Raising Questions in the Central Mojave Desert

Robert E. Reynolds, editor

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Kelso Dunes mining claim validity examination

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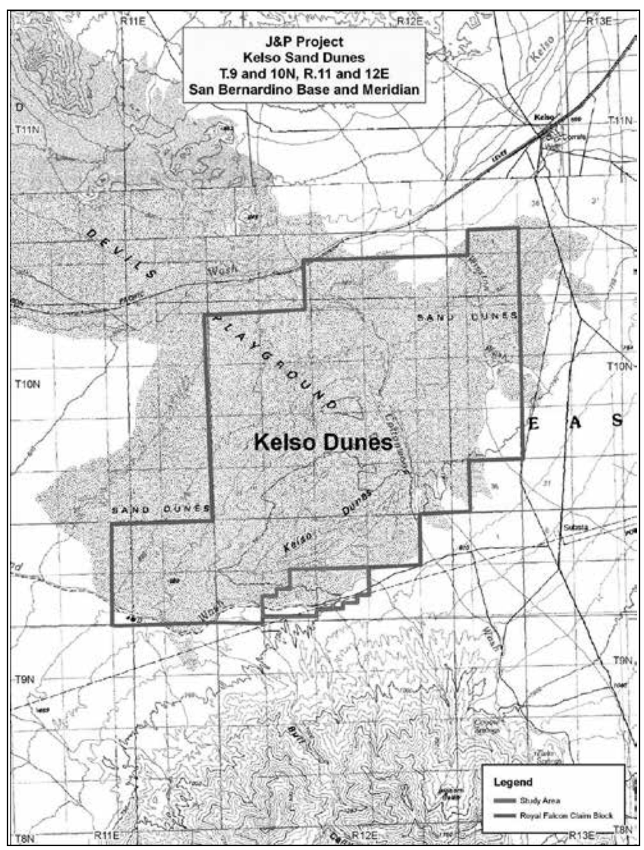
ABSTRACT—Platinum was reported to exist in economic concentrations in a portion of the Kelso Dunes, beginning in 1967. The mining claimant was Mineral Extractors, Inc. They located 846 placer mining claim over an area of 4,220 acres. Almost all of the Kelso Dunes geomorphic feature was included in this claim block. The Kelso Dunes were proposed for a Wilderness Study Area (WSA number COCA 250) and later withdrawn from mineral entry by Public Land Order (PLO) 5224 in 1972. Mineral Extractors, Inc. submitted a plan of operations (POO) to BLM which they named the "J&P Project" in 1989. As part of its review of that POO, BLM conducted a mining claim validity examination to determine if a discovery of a valuable mineral deposit had been made on any of the claims. This examination was conducted under authority of 43 Code of Federal Regulations, Sections 3802 and 3891. It was completed in February, 1992.

The geologic model for the platinum ore was wind-concentrated bands of black sand in sections of the Kelso sand dunes. Samples were collected from 42 Placer Mining Claims (PMCs) included in P&J's POO. The concentrations of iron, titanium, gold, silver and Platinum Group Metals (PGMs) in these samples was evaluated using several methods and laboratories, including Bondar-Clegg Laboratories and the U.S. Bureau of Mines. The value of sand for iron oxide pigments was also evaluated. Dry magnetic mineral concentrates processed by the J&P Project plant contained no detectible PGMs and only traces of gold (0 to 0.00014 troy oz/ton Au). As a consequence of this determination, the POO for the J&P project was never approved by BLM.

Location and access

Kelso Dunes is a 52,000 acre dune field in the eastern Mojave Desert, some 35 miles south of Baker, California and roughly 50 miles west of the Nevada border. The Dunes make up the southeastern extent of a larger dune field known as the Devil's Playground. The dune field is along the Mojave River Wash in a valley surrounded by the Granite Mountains to the south, the Providence Mountains to the east and the Kelso mountains to the north. To the west, the dune field is partially surrounded by the Bristol Mountains. Our study area is on the south margin of the Kelso Dunes adjacent to Devils Playground Wash.

Access to the site is from the east by a well graded dirt road that connects to the Kelbaker paved road. Art Parker, the claimant, often arrived at the mine site by a Beechcraft propjet or a small propeller driven light plane. The landing strip used is the widened west end of the dirt access road from the Kelbaker road. From the mine site, all travel into the sand dunes had to be by foot or, in the claimants situation by ORV or rubber tired loader, as they had grandfather rights/uses up to the time the claims were declared null and void in 1993.



Location map for the Kelso Dunes and the J&P Project.

Unless otherwise noted, all information in this article comes from the report by Evans and others, 1992.

Abbreviations

BLM = U.S. Bureau of Land Management

CFR = Code of Federal Regulations

IMP = Interim Management Plan

PGM = Platinum Group Metals

PLO = Public Land Order

PMC = Placer Mining Claim

POO = Plan of Operations

WSA = Wilderness Study Area

MEL= Mineral Extractors Inc.

Physiography

Kelso Dunes form peaks, hollows, and low ridges in a complex topography over 3,000 feet above sea level. Almost all the dune area is underlain by eolian sand, although some alluvial materials and igneous rock outcrops do occur The taller dunes at Kelso are in three discontinuous east-northeast trending ridges, increasing in height to the south where peaks are several hundred feet above the other surrounding dunes. Hill 949 T is the tallest and largest dune in our study area, about four miles long and 550 feet high.

Throughout our study area there are many smaller traverse dunes which occur at lower elevations. Many of the transverse dunes have steep slip faces and broad rounded crests that curve downward before breaking off sharply. The morphology and geology of the dune field in our study area is typical of the lower slopes of the active dunes throughout the region. Within the subject area, as throughout the dune field, a combination of wind, vegetation, and moisture has produced various transverse dune forms. The southern part of our study area is marked by Devils Playground Wash. Most of the sand at Kelso Dunes was derived from western sources; however, some sand is derived from the mountains around the basin in which the Devil's Playground occurs.

Kelso Dunes comprise about 52,000 acres in the eastern Mojave Desert, some 35 miles south of Baker, California and roughly 50 miles west of the Nevada border. The dunes make up the southeastern extent of a larger, less prominent dune field known as the Devil's Playground. The dunes are in a valley surrounded by the Granite Mountains to the south, the Providence Mountains to the east and the Kelso Mountains to the north. To the west, the dune field is partially surrounded by the Bristol Mountains. Yeend and others (1984) suggest that the broad dune valley is a graben and the surrounding mountains are bound by displaced high-angle faults that resulted from Basin and Range deformation. Kelso Dunes is the most prominent dune field in the Mojave Desert and among the tallest dunes in the world. The age of the dunes is questionable. Yeend and other (1984) postulated that the dunes are likely to be 100,000 to 1 million years old. Sharp (1966) has a more conservative estimate of several thousand to 20,000 years old.

Climate

Kelso Dunes and environs are in an arid climate with hot, dry, and windy summers, and cool and windy winters. Maximum rainfall is about 4.5 in/yr, minimum rainfall about 2.5 in/yr, and average rainfall about 3.5 in/yr. Temperatures range from around a low of 32°F in the winter to a high of at least 115°F in the summer. As the area is arid and windy the evaporation rate is high. Mild winds blow most every afternoon, but strong persistent winds from the northwest and west peak during spring and even during early fall. Wind velocities are not well known, but can blow from a few miles per hour to as much as 60 or more miles per hour. As Kelso Dunes is in a valley nearly surrounded by mountains the direction of winds must be irregular. The configuration and shape of the sand dunes provides strong evidence for crosswinds. Winds of only several miles per hour will cause movement of silt and very fine sand grains. During strong winds, blowing silt and sand become a real problem for workers and goggles are necessary. In spite of the vigorous arid climate a mineral operation was viable for most of any year.

History

The following historical summary is a compilation of information obtained from Art Parker in a Retrospective Summary J&P Project, and correspondence sent to BLM by Parker and his associates. It is not intended to be a complete history of the operation, but a summary of important events in the development of Mineral Extractor's property at Kelso Dunes.

Prior to 1967, the subject claims were owned by William Glass. In 1964, Mr. Glass made some initial contacts with Irimaru Company, Ltd., of Japan, who wished to purchase the iron concentrates contained within the dune sand. A preliminary report entitled "A Tentative Plan for Development of Kelso Placer Iron Deposit, California, U.S.A." was prepared by Anzaki of Irimaru in 1965. The report states that 230,000,000 tons of iron sand concentrate reserves, with an Fe content of 65%, were available for processing, at an initial investment of $22,000,000.

Upon Mr. Glass's apparent failure to file assessment work affidavits for the subject claims in "1965 or 66", Bob Jernberg and Art Parker "adversely located" over Glass's locations and acquired ownership of the mining property. In 1967, Jernberg and Parker (J&P) developed a prototype sand plant to extract the magnetic fraction of the dune sands. Eriez Magnetics conducted initial testing, and determined that a 70% Fe product recovery was possible.

In the fall of 1967 and early in 1968, Mineral Extractors, Inc. (MEI) set up a prototype mine plant on the south side of the dunes to extract the magnetic black sands.

This plant was designed to produce 3,500 tons per day of black sand for a pig iron plant to be "located at Kelso." The equipment to be utilized in the plant included a hopper, dryer, two Eriez magnetic separators, a conveyor, Cat, grader, front-end loader, four sand buggies, oil tank, and a single trailer. A watchman was hired and was present until the project was suspended in 1994.

During the spring of 1968 (Feb–June), the plant produced about 40 tons per day of black sand, operating from 8 and 16 hours per day. During the years 1968–1972 (according to assessment work affidavits), MEI constructed 26 miles of access roads, drilled a water well, conducted surveys, operated the mine, conducted core drilling, development, research, and feasibility studies. Parker states that in 1968, all of the equipment was moved off the dunes, except for the raw sand hopper and a portion of the dryer. In 1970, negotiations were underway to supply the "Hughes Corporation" with high grade iron ore for drill bit manufacture.

During the years 1972–1977, Sandia Metals, Ken Meadows, Valley Agri-Services, Metals Western, and Bonneville/Rockwell were testing the Kelso black sands, selling some of the "precious metal products" and working to improve precious metal recovery. MEI produced about 1,800 tons of black sand during this period. In 1972–73, MEI installed a bigger firebox which increased the plant capacity to 36–40 tons of black sand per two-shift day. In 1975, MEI acquired a big dryer, capable of drying enough sand to yield 350 tons of black sand per day. In 1976, the new dryer broke and was replaced. In 1977, the mine plant was moved to its present location, new feed and production hoppers were installed, and 2 additional conveyors were acquired. During this period, the water tank and 11-mile water line were installed.

The plant continued to operate from 1977–1981 "or 1982", with one shift per day, off and on over a 7 to 8 month "season" each year. Production with the new dryer was about 4 tons of black sand per shift. The tailings were not returned to the dunes, but were "dumped" east of the current plant site.

Between 1982–1988, the plant produced only "test amounts", for a total production of about 200 tons of black sand. In 1989–90, MEl returned to its 7–8 month, one shift per day, "season," producing about 300 tons of black sand.

Historic grandfathered uses

Under 43 United States Code (U.S.C.) 1782(c) of the Federal land Policy and Management Act of 1976 (FLPMA), as guided by the BLM Interim Management and policy Guidelines (IMP), the BLM should not allow any activity to impair the wilderness characteristics of the Kelso Dunes Wilderness Study Area (WSA), unless activities are continuing in the same manner and degree as were occurring on October 21, 1976 (passage of the FLPMA). These activities have been called grandfathered uses by the BLM. At the time, an analysis (Environmental Assessment) was made by BLM and the conclusion reached that

> The operator's (Parker and others) level of activity to date, appears to be a logical progression of activity since the passage of the FLPMA as provided at I.B.6.of the IMP, and is consistent with the manner and degree clause in section 603(c) of the FLPMA, and therefore, the requirements of the IMP have been met.

Mineral Extractors Inc. had filed a timely vested rights reclamation petition with San Bernardino County under the California State Surface Mine and Reclamation Act (SMARA1). The county approved MEL's reclamation plan and vested the operation at 4 tons of magnetic concentrate per day. MEL claimed valid existing rights to impair the WSA in the conduct of their proposed operations. But the BLM had not verified "grandfathered uses" to support continuation of existing levels of operation, or logical progression under the "manner and degree" criteria to support proposed operations. Under the procedures in place at the time, the Plan of Operations was to be reviewed under the IMP as a result of valid rights rather than grandfathered uses because the right to mine in the area segregated from the mining laws by the WSA was contingent primarily on whether the mining claims are valid. Hence there arose a need for BLM to conduct a mining claim validity examination.

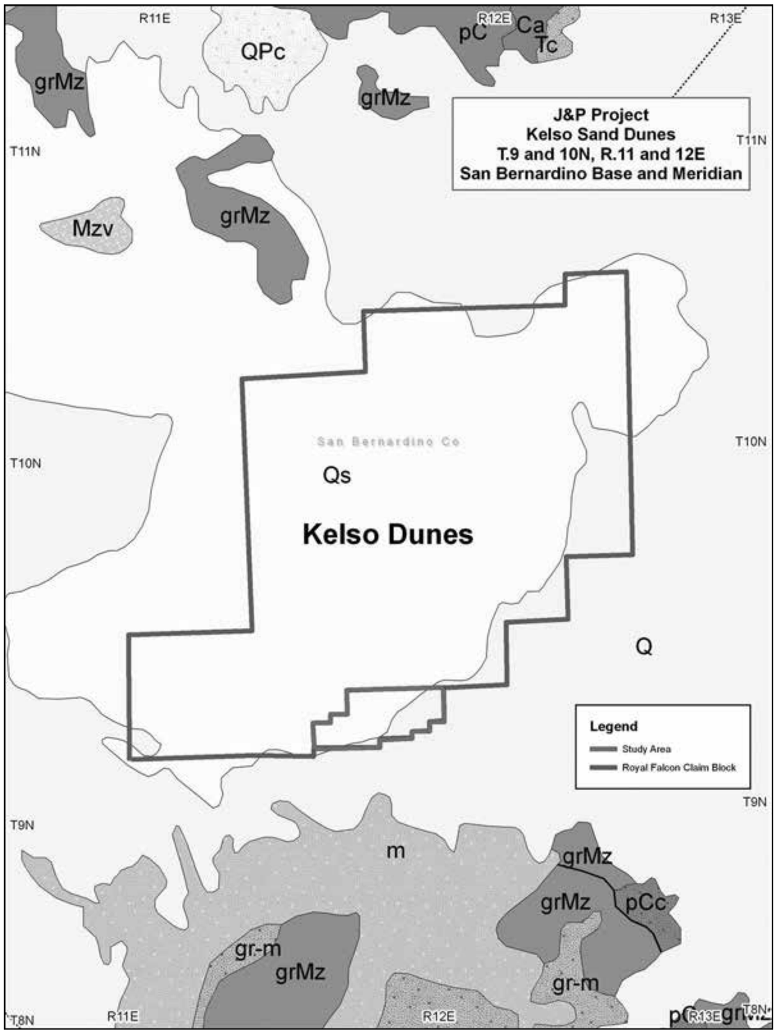
The Bureau did recognize a certain level of grandfathered activity did exist for the purpose of evaluating the environmental impacts from the BLM sampling program. This was addressed through an Environmental Assessment (EA). That analysis basically stated that the level of activity in the BLM-proposed in-sampling program for the examination of the property was much less than those which Mineral Extractors had been conducting since October 21, 1976, the date of passage of the FLPMA.

Geology

Kelso Dunes is made up of a complex topography of peaks, hollows and low ridges that surround four larger ridges. Dunes are made up almost entirely of eolian sand. Yeend and others (1984) identified six separate geologic units at Kelso Dunes. The geologic units that are described below are very similar to the units described by Yeend and others (1984) with the exception of some minor unit boundary changes which can be seen in Map M-2. There is only one general area throughout the entire dune field where all of the units are exposed. The area is in the southeast corner of the dunes near Cottonwood Wash (See Map M-2). Below are descriptions of the units throughout Kelso Dunes which are separated into Igneous, Eolian, and Alluvial units.

Igneous Rock Units

The oldest and the stratigraphically lowest unit in the map area is granodiorite (Tg). This unit has only two visual



Geologic map of the Kelso dunes Q = quaternary sediments, Qs = Quaternary sand, grMz = Mesozoic granite, QPc = Quaternary-Pliocene conglomerate, pC = Precambrian metamorphic, Ca = Carboniferous andesite, Tc = Tertiary conglomerate, MZv = Mesozoic volcanic, gr-m = undifferentiated granite and metamorphic. pCc = PreCambrian conglomerate.

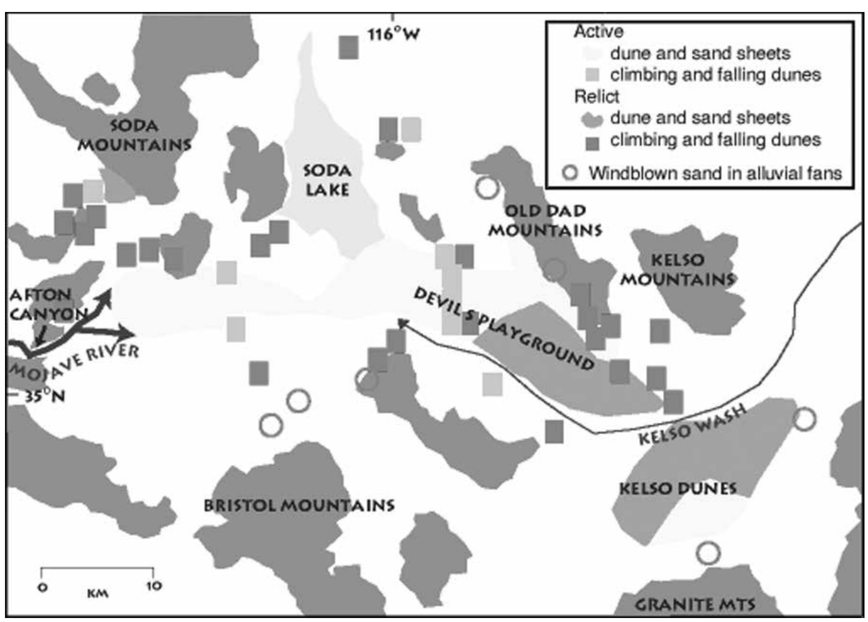
The **Sand Sheet** unit (Os) is stratigraphically the lowest of the eolian units. It consists of coarse to fine grained, 3- to 6-foot sheets of predominately quartz-rich eolian sand. The sand grains are moderate to well sorted and well rounded. The unit is exposed on the surface along the western half and the northeast portion of the mapped area (see Map M-2). Vegetative cover is moderate to heavy and most plentiful along Cottonwood Wash and the lower elevations because of higher moisture.

Stratigraphically above the sand sheet unit is the **Stable Dunes** unit (Osd). This unit consists of medium to fine grained predominately quartz sand. The sand grains are well sorted and well rounded. Vegetative cover is medium to heavy and is scattered throughout the unit as large grass patches (see Plate P-2, C). The stable dunes unit extends from the center to the eastern boundary of the mapped area (see Map M-2).

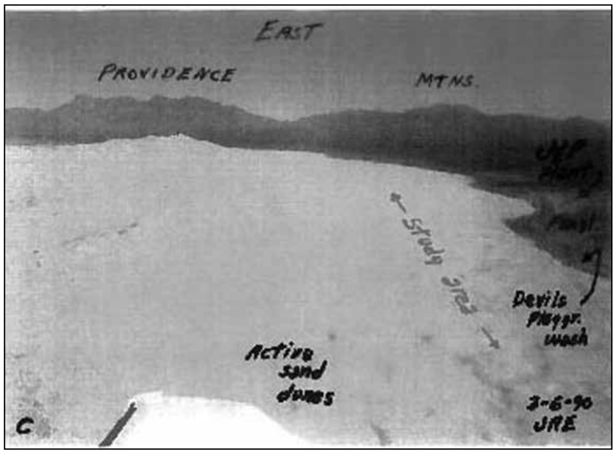
The highest stratigraphic unit throughout the dune field is the **Active Dunes** (Oad). This unit consists of very fine grained predominately quartz sand. There are several distinct dune forms throughout the active dunes. The dune forms include domes, barchans and traverse dunes and can be identified from great distances (see Plates P-2, A-C; P-3, A). The major differences between the active dunes (Oad) and the other two eolian units (Osd and Os) is that the active dunes have less vegetation , due to the continuous movement or migration of sand grains. Locally, heavier black sand grains are seen at the surface of surface exposures. The two exposures are in the form of small knobs located just east of Cottonwood Wash (see M-2).

Eolian Units

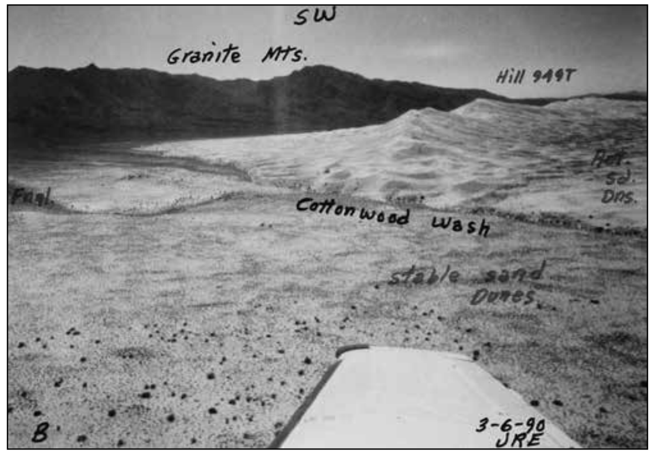
Three eolian units were identified throughout the dune field. The units appear in the form of broad flat sand sheets (Os), vegetative supported sand dunes (Osd), and active sand dunes (Oad).



Sand types in the Kelso Dunes. From U.S. Geological Survey yhttp://geomaps.wr.usgs.gov/parks/mojave/kelsomap.html., adapted from Lancaster, N., 1995, Kelso Dunes, in Reynolds, R.E. and Reynolds, J., ed., Ancient Surfaces of the East Mojave Desert: San Bernadino County Museum Association, p.47-51.



Aerial photograph of study area. View is to the east, toward the Providence Mountains.



Aerial photograph of the Kelso Dunes. View is to the southwest, toward the Granite Mountains. Hill 949T is in the top left. Cottonwood Wash separates active sand dunes to the upper right from stable sand dunes on the lower left.

the Oad dunes because the lighter quartz grains have been blown away from the area.

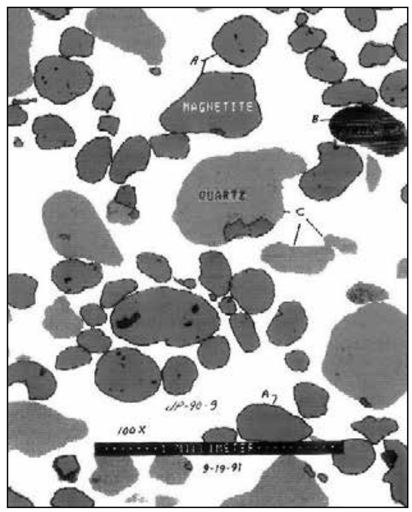
Alluvial Units

There are two alluvial units in the mapped area. The older of the two units is a fanglomerate/alluvial fan (Of). This unit is stratigraphically lower than the eolian units described above. The fanglomerate consists of sand, gravel and boulder sized igneous rock fragments that originated from the surrounding mountain ranges. Moderate to heavy vegetation is associated with the unit (see Plate P-2, 8 & C). It is exposed at the surface along the northeast and southeast boundaries of the mapped region (see M-2). The other alluvial unit (Qal) is found mainly along the modem drainages within the dune field (Map M-2). The material ranges from sand to gravel size and is mostly well rounded and poorly sorted. In some areas, boulder sized material is present. There are several modern drainages throughout the region. The drainages are easily recognized because of the heavy vegetation that fills them (See Plate P-2, 8&C).

Sampling and sample processing

It was clear from the start of the J&P project that the magnetic mineral fraction of the dune sand was only a small portion of the dune sand itself and that the fraction could vary over distance by significant amounts. Therefore bulk properties of the dune sand were measured for weight, volume, moisture, swell, mineralogy, and grain textures and sizes. There was a possible precious metal content in the magnetite fraction which was mostly magnetite. The high iron environment required special consideration for selection of any analytical testing method.

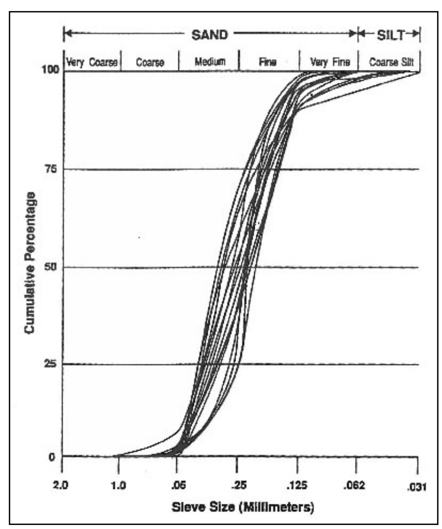
Twenty-two bulk samples were taken from the PMC corners and central PMC areas of the claims included in Parker's POO. Samples were collected from the top 3 feet of sand with Parker's rubber tired Cat 966C front end loader. The Plan of Development called for mining only the top three feet of sand. The Kelso Dune sands contain discontinuous zones of high magnetic concentrations, interspersed with zones of low magnetic mineral



Drawing of a scanning electron microscope image of sand grains in BLM sample JP-90-9. The image was taken with a JEOL JSM-T300 scanning microscope. Image is courtesy of J.J. Sjoberg, Bureau of Mines, Reno, Nevada. A= magnetite and ilmenite, B= CA–FE silicates, C= quartz and plagioclase.

concentrations. The zones vary in areal extent and depth. A bulk front end loader was used for sampling in the order to obtain at least 2 cubic yards per sample to account for zonations in the material. The bulk sampling also was representative of the low percentage of magnetic concentrate in the dune sands. In addition, this sampling method reflected the historic mining practice used by Parker.

A summary of the bulk physical testing follows:



Sorting curves for natural dune sand samples from the Kelso dunes.

- Smoothed over Cat 966C wheel loader bucket content is 2.36 cubic yards
- Dry dune sand weighs 106 pounds per cubic foot
- Dry dune sand weights 2,862 pounds per cubic yards
- Dry dune sand weighs 1.43 tons per cubic yard
- An 85 gallon steel drum of magnetite concentrate weighs about one-ton
- Moisture content of the upper 3 feet of dune sand was from 0.21 to 3.46 percent
- Percent moisture averaged 1.60 percent
- Swell factor for damp sand in the top 3 feet of dune sand is 10 percent
- Wheel loader bucket contents are 2.15 cubic yards of dry sand
- Wheel loader bucket content of dry sand is 3 tons (6,000 pounds)

After determining bulk physical properties our next step was to process bulk samples through a magnetic separation process to simulate Parker's plant processing procedures. To do that, BLM mineral examiners used the Parker plant as the testing laboratory for their study.

BLM plant test for processing magnetic concentrate

During plant sample testing, the first-stage magnetic separator (25 pole unit) was used. The magnetic concentrates were removed directly by hand, through a small door at the base of the separator unit. Bulk processed sand was discharged by conveyor to the tailings pile for return to the mine site. The magnetic concentrates were subsequently weighed, analyzed for mineral character and grain size, and sealed for assay.

The plant was able to process 6,000 pounds of bulk sand in an average of 16 minutes. Sample throughput times varied from about 11 minutes to about 20 minutes. Sample throughput times represent the capacity of the current, in-place system, to process sand from the subject deposit. The system throughput capacity is fixed, adjustable only through the drying circuit. Samples were taken in mid-summer, and probably represent the median for moisture content, a critical factor in throughput time.

Weight of magnetic concentrates

Just as throughout the entire dune field, black sand is visible at the surface in the J&P project area, and most visible in the active dune unit. It is mainly concentrated along the windward side of the dunes ridges. Weight of black sand concentrate recovered from each BLM sample varied significantly. Weights ranged from 20.92 to 182.85 pounds. Of the 22 samples collected, 12 samples were from 25 to 50 lbs, three samples from 51 to 75 Ibs, five samples from 76 to 100 Ibs, one sample from 101 to 125 Ibs, and one sample from 176 to 200 Ibs. In terms of percent concentrate, 13 samples had less than 1 percent concentrate; eight samples had between 1 and 2 percent, and one sample had over 3 percent. Weight per unit volume of the magnetic concentrate from the BLM samples ranged from 1.93 tons per cubic yard to 2.32 tons per cubic yard.

On microscopic analysis of the magnetic concentrate, it was noted that many grains of the magnetic concentrates are attached to other grains, mainly quartz and feldspar. Because these grains are connected they become part of the magnetic concentrate and are recovered by magnetic separation, reducing the sample weight per unit volume.

Magnetic concentrate mineralogy

Scanning electron microscopic observation of the magnetic concentrates showed that from about 58 to 80 percent is magnetite, 10 to 15 percent quartz, 10 to 15 percent feldspar, and about 5 to8 percent ilmenite, sphene, hornblende, garnet, apatite, pyroxenes, rutile, and epidote.

Magnetic concentrate texture

Sieve analysis showed that the size of the grains of magnetic concentrate ranged from 0.05 to 0.0625 mm (medium to very fine). The majority of the grains was magnetite and passed through the 0.250 screen and remained on the 0.125 screen (fine sand). Concentrates were very well sorted with grains well rounded to subrounded. Grains are spherical to sub-prismoidal in shape. All magnetite grains are rounded to well rounded.

Analytical testing and results

Bondar-Clegg, Inc. testing for the BLM

A split for each of the 22 magnetic concentrate samples stored in the BLM Folsom Minerals Lab was made in that lab on August 22, 1990, by J.R. Evans. Results from the testing by Bondar-Clegg showed no platinum group elements or gold above 0.002 troy ounces per ton (detection limits) in the magnetic concentrate.

Chemical testing of magnetic concentrates through the J & P staff for themselves

On several occasions, Art Parker had told J.R. Evans that "standard assayers with standard methods cannot determine PGM in my magnetic concentrates". Parker also told BLM staff that his own customized assay methods would work, but that they were confidential.

The confidential methods were investigated in 1990 and 1991 when BLM staff visited Parker's laboratory and the laboratory of his assayer, AST lab of Scottsdale Arizona. The owner of AST labs was Siegfried Bremer. Parker's procedures involved a smelting method and an acid-resin-fire assay method. Bremer described his assay theory and methods for determination of the precious metals (PGM) and precious metal elements (PGE), or "clusters" as he called them. Bremer said he could detect both PGM and PGE using his assay methods, but contended this does not necessarily mean that standard assays will show the presence of PGE, or that they are commercially recoverable. He also said that if PGM were present, they should be detectable by fire assay, Atomic Absorption (AA), or induced coupled polarization (ICP) methods. However, according to Bremer's assay theory, these standard methods would only work if the PGE's are broken from their "molecular" or "cluster" bond to a metallic bond before they are detectable by standard assay methods. Bremer indicated that if he identified PGM, then BLM should also be able to detect them. However, any PGE which are not in metallic or ionic bonds, but rather "molecular" bonds, must be broken down to atoms (metal) before they are detectable by normal analytical means. He said the way to break down the "molecules" is by means of the vacuum electron beam furnace. He uses a furnace of Lleibold (Company of Degussa Corp.) in Hanover, Germany.

Bremer discussed briefly his spectrophotometric methods. He used one or half-ton fire assay preparation with the same fluxes as recommended by Beamish (1977) for iron ore. Bremer takes the lead button from the fusion and runs a portion of it at high voltage spark for PGM. For PGE, the lead button, or a part of it is run in the DC Arc Plasma on the spectrograph.

Chemical testing of magnetic concentrate through the Bureau of Mines for the BLM

To verify the Parker/Bremer assay process, on August 23, 1990, Evans and Waiwood took three samples to Ken G. Broadhead, Bureau of Mines, Reno. These samples had been collected at Parker's Twentynine Palms lab during their visit to observe Henderson's procedures in July 1990.

Sample #1, iron matte (Y2 square inch ±); broken off a large dinner plate sized iron billet made by Parker in an induction furnace in his lab at Twentynine Palms; collected 7-30-90. Parker indicated these plates contained PGM.

Sample #2, gold-bearing residue from nitric acid processing; collected 7-31-90.

Sample #3, gold fragment (100 microns) in residue from sample #2; collected 7-31-90

No PGM were detected in #1 above. Numbers 2 and 3 were not tested for PGM because no PGM were considered to be present after Henderson's processing.

On January 23, 1991, in the BlM Minerals lab at Folsom, California, Evans packaged a random scoop sample of magnetic concentrates from each of the 22 samples collected by the BlM during June, 1990. On January 24, 1991, Evans took the samples to K.G. Broadhead at the Bureau of Mines lab in Reno. The Bureau determined bulk density for all samples, mineralogy for JP-90-5 and 5A, PGM and gold for all samples, result of assay using copper as a collector for PGM, and a sample assay run with a known amount of platinum. Results of the Bureau of Mines tests are summarized below:

1. There was a significant variance in bulk density as a result of various quartz and feldspar content. Fibrous material (burnt organic matter) was present in all samples. In mining only the top three feet of sand, a certain amount of grass and vegetation is to be expected in the samples.
2. Upon one-half ton fire assay preparation with ICP finish, no platinum, palladium, or rhodium was found to be present at detection limits of the analytical process (0.003 troy ounce per ton).
3. Recovery was excellent for known amounts of platinum introduced as a standard.
4. The copper collector test was disappointing and inconclusive. High copper content of the HN03 solution could not be run because of background interference.

On April 19, 1991, Evans went to the Bureau of Mines Reno lab to meet with Ken Broadhead where the April 11 and 12, 1991, trip to Bremer's AST lab in Scottsdale, AZ, and future PGM testing was discussed. Evans left a cut piece of the copper-iron bar from sample JP-90-11 and a cut piece of the lead "bar" from sample JP-0-5A~ for appropriate PGM tests. These bars were developed during the BlM trip to Parker slab on April 8 and 9, 1991.

No gold or PGM were detected in any of the materials described above. Copper-iron bars, such as the one developed from BlM sample JP-90-11, are said to be marketable by Parker, along with magnetic concentrates. Because of the statement, a polished surface of the JP-90-11 bar was examined carefully by scanning electron microscope even through no PGM were detected by ICP analysis of the copper and iron zones.

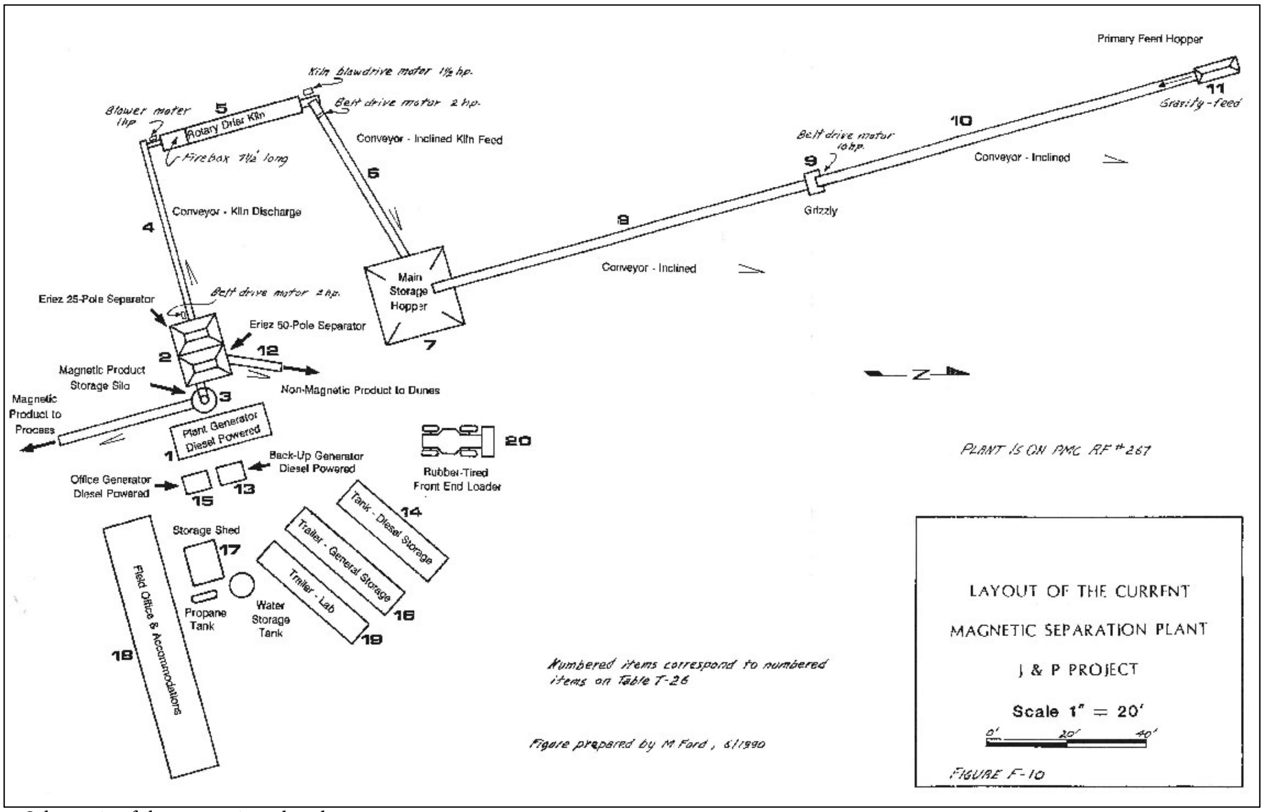
Four metals phases were identified. Copper phase A was most abundant because of the copper added during fluxing of the 5-assay ton sample. No PGM spectra or phases were detected during the microscopic examination.

Parker's mining and plant processing procedures

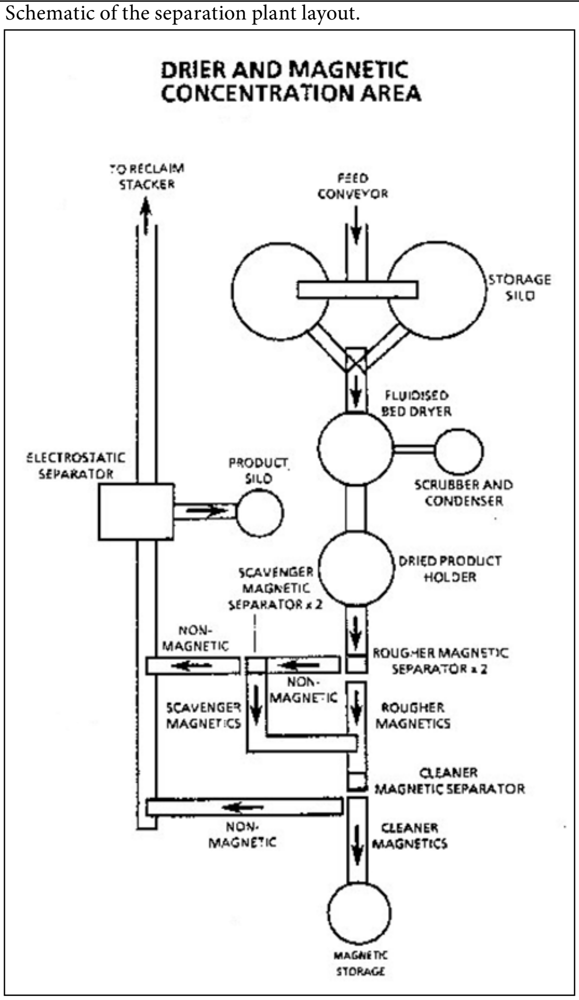
The J&P processing plant was located on the southern margin of Kelso Dunes, approximately 8.8 airline miles south-southwest of Kelso Train Depot. The J&P plant used a magnetic concentration process to extract magnetic minerals from bulk placer sand dune deposits.

The mine plant consisted of a primary feed hopper, conveyor system, grizzly, main storage hopper, rotary drier kiln, two-stage magnetic separator unit, and a magnetic product storage silo. Material from the top 3 feet of sand was delivered to the plant by a rubber tired front-end loader, Cat 966C, using a 3 cubic yard bucket.. The loader operator mined sand from dunes in close proximity to the processing plant, typically within a radius of 2,000 feet.

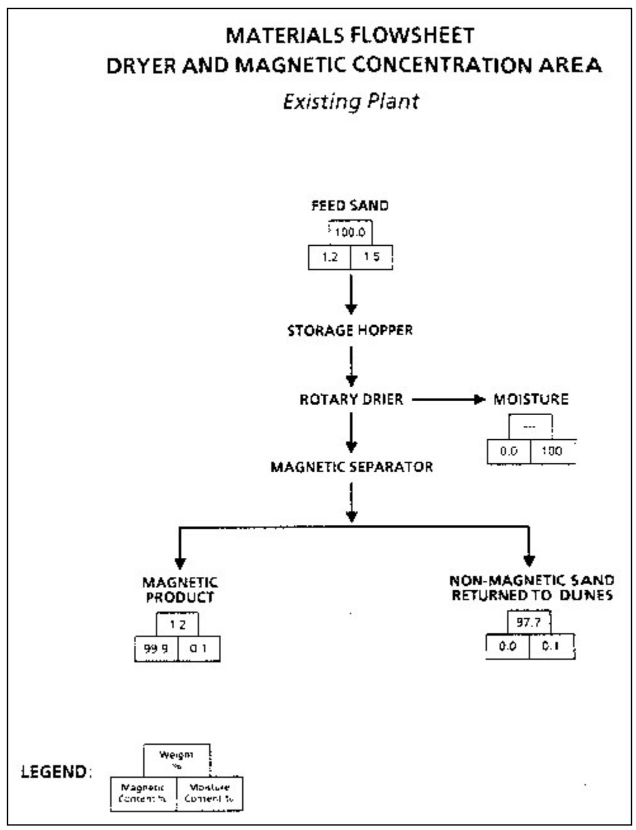
The front-end loader was driven to the mining area to load the bulk sand independently, then transported the material to the plant for processing. At the plant, sand was



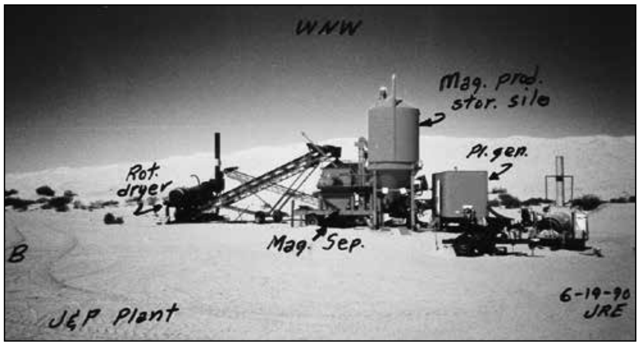
Schematic of the separation plant layout.



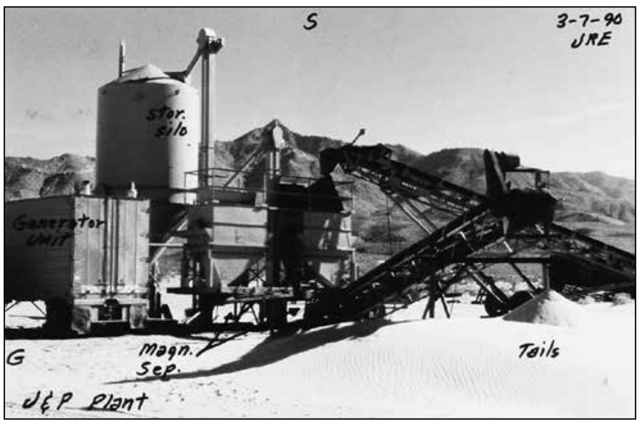
Schematic of the dryer and magnetic concentrator configuration.



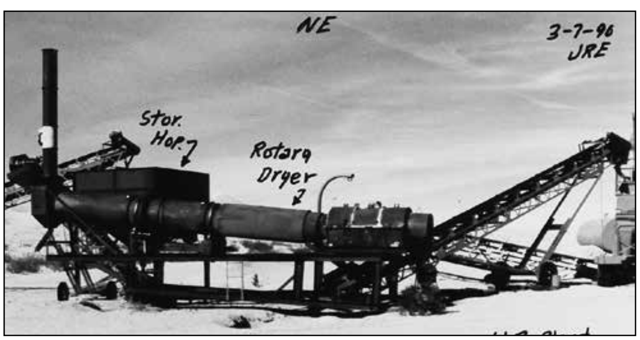
Material flow sheet for dryer and magnetic concentrator.



J.P. Project processing plant showing rotary drier, magnetic separation unit, and magnetic concentrate storage silo. Photo taken 6/19/1990 by J. R. Evans.



J.P. Project processing plant, showing conveyors, magnetic separation unit, and magnetic concentrate storage silo and generator unit. Photo taken 3/7/1990 by J.R. Evans.



J.P Project processing plant rotary dryer.

dumped into the primary feed hopper for direct feed onto the conveyor system. The material then passed through a minus one-inch grizzly, which separated the wood, plant material, and cow chips from the sand. The cleaned sand was carried by conveyor to the main storage hopper for through-feed by conveyor into the rotary drier kiln. Upon entering the kiln, the material was heated to 150 degrees to dry the sand and possibly increase its magnetic attraction. The dried material was transported by conveyor from the rotary drier kiln through a star feeder, and into a two-stage Eriez magnetic separation unit.

The first-stage separator, Eriez Model D.F.H. 25. contained a 25 pole Hi Speed magnetic drum concentrator which is intended to separate pure magnetite grains from the bulk sand at 800 to 10,000 gauss. This stage was designed to recover 95% of the contained magnetite along with magnetite locked in silica and ilmenite grains and ferro-titanium minerals. This unit operated at drum peripheral speed of 800 feet per minute.

The second-stage separator. Eriez Model D.F.H. 50, contained a 50 pole Hi Speed magnetic drum concentrator which was intended to separate clean magnetite from the sand. It produced a high grade concentrate low in silica and titania. This stage was designed to operate at 12.000 foot per minute drum speed to obtain increased "magnetic agitation" and pronounced centrifugal force for maximum rejection of the iron-bearing silica and ilmenite particles which were not as magnetic.

After the bulk sand was processed through the magnetic separator unit, the tailings were discharged by conveyor to a tailings pile. for eventual return to the mine site. The magnetic material was typically transferred by elevator from the two-stage magnetic separator unit into the magnetic product storage silo.

Reclamation and environmental mitigation costs

In order to ensure that reclamation and environmental mitigation considerations and costs were considered as part of the economic analysis of the claims, a separate reclamation and environmental costs (REC) analysis was made. For the J&P Project. reclamation and environmental costs included the cost to provide any compensation for the loss of habitat for the Desert Tortoise (if the tortoise were to be affected by the operation), a species that had, in 1991, been placed on the threatened species list by the United States Fish and Wildlife Service. Additional REC costs included the costs to assure adequate reclamation of the access road, mine plant site, and disturbed dune areas.

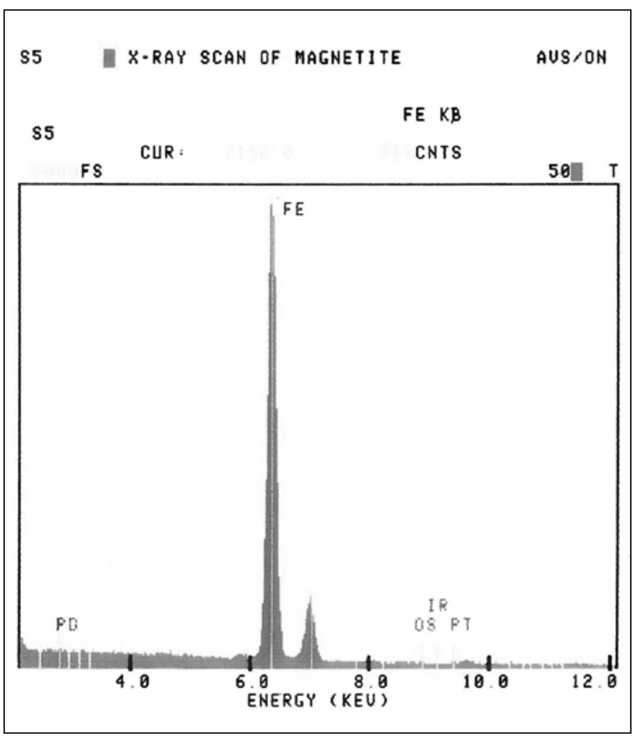
Gold and PGM resources

For purposes of BLM's investigation, gold and PGM resources on the J&P claim block were those that can be developed from magnetic concentrates processed through the J&P Project plant. Any gold or PGM that might be recovered by wet-gravity separation was not considered. BLM staff did not make any tests for free gold or PGMs. Presence of free PGM in the Kelso Dune sand is highly unlikely. Free gold in very minor amounts does occur in the region surrounding the J&P claim block according to the Bureau of Mines. In 1982 they sampled from an area about 750 ft. north of the J&P Project plant. Nine samples weighing from 9 to 17.5 pounds were taken at about equal distances along a line 400 ft. west of the 750 ft. point (see Munts, 1983, location map, p.51). A wet-gravity separation using a Wilfley table in a laboratory environment was made of pulverized materials crushed from these samples. Samples showed from zero to 0.00014 troy ounce per ton free gold, and from about one-tenth to one percent of magnetic concentrates (Munts, 1983, Tables 3 and 5, p. 53 and 59).

About 250 ft. east of the 750 ft. point, a pit was dug and 24 grid samples of several pounds each were taken from about 3 feet of damp sand. They were also separated by wet-gravity means. The magnetic fraction was from about 3 to 13 grams. Free gold was from zero to as much as 285 milligrams. Most of the gold fraction was below 25 milligrams (see Muntz, 1983, Figures 9 and 10, p. 47 and 48). Sample weight fractions for both magnetic concentrates and free gold varied widely, laterally and vertically. Parker has said from the beginning of this study that real PGM and gold values were in the magnetic concentrate portion of the dune sand, specifically within the magnetite itself. Testing done for BLM by Bondar-Clegg, Inc., and the Bureau of Mines Research laboratory at Reno, Nevada. These analytical studies showed no detectable PGM or gold in the samples BLM or Bureau of Mines staffs collected. Parker had always claimed that the methods he used or subscribed to are the only way to detect PGM in the Kelso Dune sands. BLM staff could not accept Parker's thesis and arrived at the conclusion that the magnetic concentrate and copper-iron bars that Parker indicated he could market for PGM do not contain either PGM or gold. Therefore, the BLM mineral examiners concluded that no gold or platinum resources occur in the magnetic concentrate of the Kelso Dunes sand.

Conclusions and recommendations

Iron resources, gold, and platinum group elements were not found within the limits of the Placer Mining Claims



X-ray scan of a magnetite grain from the Kelso Dunes collected from BLML sample JP-90-9. There are no Platinum Group Metal lines in the spectra.

(PMC's) investigated by BLM in sufficient quantities and/or qualities to constitute a discovery of a valuable mineral deposit.

As no discovery was found to exist on any of the PMC's in the Parker claim block, all 10-acre tracts were classified by BLM as non-mineral in character. BLM staff recommended that a contest complaint be initiated against the PMCs .

Hearing and appeals

The technical investigation of the Parker PMC's led the California State Office of BLM to determine that the Hope #86 to #89, Jemberg #37 to #50 and Royal Falcon #231 to #279 placer mining claims invalid for want of discovery of a valuable mineral deposit. Upon being informed of BLM's decision, the claimants appealed it. The Chief of Adjudication and Records, Robert Naurt, issued a complaint on April 16, 1992. It became Contest number CACA 29673-B. The hearing judge for this complaint agreed with BLM and declared the mining claims BLM staff had examined to be null and void for want of a discovery of a valuable mineral deposit. The hearing judge was not impressed by the claimants "black box" methods of processing the black sands to recover PGMs.

This judicial action voided the claims in the study area (red in location map) and the J&P operation plant was subsequently dismantled in 1993.

But there were hundreds of claims outside the study area in the Royal Falcon claim block (blue on the location map). The claimants continued to pay maintenance fees on their claims for six more years. In 1999 the claimants failed to do assessment under a small miner's waiver or pay the maintenance fees. The fee was $100 per claim, so holding hundreds of them meant they were paying thousands of dollars a year, and getting nothing in return. By 1999 the California Desert Protection Act of 1994 was being implemented, and the prospects for them getting a permit to mine was dimmer than ever. So the Kelso Dune platinum project a project that began in 1967, came to a slow end,.

The Kelso Dunes platinum project legacy

The effect of the Kelso Dunes J&P project was to galvanize anti-mining feelings during development of the California Desert Plan and during debates for what became the California Desert Protection Act of 1994. Even though BLM eventually found the J&P project claims to be invalid, the possibility that a mining operation on the Kelso Dunes *might* be permitted caused several angry articles to be written in Southern California newspapers. Many thousands of other mines and mineral collecting sites in the California Desert District were also closed by the 1994 legislation. In part that was because of fears that J&P-like projects *might* be approved in those other areas.

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