Barrett Consulting Group

Offices throughout the Western United States and the Pacific Islands

9675 Business Park Avenue, Suite 100
San Diego, California 92131
619 536-5610
Fax 619 536-5620

Civil and Environmental Engineers

HYDROGEOLOGICAL INVESTIGATION, PROPOSED JACUMBA VALLEY RANCH DEVELOPMENT, JACUMBA, SAN DIEGO COUNTY, CALIFORNIA

Prepared for:

JACUMBA VALLEY RANCH
2423 CAMINO DEL RIO SOUTH,
SUITE 212
SAN DIEGO, CALIFORNIA 92108

Prepared by:

BARRETT CONSULTING GROUP
9675 BUSINESSPARK AVENUE
SAN DIEGO, CALIFORNIA 92131

PROJECT NO. 22603701

OCTOBER 18, 1995

Response to
County of San Diego's Comments,
Jacumba Valley Ranch

Prepared for:

Mr. Karl Turecek
Jacumba Valley Ranch
2423 Camino del Rey, Suite 212
San Diego, California 92108

Prepared by:

EARTH TECH
formerly Barrett Consulting Group
9675 Businesspark Avenue
San Diego, California 92131

March 11, 1996

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Mr. Karl Turecek
Jacumba Valley Ranch
2423 Camino del Rey, Suite 212
San Diego, California 92108

Subject: Response to County of San Diego's Comments, Jacumba Valley Ranch

Reference: Barrett Consulting Group, 1995, Hydrogeological Investigation, Proposed Jacumba Valley Ranch Development, Jacumba, San Diego County, California, dated October 18.

Telephone
619.536.5610
Facsimile
619.536.5620

As you requested EARTH TECH, formerly Barrett Consulting Group, has prepared this letter to respond to items 3 through 18 of the County's response to the Draft Environmental Impact Report (EIR) prepared by Brian F. Mooney Associates. The numbers below correspond to the item numbers in the County's January 9, 1996 letter. In addition, we have also addressed item 1.a. of the County's February 6, 1996 letter.

January 9, 1996 Letter

3. On February 6, 1996, the County Groundwater Geologist, Mr. John Peterson, told Doug Roff of EARTH TECH that the Jacumba Community Services District had no documentation of any wells that were shut down because of high fluoride concentrations. Therefore Mr. Peterson said the County would withdraw the issue.

   We note that although the thermal well which Leighton and Associates sampled had a fluoride concentration above the California Maximum Contaminant Level (MCL), the town well, Ketchum Ranch Water Company (KRWC) well, and well K4 all had fluoride concentrations below the MCL. The proposed reverse osmosis and blending will result in fluoride concentrations below the MCL. (Note that the BCG report contained a typographical error. Leighton and Associates had reported a fluoride concentration of 1.0 mg/l for the town well while BCG misreported this value as 4 mg/l.)

4. The water delivered to the homes and businesses will have a total dissolved solids (TDS) concentration of roughly 500 mg/l. After human usage and wastewater treatment, the TDS concentration of effluent typically will increase roughly 250 to 300 mg/l. This means the reclaimed water from the wastewater treatment plant which is used for irrigation is expected to have TDS concentrations of roughly 750 to 800 mg/l. The TDS concentrations of the water from the pond, road well, north well, and weir were 2,080, 772, 1,740, and 2,220 mg/l, respectively. Therefore, reclaimed water used for irrigation should have a lower TDS (i.e., be of higher quality) than the surface water and groundwater in the area. Total nitrogen concentrations will likely be higher in the reclaimed water than in the surface water and groundwater. Since nitrogen is an

essential macro nutrient for vegetation, the plants irrigated with this water will utilize the nitrogen for growth. This nitrogen fixation should reduce nitrogen concentrations in the applied water.

5. The values presented on Pages 7 and 8 of the referenced Hydrogeologic Investigation report were based on Swenson (1980). These values considered the storage in an area slightly different than the 1,347-acre Jacumba Valley Ranch. Mr. Peterson has agreed with the specific yield values used in those calculations. We have updated the storage values to include only the groundwater in storage on the Jacumba Valley Ranch site. The updated calculations are presented below:

Aquifer	Area (acres)	Saturated Thickness (feet)	Specific Yield (dimensionless)	Groundwater in Storage (acre-feet)
Alluvium	850	100	0.25	21,250
Table Mountain	850	300	0.05 to 0.10	11,750 to 25,500

6. This item will be addressed by others.

7. A more detailed groundwater monitoring and management plan has been prepared and agreed to by Mr. Peterson.

8. As stated in the Hydrogeological Investigation report, extraction from the new well to be located near the KRWC Well is to be limited to 140 acre-feet per year. This is only 58 percent of the 242 acre-feet per year that KRWC has historically extracted and to which it claims legal right. The previously mentioned groundwater monitoring and management plan contains production limits and shut down requirements based on water levels and quality in the area.

9. This item will be addressed by others.

10. a. As noted on the appended table (Appendix A) we have revised the water consumption values to include evaporation from lakes, and water usage by mining operations. Common area landscaping irrigation had already been considered.

    b. The appended table (Appendix A) was modified to remove residential irrigation return flows.

    c. According to Mr. Jerry McLees of Brian F. Mooney Associates, the actual irrigated area of the golf course will be 130 acres. One-hundred thirty acres is a reasonable maximum estimated area for irrigated tees, greens, and fairways. This is based on similar local projects such as the proposed Woods Valley Ranch (120 irrigated

acres) and is within the range of 110 to 160 acres recommended in *Site Planning Standards* (De Chiara and Koppleman, 1978). Roughs and out-of-bounds areas adjacent to the fairways will not have permanent irrigation system. Plant materials for this area would be selected from a list of native and naturalizing plants which would be suitable for the climate and rainfall conditions of Jacumba Valley Ranch and would only need to be watered through two or three growing seasons in order for them to become established.

d. Golf course irrigation will require 585 acre-feet of water. At project buildout 427 acre-feet will come from the wastewater treatment plant. Another 158 acre-feet will come from groundwater and surface water.

e. The landscape architect, Tom Cherry, has informed us that the irrigation system will result in roughly 20 percent of the applied irrigation water recharging the groundwater. It is typically assumed in technical reports that 10 to 33 percent of applied irrigation will recharge the groundwater. The value of 20 percent was previously agreed to by Mr. Peterson for this project.

11. This item will be addressed by others.

12. a. We understand that additional details regarding water company formation will be presented in the EIR.

    b. In addition to extraction from the Boundary Creek basin, approximately 27 acre-feet is extracted annually by the Mexican agricultural community *(ejido)* of Jacumé, located within the Flat Creek basin approximately 1.5 miles south of the international border. Approximately 2 miles south of Jacumé, a large water line conveys water to areas of Baja California, but does not presently serve Jacumé. It is possible that Jacumé will be connected to this waterline in the future. In the recent past the population of Jacumé has changed very little. We do not have any information to suggest any rapid population increases in Jacumé. The current extraction rate is about 2 percent of the average annual basin recharge. Even a doubling of the usage at Jacumé would mean the community would require less than 4 percent of the basin total.

    c. The extraction values were updated in the table appended (Appendix A) to this letter. The majority of the water (709 acre-feet/year) will come from a new well near K4 and surface water. The remainder (140 acre-feet/year) will come from a new well near the KRWC Well.

13. Total basin surface outflow has varied from roughly 260 acre-feet in 1988/1989 to 7,420 acre-feet in 1994/1995, with an average of 2,233 acre-feet per year from 1988

to 1995. These values may be underestimates because of the difficulty in accessing the weir to record peak runoff during heavy rainfall. This includes rainfall runoff and surfacing groundwater. Of this surface outflow it is estimated that an average of 1,111 acre-feet (roughly 50 percent of the total surface outflow) is groundwater which surfaces in the on-site marshy area south of Interstate 8. This surfacing groundwater proceeds off site where it is joined north of Interstate 8 with additional surface flows from the east and north side of Round Mountain (an unnamed drainage), surface flows from the north side of Table Mountain (also an unnamed drainage), and surface flows from Walker Canyon and Tule Canyon from the west (see Figure 3 of Barrett, 1995). Dozens of springs also contribute to this surface flow between the northern project boundary and the point where Carrizo Creek begins its steep descent into Carrizo Gorge. Some of this spring water originates as groundwater from the Jacumba area. If the groundwater component of the surface outflow declines from 1,111 to 814 acre-feet per year, the average total outflow would decline from 2,233 to 1,936 acre-feet per year. It should be noted that spring flow into Carrizo Gorge is expected to be unchanged by the JVR development. In addition, we note that this is only one of several tributaries into Carrizo Gorge. Flat Creek and Boundary Creek Basin have a combined area of about 100 acres. The basins to the north of the project which empty into Carrizo Gorge, below Sweeney Canyon, comprise about 180 acres. Therefore, runoff from the basins north of the project would dominate any flows from the JVR area. Since the project involves channelizing the creek and the addition of impermeable surfaces such as asphalt roads, concrete sidewalks and patios, and shingled roofs, this should result in increased rainfall runoff in the immediate project area.

14. A monitoring and management plan has been prepared and approved by Mr. Peterson.

15. This item will be addressed by others.

16. The extraction values were updated in the tables appended (Appendices A and B) to this letter.

17. A monitoring and management plan has been prepared and approved by Mr. Peterson.

18. This item will be addressed by others.

February 6, 1996 Letter

1.a. Groundwater elevation data for Well K3 and production data from Well K4 were presented in Leighton and Associates July 8, 1994 report and are updated in Appendix C.

We appreciate this opportunity to be of service. If you have questions feel free to call.

Very truly yours,

EARTH TECH

Douglas F. Roff, CHG 293
Principal Hydrogeologist

DFR:sd

Attachments: Appendix A - Water Consumption Calculations
Appendix B - Equilibrium Water Budget and Salt Balance Calculations
Appendix C - Groundwater Elevation and Extraction Data

cc: Jerry McLees, Brian F. Mooney Associates

APPENDIX A

WATER CONSUMPTION CALCULATIONS

PHASE I - JACUMBA VALLEY RANCH		
Facility	Unit Usage	Yearly Usage (acre-feet)
703 single-family units	0.5 acre-feet/unit	351.5
175 condominium units	0.45 acre-feet/unit	78.7
100 detached 1,000-square-foot units	0.45 acre-feet/unit	45.0
70 apartment units	0.4 acre-feet/unit	28.0
200-room hotel	114 gallons per day/room	25.5
11,200-square-foot golf course club house	210 gallons per day/1,000 square feet	2.6
90-bed senior care center		12.9
108,000-square-foot commercial	210 gallons per day/1,000 square feet	25.4
125-student elementary school	6 gallons per day/student	0.9
Equestrian Center		2.3
Evaporation from lakes	6 acres @ 6 feet/year	36.0
Dust control at quarry		1.0
	Estimated Water Usage	609.8

In addition to the above water uses, Jacumba Valley Ranch (JVR) will provide water for the following facilities, which are not part of the development itself:

Other Developments That Will be Supplied With JVR Water		
Facility	Unit Usage	Yearly Usage (acre-feet)
2 Automobile service stations	600 gallons per day/station	1.3
6-acre commercial (83,500 square feet)	210 gallons per day/1,000 square feet	19.7
	Estimated Groundwater Usage	21.0

APPENDIX A (continued)

In all discussions of JVR water usage we have included the service stations and 6-acre commercial space. Based on the above information, the estimated water usage for JVR Phase I is 631 acre-feet per year.

The 130-acre golf course is expected to require approximately 585 acre-feet of irrigation per year. The golf course will be irrigated with reclaimed water from a proposed on-site wastewater treatment plant, groundwater, and surface water (when available). At the completion of Phase I, approximately 427 acre-feet of reclaimed water should be available on an annual basis. The remaining 158 acre-feet could come from surface water and groundwater. The better-quality water will be needed for the salt-sensitive golf course greens and tees.

Approximately 60 acre-feet of RO reject brine will be evaporated in lined ponds each year. Since the water in the brine is lost to evaporation, it is considered a water usage. Therefore, the sum of the anticipated JVR usage (631 acre-feet), golf course usage (158 acre-feet) and water lost by brine evaporation indicates a total of 849 acre-feet of ground and surface water would be extracted annually.

Approximately 20 percent of the irrigation water applied to the golf course (585 acre-feet) is expected to recharge the groundwater system. Irrigation recharge is expected to be approximately 117 acre-feet per year. Therefore, the net surface and groundwater extraction is equal to the difference between total water extraction (849 acre-feet) and golf course irrigation recharge (117 acre-feet) or approximately 732 acre-feet per year. Our calculations of the above values are presented below:

Water Usage	
Jacumba Valley Ranch Reverse Osmosis Reject Brine Golf Course Irrigation from Groundwater	631 acre-feet per year 60 acre-feet per year +158 acre-feet per year
Total Water Extraction	**849 acre-feet per year**

Irrigation Recharge	
Golf Course Irrigation Recharge	585 acre-feet per year x 0.20 = 117 acre-feet per year
Total Irrigation Recharge	**117 acre-feet per year**

Net Water Extraction	
Total Water Extraction Total Irrigation Recharge	849 acre-feet per year 117 acre-feet per year
Net Water Extraction	**732 acre-feet per year**

APPENDIX B

EQUILIBRIUM WATER BUDGET AND SALT BALANCE CALCULATIONS

	Current Quantity (acre-feet/year)	Projected Quantity after JVR Phase I (acre-feet/year)	Current TDS Concentration (mg/l)	Projected TDS Concentration After JVR Phase I (mg/l)
Recharge from Flat Creek Basin	1,400 [1]	1,400	1,630 [7]	1,630
Usages on Mexican side	-27 [2]	-27	1,630 [7]	1,630
Recharge from Boundary Creek Basin	982 [3]	982	367 [8]	367
Town of Jacumba Usage	-91 [4]	-138	384	384
Ketchum Ranch Usage	-2 [5]	0	422	422
JVR Agricultural Irrigation Extraction	-610 [6]	0	1,630 [7]	1,630
JVR Agricultural Irrigation Recharge	122 [9]	0	8,150 [9]	0
Net Residential Usage in Boundary Creek Basin	-13 [3]	-19	367	367
JVR Extractions from Flat Creek Basin	0	-709	0	1,630
JVR Extraction from Boundary Creek Basin	0	-140	0	367
Golf Course Irrigation Recharge from WTP	0	85 [10]	0	3,750 [10]
Golf Course Irrigation Recharge from Groundwater	0	32 [9]	0	8,150 [9]
Phreatophyte Losses	-300 [11]	-300	0	0
Groundwater Outflow	-350 [12]	-350 [14]	1,751 [14]	1,649 [14]
Groundwater Contribution to Surface Outflow	-1,111 [15]	-814 [13]	1,751 [14]	1,649 [14]

1 Swenson, 1980, Mido, 1991.
2 Jacumba Community Services District, 1994.
3 Leighton, 1993.
4 Jacumba Community Services District, 1993.
5 Ketchum, W.W., 1994, Personal communication.
6 Mean of 1991 and 1992 irrigation.
7 Mean of two results from well K4.
8 Mean of Town, Thermal & Ketchum Rancho Water Co. well results.
9 Assumes 20 percent of water and 100 percent of TDS from irrigation returns to groundwater system. Irrigation TDS assumed to be 1630 mg/l.
10 Assumes 20 percent of water and 100 percent of TDS from irrigation returns to groundwater system. Irrigation TDS assumed to be 750 mg/l.
11 Mido, 1990a.
12 Leighton, 1990.
13 Calculated value to achieve zero average change in storage.
14 Values calculated by dividing the sum of the groundwater water and surface flows into the summation of the products of water quality times quantity. In May 1992, the TDS concentrations at North Well and the weir at the northern end of the property were 1,740 and 2,220, respectively.

Note: Positive value equals basin inflow. Negative value equals outflow.

APPENDIX C

GROUNDWATER ELEVATION AND EXTRACTION DATA

Date	Well K3* Groundwater Elevation (feet above mean sea level)	Well K4 Annual Water Discharge (acre-feet)
1990		
June 1, 1990	2,784.5	
August 3, 1990	2,780.7	2
1991		
June 29, 1991	2,778.5	
August 14, 1991	2,775.8	538
October 22, 1991	2,777.7	
1992		
June 15, 1992	2,777.5	
August 14, 1992	2,775.0	721
September 15, 1992	2,774.5	
October 23, 1992	2,776.0	
1993		
July 15, 1993	2,785.0	
September 4, 1993	2,785.5	0
November 9, 1993	2,783.0	
1994		
August 17, 1994	2,781.5	212
1995		
September 20, 1995	2,784.5	0
1996		
February 21, 1996	2,785.0	0

Data provided by Mr. Karl Turecek.
Groundwater elevations not received prior to 1989.
* Well K3 is located approximately 120 feet west of Well K4. Ground elevation at K-3 is 2,793.5.