. Recently I read the most absurd plan – to use CAP water for the mine. How completely outrageous that water would be pumped from the Colorado River so that a foreign corporation can strip the ore from mountains of southern Arizona.
- Permanent destruction of a very special and important natural area that now provides a home to a large population of native plant and animal species.
- Permanent loss of a huge area of public land to public use. This is an important recreation area highly valued by birders, naturalists, hikers, and all those who value magnificent, undisturbed natural areas.
- There can be no justification - no number of promised jobs which are transitory at best, no amount of empty promises of environmental stewardship, no imagined influx of money to the local economy – for allowing Augusta Resource to use and abuse the lands that belong to all the people of the United States. It would be appalling under any circumstances, but the fact that the antiquated mining laws of this country allow this to take place for virtually no compensation makes the situation all the more deplorable.
- I would object to any corporation mining the proposed area, but to have not one, but now two Canadian companies that will reap the rewards and profits, sending the silver, copper, gold and other valuable minerals out of the country while leaving southern Arizonans with a legacy of environmental damage forever, simply infuriates me. When the price of metals falls, as it inevitably will, Augusta Resource will close the mine, lay off the employees, and leave behind the hideous scars on the land that will long outlive all of us.

- Dust, traffic, noise and water pollution will all be increased in the area surrounding the mine as well as for a huge swath of southern Arizona. Augusta Resource has a poor environmental record and has not adequately addressed these issues for the proposed mine, including the lack of completed hydrologic studies.
- Mining's legacy of hideous scars and tailings already assault the views along Interstate 19. Allowing another mine will only add to this sad spectacle.

In closing, I am requesting that the Forest Service consider this Rosemont proposal as part of the totality of impact by the numerous other mining proposals in southern Arizona. Also, I request that Rosemont not be allowed to continue with any activity at the proposed site until the environmental and public hearing process is complete. Rosemont needs to make all materials available for easy public access so that Arizonans have a fair opportunity to evaluate them.

Seldom do any of us have the real opportunity to positively impact the future of our beautiful land, our all-too-precious resources and our legacy as human beings. This is one of those opportunities, and I beg you to not let it pass us by.

Thank you for listening.

Sincerely,

Carole DeAngeli

Carole DeAngeli

Cc: Save the Scenic Santa Ritas
8987 E. Tanque Verde, #309-157
Tucson, AZ 85749

The Honorable Gabrielle Giffords
1661 N. Swan, Suite 112
Tucson, AZ 85712

Supervisor Ann Day, District 1
Pima County Board of Supervisors
130 W. Congress, 11th floor
Tucson, Arizona 85701

DeAngeli
5459 N. Agave Drive
Tucson, Arizona 85704
ejdeangeli@earthlink.net
520-690-1107

anta Rita Mountains. My opposition

water. Not only are large volumes of
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CAP water for the mine. How
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This is an important recreation area
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TUCSON AZ 857
05 MAY 2008 PM 3 T

Team Leader Rosemont Copper Project
Coronado National Forest
300 W. Congress St.
Tucson, Arizona 85701

85701+1331

Carole DeAngeli
5459 N. Agave Drive
Tucson, AZ 85704

Rosemont Copper Project EIS
Coronado National Forest
300 W. Congress Street
Tucson, AZ 85701

May 5, 2008

To Whom It May Concern:

When we decided to move to Tucson four years ago, part of the appeal was the scenic drive up to Sonoita. There were other reasons, of course, but that pristine Southwestern landscape appealed to our souls. After moving here, we discovered the consequences of mining after hiking the various areas, visiting Bisbee's pits and viewing the destruction of a once lovely range by Phelps-Dodge in Green Valley.

It is with those eyesores in mind that I write you in protest over the proposed Rosemont Copper Project. The huge impact of big rigs on the traffic on a two-lane highway not to mention the cost of road maintenance is frightening. We currently live in Corona de Tucson and we can attest to the destruction of the Houghton corridor by all the heavy trucks that used to travel in and out of the area when home construction was still going strong, prior to the current real estate lull. Furthermore, the folks in the upper regions will no longer have easy access to Metro Tucson without taking other routes or vice-versa. With the cost of fuel seemingly unabated, those longer routes will be a hardship for anyone required to travel on 83. Who will maintain the surface of those roads once the heavy traffic creates massive potholes on that scenic highway? Who will pay for the extra fuel imposed on the people forced to drive longer routes? Will they be compensated for the time lost waiting for the traffic to clear? Then, there is the major issue of water impact which is still being debated. What about the destruction of habitat for the desert dwellers?

When my sister-in-law recently attended the Patagonia meeting, she was sorry to discover there was not to be an open forum, simply a dispensing of literature. Will the proposed discussion hearings that are scheduled for May 12, June 7 and June 30 be as constrictive? When Yellowstone or the Grand Canyon or other national treasures were preserved for prosperity, the forces then in power had vision beyond their generation. Can we say the same of the decision makers of today? Will the generations that follow be able to enjoy the beauty of the Santa Ritas or will we point to the mountains and describe what **used to be there** to our grandchildren? Your call.

Sincerely,

Marie Dagucon
(520) 762-9350

Marie Dagucon
241 S. Nashville Ave.
Vail, AZ 85641

TUCSON AZ 857

05 MAY 2008 PM 3 T

FIRST-CLASS USA

Rosemont Copper Project EIS
Coronado National Forest
300 W. Congress Street
Tucson, AZ 85701

Tucson, AZ 85701
Received
MAY 07 2008
Coronado National Forest

85701181371

Rosemont Copper project EIS
Coronado National Forest
300 W. Congress St
Tucson, AZ 85701

My water is pumped from well number 55-531221

The legal description for the property is:

Township 19 **S-Range** 17 **E-Sec** 32

PIMA COUNTY **BOOK** 307 **MAP** 30 **PARCEL** 0670

I would like to know what impact the Rosemont mine would have on my well.
Can I expect the water table to be lowered, if so will my well run dry?
If my well runs dry who will pay to get water to my home?
What do you estimate the future groundwater table depth to be?
Will a trust be established securing funds for wells that are directly or indirectly affected by Rosemont Mine?
Will a surface and ground water study be completed describing the impacts of the Rosemont mine on the East Side of the Santa Rita's?

Thank you for answering these questions.

Sincerely,

Walter J. Karl
Evelyn A. Karl

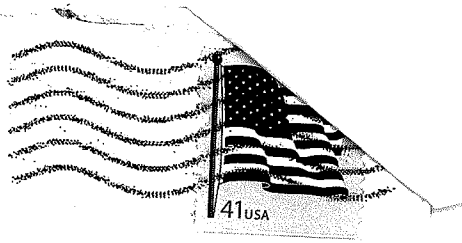
6 MAY 2008

Mr. & Mrs. Walter J. Karl
P.O. Box 894
Curly Horse Ranch Rd.
Sonoita, AZ 85637

Mailing address
physical address is in Pima County

Mr. & Mrs. Walter J. Karl
P.O. Box 894
Sonoita, AZ 85637

TUCSON AZ 857
06 MAY 2008 PM 4 T



Rosemont Copper Project EIS
Coronado National Forest
300 W. Congress Street
Tucson, AZ 85701

Tucson, AZ 85701
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MAY 07 2008
Coronado National Forest

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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:

(1) Nancarbon alternatives to copper: how are mine investors discounting the risk that this new technology will supplant copper in many applications? Is the EIS comparing different estimates and the underlying assumptions? Are investors prepared to escrow funds in case their economic model falls apart in 10-15 years?

(2) Solar panels on tailings/crater: As a gesture of good will, why don't the planners install solar collectors on the mine crater and tailings to contribute to non-polluting energy production?

NAME: ARNOLD URKEN

EMAIL: arniebu@gmail.com

ADDRESS: 1104 N Ramshead Rd
Green Valley, AZ 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

Tucson, AZ 8570
Received
MAY 01 2008
Coronado National Forest

Arnold B. Urken
1104 N. Rams Head Rd.
Green Valley, AZ 85614

TUCSON AZ 857
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USA FIRST-CLASS FOREVER

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.

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: How will this affect my well & what contamination will our water have.

I'm concerned about all the additional traffic with heavy trucks.

What about the noise 24 hr a day & the air pollution to our "quite, peaceful area"?

Our beautiful views of the Santa Rita's that we see every day will be destroyed forever!

Where will they get enough power to run a mine?

Who will take care of our water problems long after the mine closes ???

NAME: Linda Pennington

EMAIL: jays of tucson @ msn.com

ADDRESS: 20404 S. Marauders Tr
Vail, Az 85641

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

TUCSON AZ 857
30 APR 2008 PM 2 T

Place First Cl
Stamp Here

USA FIRST-CLASS FOREVER

Fold Here

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UNITED STATES POSTAL SERVICE

Attn: Beverly Everso

USPS
Permit No. G-1

Tucson, AZ 85701
Received
MAY 01 2008

Coronado National Forest

COUNTY ADMINISTRATOR'S OFFICE
PIMA COUNTY GOVERNMENTAL CENTER
130 W. CONGRESS, TUCSON, AZ 85701-1317
(520) 740-8661 FAX (520) 740-8171

C.H. HUCKELBERRY
County Administrator

May 19, 2008

Jeanine Derby
Forest Supervisor
Federal Building
300 West Congress
Tucson, Arizona 85701

Re: **Rosemont Copper Project EIS**

Dear Ms. Derby:

This letter is part of the County's continuing comments during the Environmental Impact Statement Scoping comment period for the proposed Rosemont Copper Mine project. The purpose of this specific letter is to ask for clarification on a number of issues and to ensure that certain matters are included in the EIS analysis of the proposed Rosemont action. First, I believe the Federal Register Notice requires some clarification, either by amendment or new notice.

Federal Register Notice Confusion

The purpose of the scoping period under NEPA is to notify those who may be affected by a proposed government action that the Forest Service is beginning the EIS process. This notice requirement is to ensure that interested parties are aware of, and are able to participate meaningfully in, the entire EIS process from start to finish. The scoping period should also identify the issues that need to receive in-depth treatment in the EIS and in determining the range of actions, alternatives, and impacts from the proposed government action. The duty of the Forest Service during the scoping period is to provide adequate notice and begin a meaningful dialogue (40 CFR §1501.7).

From the publication of Federal Register Notice this process has not met this required standard. Your Federal Register Notice of February 28, 2008, finally mentions the word "scoping" on Page 5 of the internet printed notice. It states, "Following the 30-day scoping period announced in this notice, the Forest Service will prepare a draft environmental impact

statement (DEIS)." However, on Page 1 of the notice it states that comments ". . . concerning the scope of the environmental impact statement (EIS) analysis must be received by the Coronado National Forest (Forest) within 30 days following the publication of this notice in the Federal Register." And again on Page 5, it states "Although comments are welcome at any time during the NEPA review, they will be most useful to use if they are received within 30 days following the publication of this notice."

As a fairly sophisticated public agency, we are somewhat confused about this notice. The general public must be completely confused as evidenced by the hostility expressed in early public meetings on this matter. In the early meetings it is obvious the public simply did not understand what they were being asked to provide. I am sure that they have little understanding of the "scoping process." Your notice states "within 30 days" in one location and "comments are welcome anytime" in another, and finally, "following the 30-day scoping period." The public must be confused as to what they are being asked to provide. There cannot be meaningful participation when the public is confused.

Finally, in the "ACTION: Notice of intent to prepare an Environmental Impact Statement" there is no indication of a scoping process being initiated, except for that section in the notice under "dates." We believe there should be re-notice in the Federal Register that is specific regarding scoping and specific regarding the purpose of the early informational meetings, which could not have been construed as scoping meetings given this notice. The new or amended notice should also include the extension of the comment period to at least the July 14, 2008 date, as announced by the Forest Service in response to Congresswoman Gifford's request, and the additional three public hearings being held currently.

Purpose and Need Do Not Conform to NEPA Standards

In the Federal Register Notice of February 28, 2008, on Page 3 of the internet-produced copy of the notice, the purpose of and need for action is defined as "The purpose of the proposed Forest Service action is to grant permission to the Company to use NFS land for certain activities related to operation of the Rosemont Mine," while on Page 5 of the notice there are at least three decision alternatives listed, including no action. If the no action alternative is selected, how can permission be granted? Forest Service officials have stated on multiple occasions, dating back to the Congressional Field hearing held in Tucson on February 24, 2007, that the Forest Service cannot deny this mine. How can the Forest Service sufficiently analyze a no action alternative after making such statements?

Another flaw in the purpose and need statement is that it is only for activities relating to operation of the mine. Does the Forest Service intend not to make any decisions with regard to closure or post-closure activities?

This purpose statement as it is currently written is inadequate, misleading, and unfairly constrains alternatives. Pima County requests that the purpose be modified to state what the project is intended to accomplish, such as " to provide copper from the mineral estate of the United States and to ensure compliance with all state, local and federal laws during and after operation of any activities relating to mining."

Alternatives to the Proposed Action

This EIS would clearly benefit from a Tiering Process. We are concerned with the development of our limited national resources. Alternatives to the proposed action are too limited or not adequately described. In the alternatives analysis, alternatives should be included that indicate the benefits derived from exploitation of the mineral estate of the nation could be accomplished at different locations and in different manners such that the adverse environmental impacts are significantly less than the Rosemont alternative. Producing copper at another location must be a real alternative. The Forest Service decision should be reviewed at the national level among competing alternatives requiring the preparation of a programmatic EIS (PEIS). At this time there are multiple proposals to develop copper from state, federal and private mineral estates in Arizona (see Attachment 1). At a minimum there should be a regional EIS, which at a regional level evaluates regional considerations. These should be completed before the site specific EIS. This process has been used by the Federal Aviation Administration to evaluate choices and alternatives to providing national aviation services.

We believe that such an alternatives analysis is certainly contemplated within the National Environmental Policy Act (NEPA). However, we also understand that such an interpretation would be fertile ground for litigation. Nevertheless, we believe such an alternatives analysis is exactly what was contemplated in the Act – to arrive at the least environmental harm for the same benefit. The concept of the alternatives analysis described above is clearly relevant in today's global economy. By what means will alternative proposals for copper extraction from the nation's mineral estate be weighed?

Water Impacts Are a Major Issue

The Upper Santa Cruz River groundwater basin is not in equilibrium and is in serious jeopardy due to the groundwater overdraft proposed by Rosemont. This is an irreversible and irretrievable commitment of vital water resources. Rosemont has initiated a slight-of hand solution to this problem by recharging Central Arizona Project (CAP) surface water. However, they are recharging this water in the Avra hydrogeologic basin 36 miles away and 800 feet below the proposed well fields. The proposed well fields are located in a different hydrogeologic basin where the aquifer is shared by residents of the Town of Sahuarita, City of Tucson, San Xavier District of the Tohono O'odham Nation, and unincorporated Pima County (Attachment 2). This replenishment is of no benefit to the affected area and would not in any way offset the groundwater depletion contemplated by Rosemont. It merely displaces CAP water that would otherwise be stored by the Arizona Water Bank in Marana.

There are numerous news reports of Rosemont extending a distribution pipeline to convey CAP surface water to a recharge site yet to be defined without specifics, contracts or financial commitments by Rosemont. This pipeline is of little or no benefit without recharge facilities that must be directly interrelated to the groundwater that is proposed to be withdrawn by Rosemont. In addition, the quality of the surface water being replaced to offset Rosemont groundwater depletion is vastly inferior in quality to the groundwater being proposed for withdrawal by Rosemont.

Water impacts to urban and agricultural users are a major adverse environmental impact of the Rosemont proposal, consisting of an irreversible and irretrievable commitment of resources, which would not be necessary except for the action of Rosemont. What specific studies will the Forest Service commission to evaluate water resource needs, impacts, and alternatives?

Peer Review Process

The responsible agency must thoroughly examine water resources, water quality, air quality, biological resources, economic effects, locally generated plans and cumulative impacts. This project clearly has complex impacts in all these categories, requiring expert analysis and review. Peer review of technical documents has been recommended as a means of improving environmental outcomes, based on a review of NEPA's inadequacies in predicting and mitigating water quality impacts (Attachment 3).

We would suggest that the Service institute an independent peer review process. The County benefitted significantly from a scientifically valid and independent peer review process when developing the sometimes controversial Sonoran Desert Conservation Plan. We believe that the scientific and technical studies necessary for defining the environmental impacts of the Rosemont proposal would also benefit from a valid and independent expert peer review process. Will the Forest Service establish such a process to validate the studies and other information provided by Rosemont? Anything less will be inadequate.

Rosemont Information Control

Perhaps the most important component of the public review process for EIS development is related to information development control and release. As previously mentioned, 40 CFR §1501.7 mandates that the scoping process bring about meaningful dialogue with affected parties. This process must be honest and completely transparent. To date, release of technical information to the general public has been largely controlled by Rosemont. The Forest Service receives documents months before they have been made available to the public. One document cited in the Plan of Operation, Westland (2007) Biological Resources and Mitigation Concept: Rosemont Project still has not been released to the public. Nor has the public had access to the Forest Service record of correspondence. This is not acceptable.

Meaningful dialogue requires the availability of relevant information. The Service must take control of this process to ensure transparency and accountability in developing the EIS of the proposed Rosemont action.

Sincerely,

C.H. Huckelberry
County Administrator

CHH/jj

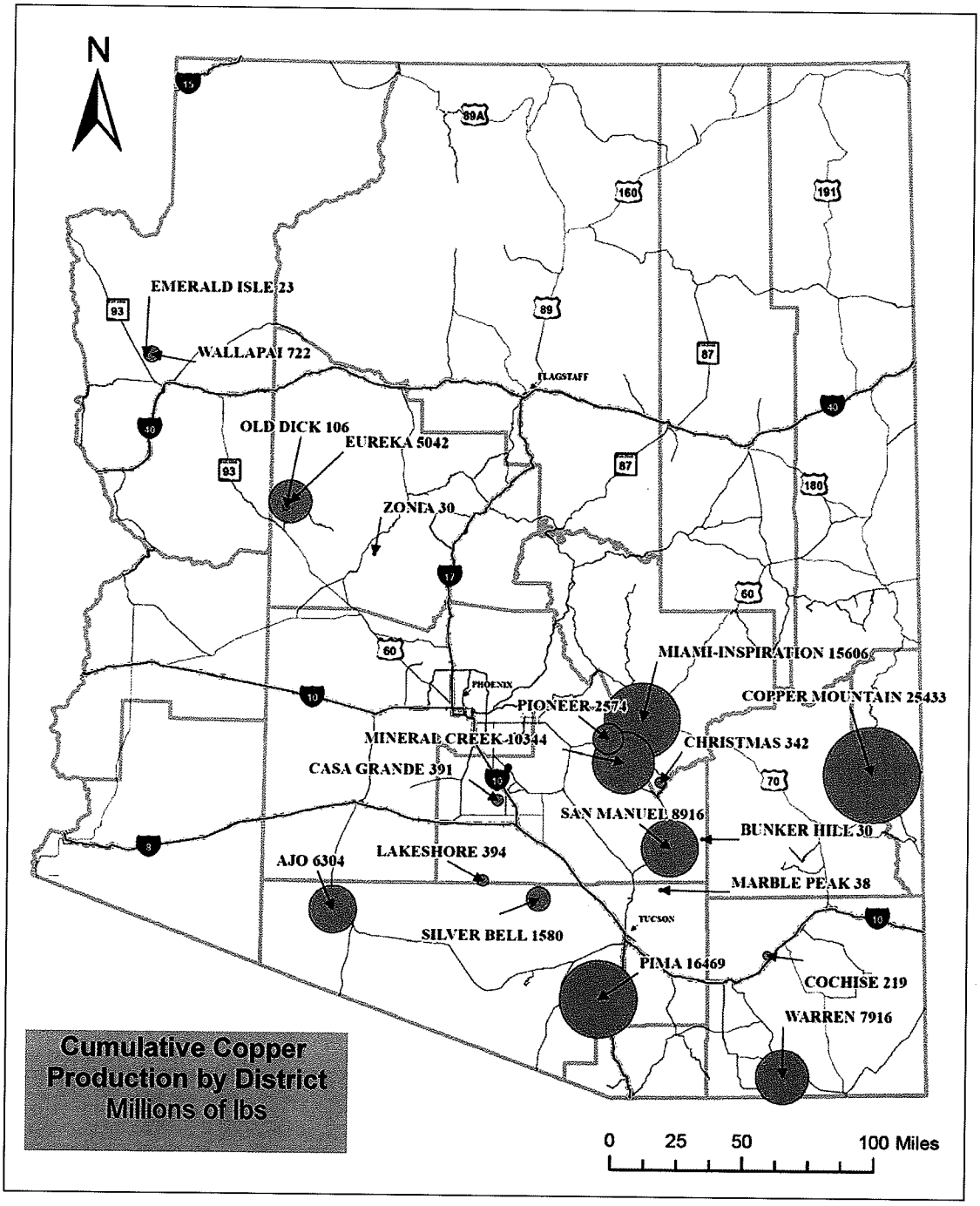
Attachments

c: Beverly Everson, Geologist, Coronado National Forest

Attachment 1

Open File Report 08-26

Arizona's Metallic Resources Trends and Opportunities – 2008



Arizona Department of Mines and Mineral Resources

Mining Summary
2008 Exploration Overview
Additional Information Sources

ARIZONA'S METALLIC RESOURCES TRENDS AND OPPORTUNITIES

Open File Report 08-26
February, 2008 v1.1

by Nyal J. Niemuth

Preface

This report was prepared to briefly highlight Arizona's metallic mineral potential and current projects. It was released to coincide with the Department's participation at the Prospectors and Developers Association of Canada (PDAC) convention held in Toronto in March 2008. It has been compiled from annual reports, websites, personal interviews, news articles, and other sources. It is acknowledged that there are additional activities and available properties not listed in this report.

About: Arizona Department of Mines and Mineral Resources

The Department promotes the development of Arizona's mineral resources. This is accomplished through technical research, field investigations, compilation of information into a mineral occurrence database, and disseminating information through publications, personal contacts, and seminars.

The Department is a service agency and does not regulate, tax, or require any type of registration. The agency provides assistance that is tailored to meet the diverse needs of the public.
The following is a partial list of services that the Department offers:

- **Maintain a site-specific database of unpublished reports and maps that includes 4,000 mine files and indexes of 10,000 computerized Arizona mineral occurrences.**
- **Maintain an information bank and library of mineral and mining information including a mine map library (hard copy and microfilm), government publications, periodicals, and unpublished master and doctorate theses.**
- **Gather and disseminate information on commodities and markets.**
- **Assist individuals and companies in their dealings with regulatory agencies to facilitate their mining and exploration activity.**
- **Produce publications in the form of mineral reports, annual directories, technical reports, annual mineral industry surveys and information circulars.**
- **Operate the Arizona Mining and Mineral Museum.**

Contact Information:
Arizona Department of Mines and Mineral Resources
1502 West Washington
Phoenix, Arizona 85007
602-771-1600
www.mines.az.gov

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Mining in Arizona

As it has for many years, **Arizona ranked first in nonfuel mineral production** in the U.S. in 2007 with a production value of $7.58 billion according to preliminary unpublished figures of the USGS and ADMMR. Arizona leads the Nation in **copper** and ranks in the top five in **molybdenum, sand and gravel, gemstones, perlite, silver, zeolites, and pumice.** Additionally, Arizona produces, or has produced, **zinc, lead, beryllium, vanadium, uranium, tungsten, rare earths, manganese, coal, and at least 18 varieties of industrial minerals.**

In 2006 Arizona accounted for 62 percent of the U.S. copper production. The copper industry had a $4.7 billion direct and indirect impact on the Arizona economy.

Arizona Mineral Production

Commodity	2005 Value[3]	2006 Value[3]	2007 Value[3]
Clay (bentonite)		$1,710,000	1,730,000
Copper	2,640,000,000	4,950,000,000	5,540,000,000
Gemstones	1,370,000	1,560,000	1,580,000
Sand & gravel	516,000,000	662,000,000	597,000,000
Stone, crushed	69,300,000	102,900,000	116,000,000
Other[1]	1,120,000,000	1,040,000,000	1,120,000,000
Coal[2]	290,000,000	190,000,000	200,000,000
Total	**$4,640,000,000**	**$6,940,000,000**	**$7,580,000, 000**

1) Includes cement, clay, lime, gypsum, gold, molybdenum, perlite, pumice, silver, salt, dimension stone, and zeolites
2) ADMMR estimate
3) Unpublished USGS data, subject to change; data rounded and may not add to totals shown; final 2005 -2007 data will be published in the Arizona Chapter of the USGS Mineral Yearbook, Area Reports: Domestic 2005 - 2007, volume II

Copper Mine Production

Mine	2006 (million lbs.)	2007 (million lbs.)
Morenci	815.6	808.0
Ray	232.9	228.9
Bagdad	165.4	202.0
Sierrita	161/6	150.0
Mission	95.6	121.3
Silver Bell	49.9	46.7
Miami	19.0	20.0
Pinto Valley	18.1	27.6
Mineral Park	9.5	11.2
Tohono	5.2	3.0
Safford	0.0	1.0
Total	**1,569.8**	**1,619.7**

Porphyry Copper

Description: Arizona hosts an impressive number of economically important porphyry copper deposits. Over 90% of the copper deposits shown in Figure 1 are of, or related to, that style of mineralization. These deposits account for a large portion of the current and historic value of mineral production of Arizona. Current production accounts for over 60% of the United States' newly mined copper. Arizona's output reached an all time annual high in 1997 of 2.7 billion lbs. while value reached an all time high of $5.5 billion in 2007. By-products of mining these porphyry copper deposits have also been significant, accounting for a large percentage of Arizona's gold, silver, and molybdenum production.

General Characteristics: Volumes of literature summarize the characteristics of porphyry copper deposits in general, as well as provide details of many specific Arizona deposits, thus making it unproductive to provide a detailed review here. See the reference listing for an introduction to the literature and deposits.

History: Deposits with current or recent production include: Morenci, Ray, Sierrita, Bagdad, Mission, Silver Bell, Miami (Inspiration), Mineral Park, Tohono (Lakeshore), San Manuel, Johnson Camp, and Copper Queen. Three properties began or renewed production in 2007: Pinto Valley open pit, the Safford project from Dos Pobres and Johnson Camp. Significant deposits awaiting development or redevelopment include: San Juan, Lone Star, Sanchez, Rosemont (aka Helvetia), Twin Buttes, New Cornelia, Cochise, Copper Creek, Zonia, and Resolution Copper. Not to be overlooked are, Carlota, production anticipated in the 2nd half of 2008, and Emerald Isle, both exotic copper deposits derived from porphyry copper systems.

Prior to the last copper price downturn, development of two deposits as in-situ leach operations seemed likely. Although it appears Santa Cruz may become a victim of its high real estate value, a portion of Poston Butte (aka Florence) is an Arizona State Land Dept. mineral lease. The Land Dept. would like to see the 300 million-ton-oxide portion of the deposit begin production. Magma Copper/BHP's feasibility study and technical data may be viewed by signing a release with Merrill Mining/Vanguard Properties.

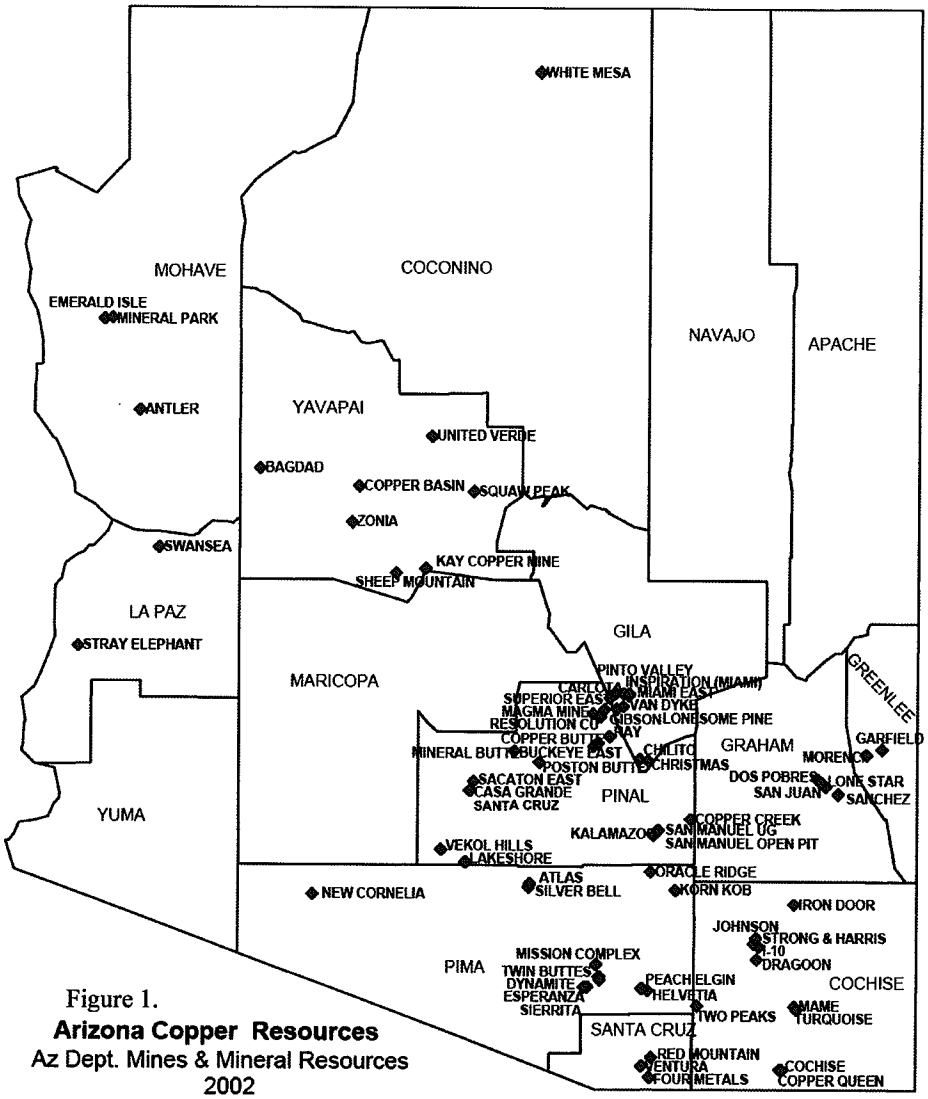

Figure 1.
Arizona Copper Resources
Az Dept. Mines & Mineral Resources
2002

Highlights of Current Activity: Copper prices that averaged $3.28/pound in 2007 resulted in a record production value of $5.5 billion. Continued strong demand and high price are driving exploration and development activity to the highest level in many years.

Morenci: Freeport McMoRan and Sumitomo invested $241 million to build the first commercial-scale copper concentrate pressure leach operation. Morenci, Arizona's largest mine, resumed concentration in 2006 to supply feed to the new plants. Two leach vessels have been installed and production is ramping up. Copper production of cathodes will be via electrowinning solutions from the new plants and continuing from heap and dump leaches. Production was 790 million lbs. in 2007. An additional $100 million will be invested in 2008 to expand mining and EW capacity, increasing production capacity by 100 million lbs. per year.

Safford Project: Expenditures of $675 million were required to construct the giant Safford leach pad, associated SX-EW plant and development of the Dos Pobres pit. First cathode production was reached ahead of schedule in December 2007 and production will increase over the next half year. Development of the adjacent San Juan deposit should begin in two years. Expected output will be 250 million lbs. of copper per year for 18 years.

Mineral Park: While continuing to mine and produce cathode copper via leach SX-EW, Mercator has pursued a plan to renew sulfide concentration of copper and the deposit's high-grade 0.04% molybdenum. Construction of a two-stage expansion of a 50,000-TPD mill has been underway since mid 2007. The $128 million first phase includes a 25,000 TPD mill that should start up in the 2nd quarter of 2008. Most of the equipment for phase 2 has been purchased and expansion to 50,000 TPD should be completed by 1st quarter of 2009.

Immediately north of Mineral Park Searchlight Exploration has assembled a 2,000 acre prospect that includes the Alum Wash/Apex Hill zone and is seeking a JV partner or lessee to conduct additional exploration.

Pinto Valley: BHP reopened the Pinto Valley mine in October of 2007 with an investment $140 million to rehabilitate the 75k TPD sulfide concentrator. They issued a $300 million contract to the Washington Group to finish mining the slice 6 pushback containing 85 million tons of mill ore at 0.41% Cu and 37 million tons of leach material at 0.21% Cu. Depending on copper prices, slices 7 and 8 may be mined.

Other Producers: A number of Arizona's other producing copper mines are receiving investments of up to $100 million to increase production to take advantage of the continued high copper prices. These include Asarco's Ray, Mission, and Silver Bell properties and Freeport McMoRan's Bagdad and Sierrita mines.

Carlota: In March 2007 a $200 million loan was arranged for the copper leach project. Quadra has moved forward rapidly with construction of the open-pit and SX-EW facility at Carlota. Completion is anticipated in the second half of 2008. Forecast annual recovery is expected to be up to 75 million lbs. per year for the mine's 11-year life.

Miami: Freeport McMoRan plans to restart mining for leach at Miami in 2010. It will invest about $100 million, primarily for mining equipment. Leaching from existing heaps produced about 20 million lbs. in 2007.

Rosemont: Since acquiring the Rosemont property in 2005 Augusta Resource has moved quickly. It completed a 30,000-meter drill program to produce a NI43-101-compliant resource estimate. Proven and probable reserves total 493 million tons at 0.47% Cu and 0.015% Mo. Plus an additional 50 million tons at 0.18% oxide ore. A progressive mining plan has been submitted to the Coronado Forest for mine dumps and plant. Augusta Resource obtained rights to Central Arizona Project (Colorado River) water to store for later withdrawal. Plans include filtering to produce "dry tailings" of less than 15% moisture to reduce water usage. Tailings will be disposed of with the carbonate rock waste that will minimize future acid mine drainage impacts on ground water quality. Additional mineralized areas of the property are beginning to be drill tested.

Resolution Copper: This deposit, with its massive size and high primary grade, continues to inspire exploration in Arizona. Resolution Copper Co., a 55/45 joint venture of Rio Tinto and BHP-Billiton continues to define the resource via surface drilling. Preliminarily reports indicate a 1.25 to 1.75 billion-

ton deposit grading 1.25% - 1.75% copper plus molybdenum. Rehabilitation work to upgrade the Neversweat tunnel and dewatering of the Magma mine continues in preparation for deepening of the No. 9 shaft. In the fall of 2007 Congress began hearings on the Southeast Arizona Land Exchange and Conservation Act to acquire land essential to development of the deposit. When in production the mine will provide approximately 25% of the United States copper needs.

Copper Creek district: Redhawk Resources has acquired a large portion of this district consisting of high-level breccia pipes and lower level porphyry copper deposits. The company has completed a NI43-101-compliant resource estimate for Mammoth, Childs-Aldwinkle, and Old Reliable and Keel zone totaling 6.4 million tons at 1.755% copper equivalent. A drilling program to expand and better define the Mammoth breccia was completed in late 2007 and will update the resource figure. Environmental studies were completed in fall 2007 allowing submittal of permit applications to develop an exploration decline into the breccia resource area. A 70,000-foot drill program drill program to expand the American Eagle porphyry, inferred resource of 150 million tons reported, and connect it to the Keel zone commenced in late 2007. The first step-out drill hole of the program contained an interval of 840.5 feet grading an average 1.4% copper and 0.033% molybdenum. Additional work is being conducted with the goal of preparing updated resources and scoping study for the project in late 2008.

Bell Resources began a 10-hole, 4,500-foot drill program on the Sombrero Butte property including portions acquired from Silver Nickel Mining in 2006. Results reported have included grades of 4.7% copper over plus 20 meters. Encouraged by the earlier results and having tested only 8 of plus 20 breccia pipe targets a Phase 2 drill 12-hole program began in fall 2007 and has recently been completed.

Zonia and Emerald Isle: Ascendant Copper Corp. (ACX) announced plans in late 2007 to acquire St. Genevieve Res. (SGV) including its assets Zonia and Emerald Isle. An October 2006 NI43-101 compliant report commissioned by SGV on Zonia in Yavapai County reported an inferred resource of 63 million tons grading 0.37% copper. A third party engineering report prepared as part of ACX's due diligence estimates that the Zonia property can be put back into leach production within 24 months producing approximately 20 million lbs. of copper annually for 17 years.

Emerald Isle is an exotic oxide copper deposit with a small "mothballed" SX-EW plant located west of Mineral Park. A NI43-101 compliant report in March 2006 based on historical drilling concluded that the property contained 2.3 million tons grading 0.62% copper.

Safford District: In addition to the major construction project being finished by Freeport McMoRan, there is also much exploration activity in the district. Freeport continues a major drilling campaign in the district with plans to further evaluate the Lone Star deposit.

Franconia Resources confirmed by drilling that the Red Knoll area contains widespread potential host rocks for porphyry copper mineralization at reasonable depths. Three holes were completed in 2007. Hole RK-4 intersected Laramide meta-volcanics displaying intense phyllic alteration, 1-3% pyrite and anomalous copper values from 979 to 2,456 feet. This may indicate proximity to a porphyry copper system. Follow up geophysics and further drilling is planned.

Entrée Gold began to test an IP anomaly on its Sol Dos property with a 6,550-foot drill program planned. Entrée Gold also entered into an agreement with Empirical Discovery LLC to explore for porphyry copper targets in southeastern Arizona.

High Desert Gold (previously General Minerals/Sprott Res.) reported in November 2007 that two 600-meter drill holes were completed at the Markham Wash property optioned by Teck Cominco. Assay results are pending.

Nord Resources completed IP and resistivity geophysical surveys in early 2007 on Coyote Springs. A drill program was planned to test anomalous IP values.

Southwest Exploration Group has assembled biogeochemical and geophysical data identifying two large alluvium covered targets, Safford West and Teague Springs, both available for additional exploration.

Copper Hill: In the Turquoise District, Aurelio Resource Corp. is developing a copper-zinc project comprised of the MAN, Courtland and South Courtland areas. Work during the last 3 years included consolidation of surface and mineral control of over 5,000 acres, acquisition of historic information including 190,000 feet of drilling data from 270 holes, as well as 76,780 feet of core from 95 holes. In

addition Aurelio has drilled 41 holes to confirm, step-out and infill the historic drilling data, which has resulted in an additional discovery of near-surface mineralization in the Courtland and South Courtland areas. An independent estimate of the Inferred Resource on the initial MAN discovery has confirmed the mineralization; 63.7 million tons at an average 0.56% copper-equivalent grade. A NI 43-101 Technical Report for the Hill Copper-Zinc project is being prepared.

Sheep Mountain: Lone Tree Exploration LLC has acquired this partially delineated copper molybdenum deposit and assembled historic exploration data. The property has had 56 core and rotary holes drilled totaling 75,000 feet. A 2007 preliminary feasibility study on only the supergene portion of the deposit concluded an 8-10k TPD operation could generate a 28% rate of return at $1.50/lb. Cu and $12/lb. Mo. The report is available at www.ammexgoldmining.com The property is available for lease or purchase.

Lebon Gold Mines controls a second area of mineralization at Sheep Mountain, west of the previously mentioned area. A drill program of 3 holes totaling 2,026 feet in 2007 found significant thicknesses of copper oxide mineralization. The holes however failed to reach to the redox boundary where historic reports of higher grades of chalcocite up to 0.8% had been reported. The company is debating further solo work or opting for a joint venture partner.

Troy Ranch: Big Bar Gold completed 4 drill holes late 2007 on the Troy Ranch prospect east of Ray where it has earned a 51% interest in a joint venture with Freeport McMoRan. Numerous intercepts of copper and molybdenum mineralization were encountered along with long potassic-altered intervals coincident with an AMT geophysical target.

Yuma King: Step out drilling by Big Bar Gold resulted in the discovery of a porphyry copper system with significant molybdenum values in a Jurassic age thrust fault complex. Favorable geology continues to the northeast and southeast that remains to be tested.

Kabba: An initial 4-hole 3,600-meter drill program by Bell Resources targeted a suspected down-faulted porphyry copper system indicated by geophysical surveys. All holes showed indications of proximity to a porphyry copper/molybdenum system. Drill hole K-4 penetrated altered and weakly mineralized granite that may be the outer shell of a porphyry copper system. A follow up drill program is being planned.

Four Metals: Black Pearl Minerals Consolidated completed a Phase 1 drilling program on this breccia pipe in 2007. The 7-hole drilling program totaled 996 meters. It confirmed grades of historic efforts while adding width and depth to the south and east sides of the deposit. Permitting is underway for additional drilling.

Monitor: Monitor is a silver gold prospect located 3 miles northeast of the Ray mine. High Desert Gold (previously General Minerals/Sprott Res.) reported that Teck Cominco terminated the joint venture agreement. Their final report recommended that two IP anomalies be drill tested for deeper porphyry copper mineralization.

Gold Hill: Teryl Resources reported in early 2008 that five RC drill holes had been completed on four separate copper targets on this patented property southeast of Bisbee. The highest grade intersect was at a depth of 275-280 feet with 4.84% Cu reported.

Mesa West, Red Hills, Silver Bell West and Superior West: In April 2007 Bell Resources entered into an alliance with Bronco Creek Exploration to jointly explore these projects, drawing on the strength of the geologic team of Bronco Creek. A drilling program has begun at Mesa Well to test a magnetic anomaly below gravel cover. Red Hills, based on previous exploration, has been reported to contain 500 million tons at 0.1% of copper oxides. Structural reinterpretation and geophysics suggests rotation of the deposit. Deeper portions of the system will be drill tested. Work at Silver Bell West is focusing on mapping and geochemical sampling to identify porphyry/skarn targets hosted in Paleozoic rocks below Mesozoic volcanics. Permitting is underway for a 2008 drill program. At Superior West there are two target types, the down-dropped extension of the high grade Magma vein system and the suspected deep-seated porphyry copper source for the vein mineralization. Drilling is scheduled to begin in the 1st quarter of 2008.

Middlemarch: This district contains multiple copper zinc silver skarn and deep-seated porphyry copper targets. In fall 2007 Southern Silver acquired an option on 68 claims and 4 state leases and is

planning a 3 to 5-hole, 1,500 meter core drilling program. Separately Minquest reports its claim block in the district is available for joint venture or lease.

Tombstone South: Southern Silver has acquired a large land package that contains multiple porphyry copper and silver replacement targets. Late in 2007 it began an initial core drill program that may total 2,000 meters.

Squaw Peak, Copper Springs, CB, and Sunnyside: American Copper has acquired these four porphyry copper molybdenum properties that contain resources reported by major companies during the early 1970s. Squaw Peak is reported to contain 20 million tons grading 0.4% Cu and 0.03% Mo. Copper Springs has a reported 20 million tons grading 0.4% Cu. Both properties are expected to have drilling programs initiated in the first quarter of 2008.

At the CB and Sunnyside, American Copper's current work program is geologic mapping and data compilation. The CB property in Yavapai County is estimated to contain 500 million tons of low-grade copper molybdenum mineralization based on previous wide spaced drilling. The Sunnyside has been reported by the USGS to contain a deep resource of 1.5 billion tons of 0.33% Cu with associated molybdenum and silver mineralization. A skarn zone containing a core drilling intercept of 124 feet grading 14% Zn, 1% Pb, 0.03 Mo and 1.4 opt Ag is adjacent to the porphyry copper resource. Four additional targets are possible. The CB and Sunnyside projects are being considered as joint ventures with larger mining groups.

Twin Peaks: The property, located in the northeastern Vulture Mountains, demonstrates widespread surface mineralization. Southwest Exploration Group reports this partially drilled, only 5 holes, copper oxide target is available.

Mohave West: Southwestern Exploration Group also has available an 800 acre claim block in Mohave county containing a target evaluated in the 1960s and 1970s. Geologic mapping and IP surveys outlined a large Laramide porphyry copper target. Only four drill holes have tested the system but all intersected thick intercepts of copper mineralization.

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Uranium

Description: Arizona's uranium production is largely attributed to deposits located in the southwestern corner of the Colorado Plateau Uranium Province. Between 1980 and 1989 Arizona was one of the leading suppliers of uranium in the United States, producing more than 13 million lbs. of U_3O_8 from four high-grade breccia pipes.

General Characteristics: Arizona's uranium deposits occur in four principal geologic environments: solution collapse breccia pipes, roll front type fluvial deposits in sandstone, deposits associated with lacustrine/paludal sedimentary facies, and metasomatic related vein deposits.

History: The first uranium production in Arizona was in 1918 from carnotite-bearing sandstone deposits located in the Carrizzo Mts. Arizona reached its production peak in 1958 with 1.6 million lbs. of U_3O_8 from 82 mines. Between 1947 and 1970 Arizona produced more than 18 million lbs. of uranium oxide and 42 million lbs. of vanadium oxide.

Price decline caused a reduction in uranium exploration and mining in the early 70s and again in the 90s. The late 70s and early 80s saw renewed interest in Arizona's uranium potential with the

producing breccia pipes averaging 0.65 percent U_3O_8. Previously mined breccia pipes include the Orphan, Kanab North, Pigeon, and Hack deposits with total production exceeding 17 million lbs. of U_3O_8.

Renewed exploration in the Date Creek Basin resulted in a major discovery. Estimates based on drilling done by U.S. Department of Energy in the 1970s indicate that the Date Creek Basin Miocene lacustrine sediments may host 1.2 billion lbs. of U_3O_8 at depths up to 3,500 feet.

Breccia Pipes: Breccia pipes are collapse structures formed when sedimentary strata collapses into caverns formed from the dissolution of the underlying Mississippian Redwall limestone. The pipes are generally 300 feet in diameter and may extend 3,000 feet vertically. Thousands of these collapse structures exist in northern Arizona; most are hidden and require diligent exploration to find. The potential for new discoveries of high-grade uranium breccia pipes is excellent. Dozens of mining and exploration companies continue aggressive land and claim acquisitions. Exploration work continues with companies utilizing ground and aerial geophysics, surface mapping, geochemistry, and follow up drilling to confirm stratigraphy and mineralization at high priority targets. Geological investigations done in the Hualapai Reservation show over 900 pipes with approximately 8% of them having recognizable mineralization or anomalous gamma radiation. In the 1980s hundreds of suspected breccia pipes were discovered through the use of satellite imagery and surface ground domain electromagnetic geophysical surveys. Hundreds, or perhaps thousands, of potentially mineralized breccia pipes, remain untested.

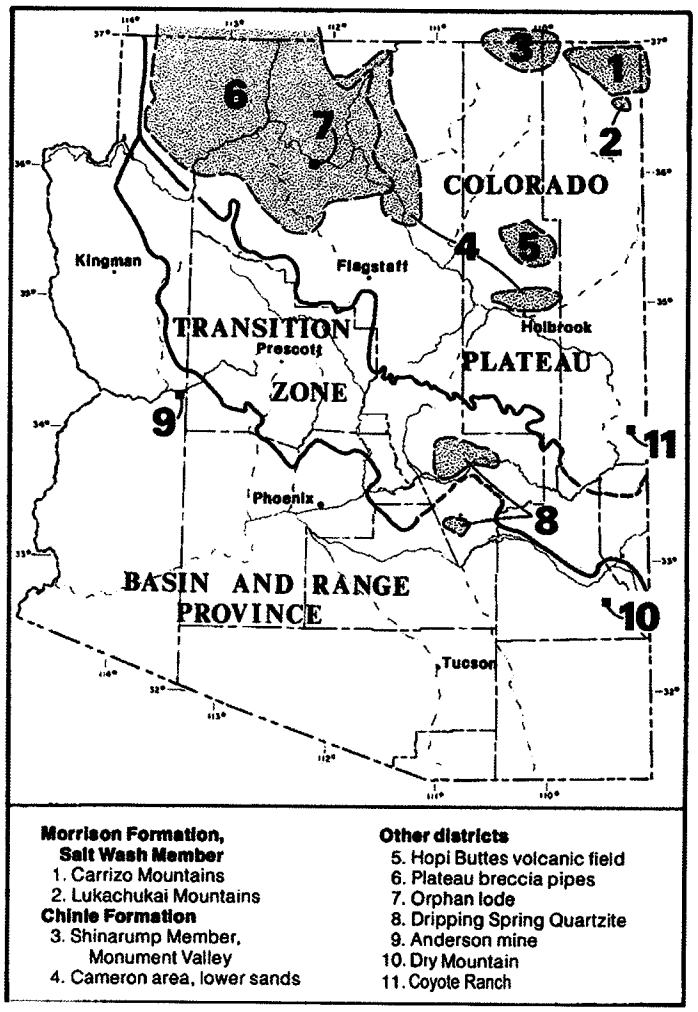

Figure 2. Areas of uranium production and occurrences – Adapted from Fieldnotes Vol. 10 no. 4

Current Activity: Denison Mines Corp. controls seven mineralized breccia pipes and a sandstone type deposit on the Arizona Strip. Denison anticipates its fully developed Arizona 1 (70,000 tons at 0.68% U_3O_8) will be on-line by mid-2008. Denison's other Arizona properties include the developed Pine Nut deposit (99,000 tons at 0.40% U_3O_8), the partially developed Canyon Pipe property (70,000 tons at 1.0% U_3O_8), and the Moonshine Springs sandstone deposit with a resource estimate of 775,000 tons grading 0.16% U_3O_8.

Liberty Star Uranium and Metals continues exploration on their North Pipes Project in the Arizona Strip, with encouraging results from their extensive geochemical sampling campaign. Drilling is underway on the Neola property, a confirmed breccia pipe, with three other high priority targets scheduled to be drilled.

Mesa Uranium drilled two holes to test and confirm previous drilling conducted on the Moonshine Springs deposit by Exxon in the 1970s. The drill holes confirmed the Exxon intercepts of 6 feet at 0.40% U_3O_8. The deposit is a mile from Denison's Moonshine Springs deposit.

Vane has five confirmed pipes out of 39 properties, with the Miller Pipe containing a 20-foot drill intercept of 1.8% U_3O_8. Seventeen targets have shown mineralization at the surface.

Quatara, in early 2007, contracted Geotech Ltd. to conduct the first extensive test of an airborne time-domain electromagnetic system on the Arizona Strip to identify mineralized collapse structures. The VTEM system has identified anomalies related to collapse structures in a majority of the known breccia pipes as well as 200 additional anomalies with similar geophysical signatures. The VTEM system may prove to be a successful breccia pipe exploration tool. Quaterra has drilled 17 prospective targets; 9 tested negative, 5 intersected breccia structures and need deep drilling, 2 intercepted mineralization and need additional drilling, and 1 VTEM anomaly is being drilled.

VMX Resources has optioned the Rose pipe from Energy Metals (now Uranium One). Historic drill information on the Rose pipe shows an intercept of 11 feet of 1.0% U_3O_8.

Takara Resources and DIR Exploration's Kaibab Joint Venture project has identified seven drill ready breccia pipe targets discovered as a result of previous geophysical and geochemical surveys.

Tournigan continues active drill programs on prospective targets in the Arizona Strip and Coconino Plateau.

Dumont Nickel has acquired 132 unpatented mining claims (Redwall Uranium Property) also on Strip. Air photo and remote imagery interpretation completed in October 2007 identified 43 circular photo-anomalies on the property that are possible manifestations of buried breccia pipes. Ground follow-up of the targets by Dumont field crews during November led to the discovery of five collapse features with diameters ranging 200 to 600 feet. Continuation of field surveys will delineate future drilling targets.

Energy Fuels has 25 pipe targets. Five of the targets are confirmed breccia pipes based on historical data from prior drilling results. Exploration efforts are underway to systematically explore all of the potential pipe targets.

Eagle Hill Exploration has acquired the Rimshot and Lombardo exploration properties with a total of 157 potential pipe targets.

Metasomatic Veins: The Dripping Springs formation in central Arizona is a past uranium producer. The uranium occurs as narrow veins and disseminations within low-grade metamorphic rocks of Proterozoic age. The ore zones are typically stratabound and occur near diabase dikes and sills. Ore from past production averaged 0.12 % to 0.22 % uranium.

Current Activity: Rodinia Minerals currently controls the Workman Creek and Red Bluff properties in the Sierra Ancha Mountains. Recent estimates from drilling indicate resources of over 9 million lbs. of U_3O_8. Previous production from mines in the area total more than 115,000 lbs. of U_3O_8.

Golden Patriot's multi-hole drilling project on the past producing Lucky Boy mine has returned positive results showing U_3O_8 grades from 0.12% to 0.13%. Past production from the mine included more than 2,000 tons of 0.16 % ore in the 1950s and 10,000 lbs. of U_3O_8 from heap leach operations in 1979.

Lacustrine/Paludal Type: Resource studies show that the Date Creek Basin may contain large low-grade resources on the order of 1.2 billion lbs. of uranium. There are a number of past producing mines and previously drilled properties that have been acquired in the Date Creek, Safford Basin, and New River areas of Arizona. Most of the properties are situated within Tertiary age lacustrine/paludal sedimentary rocks. The uranium mineralization occurs as stratabound units in carbonaceous siltstones and mudstones. These sedimentary rocks were deposited in alkaline or saline lakes. Uranium mineralization is related to the calcrete deposit model that hosts some of the largest uranium resources in the world.

Current Activity: Concentric Energy is evaluating extensive historic data on the past producing Anderson Mine. Confirmation drilling, completed in late 2006 verified 43% of historic resource estimates. Universal Uranium has acquired properties further west in the Artillery Peak area with uranium mineralization and stratigraphy similar to the past producing Anderson Mine. Uranium Energy is evaluating historic data for its Dry Mountain deposit southeast of Safford and New River, aka Los Cuatros, property located north of Phoenix.

Roll front/Fluvial deposits: The Mogollon Rim in central Arizona has 80 linear miles of Paleozoic rock outcrops. Anomalous radioactivity and anomalous uranium in outcrops is widespread. Excepting Promontory Butte, little systematic exploration of the area has occurred. The host rocks for the deposit are the Pennsylvanian and Permian age Supai group. Mineralization is associated with coalified plant remains and is located in fluvial channels with variable lithology grading from black shale to conglomerate.

Current Activity: Rodinia Minerals drilled its Mormon Lake property to confirm stratigraphy and mineralization outlined in previous exploration data. Uranium Energy is currently reviewing historic information on its recently acquired Coyote Ranch property east of Springerville. Occidental Petroleum drilled 14 holes in 1981 that indicated uranium mineralization in the Tertiary age de Baca formation at depths less than 300 feet that may be amenable to in situ recovery.

Arizona's Exploration Potential: Fueled by high uranium prices exploration for uranium in Arizona is at level not seen since the uranium boom of the 1950s. Facilitating uranium mining in Arizona, Denison's White Mesa Mill located in southeast Utah has initiated an ore-buying program for independent uranium mining operations to sell their uranium ore to Denison. The ore-buying schedule ranges from $55.31 for 0.01% grade material to $281.16 for 0.35% grade material. Denison is also offering a transportation allowance ranging from $5.00 to $22.50 per ton depending on transport distance.

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Descriptive model for solution collapse breccia pipes uranium deposits - http://pubs.usgs.gov/bul/b2004/model32e.pdf

Arizona's Uranium 2008, Google Earth KML file, available on line at: www.mines.az.gov/info/AzUranium.zip

Gold

Description: Arizona's cumulative gold production exceeds 16 million ounces contributed from 219 metallic mineral districts. Twenty-six of those districts have produced more than 100,000 ounces and 46 have produced more than 10,000 ounces. Arizona hosts a number of deposits with known potential to produce a few hundred thousand ounces or more. Gold recovery has been from a wide variety of deposit model types with the most important being epithermal (quartz adularia) veins, the more recently recognized detachment fault-associated deposits, porphyry copper, and volcanogenic massive sulfide. Economic deposits have formed during four widely diverse geologic periods: Proterozoic, Jurassic, Laramide, and Mid-Tertiary.

History: Recent primary producers include: Copperstone - produced 500,000 oz, McCabe (Gladstone), Verdstone, Congress, and Gold Road, the last to operate, closed in 1998.

Current Activity:

Copperstone: The property, with 335,000 oz of measured and indicated resources, is viewed as having potential as a near-term, oxide, high-grade, underground producer with a short permitting and construction timeline. Two new gold zones were discovered in the recently completed two-phase drilling program, consisting of 44 drill holes totaling 43,227 feet. In February 2008 owner American Bonanza signed a letter of intent to merge the company into a wholly owned subsidiary of Gryphon Gold Corporation.

Yarnell: Kinross acquired Yarnell by acquisition of BEMA Gold in late-2006. CaNev Resources Corp. then acquired the property. In January 2008 General Properties signed a letter of intent with CaNev and Yarnell Mining to acquire a 70% interest. Asarco has previously identified 7.3 million tons of 0.037 oz. per ton Au.

Verdstone: Two additional resources have been identified at past producer Verdstone. A drift to collect a bulk sample for metallurgical testing is being permitted. A private group holds the property; Fred Brost of Phoenix is the project engineer. The group plans to develop a millsite on private land nearby.

Margarita: Patriot Gold controls the Margarita mine area covering approximately 900 acres of patented and unpatented mining claims. A historic resource of approximately 35,000 ounces of gold exists near the center of the claim holdings. A drilling program will be carried out the first quarter of 2008 to test for high-grade faults that feed the near surface cap of disseminated mineralization.

Burro Creek: Northern Freegold Resources controls this 2,000-acre property consisting of four patented claims and 100 surrounding unpatented claims. It covers a low-sulphidation epithermal vein system that has been traced for over 1.7 km and exhibits widths of up to 45 meters. Previous reverse circulation, diamond drilling and underground development conducted on the property focused on a 300-meter strike length in the central block of the exposed vein system and outlined a historical gold and silver resource of 2.6 million tons with an average grade of 0.03 oz gold and 1.1 oz silver per ton. Within this historical drill-proven resource, an open pitable resource of 1.2 million tons grading 0.04 oz gold and 1.470 oz silver per ton respectively with a 1:1 stripping ratio was defined.

Rosebud: Kent Exploration Inc. holds a 100% option on the property. It includes 40 unpatented claims and adjacent deeded land with 2,600 feet of underground workings that were developed between 1928 and 1930. A 1,500-meter diamond drill program was started in Sept. 2007 with assay results received on three of the seven holes in February 2008. The highest grades were 18.45 g/t Au and 18.9 g/t Ag over 1.5 feet between 193 to 194.5 feet and 5.73 g/t Au and 42.9 g/t Ag over 1.5 feet between 223-224.5 feet.

Gold Gulch: In August 2007 Ventura Gold commenced a core drilling program at the 100% held property located approximately two miles southwest of Freeport McMoRan's Morenci copper mine. One core drill rig has been mobilized to site and completed the first hole to a depth of 1,195 feet. They plan to complete six to eight drill holes for a total of 10,000 feet.

Hardshell: Wildcat Silver Corporation is an 80% owner along with Arizona Minerals Inc. The company commenced a 7,500-foot drill program in July 2007 to obtain material for metallurgical testing and to explore as-yet untested deeper extensions of Hardshell mineralization. In February 2007 a preliminary assessment of an inferred resource of 53.5 million ounces of silver along with 1.2 billion lbs. of manganese was announced.

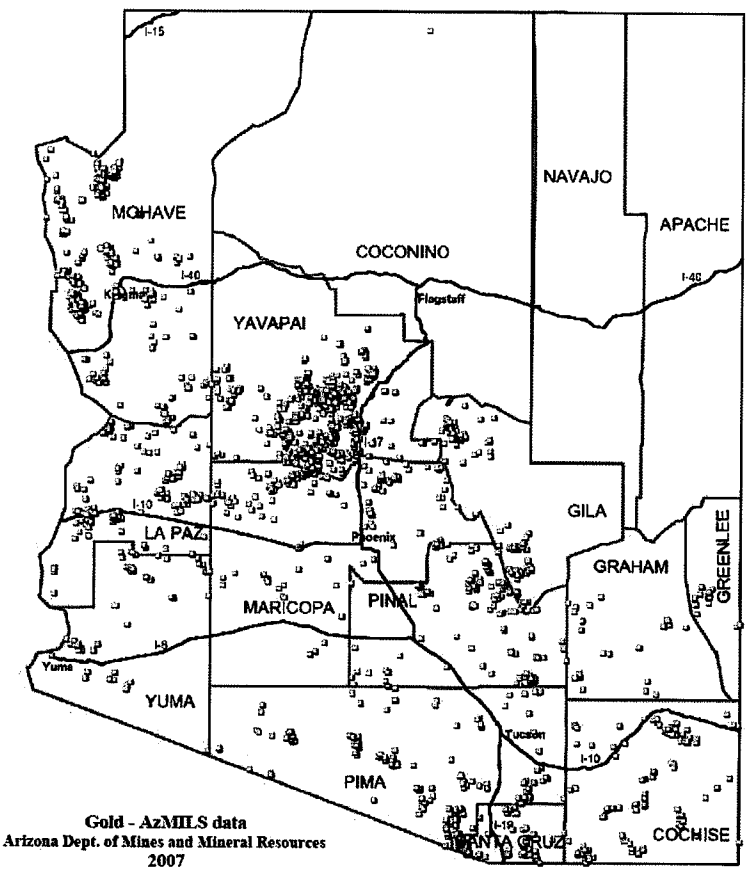

Figure 3. Primary and by-product gold occurrences.

Tombstone District: Tombstone Exploration Corp. has assembled a large land package in the historic silver district and conducted sampling of surface and underground workings. They completed a RC drill hole in March 2007 to a depth of 500 feet.

Gold Hill: Sage Gold entered into an option to acquire 50% of mineral rights at Gold Hill. Based on 1981 sampling the property has reserves of 30,000 tons at 0.27 opt Au.

Gold Chain, Roadside: Goldrea Resources acquired this property with 40,000 oz delineated previously by Western States.

Burnt Well, Silver District, Clanton Hills: Columbus Gold is exploring these projects in western Arizona. Columbus sampling of the Burnt Well shaft yielded values up to 1.0 opt gold. Also of considerable interest are disseminated values ranging from 0.01 to 0.03 opt Au in silicified Tertiary

siltstones, over widths up to 20 feet or more. At Silver District past programs delineated a resource of 3,820,000 tons grading 4.60 ounces per ton silver (17,500,000 ounces) plus potentially commercial fluorite, barite and zinc-lead in a number of deposits. At Clanton Wells reconnaissance sampling of irregularly shaped bodies of quartz and calcite in silicified breccia yielded several samples running from 2-7 opt silver with low gold values (up to 170 ppb).

Moss: The mine is controlled by Patriot Gold and consists of over 1,400 acres of patented and unpatented mining claims. Historic reports suggest a resource of between 250,000 and 300,000 ounces of gold occurs within the property boundary. Recent work by Patriot includes drilling and metallurgical sampling. The project may be considered for joint venture.

Bullard: Canadian Mining Company Inc. is conducting a soil exploration program to delineate drill targets on the detachment-fault related property.

Tiger: Q-Resources Ltd. has entered into a purchase option agreement with Silver Nickel Mining Co. for a land package that includes past-producers in the Tiger - Oro Belle area.

Cruce Gold: Fischer-Watt is starting its first drill program on its Cruce Gold property in Pinal County, Arizona. The company will be using an Air-track drill rig to drill a close spaced grid of shallow holes to test four target zones on this 1,200-acre property. The four targets identified to date are surface geochemical anomalies with three of them being areas anomalous in gold and one being anomalous in copper.

The following gold or gold/silver properties are available from the McIntrye & Bauman Group. See www.mcintyrebaumangroup.com for locations and details.

Ambassador: Precambrian gold and silver deposit with underground and possible open pit.

Bonanza: Detachment fault gold / silver deposit. Former Phelps Dodge project.

Bouse: Gold and silver detachment fault deposit in La Paz County, Arizona. Former Homestake Gold project.

Clara Moro, Silverfield Gold: Gold deposit in detachment fault environment. The Clara property has encouraging results from a drill campaign by Nevada Pacific. The Silverfield may be a hot springs high grade gold/silver deposit in detachment fault environment. It is close to Clara Moro and could be jointly explored.

Ester Basin: Gold, silver and copper deposit spatially associated with diatreme in detachment fault environment. Former Phelps Dodge project.

McCracken Gold: Gold with silver and copper in breccia zone adjacent to one of Arizona's historic silver producers.

Mockingbird: Gold and silver deposit related to detachment fault. Anaconda/Chevron work indicated potential.

North Rawhide: Upper plate gold, silver and copper deposit. Former Phelps Dodge project.

Oatman: A dozen mines in Arizona's largest primary gold district. Includes patented Lexington gold mine. High-grade Tertiary vein deposit in volcanics with potential for low-grade open pit resource.

South Copperstone: Large contiguous claim block adjacent to the Copperstone Mine, Arizona's largest recent open pit gold producer.

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Descriptive model of detachment fault related polymetallic deposits – http://pubs.usgs.gov/bul/b2004/html/bull2004detachmentfaultrelate_polymetall.htm

Volcanogenic Massive Sulfides

Geology: Volcanogenic massive sulfide occurrences of Arizona formed 1.7 –1.8 Ga. Deposits occur as stratabound-strataform accumulations of iron and base-metal sulfides with variable amounts of gold and silver. They are hosted in a thick sequence of submarine volcano-sedimentary strata metamorphosed to greenschist and occasionally amphibolite facies.

Economic Geology: Of the 70 known VMS targets, 48 have reported production. Cu-Zn mineralization with precious metals is economically important in these deposits. Production totals over 55 million tons and three deposits have yielded over 4 million tons each. The majority of the production is from the Verde district. The United Verde mine is reported to currently contain over 20 million tons of mineralization grading 6.6% Zn plus Cu and precious metals.

Structure and Distribution: Most orebodies are highly deformed and exhibit high ratios of plunge to strike length. Larger deposits are described as elliptical lenses, or rod like bodies, that plunge steeply and parallel major or minor fold axes. The United Verde mineralization is located within the axis of a major steeply plunging fold. Ratios of plunge length to strike ratio of 3:1 are common and ratios as high as 8:1 are known. Thus most deposits present only limited surface expression. The geographic extent of favorable host rocks is wider than that of known VMS deposits suggesting exploration potential for new discoveries. Lindberg suggested a number of exploration ideas and targets that remain untested.

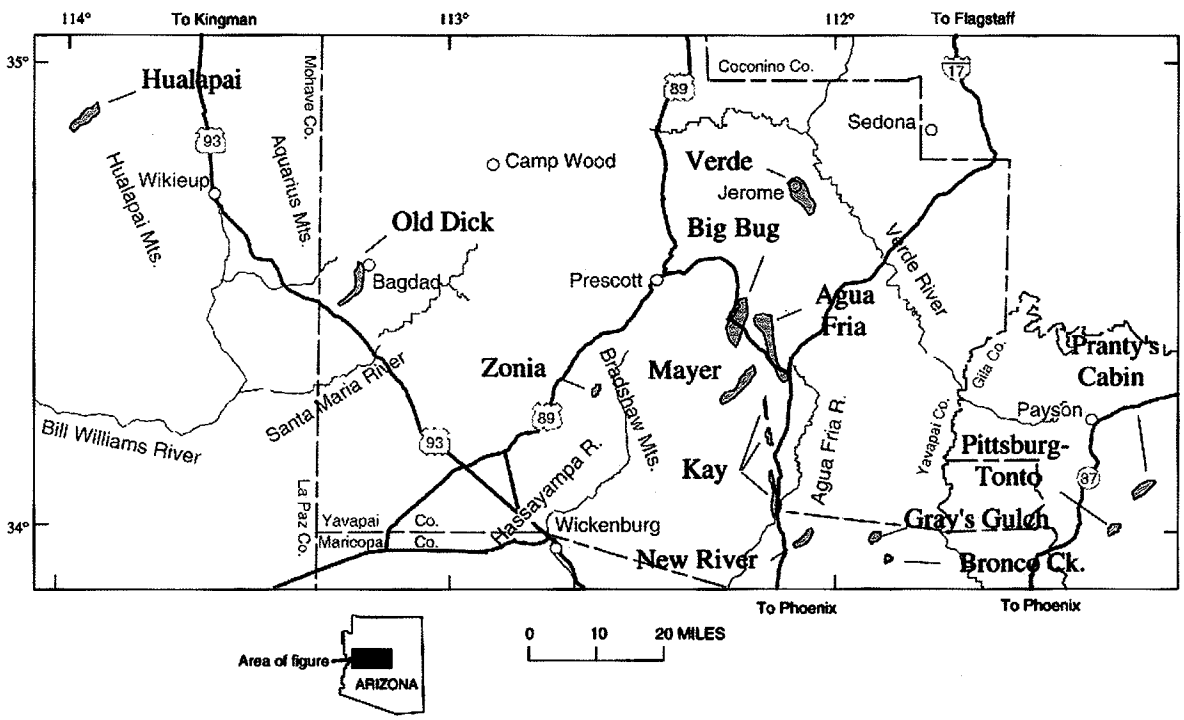

Figure 4. Proterozoic massive sulfide deposits in Arizona. From: USGS Bulletin 2138.

Current Activity: The Exploration Syndicate Inc. conducted VTEM surveys during 2007 over broad areas of central Arizona, including the Verde, Agua Fria, and Old Dick districts. Follow-up surface investigation and land acquisition is underway. Mohave Resources has optioned the Blue Bell and De Soto properties and is evaluating their oxide copper potential. The joint venture of Ivy Minerals and Kaaterskill Exploration (IKE JV) has generated geochemical and VLF-EM anomalies within fold axes on two new exploration targets in the Mayer district known as the Cobre Sud and Cordes Peak prospects. These properties are currently available for lease-option agreement to a company willing to accept a work commitment that includes a drill program. Although past exploration by major mining companies

generated much data (see ADMMR files) in the VMS target districts, these areas are currently under-explored (Figure 4).

Many promising prospects, not limited to the few described here, are available for exploration.

In the Old Dick district Silver Nickel Mining has acquired the Pinafore mine (Cu-Zn) and collected exploration data including drill results from Arizona Explorations Inc's. (syndicate of American Barrick, Homestake and Placer Dome) mid-90s effort.

Freeport McMoRan controls the United Verde zinc resource discussed above. Teck Cominco completed a multi-year effort there without releasing results.

The Kay mine near Black Canyon has a Cu-Zn resource defined by Exxon and Rayrock with drill data available at ADMMR.

Ricks Brothers Enterprises controls a copper resource near Mayer with both disseminated and limited massive mineralization and have project data available. The McIntyre Bauman Group also has large claim holdings in the Copper Mountain trend. In addition, the McIntyre Bauman Group has the following 3 VMS related properties available. Treasure King has a 150,000-ton deposit at a grade of 0.06 oz/ton gold resource along with four additional areas untested by drilling. The nearby Yaba is a high-grade silver deposit with gold. Near Jerome the Middle Verde comprises 5 claim groups and 3 patented claims along the Verde fault that contain un-drilled anomalies from prior work of Phelps Dodge and Oxymin.

Also in the Verde district, Southwest Exploration Group has available the West Jerome VMS located west of Freeport McMoRan's patented ground. The target has favorable stratigraphy under Paleozoic cover with 2 widely spaced drill holes that show strong chloritic alteration with anomalous copper and zinc values.

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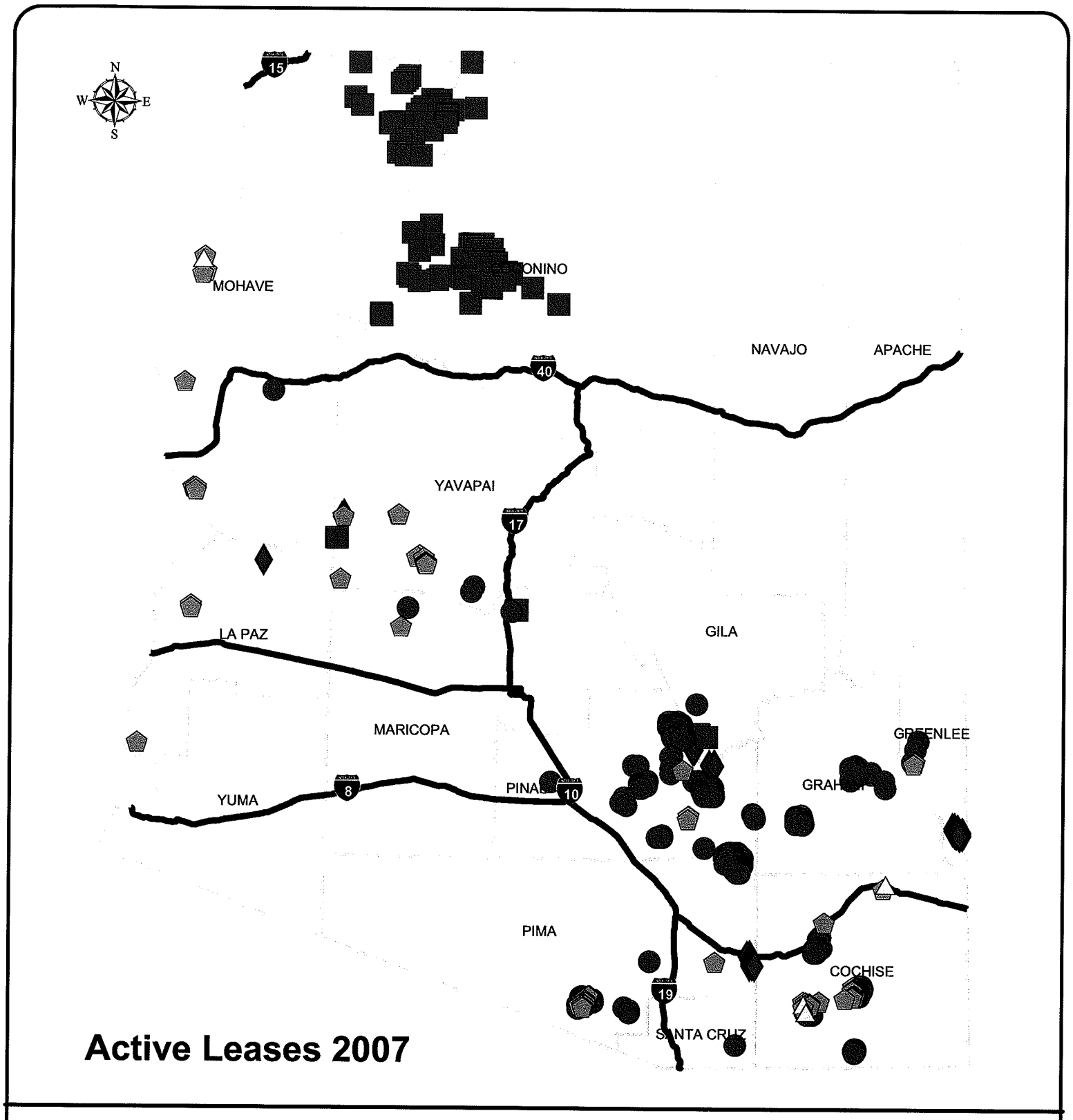

Commodity

- Silver
- Gold
- Copper
- Uranium
- Other Metals

0 50 100 150
Miles

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Arizona State Land Department

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January 25, 2008

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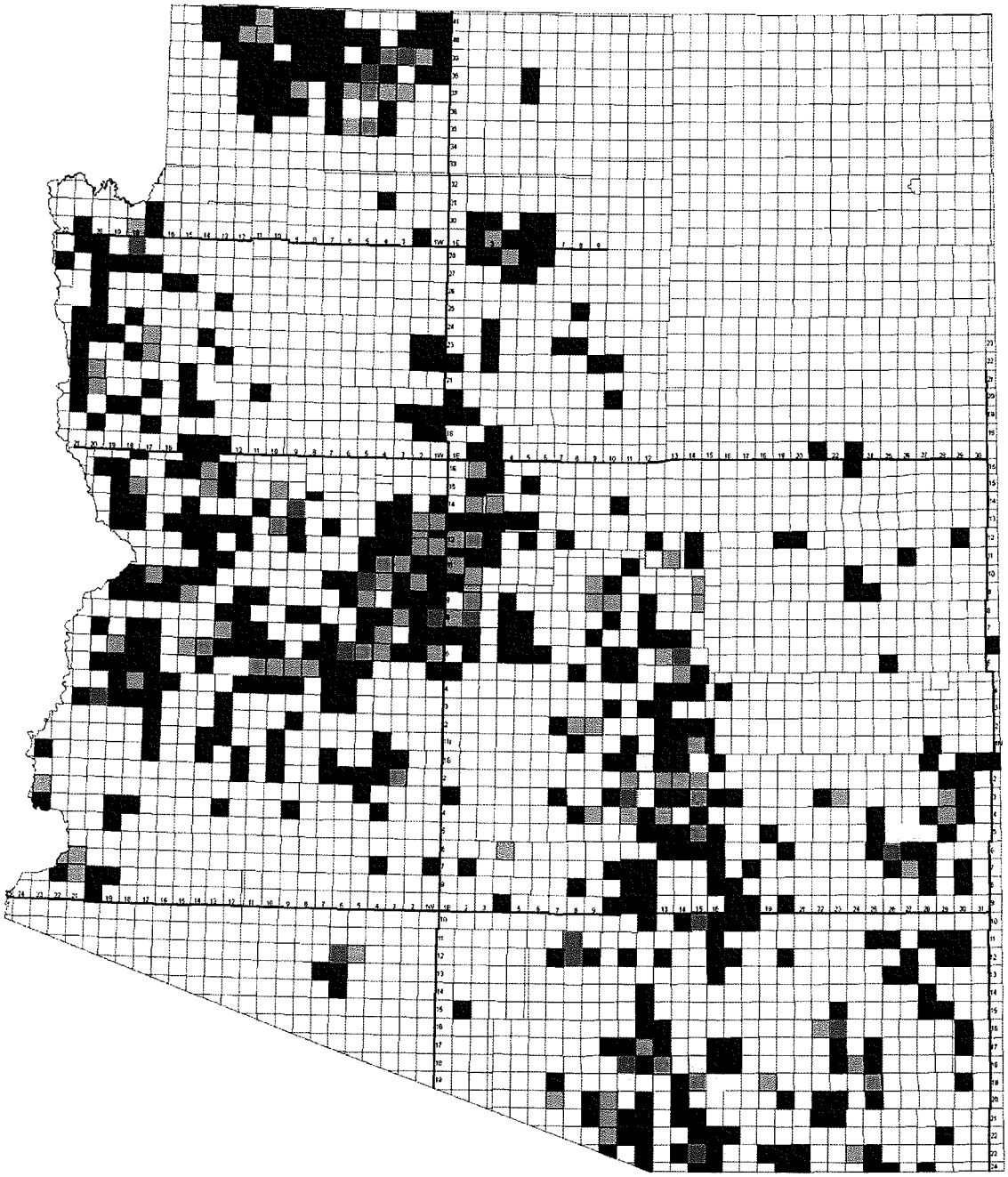
Micheel Dennis

Mining Claim Distribution on Federal Lands



Mining Claims - 6000 to 18000 acres/township
Mining Claims - 5000 to 6000 acres/township
Mining Claims - 4000 to 5000 acres/township
Mining Claims - 3000 to 4000 acres/township
Mining Claims - 2000 to 3000 acres/township
Mining Claims - 1000 to 2000 acres/township
Mining Claims - 1 to 1000 acres/township
Townships

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Bureau of Land Management
Arizona State Office
Map created on Dec 4, 2006

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25,600 mining claims in 2004
31,000 mining claims in 2005
35,000 mining claims in 2006
38,000 mining claims in 2007 (estimate)

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DIRECTORIES

D50 Arizona Mining Consultants, N. J. Niemuth, 2004. A listing of Arizona-registered consultants for the following mining related disciplines: assayers, geological engineers, geologists, geophysical engineers, metallurgical engineers, and mining engineers. 22 p. **$3.00 ***

D51 Directory of Active Mines in Arizona - 2007, N.J. Niemuth, D.R. Bain, F.S. Kimbler, 2007.This directory lists corporate addresses, key personnel, number of employees, websites, mine, mill, or smelter location, and operation description. Includes a 1:1,000,000 color map showing the locations of all active mines. 34 p. **$20.00**

SPECIAL REPORTS

SR1 Uranium Prospector's Guide, by K.A. Phillips & M.N. Greeley, 1979. A guide for the independent prospector searching for occurrences of uranium. Chapters on mineralogy and geology of uranium and prospecting methods. 34 p. **$6.00**

SR12 Laws and Regulations Governing Mineral Rights in Arizona, by V.H. Verity and L.D. Clark. 9th Edition, reprinted 1988. A lay language interpretation of federal and state laws applicable to mineral rights. Includes discussions and forms for locating claims on both public domain and State-owned lands. 91 p. **$8.00**

SR23 ***Manual for Determination of Status and Ownership, Arizona Mineral and Water Rights,*** by J.C. Lacy, 1999. A detailed explanation of land, mineral rights and water rights ownership status. Includes annotated samples of status maps and indexes. 29 p. **$3.00**

MINERAL REPORTS

MR3 Molybdenum Occurrences in Arizona, by C.J. Hicks, 1979. Occurrences are listed by county with a brief description of each. The mineralogy, geology, uses and history of molybdenum are provided. 37 p. **$6.00**

MR4 Arizona Industrial Minerals, by K.A. Phillips, 1987. Covers 1400 Arizona industrial mineral occurrences. Location tables and maps. 185 p. **$12.00**

MR7 Gold Panning in Arizona, by D.R. Bain, 1990. Includes the origin of placer gold in Arizona, prospecting tips, panning instructions, and maps to panning locations. 30 p. **$3.00**

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Number-County	Number of Maps	Index Pages	Mines	Price
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CM-2 - Cochise	9	17	698	15.00
CM-3 - Coconino	28	12	594	30.00
CM-4 - Gila	9	19	731	15.00
CM-5 - Graham/ Greenlee	12	16	516	20.00
CM-6- LaPaz/Yuma	15	15	583	20.00
CM-7 - Maricopa	11	21	915	15.00
CM-8 - Mohave	20	33	1,411	25.00
CM-9 - Navajo	17	5	232	20.00
CM-10 - Pima/ Santa Cruz	14	36	1,487	20.00
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OPEN-FILE REPORTS

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OFR92-10 Copper Oxide Resources, by N.J. Niemuth and K.A. Phillips, 1992. A listing of over 800 Arizona deposits that contain copper oxide. 18 p. **$5.00**

OFR93-12 Economic Geology of the Sierra Estrella, Maricopa and Pinal Counties, Arizona, by E.B. Melchiorre, 1993. Includes site descriptions of metallic and nonmetallic resources. 29 p. **$2.50**

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OFR07-25 ***Checklist of Arizona Minerals,*** by Raymond W. Grant, 2007 Lists all 861 Arizona minerals, including the 61 new ones added since the third edition of *Mineralogy of Arizona.* 57 p. **$15.00**

OFR08-26 ***Arizona's Metallic Resources – Trends and Opportunities,*** by N.J. Niemuth, 2008. 22 p. **Free***

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C59 ***Mining Scams,*** by M.N. Greeley, 1995. Discusses common features of mining scams and ways to avoid being a victim of one. *

C63 ***Reference Material Listing,*** 1996. Library holdings on mines, mining, and recovery technology. *

C91 ***Assayers and Assay Offices in Arizona,*** 2001. List of commercial assay laboratories in Arizona with registered assayers. Includes information on the history of assaying and the assaying process. *

C103 ***A Historic Review of Mercury Mining in the Phoenix Mountains, Maricopa County,*** by D.R. Bain, November, 2003. *

C115 ***Mining Claim Forms,*** 2006. Includes Location Notices for lode and placer claims, Claim Map, Affidavit of Performance of Annual Work, Notice of Non-liability for Labor and Materials Furnished, Notice of Intent to Hold Mining Claims, and Attachment for Additional Claims. *

C119 ***Listing of U.S. Bureau of Mines Mineral Land Assessment Open File Reports s in Arizona,*** 2006, A listing of all MLA Open File Reports conducted in Arizona. *

C120 ***State Agencies Concerned with Mining & Mineral Resources in Arizona,*** 2007. Contains names, addresses, and pertinent people at state agencies concerned with mines and mineral resources.*

C121 ***Federal Agencies Concerned with Mining in Arizona,*** 2007. Contains addresses of Bureau of Land Management, Forest Service offices, and other Federal agencies. *

C122 ***County Agencies Concerned with Mining & Mineral Resources in Arizona,*** 2007. Includes a listing of addresses, phone numbers, and websites. *

C123 ***Arizona Gem Shows, 2007-2008.*** Includes date, location, sponsoring group, contact person. *

C125 ***Arizona Mining Update, 2006,*** N.J. Niemuth. A review of mining activity in Arizona. Describes copper, gemstone, industrial mineral, and coal mines as well as mineral exploration and government news. *

C126 Guide to Online Land Status Records. A guide to the online availability of ownership records for mining claims and other lands. Includes records of the Bureau of Land Management, State Land Department, and County Recorder Offices in Arizona. *

MAPS

All maps are shipped folded. Contact the Department to special order rolled maps or a different scale or media.

MM-17 ***Metallogenic Provinces of Arizona,*** by P.F. O'Hara, N. J. Niemuth, and G. Ryberg, 1989. Scale 1:1,000,000, Preliminary edition showing 49 metallogenic provinces in Arizona. Blackline **$2.50**

MO2-2 ***Map of Arizona Copper Resources,*** by N.J. Niemuth, 2002. Scale l:3,000,000. Provides names and locations of principal deposits. Order OFR 1-17 for details of the deposits. **$.50** *

MO7-3 ***Active Mines Map – 2007,*** cartography by S. Eastman. Scale 1:1,000,000. Shows all 402 active mines in Arizona, including sand and gravel. Color. **$10.00**

NON-ADMMR PUBLICATIONS

Principal Deposits of Strategic and Critical Minerals in Arizona, 1992. Published by the U.S. Bureau of Mines. A comprehensive review of Arizona's mineral commodities and infrastructure. 334 p. **$8.00**

Arizona Mining Summit – Guide to Permitting Mining Operations in Arizona, 1999. 157 p. *

In addition to the Department of Mines and Mineral Resources, many other Arizona agencies and organizations cooperate to encourage and support Arizona's mining industry. The Department wishes to thank the following organizations for providing information for PDAC 2008.

Our Job is JOBS!

Arizona Department of Commerce

Arizona Geological Society

Arizona Geological Survey

Arizona Mining Association

BLM - Arizona

State Land Department - Minerals Section

University of Arizona, Mining & Geological Engineering

THE IMPACT OF THE COPPER INDUSTRY ON THE ARIZONA ECONOMY

- In 2006, the Arizona copper industry had a combined direct and indirect impact on the Arizona economy of:

$4.719 Billion

- **including combined direct and indirect contributions of:**

$1.404 Billion	in personal income, equivalent to 28,600 jobs for Arizonans
$2.990 Billion	in business income, and
$325 Million	in state and local government revenues

- as a result of the circulation (and multiplication) of the copper industry's total direct impact of

$2.120 Billion

- **that included direct payments of:**

$141.305 Million	to the State and its local governments in taxes and fees,
$1,439.740 Million	to other Arizona businesses for products and services, and
$538.3567 Million	in personal income for Arizonans, including wages and salaries for the industry's
8,200	employees

- who labored to produce:

787,236 tons of copper and other minerals with a total value of

$5.628 Billion

(59% more than in 2005)

Compiled by **WEAC** for the

Arizona Mining Association
5150 N. 16th St., Ste. B134
Phoenix, AZ 85016
602-266-4416 Fax: 602-230-8413
www.azcu.org

Exploration Permits and Mining Leases on Arizona State Trust Land

The Minerals Section of the Arizona State Land Department (ASLD) is responsible for mining/mineral activities on State Trust land. Its primary obligation is to maximize revenues for the Trust from the disposition and management of mineral commodities while considering the long-term best interest of the Trust. Arizona's public schools are the primary State Trust beneficiary.

Mineral commodities are classified into three separate categories:

Hard Rock Minerals refer primarily to *base and precious metals* as well as *industrial minerals* that are unique and distinct.

Common Variety Minerals, also referred to as salable minerals or mineral materials, include *construction and landscaping materials* (cinders, sand, gravel, boulders, loose rock and common clay) and *minerals of similar occurrence* commonly used as aggregate, riprap, ballast, borrow or fill.

Energy Minerals (also leaseable) refer primarily to *oil, gas, and geothermal resources.*

The right to explore for and produce mineral commodities on State Trust land is accomplished by obtaining one of the following mineral-related permit / leases:

- Mineral Exploration Permit
- Mineral Lease
- Common Variety Mineral Lease / Sale
- Oil and Gas Lease

Details for each mineral category can be obtained from ASLD's Minerals Section.

Mineral Exploration Permits

A mineral exploration permit is permission from ASLD to prospect and explore for minerals on State Trust land. Exploration is any activity conducted for the purpose of determining the existence of a valuable mineral deposit, such as: geologic mapping, drilling, geochemical sampling, and geophysical surveys.

Prior to exploration, the Plan of Operations *must* be approved.

- The permitting process for an exploration permit takes a minimum of sixty (60) days.
- If the application is approved, the initial rent is $2 per acre. If renewed, no additional rents are due for the second year. Rents are set at $1 per acre for years 3 thru 5.
- Work expenditure requirements are:
  $10 per acre for years 1-2; and
  $20 per acre for years 3-5.

The permit is valid for one year from the due date of the rental and bond. If renewal requirements are met, the permit can be renewed annually for up to five years. If discovery of a valuable mineral deposit is made, the permitee must apply for a mineral lease before actual mining activities can begin.

External permitting requirements can greatly impact application processing time.

A Pre-Application Conference with ASLD is recommended for the following leases.

Hard Rock Mineral Leases

A mineral lease permits the mining of minerals discovered under the exploration perm it.

- The approval process takes a minimum of six (6) months.
- The mineral lease is issued for a term of twenty (20) years. Leases may be renewed for an additional term.
- Both *rents* and *royalties* are determined by appraisal. Royalties may be based on:

1) a fixed rate subject to annual adjustment; or
2) a sliding-scale rate which is linked to a commodity index price and the operation's breakeven price. There is a statutory minimum royalty rate of 2% of gross value.

Common Variety Mineral Lease

This agreement is for the purchase, mining and processing of common variety minerals (sand and gravel, and other construction and landscape materials). Statutes require these mineral commodities to be sold at public auction. It is the auction process which determines the market value (royalty rate) of the commodity. Statutes require that the sale be advertised for ten (10) weeks prior to the auction. Advertising costs are paid by the applicant.
However, should the applicant not be the successful bidder, advertising costs and certain other costs are reimbursable.

- The application approval process takes a minimum of six (6) months.
- An agreement is issued initially for a ten (10) year term with provisions to extend up to a maximum of twenty (20) years.
- *Rents* are based on a percentage of the appraised surface value.
- *Royalty rates* are determined at public auction.

A minimum annual production guarantee is assessed for each agreement.

Recreational mining or mineral collecting on State Trust land is prohibited

Oil and Gas Leases

The oil and gas lease is for the exploration and/or production of oil and gas resources. *All drilling must be approved by the Oil and Gas Commission* (through the Arizona Geological Survey) as well as the ASLD.

The permitting process for an oil and gas lease takes a minimum of one (1) month.

- Leases are issued for a primary term of 5 years. A secondary term of 5-years may be requested prior to the expiration of the first term for a maximum of ten (10) years, or so long thereafter as production continues.
- Annual rents are payable in advance at $1 per acre for the primary term, and $2 per acre if extended for a secondary term.
- Royalties: 12.5% of the value for all products sold or removed from the lease.

Applicable State Laws

ARIZONA REVISED STATUTES
Title 27: Minerals, Oil and Gas
Title 37: Public Lands
Title 41: State Government

A.R.S. § 41-844 requires parties in charge of ground disturbing projects on State [Trust] land to promptly report the discovery of any archaeological, paleontological or historic site or object to the director of the Arizona State Museum.

ARIZONA ADMINISTRATIVE CODE
Title 12: Natural Resources, Chapter 5

General Requirements

APPLICATION FEE
There is a non-refundable filing fee of $100 per application.

OTHER FEES
Rental fees are required on all agreements.
Royalties are paid on all recovered mineral products.
Additional fees, such as appraisal or administrative fees, may also be required.

REQUIRED MAPS
A USGS topographic map showing lease boundaries, access routes, roads, utilities, etc., must be submitted with the application. Other detailed maps, related to your operation will be required in a Mineral Development Report.

MINERAL DEVELOPMENT REPORT (MDR)
All mining-related operations require a detailed MDR which includes: 1) geologic assessment, 2) economic feasibility, 3) environmental assessment, 4) mine operations plan, and 5) reclamation and closure plans. Detailed requirements for the MDR are available upon request.

OTHER NECESSARY DOCUMENTS
Exploration permits require a plan of operations. Aerial photos, contour maps and registered surveys may also be required. Surveys of cultural resources, native plants, wildlife, and endangered species are required components.

RECLAMATION BOND
The *minimum* bond required is $3,000. The actual bond amount is based upon the type of operation and the degree of disturbance.

INDEMNITY INSURANCE
Indemnity insurance will be required for most operations.

OTHER PERMITTING REQUIREMENTS
The applicant is responsible for determining permitting requirements from other regulatory agencies *and* to be in compliance.

For More Information:
Arizona State Land Department
MINERALS SECTION
1616 West Adams Street
Phoenix, Arizona 85007
602-542-4628
fax 602-542-3507
www.land.state.az.us

Other Useful Contacts:
Arizona Department of Mines & Mineral Resources
602-771-1600
www.mines.az.gov

Arizona Geological Survey
520-770-3500
www.azgs.az.gov

Arizona Mine Inspector
602-542-5971
www.asmi.az.gov

Arizona State Museum
520-621-4011
www.statemuseum.arizona.edu

Bureau of Land Management
Land and Mineral Records
602-417-9200
www.blm.gov

U.S. Geological Survey
Western Mineral Resources Tucson Office
520-670-5544
http://minerals.usgs.gov/west/tucson.htm

ARIZONA GEOLOGICAL SURVEY
Partial list of Mineral and Energy Resource Publications

Bulletin 180—Geology and Mineral Resources of Arizona, by U.S. Geological Survey, Arizona Bureau of Mines, and U.S. Bureau of Reclamation, 1969 (reprinted 1989), 467 p. [Photocopy only]....$22.00

Metallic Mineral Resources

Bulletin 194—Metallic Mineral Districts and Production in Arizona, by Stanley B. Keith, D.E. Gest, Ed DeWitt, Netta Woode Toll, and B.A. Everson, 1983, 58 p., scale 1:1,000,000, [includes Map 18]....$10.00

Map 18—Metallic Mineral Districts of Arizona, by Stanley B. Keith, D.E. Gest, and Ed DeWitt, 1983, scale 1:1,000,000. [also included in Bulletin 194]....$7.00

Digital Information Series 3—Database Files describing Mineralized Sites in the State of Arizona, v. 1.0, Data structure and editing by S.M. Richard, 1996, 3 diskettes, 22 p.. DBase and Access 95 formats. Can be used in a GIS application.....$10.00

Digital Information Series 21—Database for Mineral Districts in the State of Arizona, S.M. Richard, editor, 2002, 1 CD-ROM. MS Access database, ESRI shapefiles.....$30.00

Indexes of Mining Properties

Bulletin 187—Index of Mining Properties in Cochise County, Arizona, by Stanton B. Keith, 1973, 98 p....$5.00

Bulletin 189—Index of Mining Properties in Pima County, Arizona, by Stanton B. Keith, 1974, 156 p....$6.00

Bulletin 191—Index of Mining Properties in Santa Cruz County, Arizona, by Stanton B. Keith, 1975 (reprinted 1990), 94 p....$15.00

Bulletin 192—Index of Mining Properties in Yuma County, Arizona [includes La Paz County], by Stanton B. Keith, 1978, 185 p....$6.00

Bulletin 196—Mine Index for Metallic Mineral Districts of Arizona, by J.W. Welty, S.J. Reynolds, Stanley B. Keith, D.E. Gest, R.A. Trapp, and Ed DeWitt, 1985, 92 p.....$7.00

Bibliographies

Circular 24—Bibliography for Metallic Mineral Districts in Cochise, Graham, and Greenlee Counties, Arizona, by Lorraine Schnabel and J.W. Welty, 1986, 38 p....$6.00

Circular 25—Bibliography for Metallic Mineral Districts in La Paz, Mohave, and Yuma Counties, Arizona, by Lorraine Schnabel and J.W. Welty, 1986, 45 p.....$6.00

Circular 26—Bibliography for Metallic Mineral Districts in Pima and Santa Cruz Counties, Arizona, by Lorraine Schnabel, J.W. Welty, R.A. Trapp, and S.J. Reynolds, 1986, 44 p.....$6.00

Circular 27—Bibliography for Metallic Mineral Districts in Gila, Maricopa, Pinal, and Yavapai Counties, Arizona, by J.W. Welty, Ed DeWitt, and Lorraine Schnabel, 1989, 81 p.....$11.00

Circular 28—Bibliography for Metallic Mineral Districts in Apache, Coconino, and Navajo Counties, Arizona, by J.W. Welty and W.L. Chenoweth, 1989, 47 p.....$9.00

OFR-88-22—Additions to Bibliographies for Metallic Mineral Districts in Cochise, Graham, Greenlee, La Paz, Mohave, Pima, Santa Cruz, and Yuma Counties, Arizona, by J.W. Welty, 1988, 32 p.....$5.25

Industrial Minerals

Circular 30—Arizona has Salt!, by S.L. Rauzi, 2001, 40 p.....$10.00

Special Publication 4—Proceedings of the 21st Forum on the Geology of Industrial Minerals, edited by H.W. Peirce, 1987, 134 p.....$12.00

Energy Resources

Bulletin 182—Coal, Oil, Natural Gas, Helium, and Uranium in Arizona, by H.W. Peirce, Stanton B. Keith, and J.C. Wilt, 1970, 289 p., 15 sheets....$10.00

Circular 29—Arizona has Oil & Gas Potential!, by S.L. Rauzi, 2001, 40 p.....$10.00

Map 15-2—Geothermal Resources of Arizona, by J.C. Witcher, Claudia Stone, and W.R. Hahman, Sr., 1982, scale 1:500,000.....$5.00

Geologic Maps

Map 17—Index of Published Geologic Maps of Arizona, 1903-1982, by R.B. Scarborough and M.L. Coney, 1982, scale 1:1,000,000, 6 sheets. [See also M-31] All 6 sheets....$8.00

Map 31—Index of Published Geologic Maps of Arizona: 1982 to mid-1993, by R.C. Harris, R.A. Trapp, T.G. McGarvin, and J.E. Spencer, 1994, 45 p., scale 1:1,000,000, 3 sheets. Text and sheets....$8.00

Map 33—Arizona Geologic Highway Map, 1998, scale 1:1,000,000. Available as a folded map only....$10.00

Map 35—Geologic Map of Arizona, by S.M. Richard, S.J. Reynolds, J.E. Spencer, and P.A. Pearthree, compilers, 2000, scale 1:1,000,000. (For rolled map, add $1.00 for mailing tube. Rolled maps cannot be delivered to P.O. Box)....$5.00

Digital Geologic Map 01—Digital geologic map and cross sections of the Clifton-Morenci area, Greenlee County, Arizona, v. 1.0, compiled by C.A. Ferguson and M.S. Enders, 2000, 1 CD-ROM....$15.00
Or purchase as three color, paper maps, scale 1:24,000 (order as **DGM-01, S**)....$35.50

Digital Geologic Map 31—Geologic Map of the Twin Buttes 7.5' Quadrangle, Pima County, Arizona, v. 1.0, by S.M. Richard, J.E. Spencer, Ann Youberg, and B.J. Johnson, 2003, 1 CD-ROM.... $15.00
Or purchase as one color map, scale 1:24,000 (order as **DGM-31, S**)....$18.00

PUBLICATION ORDERING INFORMATION

You may purchase publications at the AZGS office or by mail. Address mail orders to AZGS Publications, 416 W. Congress St., Suite 100, Tucson, AZ 85701. See www.azgs.az.gov for additional information, or call 520 770-3500 if you have questions. Orders are shipped by UPS, which requires a street address for delivery. All mail orders must be prepaid by a check or money order payable in U.S. dollars to the Arizona Geological Survey. Master Card or Visa are accepted for orders over $10.00. Please include card number, expiration date, and signature on order form. Do not send cash. Arizona residents must add 8.1% sales tax to the order. Order by publication number and add the following shipping and handling charges to your order:

SHIPPING AND HANDLING CHARGES In the United States					
Less than	$2.00			add	$2.50
	$2.01	to	$10.00,	add	$6.00
	$10.01	to	$20.00,	add	$7.50
	$20.01	to	$30.00,	add	$8.75
	$30.01	to	$40.00,	add	$9.50
	$40.01	to	$50.00,	add	$11.00
	$50.01	to	$100.00,	add	$13.00
	$100.01	to	$200.00,	add	$17.00
More than	$200.01				call
Other countries, request price quotation					
Shipping and handling charges include insurance. For rolled maps, add $1.00 for a mailing tube.					

Arizona Geological Society

P.O. Box 40952, Tucson, AZ 85717
520-663-5295
www.arizonageologicalsoc.org

Purpose of the Society

is the promotion and encouragement of interest in the science of geology of the state of Arizona. To this end the Society holds monthly meetings, sponsors field trips, and publishes field trip guides and the Digest at irregular intervals. The Society has produced a distinguished publication series, see listing below. AGS was founded in 1948.

Membership

in the Society is open to all who are professionally interested in the geology of the State of Arizona.

Dues: $20 for 1-year membership
$35 for 2-year membership,
$50 for 3-year membership,
full-time student - free

Arizona Geological Society Publications - partial listing

The Arizona Geological Society's publications are sold over the counter and by mail through the Arizona Geological Survey. For shipping costs see the order form on the society's website or contact the Survey at 416 W. Congress #100,Tucson, AZ 85701, Phone 520-770-3500

GEOLOGIC HIGHWAY MAP OF ARIZONA, edited by R.J. Kamilli and S.M. Richard, scale 1:1,000,000, 1 sheet, 26" x 48", folded to 5" x 9", text and maps both sides, 1998, $10.00

Digest 20: PORPHYRY COPPER DEPOSITS OF THE AMERICAN CORDILLERA, edited by F.W. Pierce and J.G. Bolm. 656p., 43 papers, hardbound, 1995, $75.00

Digest 19: PROTEROZOIC GEOLOGY AND ORE DEPOSITS OF ARIZONA, edited by K. E. Karlstrom. 332 p., 25 papers, softbound, 1991, $35.00

Digest 18: MESOZOIC ROCKS OF S. ARIZONA AND ADJACENT AREAS, edited by W. R. Dickinson & M. A. Klute. 400 p., 28 papers, softbound, 1987, $ 17.00

Digest 17: GEOLOGIC EVOLUTION OF ARIZONA, edited by J. P. Jenney & S. J. Reynolds. 866 p., 35 papers, hardbound, 1989, 1 plate - Arizona Geologic Map 1988 scale 1:1MM by Reynolds. $60.00
Includes chapters on Precambrian, Laramide, and Mid Tertiary metalliferous ore deposits, uranium, petroleum, and industrial minerals.

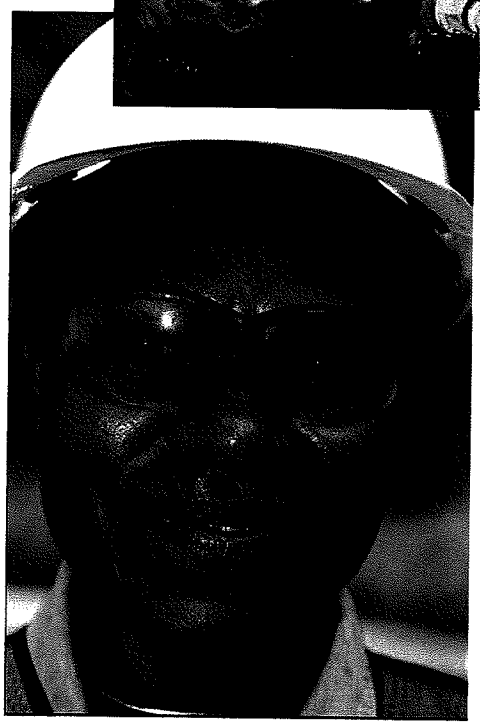
Digest 16: FRONTIERS IN GEOLOGY AND ORE DEPOSITSOF ARIZONA AND THE SOUTHWEST, edited by B. Beatty & P.A.K. Wilkinson. 555 p., 72 papers, softbound, 1986, $25.00

Digest 15: GOLD AND SILVER DEPOSITS OF THE BASIN AND RANGE PROVINCE, WESTERN U.S. edited by Joe Wilkins, Jr.. 233 p., 19 papers, hardbound, 1984, $17.00

Digest 14: RELATIONS OF TECTONICS TO ORE DEPOSITS IN THE SOUTHERN CORDILLERA, edited by W. R. Dickinson & W. D. Payne. 288 p., 19 papers, softbound, 1981, $17.00

Digest 10: TECTONICS OF ARIZONA, edited by J. C. Wilt & J. P. Jenney. 430 p., 19 papers, 4 maps, softbound, 1976, $14.00

WE WANT YOUR BEST



The Lowell Master of Engineering in Mineral Resources

The global nature and fast pace of the mining industry can make it difficult to return to a college campus for graduate courses.

The Lowell Master of Engineering in Mineral Resources is a distance degree that provides continuing education for the global minerals industry. Courses are taught by university professors, industry professionals, and senior executives of major companies.

The Master of Engineering in Mineral Resources is a program for mineral resource professionals advancing to management positions and for those from other disciplines who are entering the mineral resources industry and need professional career preparation specific to the industry.

Nominations and applications are being accepted for the fall 2008 semester. The application deadline is June 1, 2008.

THE UNIVERSITY OF ARIZONA®

Emphasis Areas

Mine Information and Production Technology
Technical Mine Management
Geomechanics
Mine Health and Safety
Mineral Processing
Environmental Management

Course Topics Include:

Corporate Strategy and Governance
Engineering Contract Law
Commodities Markets
International Minerals Trade
Introduction to Capital Markets
Mine Finance
Equipment Operations Technology
Management Operations Technology
Modern Mining Operations Systems
Block Cave Mine Design
Disease and Illness in Mining
Environmental and Occupational Health
Underground Construction Geomechanics
Mechanics of Failure in Rock
Surface Chemistry of Flotation
Hydrometallurgy
Engineering Sustainable Development
Environmental Management and Mine Reclamation

Lowell MEng Fast Facts

Students employed by a company with a business presence in Arizona pay in-state tuition (corporate rate). Learn more at:

www.oneflexibledegree.com

30 credit hours are required for the degree. Students can earn up to 9 credit hours for work-related research report and independent study.

Students can take a combination of 1-credit hour (2-day) short courses and full semester 3-credit hour courses

Students are strongly encouraged to spend one week on campus at the beginning and end of each academic year for student-faculty interaction.

Distance learning means keeping your employees on site while they enhance their skills and value to your company.

Admission Requirements

Bachelor's degree from an accredited institution

TOEFL score of 550 for paper-based; 213 for computer-based; or 79 for iBT exam

Undergraduate GPA of 3.0

Undergraduate degree in engineering or*:
3 semesters of calculus
2 semesters of calculus-based physics
2 semester of chemistry
Engineering science including statics, mechanics of materials, and fluid mechanics
Proficiency in basic geology

*Some emphasis areas will require differential equations, structural geology, mineralogy/petrology, thermodynamics, surface chemistry.

Contact us to determine prerequisites if you do not have an engineering degree at mgedept@email.arizona.edu

Complete the Graduate College Application at:
http://grad.arizona.edu

Complete the Master of Engineering Application at:
www.oneflexibledegree.com

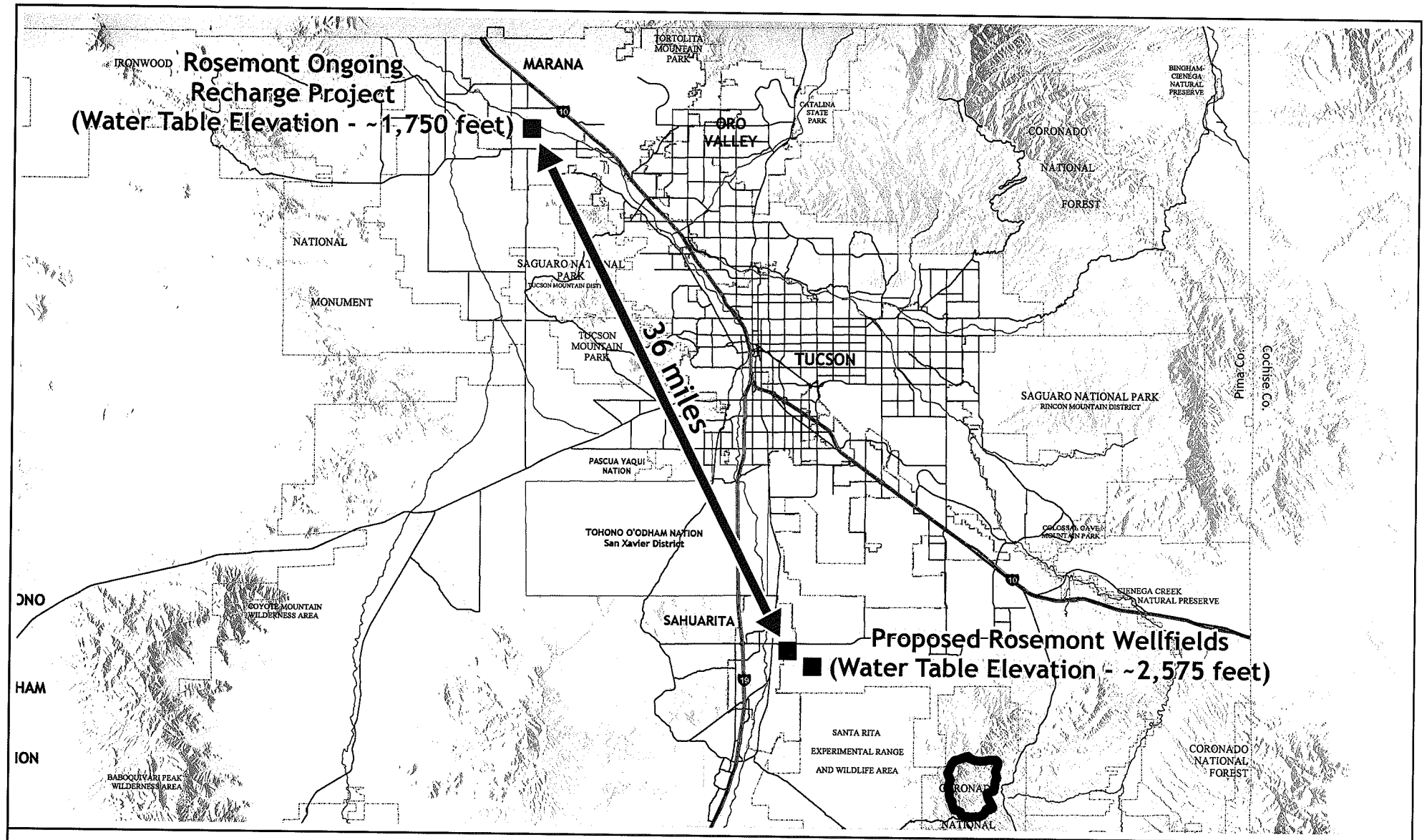
Tuition Rates

Rates below are for the current academic year. They will increase next year.

Corporate rate:	$723.33/credit hour
Non-Corporate rate:	$1114.33/credit hour

THE UNIVERSITY OF ARIZONA®

Attachment 2



Rosemont Recharge and Pumping

The information depicted on this display is the result of digital analyses performed on a variety of databases provided and maintained by several governmental agencies. The accuracy of the information presented is limited to the collective accuracy of these databases on the date of the analysis. The Pima County Department of Transportation Geographic Information Services Division makes no claims regarding the accuracy of the information depicted herein.

This product is subject to the Department of Transportation's Disclaimer and Use Restrictions.

PIMA COUNTY DOT Geographic Information Services

Pima County Geographic Information Services
201 North Stone Avenue - 9th Floor
Tucson, Arizona 85701-1207
(520)740-6670 - FAX:(520)798-3429
http://www.dot.pima.gov

N

Scale 1:120,000

May 12, 2008

RECHARGE FEATURES

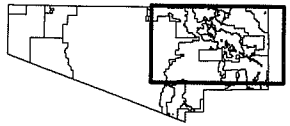
- Proposed Wellfield
- Recharge Project
- Proposed Rosemont Mine Boundary

OTHER FEATURES

- Major Stream or Wash
- Tohono O'Odham Nation - San Xavier District
- Incorporated Area
- Avra Hydrogeologic Basin
- Tucson Hydrogeologic Basin
- Jurisdictional Boundary

Water Table Elevation Source: ADWR 1994

Pima County Index Map



Index Map Scale 1:1,750,000

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Attachment 3

Pima County Regional
FLOOD CONTROL
DISTRICT

MEMORANDUM

Water Resources
Regional Flood Control District

THE SEAL OF PIMA COUNTY ARIZONA

DATE: December 14, 2006

TO: Nicole Fyffe
Executive Assistant to the County Administrator

FROM: Julia Fonseca
Environmental Planning Mgr.

SUBJECT: **Maest-Kuipers Report on Predictions Comparison**

I am forwarding you this summary of the findings of a recent study released by Earthworks, and conducted by Ann Maest and Jim Kuipers.

The study compared pre- and post-mining water quality for major bedrock mines which went through the environmental impact analysis under the National Environmental Policy Act. In summary, 100 percent of the mines studied predicted compliance with water quality standards before operations began. Afterwards, 76 percent exceeded water quality standards due to mining. Mitigation measures predicted to prevent water quality exceedances failed at 64 percent of the mines studied in detail.

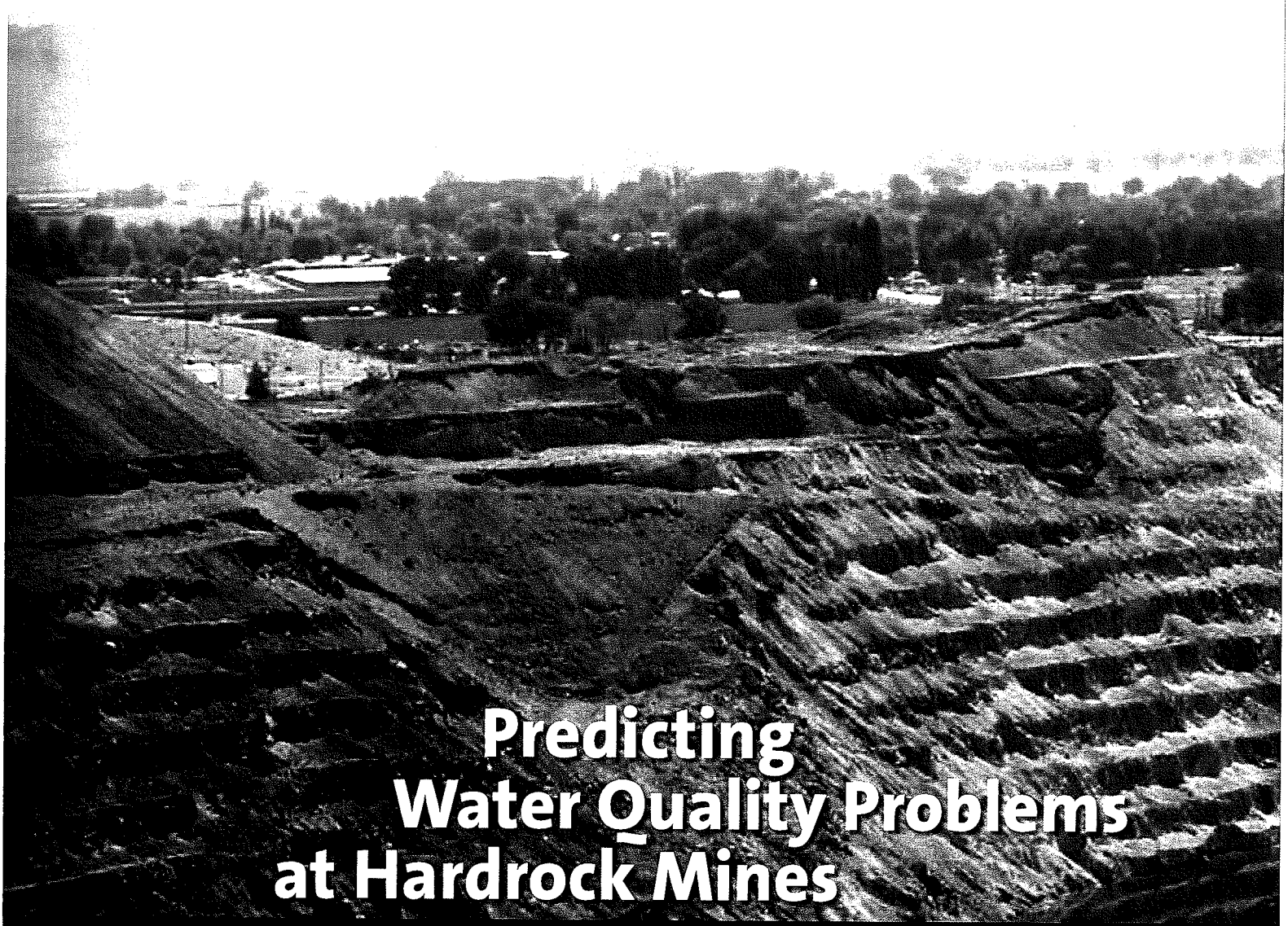
The study identified a number of problems:

1. No independent reviewers were used, and the federal agencies do not often have the expertise to do critical reviews.
2. None of the water quality predictions made in the impact statements were revisited (until this study).
3. The regulatory agencies do not have a practice of revisiting the outcomes to see where failures are occurring, or understand why.
4. The geology and hydrology of the sites are not adequately understood before permitting and during operations.
5. The adequacy of financial assurances based on the outcomes is never revisited.

Some of the solutions proposed in the report are listed below. All of them are applicable to the State Land Department process as well as the federal process.

1. Improve on-line data access for the public.
2. Review original predictions as water quality develops during mining.
3. Consult past predictions at other mines.
4. Require improved characterization of mine sites before and during operations, especially about potential to encounter surface water/groundwater.
5. More research on effectiveness of mine water quality mitigation.
6. Change procedure for selecting consultants to avoid the present conflict of interest.
7. Increase government expertise.

c: Suzanne Shields, P.E. Director
Thomas Helfrich, Division Manager



Predicting Water Quality Problems at Hardrock Mines

A FAILURE OF SCIENCE, OVERSIGHT, AND GOOD PRACTICE

An EARTHWORKS white paper summarizing and analyzing the groundbreaking studies by Ann Maest, PhD and Jim Kuipers, P.E.:

Comparison of Predicted and Actual Water Quality at Hardrock Mines: The reliability of predictions in Environmental Impact Statements

and

Predicting Water Quality at Hardrock Mines: Methods and Models, Uncertainties, and State-of-the-Art

By Alan Septoff, EARTHWORKS December 2006

Introduction

A failure of science, oversight and good practice

This paper is a summary, written for the layperson, of the findings of a two-year research study on the accuracy of water quality predictions at hardrock mines. The study, conducted by Jim Kuipers and Ann Maest[1], brings to light a decades-long failure by government regulators, industry, and consultants to recognize and correct deficient procedures and methods for predicting contamination of water at hardrock mines.

Kuipers and Maest have discovered that, in practice, there is a failure to compare predictions made before the mines are permitted with the actual results. The predictive modeling results are not adjusted to account for real-life failures—this, despite the fact that at the vast majority of mines, problems were worse than predicted. Establishment of credibility in modeling requires that the predictions be tested, and then the models adjusted based on the results. This process appears broken when it comes to predicting the impact of mines on water quality for mine permits.

To permit mines, federal law[2] requires regulators to apply scientific approaches to predict the environmental impacts of the mine proposal – including surface water and groundwater quality impacts. The accuracy of these water quality predictions is of significant public concern. Mining's impacts on water quality may affect municipal, agricultural, and rural water supplies; important commercial, subsistence and sports fisheries; wildlife populations; tourism; and recreation. One of the reports from the study, *Comparison of Predicted and Actual Water Quality at Hardrock Mines (Comparison Report)*, asks a basic question that government regulators, industry officials and consultants should have asked long ago:

Do predicted water quality impacts match reality?

The answer, in short, is **no**. The *Comparison Report* reveals:

- 100 percent of mines predicted compliance with water quality standards before operations began (assuming pre-operations water quality was in compliance).
- 76 percent of mines studied in detail exceeded water quality standards due to mining activity.
- Mitigation[3] measures predicted to prevent water quality exceedances[4] failed at 64 percent of the mines studied in detail.

Along with more analysis of this question, the *Comparison Report* and the companion report on methods and models used to predict water quality (*Methods and Models Report*), also seek to answer the necessary follow-up questions:

- In cases where predicted water quality impacts fail to match reality, why do they fail?
- Do certain types of mines fail more often than others?
- What can be done to address current failures and prevent future failures?

The Kuipers-Maest reports were prepared for a professional audience The purpose of this paper is to translate and summarize the main findings of their research (for the layperson and the interested public), and to offer common sense recommendations based on those findings with an eye toward protecting natural resources and public health.

The Context

Why this research was necessary

The Environmental and Public Costs of Faulty Predictions

The failure to accurately predict and manage water quality impacts can result in significant negative impacts on clean water and steep taxpayer liabilities for the costs of cleanup. Consider one often-cited example — the Summitville gold mine in Colorado. Water pollution at this mine has cost American taxpayers more than $200 million in cleanup costs. The majority of that money has been spent mitigating acid drainage and cyanide releases that were not predicted during the permitting process. When pollution spilled from a containment pond, 18 miles of the Alamosa River were effectively killed – impacting not only the aquatic life in the river, but also the adjacent farms and ranches that relied upon the Alamosa for irrigation and livestock watering.

While it may be argued that Summitville is one of the worst-case examples, problems abound. According to the U.S. EPA's Abandoned Mine Land Team, the cost of mine cleanup at sites on the National Priorities List (i.e., Superfund sites, like Summitville) in the United States is $20 billion – almost 3 times the EPA's FY 2007 budget request. Long term water treatment and management is often the single most significant cost associated with mine cleanup.

In fact, there is an increasing number of mine sites throughout the U.S. that will require water treatment in *perpetuity*. In the arid west, these types of long-term impacts place a tremendous burden on downstream communities who must deal with the consequences of failed predictions. For example, government regulators have determined that the Zortman Landusky mine, located near the Fort Belknap Reservation in Montana, will continue to generate acid mine drainage for thousands of years. As a result, the Fort Belknap Tribes are faced with a continual threat to important tribal water resources, and the state of Montana will be spending tens of millions in public funds for long-term water treatment.[5]

In order to ensure clean water and protect taxpayers from liability for cleanup costs it is important to understand the frequency and magnitude of failures in predicting water quality impacts. Consider that at most major mines, operators are required to post financial assurances prior to operating. This is the good news. These assurances are supposed to guarantee that, should the mine operator go bankrupt, the mine site will be reclaimed at no cost to the taxpayer. However, the bad news is that these financial assurances are based upon expected reclamation costs and expected reclamation costs are based in large part upon water quality predictions.

Previous research by Jim Kuipers demonstrates that taxpayers are potentially liable for up to $20.4 billion[6] in financial assurance shortfalls at existing mine sites (in addition to the $20 billion for Superfund sites) – due in large part to inaccurate water quality predictions.

A Growing Problem

Without correction, the environmental and financial impacts of faulty predictions could grow. Recent increases in metals prices have triggered an increase in the number of new mines being proposed in the United States. According to the Bureau of Land Management, new mining claims filed in 2006 are on track to more than quadruple since metals prices began their precipitous rise in 2002.

In the United States alone there are approximately 180 large hardrock mines – in nearly all regions of the country – that are in various stages of permitting, development, operation or reclamation and closure. In order to better protect important water resources and reduce future economic liability, improvements must be made in the prediction and prevention of impacts to water quality at these sites. On the positive side, the increase in metals prices has resulted in fewer bankruptcies in the sector—and it is bankruptcies that trigger the use of reclamation bonds for mine site reclamation and water treatment. This may provide regulators and industry officials with a window of opportunity to solve the underlying problems with water quality prediction.

Unprecedented Research: the absence of previous studies and the data gap

When they began their research, the authors expected to incorporate data from some mines where government officials had already completed a comparison of predicted and actual water quality impacts. However, they were unable to find comparisons of water quality predictions and actual water quality impacts of mines.

The authors found that no single repository exists for the Environmental Impact Statements (EISs) currently mandated under federal law. EISs contain the water quality predictions analyzed in the study. In some cases, local federal offices that processed the studies did not have copies of them. Furthermore, in many cases, the authors were forced to submit Freedom of Information Act requests and pay fees to obtain copies of these studies. Similarly, water quality from mines was inordinately difficult to obtain and in most cases required personal visits to agencies and long hours sorting through paper files.

Taken together, the absence of previously published research and the difficulty in gathering information is evidence of a data gap that surprised the authors and may help explain the previous lack of a comprehensive study of this nature.

It is important to note that the predictions data were available – no matter how difficult to obtain – only because the National Environmental Policy Act (NEPA) requires it. Without NEPA, this study would have been impossible to conduct.

A Tool for Many Audiences

While the research focuses on the underlying scientific and engineering processes that form the basis of water quality predictions, its recommendations are intended for use by many audiences to increase the effectiveness of future mine water quality predictions – directly and indirectly:

- This study should be useful to the scientific and engineering communities for suggesting ways to better characterize risks to water quality and to better apply mitigation methods to minimize or prevent potential impacts.
- The regulatory community can look to these reports, especially *Methods and Models*, for recommendations on how to fundamentally improve the permitting process to ensure a more accurate analysis of potential mining impacts. The inherent uncertainty in water quality predictions and mitigation failures should be conservatively viewed in order to ensure mine permitting decisions that are more protective of human health and the environment. The integrity of the mine permitting process is dependent on the use of accurate methods and models.
- This report can be utilized by the mining industry to improve current practices and more accurately predict consequences and ameliorate potential effects.
- It can be utilized by the insurance and investment industry as a tool to better understand the potential risks and costs associated with mining, and as a basis to re-assess risks at current mines.
- And finally, it can be utilized by the interested public to more effectively advocate for water quality protections in the permitting process and to advocate in the public arena for legislative and regulatory changes that better protect water resources.

Do Predicted Water Quality Impacts Match Reality?

As indicated above, the answer is usually no — particularly when high risk mines, such as those with close proximity to water resources, are considered.

Sampled Mines

To arrive at this answer the authors initially reviewed 104 Environmental Impact Statements (EISs) and Environmental Assessments (EAs) for 71 major hardrock mines in the United States.[7] The mines covered all important mineral sectors (gold, silver, copper, platinum group metals, molybdenum, lead, and zinc) and ten mining states (Alaska, Arizona, California, Idaho, Montana, New Mexico, Nevada, South Dakota, Utah, and Wisconsin).

A representative subset of 25 case study mines was then selected to evaluate the accuracy of the water quality predictions. Environmental impact reports for these mines were evaluated for predictions related to surface water, groundwater, and mine drainage quality during and after mining. These predictions were then compared with actual water quality conditions during and after mining.

Potential & Predicted Water Quality

The authors discovered a two-tiered system for water quality predictions, one-tier of which was based not on sound science, but on unsupported "good faith" projections.

The two tiers of "predictions" made about water quality in environmental assessments are referred to by the authors as "potential" and "predicted" water quality:

- **Potential** water quality is the expected water quality conditions in the absence of mitigation efforts by the operator.
- **Predicted** water quality takes the effect of mitigating measures into account. It is what mine operators forecast actual water quality will be during and after operations.

All the environmental reviews analyzed in the *Comparison Report* predict acceptable water quality after mitigation at mines where water quality standards were met before mining began. If this prediction were not made, the regulatory agency would not be able to approve the mine.

However, inadequate information was provided to demonstrate how the mitigation measures would actually prevent water quality impacts. Therefore, regulators were generally accepting the final water quality predictions on "faith."

Major Findings: Chronic Underestimates of Water Quality Problems

Prediction vs. Reality: Overall Water Quality Impacts to Ground and Surface Water

Of the 25 mines sampled:

- 76% of mines polluted groundwater or surface water severely enough to exceed water quality standards.
- 60% of mines polluted surface water severely enough to exceed water quality standards.
- At least 13 mines (52%) polluted groundwater severely enough to exceed water quality standards.

Predictions vs. Reality: the Failure of Mitigation

In the cases where water quality standards were exceeded, in some cases the mine proponent anticipated the potential for pollution and prepared mitigation strategies (e.g. a mine waste dump lined with plastic to prevent acid drainage leaching into groundwater). Predictions of the efficacy of mitigation were no more reliable than overall predictions of water quality:

- 73% of mines exceeded surface water quality standards despite predicting that mitigation would result in compliance. The other 4 mines didn't predict the need for mitigation.
- 77% of mines that exceeded groundwater quality standards predicted that mitigation would result in compliance. The other 3 mines didn't predict the need for mitigation.

Predictions vs. Reality: Mines near Water with Elevated Acid Drainage or Contaminant Leaching Potential are High Risk

Some mine projects are so high risk that water quality exceedances are a near certainty: those mines that are both near groundwater or surface water resources, and possess an elevated potential for acid drainage or contaminant leaching.

- 85% of the mines near surface water with elevated potential for acid drainage or contaminant leaching exceeded water quality standards
- 93% of the mines near groundwater with elevated potential for acid drainage or contaminant leaching exceeded water quality standards.
- Of the sites that did develop acid drainage, 89% predicted that they would not.

Water Quality Pollutants

Of the 19 mines that exceeeded water quality standards, the pollutants that exceeded standards were as follows

- Toxic heavy metals such as lead, mercury, cadmium, copper, nickel or zinc exceeded standards at 63% of mines.

- Arsenic and sulfate exceeded standards at 58% of mines.
- Cyanide exceeded standards at 53% of mines.

Why Do Predictions Fail?

In order to evaluate water quality impacts during the permitting process, government regulators rely on water quality predictions created by hydrologists and geochemists and mining engineers using computer models and other types of field or laboratory studies. Those predictions are only as good as the science upon which the models/tools are based, and the site characterization information supplied to those models. So when water quality predictions fail to predict water quality for mining operations, they fail for two general reasons:

1. the science of mine water quality prediction is imperfect
2. the science of mine water quality prediction is imperfectly applied at mine sites

The Imperfect Science of Mine Water Quality Prediction

The complexity of pollutants' interaction and movement in groundwater and surface water systems at mines is difficult to recreate in a model. This is addressed in detail in the companion report by Maest & Kuipers titled *Predicting Water Quality at Hardrock Mines: Methods and Models, Uncertainties, and State-of-the-Art.*

According to *Methods and Models*, factors that complicate the prediction of water quality at mine sites range in scale from small to large. On a small scale, for example, it is not well known how minerals react in complex systems. On a large scale, geology, climate, methods of mining and mineral processing, and mine waste management approaches vary among and within mine operations. These large scale variations limit the degree to which information from one site can be applied to another.

Also, extrapolation from the laboratory to the mine must address complicating factors such as environmental conditions, water and gas transport, differences in particle size, and how these variables affect drainage quality over periods of decades or centuries. However, there is virtually no available field information describing the effect of these variables over extended periods of time. The lack of this field information introduces significant additional uncertainty into predictions.

Just as weather cannot be accurately predicted beyond a certain point because weather models and their inputs are not perfect, the transport of pollutants through complex geological and hydrological systems over the longer term, which can range from five years to tens of thousands of years is similarly difficult to predict.

One of the study's most significant findings, however, is where the practice of predicting weather and the practice of predicting water quality at mining operations part ways. Weather models are consistently reevaluated based on a comparison of predictions with actual weather conditions that occur subsequently.

Not so with the models used for predicting water quality at mining operations. The very fact that the study is unprecedented shows that *professionals who predict mine water quality do not revisit their predictions, and neither do the regulators responsible for ensuring the accuracy of those prediction.* The models used for the predictions cannot be improved if their failures and successes are not evaluated. Where predictions of water quality at mining sites are concerned, the scientific process is broken.

Imperfect Science, Imperfectly Applied

A mine water quality prediction model can only reach its potential at any individual mine site if that site is correctly characterized (in terms of its hydrology and geochemistry) to the extent possible. According to Maest and Kuipers, that potential is not being reached.

There are two types of characterization failures described in the *Comparison Report*: hydrologic (related to water flow at a mine site) and geochemical (the chemistry, geology and mineralogy of the materials/minerals that comprise the mine site).

The *Comparison Report* documents that six of the 25 case study mines were inadequately characterized hydrologically, and that eleven of the case study sites were inadequately characterized geochemically.

Another example of "imperfect science, imperfectly applied" is the bias of mine water quality predictions made by consultants hired by the prospective mine operator. This problem is implied by the number of site characterization failures, and by the failure to check the results of past mine water quality predictions.

Regulatory agencies, both federal and state, allow the mining company to select and directly pay consultants to predict mine water quality impacts, and to review and comment on (or even reject) those predictions, prior to release to the agency. It is an understatement to say that consultants heavily influence mine water quality predictions.

Unfortunately, given the client/customer relationship between prospective mine operators and their consultants, consultants are rewarded for having favorable predictions. On the other hand a prediction of poor water quality will usually delay a permit, which increases the permitting costs. While exceptions exist, consultants that predict poor water quality often are not rehired. This perverse incentive is contrary to the spirit of unbiased science, and contrary to the public interest.

Preventing Future Failures (and Addressing Current Failures)

Recommendations

Both the *Comparisons* and the *Methods and Models Reports* reveal that the prediction of future mine water quality is an uncertain business. And given the difficulty in modeling natural systems, even if the all the recommendations included here and in the Kuipers-Maest research are implemented, mine water quality prediction will always be an uncertain business. However, there is considerable room for improvement.

Just as weather prediction has improved over time, so can mine water quality prediction — if regulators and professionals in the sector learn from past predictions and improve characterization efforts.

With that in mind, the following recommendations are intended to help improve mine water quality predictions today and in the future.

Addressing the Consequences of the Existing Prediction Process

Assess existing mines. If the results of the *Comparison Report* are extrapolated to all operating major mines, water quality standards would be exceeded at roughly 75% of all mines in the United States. Regulators should, in a public process, canvass all permitted mines to:

- determine which mines are exceeding water quality standards,
- evaluate how surrounding communities and the environment are being affected, and what cleanup steps are necessary,
- revisit the original predictions, and
- reassess the adequacy of the financial assurances provided by mine operators to guarantee mine cleanup and long-term water treatment.

Incorporate uncertainty into permitting process. Regulators should take a suitably precautionary approach to the mine permitting process, and require that mine design, mitigation and financial assurance calculations prepare for reasonable worst-case rather than best-case scenarios.

Better screen high-risk mines. Regulators must demonstrate concrete improvement in the accuracy of mine water quality predictions and mitigation efforts. For example, additional regulatory scrutiny should be given to the highest risk proposals such as those mines near water resources **and** with elevated acid drainage or contaminant leaching potential. In cases where the risks are too high, regulators should not permit mines. It should be noted that this recommendation is supported by the *Comparison Report* which demonstrates that 93 % of such mines near groundwater, and 85% near surface water, exceeded water quality standards.

Some major mining companies are realizing that the life-cycle costs need to be clearly evaluated, including the costs of *perpetual maintenance and water treatment after mine closure.* While some leaders in the industry are using life-cycle cost estimates, this is still not a uniform industry standard, and regulators ultimately must make the determination for many mine proposals.

Inform the public about the uncertainty of water quality prediction. As part of the mine permitting process, regulators should inform the public of the history of the accuracy of mine water quality predictions so they can better determine the risk involved in a mine proposal.

Improving Future Mine Water Quality Predictions

Ease access to predictions and results. Information regarding pre-mining, mining and post-mining water quality should be publicly available online, along with the associated mine water quality predictions made during the permitting process. This will facilitate a more informed mine permit process for regulators and the public.

Review original predictions as water quality develops during mining. Mine operations should be regularly assessed to determine if they are departing from mine water quality predictions. This will allow regulators and mine operators to take early action when mine water quality begins to depart from the predicted.

Consult past predictions at other mines. When permitting a mine, regulators should be required to seek similar mines, or similar aspects of different mines, and determine what predictions were made and what water quality actually occurred. These mine analogs should be publicly disclosed.

Require improved characterization of mine sites. This recommendation is covered in much greater detail in the *Methods and Models Report.* In summary, regulators should require better information about the mine site — before, during and after operations.

Require more research on the effectiveness of mine water quality mitigation. The *Comparison Report* found that where predictions of good mine water quality were predicated upon the mine operator using mitigation strategies, mine water quality usually exceeded water quality standards. More research is needed to determine how and why these mitigation efforts fail, and how to improve them.

Change the procedure for selecting consultants to avoid the present conflict of interests. Agencies should independently select and pay the consultants to conduct the

studies. This will limit the ability of a mining proponent to influence the outcome of the predictions. The mine proponent can comment on the study, similar to public interest organizations, but they should not be able to exert sufficient influence to bias the outcome.

Increase government expertise. Many state and federal agencies are not sufficiently funded to employ staff with the technical expertise to provide appropriate analysis and oversight of the mine permitting process. Increased funding should be incorporated into agency budgets to ensure that technical expertise is available for permit review.

Endnotes

1. Jim Kuipers, PE, is a mining engineer with Kuipers & Associates in Butte, Montana, and Ann Maest, PhD, is an environmental geochemist with Buka Environmental in Boulder, Colorado.

2. The National Environmental Policy Act requires a science-based review of mine proposals when federally-owned land is affected, or when a federal permit is required (e.g. the Clean Water Act requires a permit when a mine discharges into waters of the United States). Many states have similar laws, based on NEPA, that apply to mine proposals even when federal land is not involved.

3. Mitigation is the effort by a mine operator to prevent or reduce pollution. For example, some mine waste (e.g., tailings impoundments) is underlain by thick plastic to prevent contaminants from moving into nearby water resources.

4. In this paper, an "exceedance" is the presence of a pollutant in concentrations higher than a water quality standard. This is different from a water quality "violation," which is a breach in the terms of a water quality permit. A water quality permit, although based on standards, may allow exceedances under some conditions. A mine operator is legally liable for a water quality violation.

5. Mitchell, Larry D., a staff paper prepared for the Environmental Quality Council, "Zortman and Landusky Mines: HJ 43 Water Quality Impacts, October 2004.

6. Kuipers, J, 2003, Putting a Price on Pollution: Financial Assurance for Mine Reclamation and Closure. This report was funded by Mineral Policy Center.

7. Many mines have multiple EISs or EIAs for different eras of mining.

US POSTAGE

PIMA COUNTY
ADMINISTRATOR'S OFFICE
130 W. CONGRESS, 10th FLOOR
TUCSON, AZ 85701-1317

Jeanine Derby
Forest Supervisor
Federal Building
300 West Congress
Tucson, Arizona 85701

Tucson, AZ 85701
Received
MAY 20 2008
Coronado National Forest

Kathryn Chwalek
19960 South Sonoita Highway
Vail, Arizona 85641
(520) 762-0073

May 15, 2008

Team Leader
Rosemont Copper Project
Coronado National Forest
300 West Congress Street
Tucson, AZ 85701

Dear Rosemont Team Leader,

I would like to voice my concerns/opinion during the comment process for the proposed Rosemont Copper Mine Project. My husband and I live at 19960 South Sonoita Highway. We moved here in December of 1998. After our children grew-up and graduated, we decided to make the move out of town that we always dreamed about. After about six months of looking, we found our "Green Oasis in the Desert" at Sonoita Highway; where we live now and will eventually retire to. It is far enough away from Tucson that at night you can clearly see all the stars, yet it is only half hour from where we work.

Below are the many concerns/problems we have with the proposed mine which would be located only three miles south of us:

1) Our water is from a well that supports six families. We have never had a problem with our water, it is soft and crystal clear. Our well is 650 feet deep and the underground stream that supplies our well runs from south to north. With the proposed mine just three miles south of us, it will have a horrific effect upon our well. The proposed wells of the pit mine will be as deep as 1,800 to 2,900 feet. There goes the water supply to six families. Without that water, it will make life very hard and reduce the value of our land considerably. Water is very scarce in the desert and the mine will either take our water away from us or pollute it to an extent that it would be unusable. Tapping the ground water has been going on for some time in the Sonoran Desert. As pumping technology has enabled aquifers to be more effectively exploited, the region's water table has dropped an average of 160 feet and as much as 1,000 feet in some areas. Are we going to continue to let this happen?

2) a) All day I listen to the chimes we have on our porch outside, because this area is always windy. We worked our whole life to buy this house. If the mine is approved 3 miles south (down wind) from our home the particle pollution and the heavy metal contamination in the dust caused from the tailing and waste piles/overburden would make living here unbearable along with causing health issues.

   b) The explosions will be going 24/7, how can we possibly think let alone sleep with this kind of noise. Our home would become worthless and the value of the house would not even pay off the amount owed on our mortgage.

3) Increased traffic on Highway 83 would be a significant safety issue. I ride my bike along with fellow bicyclist and it is a narrow road. At times there is barely enough

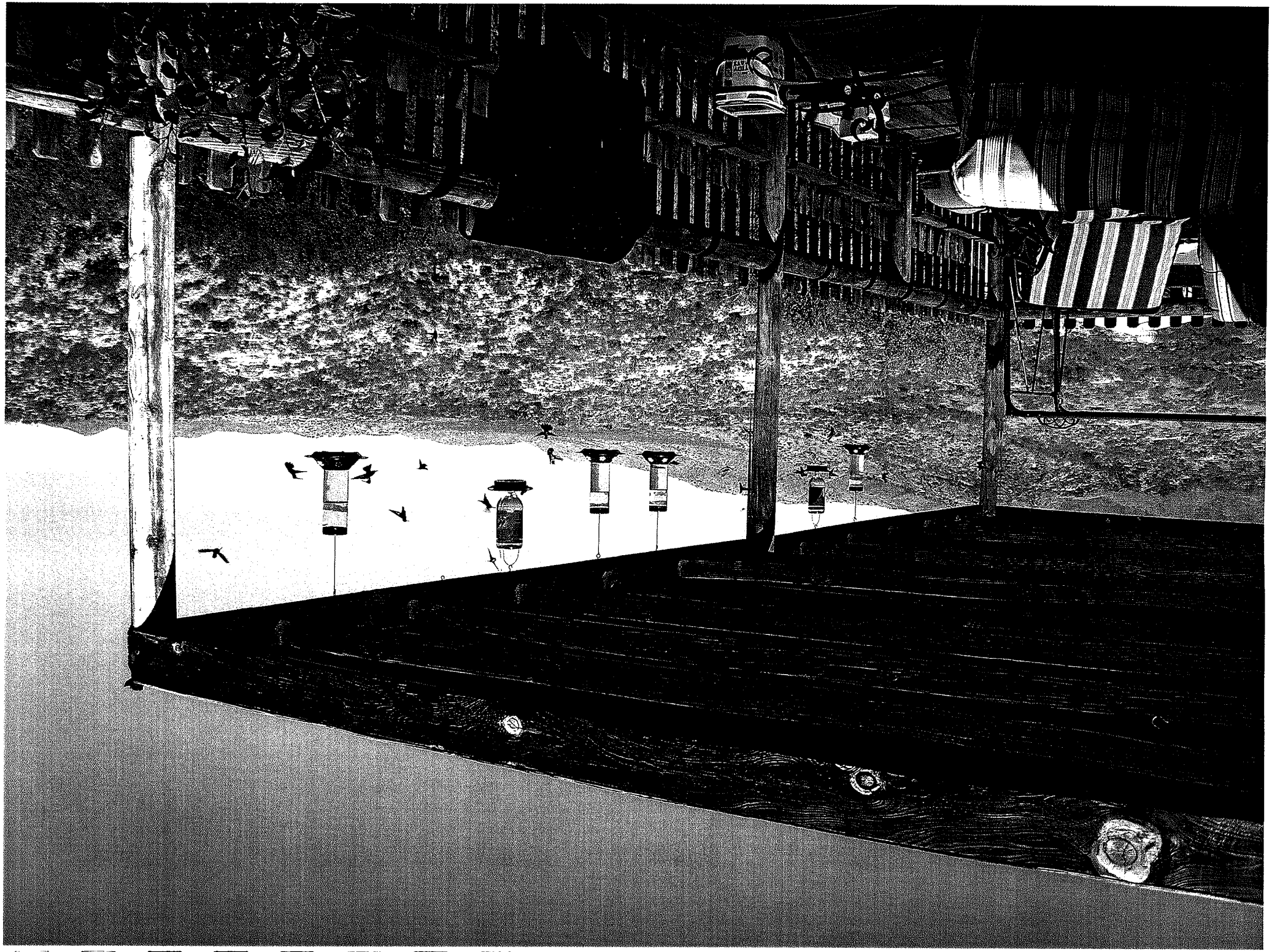
room for me and a vehicle to share the road. There will be **NO** room with the large haul trucks and wide heavy construction equipment going up and down the road. I fear for myself and other bicyclist sharing the road. There will be accidents and when you tangle with that kind of vehicle, it could and would be deadly. I fear for the lives of the neighborhood children waiting for the school bus when those mining trucks need to stop for the school bus but can't stop.

4) We live in a Wildlife corridor, the kinds of wildlife we have seen in the almost 10 years of living here is extraordinary. We have seen bobcats, coatimundis, fox, deer, javelinas, rattlesnakes, king snakes, roadrunners, gila monsters, lizards, bats... the list just goes on and on. As for the birds, we have seen all kinds and species. In the spring and fall, we have the hummingbirds coming through here in the hundreds. We put out seven (7) feeders and go through 300 ounces of food a day during the peak season. We have hummingbirds three plus deep waiting their turn to eat (see attached pictures). The tree next to the feeders are filled with hummingbirds waiting their turn. We fear for the wildlife and for our lives while we live and play here. This mine would endanger us, our grandchildren, neighbors and the tourist that come here to play. Where will all the wildlife go when they run for their lives when the mine starts operating? They will exit to our backyard and endanger our pets, children and ourselves.

We have family that come to visit and they can't get over how beautiful this place is where we live. We go down to Sonoita to eat and the trip down and back is just breathtaking. With Rosemont mine, it will be an eye sore. We fear that both the small towns of Sonoita and Patagonia will just disappear because they depend on tourism. Who will want to come here with the negative impact that Rosemont Mine will create. We have destroyed our land from within for so long and now we are letting a foreign corporation come here and do it for us. The negative impacts far out weight the profit of the corporation. Do not revise the Forest Plan to accommodate mining for Augusta Resource Corp. Augusta has no real legal right to use Arizona's public land for their mining purposes.

There is only one reason why the Augusta Resource Corp. wants to mine here and that is for the profit. There are hundreds of thousands of reason why the mine should **NOT** be open and that is for all our future generations of children, grandchildren and their children, grandchildren, etc. along with all the future generations of wildlife. Enough is enough and we the people have taken enough. **We do not want the mine to open here.** Augusta Resource Corp can stay in Canada where they belong and destroy their country not ours!

Concerned residence of Scenic Sonoita Highway,

Kathryn Chwalek

Kathryn Chwalek