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ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

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Stephen A. Owens
Director

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CTS #: 151241

March 12, 2007

Attention: E.L.(Ned) Hall, Chief Environmental Engineer
Phelps Dodge Sierrita Inc.
6200 W. Duval Mine Road
P.O. Box 527
Green Valley, AZ 85622-0527

Re: Mitigation Order on Consent, Docket No: P-50-06 – Identification of Potential Interim Actions, Groundwater Monitoring Report, Well Inventory Report

Dear Mr. Hall:

The Arizona Department of Environmental Quality (ADEQ) has reviewed the referenced reports submitted by Phelps Dodge Sierrita, Inc., (PDSI) during December 2006, and has completed a preliminary review of the "Evaluation of the Current Effectiveness of the Sierrita Wellfield" received on March 2, 2007.

Based on these reviews and the meeting held on March 6, 2007, ADEQ's comments pertaining to the December submittals are outlined below. ADEQ's comments regarding the March 2007 report are forthcoming.

A. Identification of Potential Interim Actions Report

The report presents a list of interim actions or options that could be implemented to mitigate the effect of sulfate in excess of 250 mg/l in drinking water supplies. However, the report does not identify preferred or prescribed interim actions due to what was described as a "multiplicity of alternatives" and "site specific factors" that would be taken at a specific drinking water system(s), should monitoring show sulfate in excess of 250 mg/l.

The report identifies 10 drinking water wells that could potentially require future interim mitigation actions. Further, during the March 6, 2007 meeting, PDSI stated that because most of these drinking water wells are located in the middle towards the southern portion of the well field area, the likelihood of sulfate concentrations exceeding 250 mg/l at such wells is remote. Nevertheless, there are three or four drinking water wells located in northern portion of the well field area that are susceptible to high sulfate impacts. Given the availability of information, PDSI should provide more than a glimpse of how it will respond and implement interim actions to mitigate sulfate impact at drinking water supplies that exceed 250 mg/l. At a

minimum, ADEQ recommends PDSI provides a flow chart describing specific actions that will be taken, should sulfate concentration exceed 250 mg/l under any of the following three hypothetical scenarios presented in the report:

1. A private well (only one private well is identified on the list);
2. A public water supply well feeding directly into the distribution system. (Any of the 6 wells in this category can be used); and
3. A public drinking water supply that is blended with other wells (ESP-1 is a good example).

Specific Comments

1. Section 2.2.p11. paragraph 2

According to Section 2.2 of the report, "interim action selection and planning will be triggered for a water supply with a discreet sulfate concentration between 135 and 250 mg/l, and interim action implementation will be triggered if the discreet sulfate concentration is 250 mg/l or greater." ADEQ also understands that PDSI will cease interim action implementation if, after implementing such interim action, the average sulfate concentration, which is the arithmetic mean of any subsequent three discreet sulfate results, is less than 250 mg/l.

2. Section 5.p11. paragraph 2

Section 5 of the report raises the issue regarding how the source of sulfate in any impacted drinking water supply well could affect the decision to implement interim mitigation measures by PDSI. Identifying the source of sulfate after a well is impacted could lead to a significant delay in the implementation of interim mitigation. In addition to PDSI, two other potential sources of sulfate in the area were identified as the Santa Cruz sediments and the Twin Buttes Mine. Although hydrodynamic and hydrochemical analyses can be helpful but not definitive in identify the sulfate source, sulfur isotope analysis may be the only definitive way to characterize the source of the sulfate. If PDSI suspects another source of sulfate may contaminate an identified drinking water well, PDSI should consider initiating such studies at the University of Arizona, or at any appropriate commercial laboratory in readiness for this potential event.

B. Groundwater Monitoring Report

The scope of the groundwater monitoring report is consistent with the approved work plan. ADEQ agrees with PDSI's conclusion that compared with the September 2006 data, there are "no substantive differences in the plume configuration". ADEQ requests that PDSI also provide

the groundwater monitoring report and data in electronic format to facilitate easier evaluation and comparison of future data.

Specific Comments

Section 1.1.1, p. 2, paragraph 3:

Many of the wells scheduled for quarterly sampling could not be sampled due to access related issues. Despite PDSI's assurances during the March 6, 2007 meeting that the unsampled wells did not create data gaps, ADEQ recommends that all necessary steps should be taken to ensure that all wells are sampled. Wells such as CW-8 are crucial in defining accurately the plume's configuration.

1. Section 2.2, p. 5 paragraph.1:

   The results presented in Table 4 for ESP-4 and MH-12 are only for depth specific samples. There are no results for representative samples of the whole well. However, an evaluation of the sulfate isoconcentration lines in Figure 1 shows the values for these wells are extrapolated as 500 and 1400 ug/L respectively. These isoconcentration values are not consistent with the depth specific data or their averages. In future, depth specific sample results should be accompanied by the collection and analysis of a representative sample of the whole well.

2. Section 3, p.7, Discussion:

   The report states that the results of depth specific sampling at ESP-4 indicate that sulfate concentrations increase significantly below a depth of 750 ft, while well MH-12 did not show a similar trend with depth. This interpretation did not consider the fact that MH-12 was sampled only to a depth of 700 ft. During the March 6, 2007 meeting, PDSI explained that an obstruction was present at 700 feet limiting drill depth. It is most probable that if deeper samples were obtained at MH-12, a similar stratification as in Well ESP-4 , which was sampled to a depth of 950 feet, could exist. For future comparative analysis, well depths for this type of study should be comparable. If not possible, an explanation should be provided the appropriate context or basis for any conclusion reached.

C. Well Inventory Report

The Well Inventory Report was prepared in accordance with the approved Work Plan. The principal objective of the report was to identify and sample all drinking water

sources within one mile radius of the 250 mg/l sulfate plume boundary. The well search, screening processes, and safety checks were thorough and well implemented. Since the plume boundary is dynamic it may be necessary to update the report in the near future.

Please call me at 602-771-4614 if you have any questions.

Sincerely,

Robert Casey, Manager, Water Quality Enforcement Unit, ADEQ

cc: Stuart M. Brown, President, Bridgewater Group, Inc.
John Brack, Phelps Dodge, Sierrita, Inc.
Ray Lazuk, Phelps Dodge Corporation
Chad Fretz, Phelps Dodge, Sierrita, Inc.
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