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Mr. Gary Kaiser
Planner (or To Whom It May Concern)
Planning and Development Department
County of Santa Barbara, California

RE: My opinions about the proposed Diamond Rock Sand, and Gravel Mine and Processing Facility (the Diamond Rock Mine hereafter), Cuyama River, Santa Barbara County, California

1. Cumulative impacts

Sand, gravel, and rock would be excavated from 84 acres of channel bed of the Cuyama River, with an average annual production of 500,000 tons of material, with a maximum annual production of 750,000 tons. The excavation would reach a maximum depth of 90 (ninety) feet relative to existing ground elevation. The operation permit would extend over 30 (thirty) years. The magnitude and duration of the proposed mining would embody a large-scale project whose cumulative impacts on channel morphology, ground water, sediment budget, aquatic habitat, and water quality are certain to be deleterious and irreversible in the Cuyama River.

2. Geomorphologic impacts.

2.1. The proposed Diamond Rock Mine would be located only 1,500 feet upstream from the existing GPS Mine. The latter has an average annual sand, gravel, and rock extraction of 500,000 tons. The sum of the Diamond Rock, Sand, and Gravel Mine's and the GPS Mine's annual material extractions would be 1,000,000 tons. This is an unsustainable rate of mining that is well in excess of the natural sediment supply of sediments by the Cuyama River at the Diamond Rock's and GPS Mine's locations.

2.2. Section 3.1.2.2.3 of the Environmental Impact Report (EIR) of the Diamond Rock Mine prepared by the URS Corporation for the County of Santa Barbara's Planning and Management Department in May 2007, which deals with sediment transport estimates in the Cuyama River, presents methodologically questionable and irreproducible estimate of annual sediment accumulation rate at the Diamond Rock Mine site equal 229,000 tons. Assuming that the latter estimate were close to the real (and unknown) sediment accumulation, the 229,000 tons estimate is

much less than the proposed average annual mining at the Diamond Rock Mine of 500,000 tons, and even less than the annual combined 1,000,000 tons mining for the Diamond Rock Mine and GPS Mine. The mismatch between the natural Cuyama River's sediment supply and the proposed annual rate of sediment mining would lead to severe degradation and channel incision at the Diamond Rock site.

2.3. A revised EIR is needed that meets the standards of care of geomorpholic analysis of the Cuyama River at and upstream of the Diamond Rock Mine. A correct and proper geomorphologic analysis must include the following tasks to estimate the actual total annual sediment supply at the Diamond Rock site:

2.3.1. Collect bankfull discharge, bedload sediment and suspended sediment data for the reach of the Cuyama River at the Diamond Rock site;

2.3.2. Obtain dimensionless bedload and suspended sediment rating curves;

2.3.3. Convert dimensionless bedload and suspended sediment rating curves to dimensioned sediment rating curves;

2.3.4. Convert dimensionless flow-duration curve to dimensioned flow-duration curve;

2.3.5. Calculate total annual sediment yield for bedload and suspended sediment;

2.4. The following tasks must be undertaken to assess the impact of the proposed Diamond Rock Mine on Cuyama River stability in the river's reach affected by proposed mining. The May 2007 EIR report did not address in a proper manner these tasks:

2.4.1. Predict river channel response based on sediment competence and transport capacity with and without the Diamond Rock mining;
Determine channel stability ratings with and without the Diamond Rock mining;

2.4.2. Calculate potential river channel successional stage shift caused by the proposed Diamond Rock mining;

2.4.3. Calculate lateral stability ratings with and without the Diamond Rock mining;

2.4.4. Calculate vertical stability ratings with and without the Diamond Rock mining;

2.4.5. Calculate channel enlargement, degradation/incision by the proposed Diamond Rock mining;

2.4.6. Evaluate potential consequences of channel stability changes;

2.5 My opinion is that certain adverse geomorphologic impacts of the proposed Diamond Rock Mine would be:

2.5.1. Lower the river's base level;

2.5.2. Lower the channel below the rooting depth of plants and create unstable banks;

2.5.3. Trigger a succession of stream morphology leading to river instability and incision;

2.5.4. Drastically and adversely alter the sediment budget on site and downstream from the mining site;

2.5.5. Produce accelerated bank erosion;

2.5.6. Loss and adverse alteration of riverine aquatic habitat at the proposed mining site;

2.5.7. Change of the width/depth ratio of the Cuyama River at the proposed mining site, leading to excessive channel degradation/incision, increased flood hazard on site;

2.5.9 Degradation of water quality on site and downstream of the proposed mining site. Water quality characteristics to be affected are: water temperature, dissolved oxygen, dissolved and suspended solids, nutrient load.

3. Hydrologic impacts.

The May 2007 EIR's estimates of flood events for various return periods presented in its sections 3.1.1.1, 3.1.1.2, 3.1.2.2.1 are incorrect. For an ungaged site like the one at the proposed Diamond Rock Mine the best source for estimation is the U.S. Geological Survey Water Resources Investigations Report 77-21 "Magnitude and Frequency of Floods in California" (1977). Specifically, two methods for the estimation of flood events must be considered for the Cuyama site:

3.1. If a gaged site nearby is available, adjust the peak river discharge for the gaged site by the ratio of tributary areas upstream of the ungaged (Diamond Rock Mine) and gaged sites:

$$Q_{ungaged} = Q_{gaged} \left(\frac{Area_{ungaged}}{Area_{gaged}} \right)^{b} \qquad (3.1)$$

where the coefficient b is given in the USGS WRI Report 77-21;

3.2. If there aren't nearby gaged sites use the following regression equation to estimate river flow peaks (in cubic feet per second):

$$Q_{RT} = a\, A^{b}\, P^{c}\, H^{d} \qquad (3.2)$$

in which RT represents a return interval (say 5, 10, …, 100 years), A is the drainage area upstream of the proposed Diamond Rock Mine (in squared miles); P is the average annual precipitation in the region of analysis (in inches), H is the altitude index (in thousands of feet), computed as the average of the altitudes of points along the river channel 10 and 85 percent of the distance from the Diamond Rock Mine to the Cuyama River basin divide, and a, b, c, d, are regression coefficients reported in the USGS WRI Report 77-21;

3.3. Evaluate the estimates by (3.1) and (3.2) for consistency with compared gaged streams of comparable characteristics in making a final recommendation for peaks flows;

3.4. Determine bankfull discharge at the Diamond Rock Mine site by visual inspection of water marks and geomorphologic field evidence. Implement a HEC RAS hydraulic model to compute the bankfull discharge that matches the field evidence. Evaluate the consistency of the HEC RAS estimate of bankfull discharge (the discharge that shapes the average geomorphic characteristics of a river) with regional curves for bankfull discharge reported in D. Rosgen's (2006) "Watershed Assessment of River Stability and Sediment Supply" and in other sources found in that book. The bankfull discharge is central to determine sediment load and the channel stability.

3.5. Ground-water impacts. The lowering of the river channel's elevation at the proposed Diamond Rock Mine site would expose ground water elevated by natural recharge to the underlying aquifer. This would drain aquifer storage and adversely affect neighboring wells that depends on ground water for domestic or agricultural supply.

3.6. The U.S. Geological Survey (San Diego Office) will conduct a comprehensive water-resources investigation for the Cuyama River under a cooperative agreement with the County of Santa Barbara (R. Hanson –USGS hydrologist- personal communication, August 2008). My recommendation is that review of the proposed Diamond Rock Mine be postponed until such water-resources investigation is completed. I expect important hydrologic discoveries will be made by the

USGS that are not available at present and that are pertinent to evaluating a permit for the Diamond Rock Mine.

4. Monitoring impacts.

The May 2007 EIR report did not include an adequate monitoring plan for the proposed mining operation of the Diamond Rock Mine. Monitoring must include the following tasks:

4.1. Measure the geomorphologic and hydrologic responses of the Cuyama River to changes caused by the mining of its sand, gravel and rock.

4.2. Document the geomorphologic and hydrologic responses of the Cuyama River and compare the observed responses to the predicted responses written in the May 2007 EIR.

4.3. Assess the effectiveness of the mitigation measures proposed to cope with sand, gravel, and rock mining at the Diamond Rock Mine;

4.4. Evaluate the effectiveness of river stabilization and restoration measures;

4.5 Build a hydrologic, geomorphologic, biologic database to extrapolate to future conditions based on observed changes at the Diamond Rock Mine's reach of the Cuyama River.

5. Conclusion.

The permitting review for the Diamond Rock Mine is hindered by a paucity of relevant hydrologic and geomorphologic biologic data. To compound matters, the May 2007 EIR failed to implement correct methodology to ascertain the nature of hydrologic and geomorphologic processes in the Cuyama River. Consequently, I judge the May 2007 EIR to be deficient in its assessment of the magnitude of the adverse geomorphologic and hydrologic impacts that the Diamond Rock Mine would have on the Cuyama River. I strongly recommend that an operation permit for the Diamond Rock Mine not be issued under the current circumstances of uncertain and inadequate knowledge about the full magnitude of impacts that would arise from the Mine's operation.

Sincerely,

Hugo A. Loáiciga,
Ph.D., P.E.
Professor of Geography/UCSB