



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IX

75 Hawthorne Street

San Francisco, CA 94105-3901

**MEMORANDUM**

DATE: April 30, 1997

SUBJECT: Request to issue a UIC permit and aquifer exemption to BHP Copper for the Florence In-Situ Project

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THROUGH: Laura Bose, Chief  
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TO: Alexis Strauss, Acting Director  
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Purpose

The purpose of this memorandum is to summarize BHP Copper's Florence In-Situ Project and to request the issuance of a UIC permit and aquifer exemption for this project. The permit, aquifer exemption, statement of basis, response to comments, and a BHP brochure on the project are attached.

Summary

*Background on in-situ approach*

A substantial copper oxide orebody lies between 400 feet to 1600 feet below ground surface in Florence, Arizona (approximately 50 miles southeast of Phoenix). In the early 1970's, a mining company attempted to mine this deposit but found that neither open pit nor shaft technology were feasible because the copper is too deep for open pit and too low-grade for shafts. Advances with in situ (or "in place") technology have allowed Broken Hill Proprietary (BHP) Copper to design a project that would economically mine this deposit. The project would require no excavation or shaft/drift construction. The project would rely entirely on 4-inch injection and recovery wells (i.e., Class III UIC wells).

The BHP-Florence Project is interesting for two reasons: 1) it would be the first commercial-scale in-situ copper mine in the world, and 2) if designed and operated properly, the environmental impacts from the in-situ approach should be less significant than the impacts associated with conventional copper mining methods. Compared to open pit and shaft mining, the in-situ approach does not require groundwater de-watering; water quality in the mining zone can be restored to adequately protect surrounding groundwater; by avoiding major excavations, particulate matter (dust) impacts are less significant; and after closure, aesthetic impacts are relatively insignificant.

### *The proposed mining project*

Over a 15-year mine life, approximately 3,000 injection and recovery wells would be constructed. BHP would move through the deposit block-by-block constructing side-by-side 5-spots (an injection well surrounded by 4 recovery wells, approximately 75 feet apart). A dilute sulfuric acid solution would be injected into the ore zone, copper would be solubilized (i.e., moved from a solid state to a dissolved state), and the copper-laden solution would be pumped out via surrounding recovery wells.

Although there are many advantages to in-situ mining, since the mining zone cannot be visually observed, groundwater modeling and monitoring must be emphasized in order to verify that surrounding groundwater is not endangered. Therefore, the proposed permit requires various well construction and testing requirements, hydraulic control (flow must be inward), thirty-one (31) groundwater quality wells, and in order to protect surrounding groundwater after the completion of mining, restoration of the mining zone to primary drinking water standards. Since BHP will move through the ore body block-by-block, BHP will be required to commence restoration immediately following the mining of each block. This will add a level of assurance as the endangering zone will never be more than the size of one mining block.

### *Drinking water wells*

There are no drinking water wells, public or private, downgradient from the mine site. Future downgradient wells are also controlled as BHP Copper owns about 2-3 miles of land to the north and west (downgradient) of the site. There are many agricultural wells and several public water supply wells within a 2-mile radius of the proposed mine, however, these wells are all to the east and southeast (upgradient) of the proposed site. Due to the location of the proposed site and the location of the existing wells, even with no controls, impacts to existing drinking water wells would be highly unlikely.

### *Water use*

Although this project will include large evaporation ponds and will consume significant quantities of water, the mining project would consume less water than if the land was used entirely for cotton farming. Currently, approximately half of the 400-acre mine area is used for cotton farming and about half is undeveloped desert land.

### *Cultural resource issues*

The northern half of the site (the desert land) was the site of an 800 A.D. civilization. The area has artifacts from the Hohokam Period that include mounds, building foundations, arrowheads, and pottery. Due to the sensitivity of this area, EPA has signed a Programmatic Agreement with the Gila River Indian Community, the State Historic Preservation Office (SHPO), the Advisory Council, and BHP to ensure that all findings are handled properly and sensitive areas are avoided, when possible. To date, there has been no opposition from the tribes and BHP's archaeologists have been working cooperatively with SHPO.

### *Public comments/opinion*

Approximately 20 citizens of Florence (population 6,000) attended a public hearing on the project. Although most citizens just asked basic questions about the project, a couple of

citizens spoke out for the mine, and a couple of citizens spoke out against the mine. All comments from the public hearing and written comments received during the 30-day review period are summarized in the attached "Response to Comments."

*Technical reviews and legal consultations*

Due to the technical and unique nature of the project, Region 9 utilized some of EPA's national groundwater expertise. Scientists at the EPA Groundwater Research Lab in Ada, Oklahoma reviewed BHP's groundwater modeling and Paul Osborne (Region 8), a National UIC Expert, reviewed the draft permit and statement of basis. At Region 9, John Hillenbrand reviewed the groundwater modeling and geologic assumptions and I performed an overall review of the proposed project. Since ADEQ required an Aquifer Protection Permit (APP) for the project, a geologist and engineer from ADEQ also reviewed and commented on the design of the project. I have consulted with Chris Sproul (ORC) on several legal issues related to the permit and aquifer exemption.

Requested EPA actions

Pursuant to 40 CFR 146.4, the proposed operation meets the criteria for an aquifer exemption as the zone does not currently serve as a source of drinking water and there are minerals that are commercially producible. Furthermore, the UIC permit would ensure that present and future underground sources of drinking water surrounding the site would be adequately protected. It is therefore requested that the attached aquifer exemption and UIC permit be issued to BHP Copper.