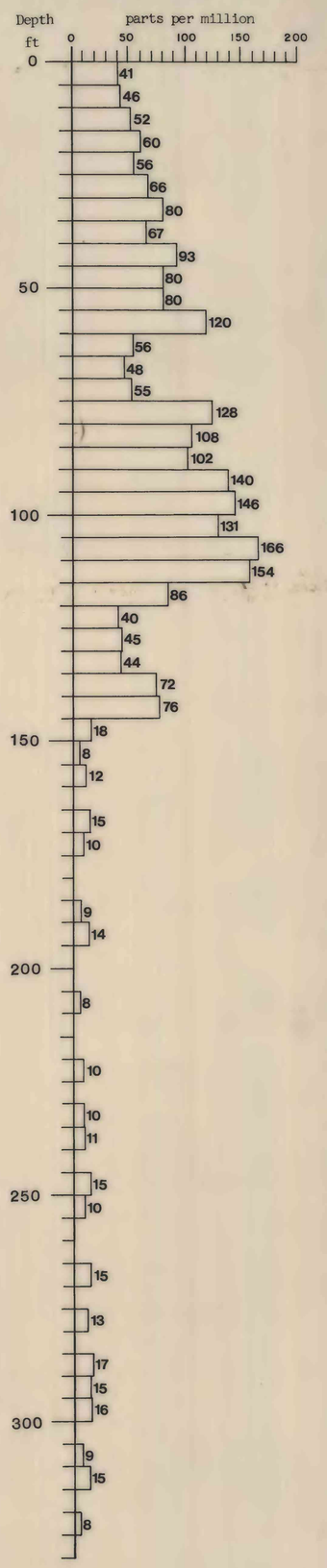
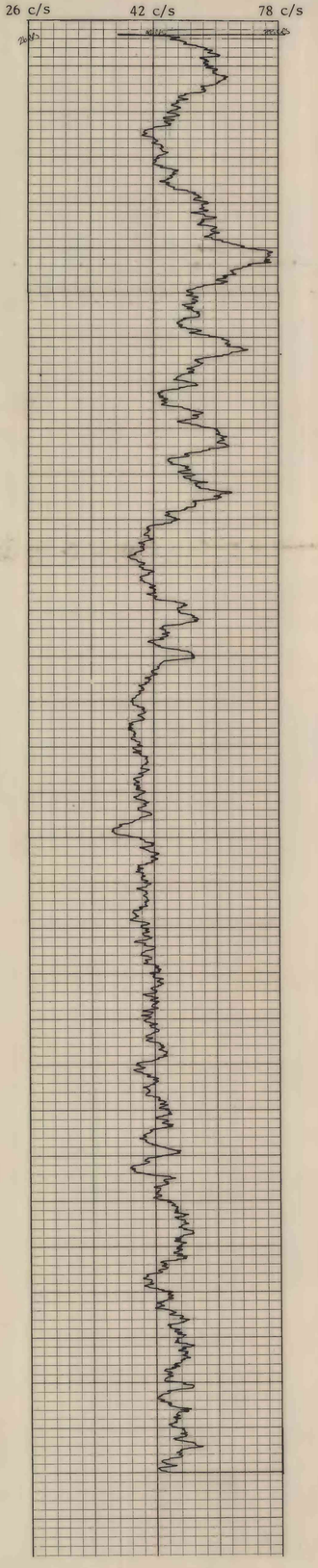
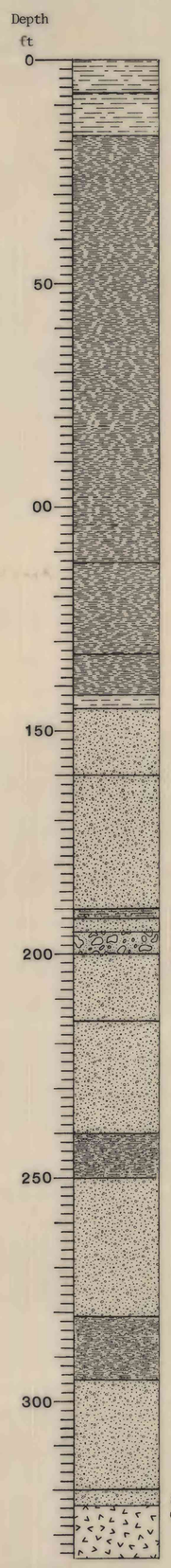
LITHIUM LOG
(J. D. Vine, 1978, written commun.)



GAMMA - RAY LOG
[c/s]



COLUMNAR SECTION



Total depth (TD) = 335 ft

LITHOLOGIC LOG

Depth (Feet)		DESCRIPTION
0	- 17	Silt, dark-yellowish-brown (10YR 4/2), and fine to very fine sand. Unit changes to clayey silt with some sand below 7.0 ft
17	- 23.5	Clay, moderate-yellowish-brown (10YR 5/4), calcareous, sticky
23.5	- 27	Clay, pale-yellowish-green (10YR 8/2), calcareous
27	- 41	Clay, dark-greenish-gray (5G 4/1), calcareous
41	- 52	Clay, grayish-olive (10Y 4/2), calcareous
52	- 55	Clay, greenish-black (5G 2/1), calcareous
55	- 65	Clay, moderate-yellowish-brown (10YR 5/4), calcareous
65	- 95	Clay, pale-olive (10Y 6/2), calcareous
95	-100	Clay, light-olive-gray (5Y 5/2), calcareous
100	-105	Clay, pale-olive (10Y 6/2), calcareous
105	-112.5	Clay, light-olive-gray (5Y 5/2), calcareous
112.5	-133	Clay, moderate-yellowish-brown (10YR 5/4), calcareous, gritty, and fine to very fine sand. Unit is composed of 70 percent clay and 30 percent sand
133	-142	Clay, grayish-olive (10Y 4/2) and moderate-yellowish-brown (10YR 5/4), interbedded calcareous
142	-145	Silt, dark-yellowish-brown (10YR 4/2), sandy to pebbly. Unit is composed of 90 percent silt, 5 percent coarse to very coarse sand, 3 percent granules, and 2 percent pebbles 4-9 mm across
145	-160	Sand and gravel. Granules and pebbles 4-10 mm across and very fine to very coarse, subrounded sand. Unit is composed of 50 percent pebbles and granules, and 50 percent sand. Maximum pebble size is 40 mm across at 152 ft and 30 mm across at 155 ft. Pebbles are composed of quartz monzonite, potassium feldspar, and cemented fanglomerate
160	-170	Sand, dark-yellowish-brown (10YR 4/2), predominantly coarse subangular, with some pebbles. Sand ranges from very fine to coarse; pebbles are up to 15 mm across. Unit is composed of 90 percent sand and 10 percent pebbles, but changes to 40 percent pebbles and 20 percent each of fine medium, and coarse sand by 170 ft
170	-180	Sand, dark-yellowish-brown (10YR 4/2). Lithology similar to 170-180 ft, but pebbles as much as 30 mm across, averaging 10 mm, which are composed of quartzite, quartz monzonite, and feldspar fragments. Coarse sand comprises 35-40 percent of the unit and increases to 90 percent by 180 ft
180	-195	Sand, coarse, with pebbles in a dark-yellowish-brown (10YR 4/2) silt matrix. Pebbles are quartz monzonite and feldspar fragments. Unit contains interbed composed of 50 percent pebbles and 50 percent silt at 190 ft. Unit composition changes to 70 percent coarse to very coarse sand, 10 percent medium sand, and 20 percent granules and pebbles, 4-15 mm across below 192 ft
195	-200	Gravel, pebble, 4-30 mm across, composed of quartzite and quartz monzonite and coarse to very coarse sand in a dark-yellowish-brown (10YR 4/2) silt matrix
200	-211	Sand, medium to coarse, with subangular to subrounded pebbles, 2-15 mm across in a dark-yellowish-brown (10YR 4/2) silt matrix. Unit is composed of 70 percent sand, 10 percent pebbles, and 20 percent matrix
211	-215	Sand, very coarse, with subangular to angular pebbles in a dark-yellowish-brown (10YR 4/2) silt matrix. Unit composed of 75 percent sand, 5 percent pebbles, and 20 percent matrix
215	-240	Sand, coarse to very coarse, with pebbles in a moderate-yellowish-brown (10YR 5/4), slightly calcareous, sticky silty clay matrix. Unit is composed of 40 percent sand, 10 percent pebbles, 20 percent silt, and 20 percent clay
240	-250	Clay, silty, moderate-yellowish-brown (10YR 5/4), slightly calcareous, with medium sand and pebbles. Unit composed of 75 percent silty clay, 25 percent sand and pebbles. Sand content increases to 40 percent from 246-250 ft
250	-256	Sand, fine to coarse, and pebbles in a moderate-yellowish-brown (10YR 5/4) silt matrix. Unit is composed of 80 percent sand and pebbles and 20 percent matrix
256	-259	Sand, very coarse, with quartz monzonite and quartz diorite pebbles in a moderate-yellowish-brown (10YR 5/4), silt and fine sand matrix. Matrix comprises less than 20 percent of unit
259	-265	Sand and pebbles in a silty matrix. Lithology similar to 256-259 ft, but with fewer pebbles
265	-275	Sand, coarse, with 4-20 mm, angular to subangular granules and pebbles, composed of quartz, feldspar, and mica fragments in a moderate-yellowish-brown (10YR 5/4), silt to fine sand, calcareous matrix. Unit composed of 80 percent sand, granules, and pebbles and 20 percent matrix
275	-281	Sand, very coarse, with pebbles. Matrix present but not recovered
281	-295	Clay, silty, moderate-yellowish-brown (10YR 5/4), calcareous, with very coarse sand and pebbles. Unit composed of 70 percent silty clay and 30 percent sand and pebbles. Pebbles and sand increase to 40 percent below 290 ft and are present in equal amounts
295	-320	Sand and pebbles in a silty clay matrix. Lithology similar to 281-290 ft, but unit now 50 percent 4-12 mm pebbles and sand and 50 percent matrix. Below 305 ft pebbles are up to 9 mm across, and unit contains less clay
320	-323.5	Sand, coarse and pebbles up to 25 mm, unconsolidated, with iron-stained surfaces
323.5	-330	Quartz monzonite, weathered and rotten, but becoming fairly rigid by 324 ft. Fragments are as much as 55 mm across, with albite (?) and calcite surface coatings. Epidote is scattered throughout the rock
330	-335	Quartz monzonite. Lithology similar to 323.5-330 ft, but drill cuttings are larger, well consolidated and less weathered

Chemical analyses of ground water from test well E-1, Emerson Dry Lake, California
[Analyses by U.S. Geological Survey, Denver, Colo. —, no data.]

Test well-sample No.	Date sample collected	Sample depth (ft)	Specific conductance (microohms/cm at 25°C)	pH Field	pH Lab	Temperature, water (°C)	Specific gravity	Hardness, total (mg/l)	Calcium (Ca) (mg/l)	Magnesium (Mg) (mg/l)	Sodium (Na) (mg/l)	Potassium (K) (mg/l)	Bicarbonate (HCO_3)* (mg/l)	Alkalinity, total ($CaCO_3$) (mg/l)	Sulfate (SO_4) (mg/l)	Chloride (Cl) (mg/l)	Fluoride (F) (mg/l)	Iodide (I) (mg/l)	Silica (SiO_2) (mg/l)	Solids, residue on evaporation at 180°C (mg/l)	Nitrite plus nitrate (N) (mg/l)	Phosphorus (P) (mg/l)	Boron (B) (µg/l)	Iron (Fe) (µg/l)	Lithium (Li) (µg/l)	Manganese (Mn) (µg/l)	Strontium (Sr) (µg/l)	Uranium (U) (µg/l)
E-1-1	5/12/78	115	102,000	9.6	9.3	26.2	1.070	4	0.4	0.7	33,000	110	12,444	10,200	11,000	40,000	84	0.94	21†0.4†	86,400	0.79	16	19,000	210	70	140	—	—
E-1-2	5/12/78	335	5,059	7.6	8.2	26.4	1.015	270	100	4.8	920	9.8	81	66	450	1,300	2.1	.13	1.7	2,500	.85	.01	2,200	2,200	110	40	1,800	0.18

* Calculated.
† Determined on 1:200 dilution.

INTRODUCTION

DISCUSSION

The Federal Land Policy and Management Act of 1976 (Public Law 94-579) directed the Secretary of the Interior to prepare and implement by September 1980 a comprehensive long-range plan for the management, use, development, and protection of public lands within the California Desert Conservation Area (CDCA). The responsibility to prepare this plan was assigned to the Bureau of Land Management's (BLM) California Desert Planning Staff. The BLM was directed to evaluate mineral as well as botanical, wildlife, cultural, and recreation resource data for effective multiple-use land planning. In turn, the BLM requested assistance from the U.S. Geological Survey (USGS) in defining the mineral resources.

In 1978 the USGS drilled 56 shallow test wells to depths of 50-600 ft to provide BLM with the requested mineral resource data. The lithologic, water quality, and geophysical data obtained from one of these test wells drilled on Emerson Dry Lake, Calif., are presented in this report.

LOCATION AND DRILLING METHODS

Test well E-1 was drilled in the NE¼SE¼NE¼ sec. 12, T. 4 N., R. 5 E., SBM, California (lat 34°25'56" N., long 116°25'10" W.) on Emerson Dry Lake (see index map). This test well was completed in May 1978 to a total depth of 335 ft by a track-mounted, reverse-circulation drill rig. Drilling fluids, a mixture of air and water, were pumped down the outer annulus of dual-wall drill pipe to an open face insert bit. Drilling fluids mixed with sediment cuttings were forced up the inner annulus of the drill pipe to the surface where samples were collected. This drilling technique ensured recovery of uncontaminated sediment or ground-water samples because the return cuttings or ground water were not in contact with the bore wall. In situ ground water was used as a drilling fluid where possible; otherwise, a fine mist of imported freshwater and air was used.

A continuous lithologic log was completed during drilling. Sediment samples were collected at 5-ft intervals and were described in the field. Field lithologic descriptions were supplemented by microscopic study when the samples were returned to the laboratory. Sediment names used in this report are those defined by Folk (1968). The rock-color chart (Goddard and others, 1948) was used to color classify damp to wet samples. Lithologic percentages are approximate.

Drill cuttings were analyzed for lithium (Li) by the USGS, in Denver, Colo. Lithium analyses are included in this report to complete the mineral resource appraisal on Emerson Dry Lake.

WATER QUALITY

Ground-water samples were collected at the first aquifer having measurable flow into the bore and at total depth of the test well by stopping drill rotation and pumping air through the drill string. The aquifer was allowed to flow for several minutes to remove drilling fluids and cuttings from the drill string before a ground-water sample was collected. Temperature and pH of raw, untreated samples and specific gravity of filtered samples were measured in the field. Chemical analyses of filtered samples collected from test well E-1 are listed in the chemical analyses table.

GEOPHYSICAL LOG

A gamma-ray logging survey was run from the surface to a drilled depth of 320 feet. The log was run through the drill string because the playa sediments would have squeezed in or collapsed and sealed the test well before conventional open-hole logs could have been run in the well. Before the log can be interpreted, corrections must be made for the effect of the drill pipe. The necessary data for the correction, described on Schlumberger Chart FOR-8, are listed below. The corrected log will approximate the natural radioactivity, but quantitative measurement is not possible, inasmuch as the sonde was not calibrated.

Test well diameter: 4.5 in.	Total thickness of dual-wall drill pipe: 0.63 in.
Drill string inner diameter: 2.47 in.	Sonde outer diameter: 1.25 in.
Outer diameter: 4.5 in.	Logging speed: 17 ft/min

ACKNOWLEDGMENTS

G. Thomas Server supplemented field lithologic descriptions by laboratory study of sediment cuttings under binocular microscope. J. D. Cathcart, U.S. Geological Survey, Denver, Colo., ran the geophysical log.

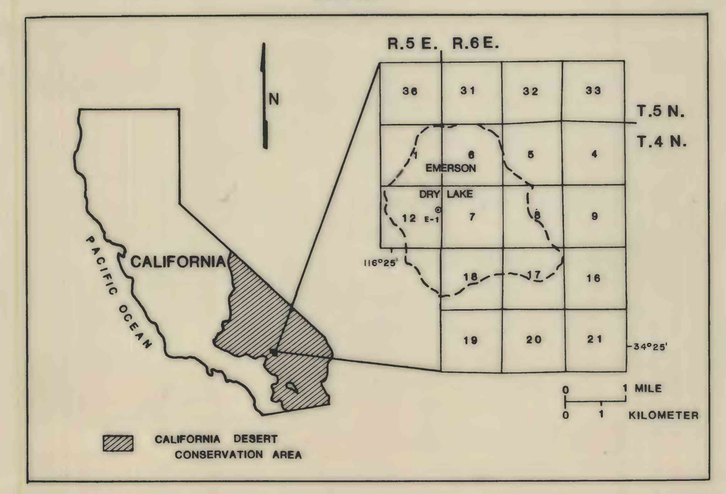
NOTE

Data from test well E-2, NE¼NW¼SE¼ sec. 7, T. 4 N., R. 5 E., are published in Open-File Report 80-872.

CONVERSION FACTORS

Multiply English unit	By	To obtain metric units
Inches (in.)	2.540	Centimeters (cm)
Feet (ft)	0.305	Meters (m)

INDEX MAP



This report has not been edited for conformity with U.S. Geological Survey editorial standards

GEOPHYSICAL, LITHOLOGIC, AND WATER-QUALITY DATA FROM TEST WELL E-1, EMERSON DRY LAKE, SAN BERNARDINO COUNTY, CALIFORNIA

By

Roger D. Dockter

1980