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Project No. C242-0301

Pete Dwelley
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4001 Bradshaw
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Subject: **Rio Del Oro Mining Project, Mitigated Negative Declaration, Project RC-06-224 – Response to RWQCB Comment**

Dear Pete:

This letter offers responses to general comment number 1 in the May 3, 2007 letter from Alexander MacDonald of the California Regional Water Quality Control Board (RWQCB) to Ben Ritchie of the City of Rancho Cordova Planning Development regarding the proposed Rio Del Oro Mining Project. The RWQCB comment states that

> "The report needs to discuss the potential adverse health affects *[sic]* to mining workers associated with natural *[sic]* occurring levels of arsenic that are present on the property. Only in that manner can it be determined if mitigation measures are needed to allow the proposed operation on the property. A copy of pertinent sections of a report regarding the background metal concentrations on the property has been previously provided to City Planning staff and we submitted a similar comment on the draft Environmental Impact Report for the Rio Del Oro development."

Based on the data I have reviewed, it is evident that naturally occurring arsenic in soil at the Rio Del Oro site will not cause adverse health effects in mining workers. The reported arsenic levels in the soil are not elevated above common background concentrations and will not contribute meaningfully to typical exposure to inorganic arsenic from food and drinking water that are experienced by all Californians. Consequently, adverse health effects are not anticipated. The remainder of this letter provides an explanation of this opinion.

It is my understanding that Granite Construction Company is proposing an aggregate mining, processing, and reclamation operation located on the Rio Del Oro site in the City of

Rancho Cordova. The project site consists of a 1,300-acre proposed mining and processing area, situated within a 2,526 acre parcel owned by Aerojet-General Corporation referred to as the Inactive Rancho Cordova Test Site (IRCTS). The site is located directly adjacent and south of White Rock Road, 4,800 feet east of Sunrise Boulevard, and 5,100 feet north of Douglas Road. Approximately 600 acres of the total mining area are expected to be disturbed. The proposed project involves the mining and processing of tailings, which were created by previous gold dredge mining operations. These tailings consist of cobbles intermixed with sand and gravel, and vary from 5- to 75-feet in height with typical base widths in the range of 100- to 300-feet. The proposed operation will remove and process these mounds and the end result will be a site with elevations similar to the natural elevation of the site prior to gold dredging operations. All material mined from the site will be processed by a portable crushing and screening plant that will work its way across the site as mining progresses. Processed material from the site will be loaded into transport trucks and weighed at an on-site scale house before entering onto White Rock Road or Douglas Road for general circulation. Excess screened fine aggregate material may be used to reclaim excavation areas. The duration of the project is up to ten years.

The report referenced in the RWQCB comment quoted above is assumed to be the December 1994 report titled "Sitewide Background Levels of Soil Trace Elements, Aerojet Propulsion Systems Plant and Adjacent Subsidiary Sites, Rancho Cordova, California" (Prepared by Robert Borch, Environmental Geoscience Research & Analytical Services), sections of which were provided to me. Based on the data included in the pages of the report that were provided, it is difficult to understand the concern that lies behind the comment.

As you know, inorganic arsenic is naturally present in soil, water, air and food. Arsenic is present in much of the earth's crust, and both natural and anthropogenic processes have contributed to arsenic's wide distribution. Due to the pervasive presence of inorganic arsenic in the environment, speculation about potential health impacts from typical background exposures are not scientifically supportable, i.e., because all of humankind shares these exposures, effects cannot be discerned by observational studies. In some parts of the world, however, naturally occurring levels of arsenic in drinking water supplies are markedly elevated. In these cases, epidemiological studies have demonstrated health impacts, including elevated incidence of certain cancers. For areas where inorganic arsenic concentrations are elevated in soil, no such health impacts have been confirmed.

Arsenic is present in soils from a variety of different processes. The natural breakdown of rocks containing arsenic accounts for the presence of arsenic in all soils and with higher concentrations present in soils near rocks that are naturally enriched in arsenic, such as granite. Additionally, human activity such as the use of arsenical herbicides and pesticides, fallout of air releases from smelters, cotton gins, and coal burning, and releases from mine tailings can all lead to increased arsenic concentrations in soils. Much agricultural land across the United States and in California has been impacted by the historical use of arsenical pesticides.

The predominant forms of inorganic arsenic compounds in soils are trivalent and pentavalent. Arsenic is typically found in soils as sulfide minerals, complex oxides, and arsenic present in iron, manganese, and phosphate mineral species, which have low solubility. The presence of these less water soluble mineral phases and ionic forms that are strongly adsorbed to soil particles or coprecipitated with other elements in soil contributes to reduced bioavailability of arsenic in soil (Kelley et al. 2002). Roberts et al. (2007) recently reported that soil arsenic was only 5-31% as bioavailable as water soluble arsenic. This reduced bioavailability of soil arsenic contributes to reduced exposure compared with arsenic ingested in food and water. Arsenic present in soils as a result of breakdown of rocks with naturally occurring arsenic are expected to have very limited solubility and bioavailability.

Based on the data provided in the 1994 report, it does not appear that arsenic in soil in the area of the Rio Del Oro development is elevated beyond the typical background range of concentrations. Summary statistics provided in Table 2 indicate a mean of 5.4 ppm (range 0.2 to 15.6 ppm) for 156 samples. For the 40 samples from the IRCTS the mean was 6.1 ppm (range 1.8 to 12 ppm). For the 15 samples within the proposed mining area the mean was 7.5 (range 4.4 to 12 ppm). The 1994 samples were analyzed by Chemex (a laboratory specializing in exploration geochemistry) using a total digestion procedure (grinding followed by hydrofluoric acid digestion and then inductively coupled plasma analysis). This total digestion analysis would have yielded higher concentration estimates than the standard U.S. Environmental Protection Agency (EPA) method (3050B) currently used for soil investigation. The hydrofluoric acid digestion used breaks down any silicon containing materials, whereas the current EPA 3050B strong acid digest with nitric acid and hydrogen peroxide would not break down those materials. Although the 1994 Chemex analyses could overestimate arsenic concentrations, a more recent study of background concentrations in the Aerojet Main Plant Site using an approved EPA method did yield similar concentrations, with a mean of 5.1 ppm and a maximum value of 12 ppm in 37 samples collected from xerorthents soil in areas without obvious sources of contamination.[1] Concentrations in Redding-Corning-Red Bluff soil were lower (mean of 2.7,ppm, maximum of 8.3 ppm).

[1] Source: Background Metals in Xerorthents and Redding-Corning-Red Bluff Surface Soils at the Aerojet Superfund Site, Main Plant Sacramento, California. Aerojet Document Control No. SR10121202. Prepared by R. Bienert, R. Borch and S. Neville, July 2006.

The range of concentrations observed at the site is typical of the expected range of concentrations in the State of California. Information on arsenic concentrations in California soil is available from a number of surveys. According to soil samples collected by the U.S. Geological Survey (USGS), arsenic concentrations in California soils that are not impacted by anthropogenic sources (N=72) range from 0.3 to 69 mg/kg with a mean of 6.6 mg/kg (Dragun and Chiasson 1991). Bradford et al. (1996) report concentrations of arsenic in 50 samples of California soils collected from around the state in 1967. Arsenic concentrations in that data set range from 0.6 and 11.0 mg/kg with a mean of 3.5 mg/kg. Of the nine soils collected closest to the Sacramento area, concentrations range from 0.8 to 9.6 mg/kg with a mean of 3.7 mg/kg. Hunter et al. (2005) reported values for arsenic in soil and groundwater collected at uncontaminated sites on 13 California Air Force Bases.[2] Median and 95th percentile concentrations were 2.2 and 12.7 mg/kg, respectively. The authors state that the 95th percentile represents background well "given the inherent complexities of these large and diverse samples."

As described above, anthropogenic sources of arsenic (e.g., from the use of arsenical pesticides) can result in significantly higher concentrations of soil. Background levels of arsenic in native forest soil located near a former orchard site in Placer County, California,[3] ranged from 4.1 to 31 mg/kg (MWH 2003). In the nearby orchard land, where there was historical inorganic pesticide use, arsenic concentrations in the soil ranged from 2.4 to 124 mg/kg (MWH 2003). The range of arsenic concentrations in the soils of former orchards in the U.S. can range from 100 to 200 mg/kg with levels as high as 2,500 mg/kg (ICPS 2001).

Background exposure to inorganic arsenic occurs through a variety of ways, but is primarily through diet and drinking water (Meacher et al. 2002). In 2001, EPA reduced the standard for arsenic in drinking water from 50 μg/L to 10 μg/L, but there are still many drinking water systems in the U.S., including California, that are naturally elevated above this level. Based on data from 2001 to 2004[4], the average level of arsenic in Sacramento area drinking water was estimated to be 3 μg/L, with levels in some water systems as high as 15 μg/L. Because adults ingest 1-2 liters of water per day, average arsenic intake from Sacramento area drinking water would range from 3 to 6 μg/day, with some water users ingesting 15 to 30 μg/day. Total inorganic arsenic intake from American diets (not including drinking water), measured in a market basket survey, ranged from 1 to 20 μg/day with a mean of 3.2 μg/day. Thus drinking water and food may typically contribute to arsenic intakes ranging from 6 to 9 μg/day up to a maximum of 50 μg/day.

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[2] Uncontaminated sites were identified based on the absence of organic contaminants.

[3] Placer County is the county northeast of Sacramento, California.

[4] Water Systems serving more than 50,000 people in Sacramento County as determined from http://www.epa.gov/safewater/dwinfo/index.html were included in this analysis.

Arsenic in soil contributes only a tiny fraction to these typical background exposures. For example, if a worker ingested an average of 100 mg of soil every day containing 12 ppm of arsenic (the maximum reported value in the area proposed to be mined), his or her daily arsenic exposure would only be 0.24 μg (when adjusted for 20% relative bioavailability, a value likely to be higher than actual site arsenic relative bioavailability). Typical background exposures from diet and drinking water for the Sacramento area are at least 25 times greater than this estimated dose from soil at the site.

Airborne arsenic does not contribute significantly to typical arsenic exposures and is not expected to be increased for site workers. Average air concentrations in California of 0.011 $\mu g/m^3$ lead to exposures of less than 0.1 μg/day (CARB 2006). Dust suppression measures during mining operations combined with the low arsenic concentrations present in site soil will prevent appreciable exposure to arsenic in resuspended dust.

Based on this analysis, there will be no potential health impacts to mining workers associated with naturally occurring levels of arsenic present on the property to be mined.

Sincerely,

Rosalind A. Schoof

Rosalind A. Schoof, Ph.D., DABT
Principal

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