
The Boriana Mine

By Mike Dunning
University of Alaska, Southeast

Most western mining history focuses both on the major mining sites and on the era before World War I. But mining operations covered most of the West and continue in many peripheral areas up to the present. Historically, small companies generally ran these peripheral operations, although unusual success and rising prices might lead to a flirtation with major mining concerns, especially if the site was near a railroad. On even rarer occasions some of these peripheral operations contributed knowledge to the art of mining and the science of ore recovery. The Boriana tungsten mine in the Hualapai Mountains near Yucca, in Mohave County, Arizona, represents all these phenomena. Because of their easy access by even conventional vehicles from Interstate 10, the Boriana and the Antler copper mine below it at the mouth of Boriana Canyon are two of the most visited mining sites in Mohave County.

Description

The Boriana Tungsten Mining District in the Hualapai Mountains encompasses: the Boriana Mine; the Bull Canyon Mine; the Tungstite Claims; the Neglected Vein Prospect; the Loki Claims; plus numerous small pits, adits and shafts. The Boriana Mine consisted of nine levels and three sublevels that penetrated to a depth of 1,100 feet, with more than 15,500 feet of horizontal workings. Thirty-one unpatented claims, still current as of 1987, made up the site. During its operational life, the mine produced some 118,100 stu (short ton units) of tungstite (WO_3), mostly between 1932 and 1942.¹

Of the other sites, only the Bull Canyon Mine and the Tungstite Claims produced mineral. Six adits were opened on the Bull Canyon Mine—also known as the Robinette Prospect, the Iguana Claims, or the Moore Claim—leading to between 1,350 and 1,400 feet of horizontal workings. These seven unpatented claims produced 2,176 stu and most were still maintained in 1987. On the other hand, the Black Jack was the only one of the sixteen unpatented claims that comprised the Tungstite Claims still maintained in 1987. By then its single 90-foot shaft had only produced 137 stu.²

Discovery and the Yucca Tungsten Period, 1908-1919

The Boriana was discovered sometime before 1914, possibly in 1908. In 1914 Harvey Klotzsch, of Kingman, and his son William acquired the mine and began operations as the Yucca Tungsten Mine. Things went pretty slowly until World War I increased the demand for tungsten and the price rose to \$125 per ton for concentrates. As a result of the increased demand, 1915 to 1919 marked one of the primary production periods of the mine, and in 1918 it was Arizona's leading tungsten producer. With the end of the war, prices fell and the mine shut down in 1919. In 1923 the company sold off its machinery and abandoned the site.³

The mine remained out of production between 1919 and 1929. At some point during those years, one of Arizona's pioneers acquired the property. Bill Dake had come to Arizona as an army packer in 1874. By 1915 he had settled

in Yucca. Sometime after the Klotchs' departure, he, Earl Heath, and Jimmie Craig relocated the claims. In 1928 Dake and Heath also began working the Bull Canyon Mine. In 1933 they sold two-thirds of their interest in the Bull Canyon to Dalton Robinette.⁴

The Sievers Period 1929-1937

The Borianana changed ownership, or at least management, in 1929. Some confusion exists about the exact nature of what transpired. While one report states that the Borianana Mining Company acquired the mine, the *Mining Journal* reported in June of that year that the Stooddy Company of Whittier, California, was working the fifteen claims at the site. Under the direction of L. B. Rece, they were even about to open a fifty-ton mill. According to another source, Dake, Heath, and Craig did not sell their interest in the Borianana to Stooddy until 1931. But whatever was going on at the mine, under whomever, considerable development work took place.⁵

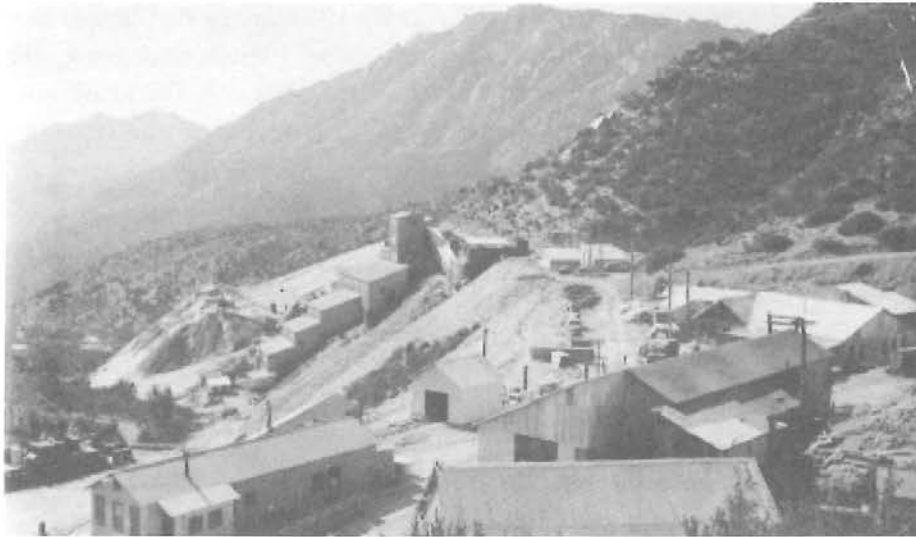
In January 1932, one of Stooddy's principles, J. P. Sievers, hired consulting mining engineer Granville Moore. He was employed to draw up a report on the operations of the Borianana for another of Sievers's Whittier concerns, the Security Investment Company. According to

Moore, the Borianana at that time consisted of fifteen contiguous and one separated claim, all unpatented, accessible by auto from Yucca. The site had a good, improved well and enjoyed sufficient water to maintain its operations. Since taking over the mine, Stooddy had erected a powerhouse, blacksmith shop, boarding houses, assay shop, bunk houses, and a manager's residence. The mill was fully operational and modern, with a 150-ton capacity over twenty-four hours, but it had never treated more than half of that amount. A minimum of five men could produce fifty tons per eight-hour shift. They had been using the cut and fill method to mine the ore. Moore thought that fifteen thousand dollars would be required to start the mine operation and bring the mill into production.⁶

Shortly after Moore's report, the Sievers family acquired the Borianana. They ran the mine as the Borianana Mining and Milling Company from 1933 until 1937. Under their management the Borianana once again became Arizona's leading tungsten producer. By 1935, car loads of lumber were being shipped into Yucca for timbering and even copper concentrates—possibly from the nearby Copper World Mine—were being shipped out. The Borianana was also becoming more than a mine; it was becoming a community.



The Borianana mining camp in 1937, about the time of the transfer of the property from Sievers family-run Borianana Mining and Milling Company to the Molybdenum Corporation of America. (Courtesy of the Mohave County Museum of Art and History.)



*The rebuilt MCA Boriana mining camp in 1940.
(Courtesy of the Mohave County Museum of Art and History.)*

Housing had to be increased and a baseball team was organized. In May, the old rodeo grounds in Yucca were converted into a ball field for the team's first game, played against the Big Sandy nine. Boriana won 12 to 8 on 10 May. How good were they? Kingman threw down the gauntlet to the upstarts the following week. Kingman's *Mohave Miner* announced the upcoming contest under the banner: "Kingman Diamond Stars to Mix with Boriana on Sunday." The Boriana pitcher set down the Kingman batters in order through the first two innings, but then his arm gave out. After the 13 to 1 loss, Boriana's record was even, just as it would be at the end of the season. Boriana took twelve innings to defeat Oatman 7 to 6, but again lost to Kingman, this time by the score of 9 to 2. Besides taking time for baseball, Sievers closed the mine and mill for one day so that everyone could enjoy the 4th of July. Earlier, forty-five folks from the mine gathered at Ben Levi's new restaurant in Yucca for a chicken and enchilada feed.⁷

Meanwhile, Sievers began shopping the Boriana at least as early as 1936. In August of that year the Nevada-Massachusetts Company hired Paul Kerr to make a pre-purchase survey of the mine. According to Kerr, an accurate

economic feasibility study of the deposit warranted more effort than his three day investigation. He did warn, however, that if the prospectus was limited only to the areas of proven ore, that the mine had no future. On the other hand, Sievers claimed that the ore blocked out on vein no. 4 alone possessed an estimated value of \$588,000. Kerr told Nevada-Massachusetts to be careful.⁸

The MCA Period 1937-1943

Nevada-Massachusetts apparently heeded Kerr's warning. But the Molybdenum Corporation of America stepped in and began operating the mine and mill under a lease and bond arrangement in 1937. No sooner had MCA commenced operations than a tremendous fire destroyed the old mill. While the mill was being rebuilt through 1938, MCA continued development work on the ore body. The new mill began production in 1939.⁹

By 1940 MCA was operating a second shift at the mine, though working only one at the 100-ton mill. The company was shipping a carload of high-grade concentrate a month to the company's smelter in Pennsylvania. H. L. Vetch

managed the property. Later that year, when Leslie Mott described the mine in a promotional tract for the Los Angeles Chamber of Commerce, he reported 120 employees producing twenty tons of copper concentrate and twenty-five tons of tungsten concentrate a month from the company's two hundred-tons-per-day mill.¹⁰

By 1941, advances at the mill made by Vetch warranted an eight-page feature article in *Mining World*, complete with pictures and diagrams of the mining and milling operations. At this point the Borianna consisted of seven levels, and was advancing at the rate of 150 feet of new stope per month. The mine needed to blast two hundred tons a day in order to yield sixty tons of quartz mill feed. Timbering was now required—usually eight-by-eight-inch timbers, occasionally twelve by twelve—but water in the tunnels was no problem. It only amounted to about eight hundred gallons a day and was easily pumped out. But what really drew the attention of the *Mining World* was the mill's pneumatic agitation floatation equipment invented by Vetch—the Vetch Cells. These were simple to operate, economical in their use of power, and required a small initial capital investment and had practically no maintenance costs. They did not clog upon shutting down and were characterized by their extremely high performance.

The *Mining World* article described the mine at its peak:

Boriana is a compact community with a total population residing near the mill and mine of about 350. Adequate hospitalization and school facilities are provided. A complete commissary is maintained and is run by the Anderson Boarding and Supply Company. The miners are all required to pay hospitalization and for a small additional sum can place their wives and families under the same protection.¹¹

By 1942 things had begun to take a turn for the worse. Vetch was gone, replaced by Bill Munds. Although the mine and mill still employed between one and two hundred, production had fallen. The 150-ton mill was only producing forty tons per day. The old drifts, winzes, and raises were in bad shape. New works all required timbering because of the swelling ground schist. But the big problem—according to A. Brodie Campbell, who filed the Mine Owner's Report to the State Department of Mines and Mineral Resources—was labor. He felt that with adequate labor the Borianna would double its production, and believed that more capital would solve all of the mine's problems.¹²

Munds elaborated on these difficulties when he spoke with Department of Mines and Mineral Resources's Kingman field engineer Elgin Holt later that year. Munds informed Holt that in 1941 the Borianna had produced sixteen thousand tons of ore yielding sixteen thousand units of tungstite. In 1942 that figure had dropped to six thousand tons and six thousand units. Even though the Borianna was paying regulation wartime wages—a 22.5 percent increase over the previous year—it could not find willing workers. Not only was Munds 25 percent short of his needed labor force, those he got were both unskilled and uninspired. Most of the skilled



MCA's Borianna manager H.L. Vetch with his Vetch Floatation Cells. (Courtesy of the Mohave County Museum of Art and History.)

workers had gone elsewhere to better paying defense jobs, while those who remained worked indifferently. The result was a 50 percent or more decline in production. Problems with swelling ground compounded Munds's woes. He could no longer develop ore reserves prudently, but had to mine as fast as deposits were developed. At best, he could only block out ore four to six months in advance. According to Munds, the mine and mill operated at a loss under these circumstances. If the fixed price of tungstite were raised to cover production costs, he felt he could boost production all the way to three thousand tons per month. He would, of course, also have had to offer better wages to get workers capable of such an effort.¹³

This gloomy discussion between Munds and Holt took place in October 1942. In January 1943 the Borianana closed down for "refurbishing." While the owners of the mine apparently sought buyers, the local press promoted every rumored development. Under the title "Borianana Mine Plans Capacity Production" the newspaper described the "miniature village" above Yucca, complete with a blacksmith shop where "all drill steel was hot milled and retempered," and a sawshed where the mine's timbers were framed. Repairs reportedly continued into 1944, but in December the company sold the equipment and began dismantling the mill. By 1945 the Borianana had been stripped. Mail addressed to Munds by the Department of Mines and Mineral Resources went unclaimed in Yucca. Once again the Borianana was idle, but not for long.¹⁴

The Dye and Bathrick Period

In 1946 Raymond Dye and Jack Bathrick acquired the Borianana. By the end of 1948 they were about to complete rebuilding the mill. Omega Metal Company was "ten days" shy of completing the mill when the Department of Mines and Mineral Resources's field engineer visited in October. Supposedly, five men would

soon begin working the dump ore. They would also receive ore from a Mr. Watell (Waughtel), who had located and begun working the Tungstite Claims. After processing 100 tons at a small gravity mill on site, he did ship 108 tons in 1951.¹⁵

Dye and Bathrick recall that they didn't really open the mill until 1951. When the Department's field engineer visited their operations in 1952, he noted five men producing thirty to forty tons of ore from the dump per day. To do better, they'd need to reopen the mine. Dye and Bathrick leased the mine to a former supervisor, Dan Harper, and his partner A.D. Allen to do just that. They concurrently had four men working, but were in serious need of a "mule trained for tramping."¹⁶

By 1953 the "reopening" of the Borianana began to receive some notice in mining journals. Meanwhile, Dye and Bathrick continued to mill ore from the 150,000 ton dump. By then, a crew of eight hoped to expand production from 40 to 150 tons per day. They hauled their concentrate 420 miles by pickup truck in one-ton lots to Bishop, where it was cleaned by the Benware Corp., then sold to Wah Chang Company. The trip took three days and resulted in about one hundred dollars in additional expenses.¹⁷

Besides ore from the dump, they still hoped to recover some from the mine. Even though most of that ore was inaccessible due to flooding and caving, Harper and Allen hoped to achieve steady production by the summer of 1953. By August ten men had reopened two thousand feet and sent some ore to the mill. Dalton Robinette also managed to provide some ore from Bull Canyon.¹⁸

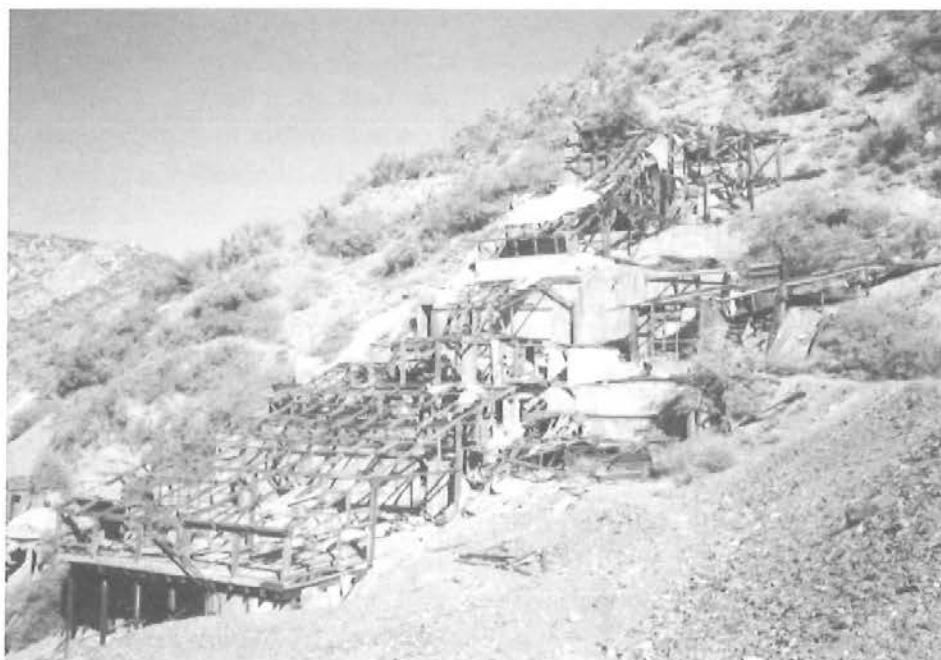
Dye and Bathrick remodeled the mill in 1955. In spite of the modest size of their operation and sources of their ore, they were among Arizona's leading tungsten producers from 1951 to 1957. Their production of dump and gob ore amounted to one hundred stu. Efforts to produce copper concentrates also netted another

thirty to fifty tons. But, by 1957 they had less than a year of material left. They'd already milled 135,000 tons of dump ore, and the price of metals was falling. The U.S. General Services Administration had stopped its price support of tungsten and the visiting engineer from the Arizona Department of Mines and Mineral Resources expected operations at the mill to cease soon. The mine was inactive again, and the mill closed in the spring of 1957.¹⁹

Another salvage dream evaporated in 1962. Dye and Bathrick leased the Boriana to the Wallapai Mining Company, which had plans to remove and concentrate the gob used in the stopes. But, while the gob was being pulled the stopes caved in and operations ceased. The Boriana did not cease to draw attention, however. For the next 20 years it continued to entice speculation and promise. Dye and Bathrick—or at least Bathrick's widow—held the claims until at least 1975. In 1968, ARKLA Corp. took a development option, but eventu-

ally dropped it. Gold Silver Exploration, Inc. next took out leases; it then interested Union Carbide in an option in April 1973. Union Carbide sent in drilling teams in August. If Union Carbide had discovered economic mineralization, it would have taken over the lease, granting GSE royalty status. The ore would have been shipped to the Union Carbide facility in Bishop. Although exploratory drilling continued into 1974, Union Carbide did not pick up the option.²⁰

The Department of Mines and Mineral Resources's field engineer suggested to the Widow Bathrick that she offer the Boriana to Standard Metals in 1975, since they were working just down the canyon. Instead Gary Branum and Jim Slack picked up the lease in April. In May they told the field engineer they expected to process one hundred tons of tailings a day, and that they intended to erect a mill in June. But when the engineer checked the site in August, he could detect no sign of activity, nor discover an operating mill.²¹



*The Dye and Bathrick 1955 remodeled Boriana Mill as it looked about 1995.
(Courtesy of the author.)*

The file on the Boriana may have finally closed with the Wabayuma Wilderness Study investigation of 1987 undertaken by Mark Chatman. His concluded that the Boriana's outlook was uneconomical. Most of its workings had caved, and those that remained accessible

were contaminated with hydrogen sulfide gas which developed from the weathering of sulfide minerals in the veins. Furthermore, the mine had been flooded to its main haulage on the 500 level since some time in the 1950s.²² ■

Notes:

1. Mark L. Chatman, *Mineral Resources of the Wabayuma Peak Wilderness Study Area [AZ-02-037/043]*, Mohave County, Arizona MLA 5-88 (Denver: Intermountain Field Operations Center, U.S. Department of the Interior, Bureau of Mines, 1988), 55-57.
2. Chatman, *Mineral Resources*, 57-58.
3. Arizona Department of Mines and Mineral Resources (ADMMR), Memo: Conference Lewis A. Smith with Raymond Dye and Jack Bathrick, 5 Sep. 1962; A. Brodie Campbell, "ADMMR Mine Owner's Report: Boriana," 7 June 1942; "Boriana Mine Plans Capacity Production," unidentified newspaper clipping, probably from the (Kingman) *Mohave County Miner*, 1943; all of these documents are contained in the CETA (U.S. Comprehensive Employment and Training Act) file "Boriana," Mohave County Museum of Art & History (Hereafter: "Boriana File."). Chatman, *Mineral Resources*, p. 56.
4. "Boriana Mine Plans Capacity Production," and ADMMR Memo, 5 Sep. 1962, Boriana File.
5. "Boriana Mine Plans Capacity Production," and ADMMR Memo, 5 Sep. 1962, Boriana File. *Mining Journal*, 30 June 1929, 35.
6. Report by Granville Moore, Consulting ME, Los Angeles, for J.P. Sievers, Security Investment Co., Whittier, CA, 27 Jan. 1932. Paul F. Kerr, "Preliminary Report on the Geology of the Tungsten Deposit at Boriana, Arizona, for the Nevada-Massachusetts Company," (Sonoma, CA:?, 23 Aug. 1936). (Copies of both of these typed reports are archived at the Mohave County Museum of Art and History.)
7. *Mohave County Miner*, 5, 10, 17, 24 May, 21 June, 5 July, and 2 Aug. 1935.
8. Chatman, *Mineral Resources*, 56. Kerr, "Preliminary Report."
9. "Boriana Mine Plans Capacity Production," and ADMMR Memo, 5 Sep. 1962, Boriana File.
10. *Mining Journal*, 29 Feb. 1940. Leslie C. Mott, "Mining Activities & Sales Opportunities in Arizona & Southwestern Sections of New Mexico," Domestic Trade Commissioner Domestic Trade Report No. 95 (Los Angeles: Los Angeles County Board of Supervisors, Domestic Trade Department Los Angeles Chamber of Commerce, 20 Dec. 1940).
11. *Mining World*, Mar. 1941, 8-15.
12. Campbell, "Owner's Report: Boriana," 7 June 1942. Elgin B. Holt, "ADMMR Field Engineer's Report: Boriana," 6 Oct. 1942, Boriana File.
13. Holt, "Engineer's Report: Boriana," 6 Oct. 1942.
14. "Boriana Mine Plans Capacity Production," and "ADMMR File Card, Boriana," Boriana File.
15. ADMMR Memo, 5 Sep. 1962, and A. C. Nebeker, "ADMMR Field Engineer's Report: Boriana, Copper World, and Antler," 9 Oct. 1948, Boriana File.
16. ADMMR Memo, 5 Sep. 1962, and George F. Reed, "ADMMR Field Engineer's Report: Boriana," 31 Oct. 1952, Boriana File.
17. *Mining World*, Jan. 1953. *Engineering and Mining Journal*, June 1953. Reed, "ADMMR Field Engineer's Report: Boriana," 2 Jan. 1953, Boriana File.
18. Reed, "ADMMR Field Engineer's Report: Boriana," 30 Aug. 1953, Boriana File.
19. ADMMR Memo, 5 Sep. 1962, Boriana File. Chatman, *Mineral Resources*, 56. Mark Gemmill, "ADMMR Field Engineer's Report: Boriana," 25 Mar. 1957; B.J. Squire, "ADMMR Field Engineer's Report: Mills-Northern District," 30 Sep. 1957, Boriana File.
20. ADMMR Memo, 5 Sep. 1962, and "ADMMR File Notes: Boriana," Boriana File. *Pay Dirt*, 27 Aug. 1973, 29 Oct. 1973, 28 Jan. 1974, and 24 Feb. 1975.
21. "ADMMR File Notes: Boriana," Boriana File.
22. Chatman, *Mineral Resources*, 58.