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CHEMICAL ANALYSES OF 75 CRUDE OIL SAMPLES FROM PLIOCENE SAND UNITS, ELK HILLS OIL FIELD, CALIFORNIA

By Peter M. Gerrild and Robert J. Lantz

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This report is preliminary and has not been edited or reviewed for conformity with U.S. Geological Survey standards and nomenclature.

ILLUSTRATIONS

TABLES

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The chemical data in table 1 were collected as part of an investigation to determine possible differences among crude oils in the Elk Hills oil field, Kern County, Calif., that might be useful in stratigraphic or genetic identification of these oils. This work is a phase of the investigations by the U.S. Geological Survey directed by Robert J. Lantz on the geology of Naval Petroleum Reserve No. 1, sponsored and supported by the U.S. Navy, Department of Petroleum and Oil Shale Reserves, with the cooperation of Captain R. E. Sparks, U.S. Navy.

The locations of the wells used in this study are shown on figure 1. Lantz (1968) has discussed the general geology of the Elk Hills oil field. Crude oil samples from 57 of the 75 wells shown on figure 1 were produced from one of six Pliocene oil sands in the field, informally called the AS, SS-1, SS-2, Mulinia, Sub-Mulinia, and Wilhelm sands in stratigraphically descending order. The oil samples from the remaining 18 wells are derived from sands of questionable designation or they are mixtures from several sands. All samples were collected by pump operators and airmailed to the Geological Survey's Denver laboratory facilities in opaque brown half-gallon polyethylene bottles, where they were promptly stored in a cool room.

The following is a brief description of the sample preparation and analytical procedures used. Nonorganic material was removed by high-speed centrifugation (1 hour at 14,600 X G). In some samples a persistent oil-water emulsion was broken by use of an ultrasonic generator, followed by recentrifugation. Water and sediment were thus separated from the oil.

The centrifuged oil was distilled under vacuum conditions at 5 mm Hg. The fraction that distilled on raising the temperature to 100° C (the "DIST FR" of table 1) was collected and then analyzed chromatographically. The distillate was separated into its two principal hydrocarbon types, saturated and aromatic, by means of fluorescent-indicator-absorption analysis, an A.S.T.M. (American Society for Testing and Materials, 1968) method for liquid-solid-chromatographic analysis. Considering the total of both the saturated and aromatic hydrocarbons as 100 percent, the percent of each was calculated and both were subsequently analyzed by gas chromatography. The chromatographic curves for each of the two hydrocarbon types were arbitrarily divided at characteristic "valleys" appearing on the curves for each sample. An integrator attached to the chromatographic recorder aided in calculating the segment area percents (normalized to 100 percent total). The approximate boiling ranges represented by the chromatogram segment area percents (APS and APA of table 1) are as follows:

(A) Saturated: 1) 139-149°C; 2) 150-156°C; 3) 157-170°C; 4) 171-176°C; 5) 177-184°C; 6) 185-196°C; 7) 197-207°C; 8) 208-227°C; 9) 228-242°C; and 10) above 242°C.

(B) Aromatic: 1) 127-140°C; 2) 141-147°C; 3) 148-156°C; 4) 157-167°C; 5) 168-171°C; 6) 172-180°C; 7) 181-198°C; 8) 199-216°C; 9) 217-239°C; 10) 240-245°C; and 11) above 245°C.

Two chromatographic liquid phases were tried in the chromatographic technique and both were found satisfactory: SE-30 (methyl silicone rubber gum), and OV-1 (dimethyl silicone). The liquid phase was coated on 60 to 80 mesh Chromosorb-W (a white, flux-calcined diatomaceous earth). The other instrument parameters are: stainless steel column, 108 in. long with 0.093 in. internal diameter, containing 6 percent OV-1 on Chromosorb-W; helium flow rate, 15 cm^3/min; inlet temperature, 300-310°C; column temperature program, 4 min isothermal at 85°C followed by a linear program to 160°C in 20 min. A Beckman GC-4 gas chromatograph equipped with a hydrogen flame ionization detector was used.

In determining the ash content, the water- and particle-free crude oil was allowed to burn under its own ignition until the use of a hotplate became necessary to maintain the ignition. The resulting carbonaceous char was then heated at 500°C for about 16 hours in a muffle furnace, and the weight of the carbon-free ash compared to the weight of the oil sample was used to calculate the percent ash. The ash was then chemically analyzed by laser-fired emission spectrography. A semiquantitative analysis, using the six-step method of reporting 29 elements, was run on duplicate samples of the ash. The averages of the duplicate analyses are listed in table 1. Of the 29 elements detectable by this method, eight were not detected in any ash (Au, Bi, La, Mo, Nb, Sb, Sc, and Y). Co, Cu, Fe, Ni, and V in the ash were subsequently analyzed by X-ray fluorescence. These last five elements were not determined in those crude oils of mixed or uncertain origin.

A preliminary study of the chemical data by J. J. Connor using computer-based techniques of multivariate statistical analysis suggests the following:

1) The overall chemical composition of the crude oils studied indicates that they can be considered as mixtures of two end-member oils. These two end-members are typified by the oil in wells 28-8G and 13-1G, and all of the remaining oils range rather uniformly between these two extremes.

2) Crude oils from different stratigraphic horizons exhibit moderately distinctive chemical compositions. Multiple discriminant functions based on three chromatogram-segment area-percents (APA-3, APA-4, and APA-6 of table 1) and logarithms of boron, vanadium, and iron in parts per million (B, V-1, and Fe-1 of table 1) have assigned 70 percent of the crude oil samples to their correct stratigraphic horizon. The results of this assignment are listed in table 2. Note that 10 of the 14 misclassified samples

were placed in horizons stratigraphically adjacent to the correct horizon suggesting that crude-oil composition in stratigraphically close sands tends to be more similar than those in stratigraphically distant sands.

3) The best correlation is found for samples from the SS-1 and Wilhelm stratigraphic horizons, which were correctly classified for 84 percent and 100 percent of the samples, respectively.

Table 2.--Summary of results of statistical analysis

Stratigraphic horizon producing crude oil	Number of samples from horizon	Number of samples assigned by discriminant functions to					
		A-S	SS-1	SS-2	Mulinia	Sub-Mulinia	Wilhelm
A-S----------	1	1					
SS-1----------	25		21	4			
SS-2----------	10		3	5	1	1	
Mulinia-------	3		1	1	1		
Sub-Mulinia---	11	1	1			8	1
Wilhelm-------	7						7

REFERENCES

American Society for Testing and Materials, 1968, A.S.T.M. Standards on petroleum products, designation D.1319-66T: Philadelphia.

Lantz, R. J., 1968, A review of the Elk Hills oil field, Kern County, California, in Geology and oil fields, west side southern San Joaquin Valley: Guidebook, 43d Ann. Mtg., Pacific Sec., Am. Assoc. Petroleum Geologists, p. 60-64.

Table 1.--Data from chemical analyses of 75 crude oil samples from Elk Hills oil field, Kern County, California [See explanation at end of table]

Producing zone	SAMPLE	ZD	ZL	DIST FR	PCT SAT1	PCT SAT2	APS-1	APS-2	APS-3	APS-4	APS-5
AS	088-35S	-2207.0000	-2331.0000	15.0000	84.1000	84.1000	4.7800	10.0300	12.9[illegible]	4.6800	10.6900
SS-1	070-01G	-2349.0000	-2394.0000	21.4000	90.6000	90.6000	7.5600	13.8900	13.34[illegible]	3.9200	9.9700
	056-01G	-2493.0000	-2546.0000	12.0000	83.9000	83.8000	5.4800	7.7200	17.86[illegible]	5.3900	12.1400
	058-01G	-2618.0000	-2678.0000	10.4000	78.8000	79.2000	2.9800	7.1600	11.99[illegible]	5.0200	10.3000
	016-02G	-2064.0000	-2151.0000	30.4000	89.9000	89.9000	6.4900	7.3800	12.5[illegible]	3.5200	8.2100
	056-02G	-2150.0000	-2232.0000	23.3000	92.7000	92.7000	9.4300	16.0600	14.02[illegible]	4.6500	11.4500
	025-03G	-1856.0000	-1935.0000	27.1000	93.0000	93.1000	10.2200	10.3400	16.92[illegible]	4.2700	10.5900
	078-04G	-1890.0000	-1968.0000	24.7000	94.3000	94.3000	9.3300	15.9500	13.51[illegible]	4.3200	11.0100
	028-08G	-2919.0000	-2949.0000	28.0000	94.0000	94.5000	10.6000	10.5800	16.45[illegible]	4.3800	10.3500
	075-08G	-1999.0000	-2228.0000	26.7000	94.2000	94.2000	8.7900	15.0800	14.03[illegible]	3.0600	10.6400
	055-09G	-2277.0000	-2352.0000	31.4000	91.4000	92.1000	8.0300	8.7500	13.70[illegible]	3.7600	8.7700
	057-09G	-2681.0000	-2767.0000	19.4000	87.1000	86.8000	5.7200	7.3500	13.09[illegible]	3.9800	8.8200
	061-09G	-1899.0000	-1974.0000	25.4000	94.7000	94.6000	12.0700	11.5400	18.63[illegible]	5.0200	11.7800
	063-09G	-2032.0000	-2112.0000	27.4000	92.5900	92.3000	9.5100	9.9700	15.97[illegible]	4.4200	10.1300
	026-10G	-2658.0000	-2771.0000	17.0000	88.9000	88.9000	5.6000	11.6900	12.98[illegible]	4.4400	10.7200
	046-10G	-2786.0000	-2895.0000	12.2000	80.9000	80.9000	3.4600	8.2800	12.47[illegible]	4.7000	9.9400
	066-10G	-2815.0000	-2895.0000	10.4000	84.0000	84.0000	4.5800	11.0600	15.51[illegible]	5.7100	11.2600
	086-10G	-2912.0000	-3031.0000	8.8000	79.0000	79.0000	2.3300	6.5500	11.75[illegible]	4.8000	10.2600
	035-11G	-2847.0000	-2927.0000	18.4000	77.3000	77.1000	3.0300	4.8000	10.78[illegible]	3.6900	7.3500
	055-11G	-2955.0000	-3038.0000	9.0000	82.0000	82.1000	7.3800	6.4000	15.63[illegible]	6.7200	12.8600
	024-12G	-2973.0000	-3058.0000	9.1300	74.4000	74.4000	0.9000	3.4700	7.56[illegible]	3.3300	8.7500
	002-34S	-2311.0000	-2392.0000	11.7000	92.2000	92.2000	9.9500	11.7800	20.94[illegible]	7.5600	13.2600
	002-35S	-2181.0000	-2241.0000	13.7000	89.5000	89.5000	5.7800	12.4500	14.36[illegible]	5.0700	11.6300
	224-35S	-2090.0000	-2208.0000	31.1000	92.7600	93.1000	9.6800	9.7900	15.93[illegible]	4.3900	9.6300
	032-36S	-2312.0000	-2453.0000	25.8000	85.6400	85.7400	6.1300	6.1200	12.26[illegible]	3.7400	7.5100
	216-36S	-2285.0000	-2326.0000	22.3000	91.9000	91.9000	8.5600	14.7800	14.38[illegible]	3.7200	10.5800
SS-2	004J01G	-2288.0000	-2440.0000	20.8000	93.0000	93.0000	12.5000	13.2800	21.45[illegible]	5.9700	12.8000
	013-01G	-2316.0000	-2341.0000	21.1000	84.7300	84.9300	5.6800	6.9300	13.27[illegible]	4.2300	8.1600
	025-01G	-2331.0000	-2494.0000	14.1000	79.5000	79.5000	3.7300	8.4000	11.65[illegible]	4.3900	9.0300
	046-01G	-2549.0000	-2592.0000	7.4000	80.0000	80.0000	6.9400	5.5800	15.70[illegible]	7.0000	13.5200
	035-06G	-1544.0000	-1590.0000	20.2000	91.8000	91.8000	6.7000	13.6800	13.16[illegible]	4.8400	11.0500
	051-11G	-2486.0000	-2512.0000	14.7000	73.1000	74.7000	2.5900	4.1400	10.81[illegible]	4.1300	7.8500
	025-29S	-1940.0000	-1986.0000	25.4000	97.5000	97.7000	12.6000	12.4300	20.04[illegible]	5.7800	11.4300
	065-29S	-2253.0000	-2284.0000	9.4000	94.0000	94.3000	4.0300	5.2100	10.91[illegible]	4.6400	9.1800
	077-29S	-2041.0000	-2109.0000	29.6000	97.2000	97.2000	12.2700	12.9800	16.46[illegible]	4.2100	10.6900
	052-33S	-2121.0000	-2169.0000	21.5000	86.7500	86.3600	5.4000	6.5200	11.37[illegible]	3.9700	7.5100
Mulinia	016-14R	-3201.0000	-3236.0000	28.3000	94.2000	94.2000	9.9700	16.0900	12.70[illegible]	4.2400	11.1400
	026-04G	-1762.0000	-1799.0000	18.9000	91.0000	91.0000	8.6000	9.6500	16.93[illegible]	5.6900	11.2600
	044-04G	-1761.0000	-1793.0000	23.7000	88.4000	88.6000	6.8600	8.4100	13.66[illegible]	4.3400	9.0400
Submulinia	033-01R	-1661.0000	-1704.0000	13.1000	93.6000	93.0000	6.8300	13.0800	7.33[illegible]	7.0600	12.9700
	042-01R	-1577.0000	-1620.0000	16.0000	95.8000	95.8000	7.9600	16.3500	17.33[illegible]	5.8200	12.1300
	053-01R	-1637.0000	-1672.0000	19.3000	91.2000	90.7000	6.2700	9.0300	16.09[illegible]	5.5400	9.9300
	222-01R	-1597.0000	-1640.0000	23.7000	94.7000	94.8000	9.7800	12.0400	19.71[illegible]	6.3100	11.2500
	064-23R	-1631.0000	-1654.0000	10.2000	95.9000	95.8000	7.7900	9.6800	21.00[illegible]	9.2500	15.6600
	084-23R	-1748.0000	-1794.0000	13.3000	92.7000	92.7000	4.6300	9.1400	13.88[illegible]	5.6900	12.5600
7	046-24R	-1693.0000	-1744.0000	21.1000	89.9900	89.6800	5.1100	7.0300	13.82[illegible]	5.6300	9.9200
	086-24R	-2105.0000	-2168.0000	13.3000	91.6000	91.6000	4.3200	8.8500	13.41[illegible]	6.1900	10.7300
6	016-34R	-1247.0000	-1318.0000	33.0000	98.0000	98.0000	16.6700	16.1500	12.81[illegible]	8.0200	11.3900
	041-30S	-2050.0000	-2213.0000	18.5000	96.3000	96.4000	10.1000	11.7900	20.14[illegible]	7.5400	13.1400
5	031-32S	-1615.0000	-1653.0000	83.5000	98.1000	97.6000	16.3400	15.6000	19.81[illegible]	5.1200	9.3800
4											
3											
2											

Producing zone	SAMPLE	ZU	ZL	DIST FR	PCT SAT1	PCT SAT2	APS-1	APS-2	APS-3	APS-4	APS-5
Wilhelm	026-28R	-1036.0000	-1081.0000	49.3000	96.8000	96.8000	13.3700	13.6500	18.2700	7.0600	9.7700
	084-29R	-1007.0000	-1021.0000	53.6000	98.3000	98.4000	9.9000	10.5100	15.6200	7.1400	10.1400
	042-33R	-1294.0000	-1563.0000	36.6000	97.6000	97.6000	16.1200	15.0600	11.7500	7.0000	10.6700
	024-34R	-1261.0000	-1324.0000	49.6000	97.3200	97.7000	14.1500	14.2000	18.3200	7.2000	9.7600
	062-34R	-1337.0000	-1376.0000	45.8000	98.4000	98.4000	13.8400	13.7800	12.4800	7.8100	11.0600
	024-36R	-1457.0000	-1532.0000	30.2000	97.3000	97.1000	14.2800	13.4600	14.9500	6.2500	10.8100
	026-36R	-1573.0000	-1666.0000	33.2000	97.4000	98.3000	12.0800	11.5500	17.0200	5.1100	9.1900
Mixed	026-06G	-1607.0000	-1680.0000	13.1000	90.0000	89.8000	7.6600	11.3200	19.2700	7.4500	13.8600
	118-27S	-2333.0000	-2424.0000	22.4000	93.3500	93.2900	9.4600	9.9600	16.2800	4.9500	10.4800
	248-27S	-2409.0000	-2522.0000	12.9000	93.3000	93.3000	8.5000	10.5100	18.8700	6.6300	12.5300
	076-28S	-2429.0000	-2513.0000	7.6000	95.2000	95.1000	4.2300	5.5300	11.5300	5.6600	10.6000
	078-28S	-2184.0000	-2273.0000	9.6000	92.3000	91.8000	6.8300	8.7300	17.2100	6.7300	12.5900
	038-29S	-1673.0000	-1743.0000	49.0000	96.4000	96.4000	11.4100	12.2600	17.8800	4.7300	9.5700
	083-30S	-2043.0000	-2065.0000	16.0000	95.7000	95.9000	9.2000	9.6500	16.8700	5.6900	10.6100
	037-33S	-1688.0000	-1745.0000	31.9000	93.9000	93.9000	9.1300	9.9800	15.3900	4.4600	8.9400
	062-33S	-2098.0000	-2199.0000	16.6000	92.3000	91.9000	7.9100	9.4800	16.1300	6.0200	10.7800
	073-33S	-2071.0000	-2170.0000	26.7000	95.5000	95.5000	9.6200	15.0000	14.7800	4.1600	10.6000
	001-34S	-2260.0000	-2460.0000	20.3000	88.4000	88.4000	5.9000	6.9700	11.9300	4.3100	8.1700
	014834S	-2818.0000	-2929.0000	29.1000	92.6000	92.4000	8.5500	9.1000	14.6800	3.9200	9.2000
	032-34S	-2112.0000	-2220.0000	15.4000	92.1000	92.1000	6.8400	13.3700	13.9300	5.0400	11.7300
	052-35S	-1926.0000	-2036.0000	13.1000	87.6000	87.2000	9.2500	11.1300	22.2100	6.7000	13.2000
	273-35S	-2240.0000	-2404.0000	23.8000	89.0000	88.6000	7.0200	8.1800	13.4500	3.7600	9.0100
	015-36S	-2331.0000	-2403.0000	24.0000	93.3000	93.3000	9.0700	15.0500	14.5900	3.5100	10.3700
	036-36S	-2230.0000	-2457.0000	17.9000	85.6000	85.5000	6.8200	7.5600	14.4900	4.5500	9.5400
	042-36S	-2652.0000	-2682.0000	9.3000	83.2000	83.4000	5.2500	6.5700	17.3200	6.2000	12.5600

SAMPLE	APS-6	APS-7	APS-8	APS-9	APS-10	APA-1	APA-2	APA-3	APA-4	APA-5
088-35S	15.4700	11.7600	14.4000	9.3900	5.8200	2.9700	0.8900	2.1700	5.3700	5.0800
070-01G	13.1800	10.2500	13.3100	8.8100	5.7800	4.6500	1.8200	1.5700	6.0900	6.4200
056-01G	15.8500	9.1200	16.7500	5.2300	4.4600	3.2900	0.8100	1.7300	6.2000	8.7800
058-01G	16.3700	12.7600	19.7300	7.4600	6.1800	0.8200	0.1900	1.0300	2.5000	4.9700
016-02G	9.2200	8.7100	17.4200	12.7500	13.7400	3.3500	1.0700	1.4100	5.7100	3.5400
056-02G	13.0000	9.9700	10.9600	6.9000	3.5200	5.3200	1.3800	1.7000	8.6300	7.5500
025-03G	11.3800	10.1200	14.8600	6.3000	4.9600	6.0700	1.5800	1.5100	8.4000	6.8500
078-04G	12.5900	9.9400	11.8800	7.9600	3.4600	5.2700	1.6600	1.6800	7.8700	6.5200
028-08G	10.9000	9.9100	15.2600	6.6800	4.9000	5.4000	1.3400	1.7700	7.9800	6.2400
075-08G	12.4200	10.0900	12.6300	8.3500	4.9100	3.0300	0.8800	1.2900	7.6700	6.7200
055-09G	9.8400	9.2700	18.0800	11.1900	8.5500	4.0200	1.3500	1.3500	6.8400	4.3300
057-09G	10.8400	10.2900	19.6400	10.5400	9.7300	2.3400	0.6700	1.5400	5.0200	4.2300
061-09G	11.7600	9.3900	11.5600	4.5500	3.7000	7.3300	1.7700	1.9200	10.1200	7.9700
063-09G	11.2200	10.3000	16.7600	7.3000	4.4200	5.2900	1.3600	1.5000	8.2500	6.4800
026-10G	13.9300	10.9300	13.5000	9.2200	6.9900	2.4600	0.7100	1.7300	5.9500	6.6800
046-10G	16.3400	11.7900	16.6200	11.1200	5.2200	0.7100	0.3200	0.7100	3.4900	5.8200
066-10G	17.3800	9.9500	11.7300	7.0900	5.7300	1.7600	0.8100	1.5700	6.3200	8.5200
086-10G	19.6000	12.8700	16.3600	9.7800	5.6500	0.5100	0.3200	0.7600	3.2000	5.8900
035-11G	10.7800	9.9300	22.0900	13.1200	14.4300	1.2600	0.3500	0.9000	3.3000	3.9800
055-11G	18.0600	11.4100	13.2300	4.2100	4.0600	1.6300	0.5600	1.5300	5.7500	9.3300
024-12G	17.9600	14.7600	20.8400	13.4400	8.9900	0.2000	0.2000	0.5300	2.2700	3.9000
002-34S	14.0900	8.9400	8.7800	2.9500	1.7300	4.5300	2.2800	3.1700	6.9300	5.4100
002-35S	15.4500	10.4400	11.8700	7.6400	5.1100	4.4000	1.5300	2.1600	6.7000	3.8300
223-35S	10.7800	9.8800	16.4100	7.7700	5.6900	6.4900	1.7300	1.8700	8.3300	6.5800
032-36S	9.5000	8.8900	18.7300	12.7800	13.5500	2.5700	1.0300	1.2400	3.7700	2.1000
216-36S	12.7800	9.8600	12.1800	8.1300	5.0300	5.9300	1.8700	1.7100	7.3700	6.4000
004J01G	12.1000	8.5200	8.8200	3.1400	1.6000	7.9800	2.2800	2.3400	11.1700	9.4300
013-01G	10.8700	9.8800	19.7000	10.9800	10.3000	2.0600	0.4800	1.3900	4.1800	4.1800
025-01G	15.1700	11.5700	15.7000	12.0800	8.4800	0.8600	0.4000	1.0900	3.5000	5.5300
046-01G	18.7700	10.9000	13.0300	4.4600	4.0300	0.8300	0.3700	1.2400	4.8200	9.3400
035-06G	14.1700	10.6900	12.6000	7.7500	5.3600	1.2600	0.7300	1.8000	2.3700	0.9300
051-11G	12.8100	10.2100	23.5500	12.0800	11.7900	0.4600	0.3300	0.7500	2.7000	4.4600
025-29S	13.1600	8.5800	10.1900	3.4500	2.3300	3.1200	1.8700	1.7200	7.7600	6.4800
065-29S	15.2400	12.8500	22.6100	8.4500	6.8200	2.0700	1.0700	1.2000	2.6500	1.6700
077-29S	12.4900	7.7700	8.6900	5.1600	3.2800	6.1600	2.6300	3.8300	6.5000	2.4000
052-33S	10.1200	9.4900	19.5800	12.3200	13.7200	2.2800	1.0000	1.4900	2.9700	1.7000
016-14B	12.2600	9.9700	11.5300	7.4000	4.6500	8.6000	3.8900	1.7000	8.2700	6.5800
026-04G	13.4400	11.2500	14.4400	4.9500	3.7800	2.7200	1.2100	2.1600	4.6400	3.0900
044-04G	10.6800	9.7100	18.0100	9.2400	10.0000	2.5700	0.9700	1.4500	2.9900	1.7600
033-01B	15.0900	9.9400	11.1600	3.5000	2.9900	6.1100	0.4100	4.7400	6.1000	0.4600
042-01B	15.1400	9.2300	8.7800	4.3200	2.9000	5.2000	0.7100	4.8700	4.6900	0.4100
053-01B	12.2500	10.3800	17.8200	6.7300	5.9700	3.0100	0.3400	2.8400	3.1500	0.2700
222-01B	12.8600	9.7300	11.6400	3.6600	2.9100	6.3500	0.6800	3.6100	4.5500	0.5300
064-23R	15.5900	8.9100	8.3400	2.3800	1.3500	1.8100	0.5100	3.2000	4.9500	0.7500
084-23R	16.5100	12.1200	13.8200	7.7100	3.8800	1.4600	0.9300	1.9800	2.2200	1.4600
7 046-24R	12.7500	11.0200	19.2900	8.4400	6.9400	1.9900	0.3700	2.5500	2.9400	0.7100
086-24R	16.6900	11.8500	13.7800	8.3400	5.8400	1.2100	0.5600	2.6900	2.2700	1.8000
6 016-34R	13.9900	7.7800	8.1800	3.9500	1.0100	16.2700	4.9300	1.7200	12.9200	8.5200
041-30S	13.8600	8.8900	9.1400	2.8600	2.5400	6.6100	2.3400	3.8100	5.7600	3.0000
5 031-32S	9.1400	6.0000	9.4800	5.3300	3.7500	27.5300	9.1200	2.7800	10.7700	6.5900
4										
3										

SAMPLE	APS-6	APS-7	APS-8	APS-9	APS-10	APA-1	APA-2	APA-3	APA-4	APA-5
026-28P	12.6800	6.9600	11.4000	4.2600	2.5200	19.7900	5.1700	1.5500	12.1000	7.9500
084-29P	15.5600	7.4600	14.3800	5.5200	3.7500	15.2100	4.3100	1.8700	12.2300	7.8500
042-33P	12.7800	7.6800	9.4900	5.3900	4.0100	11.5300	4.4200	2.6200	11.3000	7.1400
024-34P	12.7000	8.9400	10.5800	2.4500	1.6900	21.4400	5.5100	1.7800	13.0100	8.3100
062-34R	13.3700	7.5400	9.8500	6.2400	3.9900	17.2800	5.3200	1.4600	12.6300	8.6600
024-36R	12.3500	7.8300	10.1600	3.3000	1.6100	10.9000	3.7700	2.2500	10.4200	6.5900
026-36R	10.9000	8.1000	14.4600	7.0900	4.4500	9.8000	3.5400	1.9600	9.0000	5.6800
026-066	14.7200	9.9200	9.9300	3.0500	2.7900	3.3100	0.6700	3.2000	3.9200	1.6200
118-27S	12.3300	10.6500	15.3400	6.2100	4.3400	4.3100	1.4200	1.9000	6.3600	4.5700
248-27S	14.9800	10.2100	11.2800	3.6900	2.8100	4.0900	1.3700	3.1900	5.5800	2.8600
076-28S	17.6200	14.4900	19.1400	5.9200	5.2300	2.2700	0.9300	1.6100	2.9100	1.1700
078-28S	16.1400	11.2200	13.1400	4.2300	3.1200	3.9600	1.7000	2.8100	5.7100	3.0200
038-29S	10.2100	8.1700	12.9400	7.3300	5.4600	9.7600	3.4100	2.9200	8.4100	6.2500
083-30S	13.5900	10.6100	14.4300	5.4200	3.8800	7.7700	2.6100	2.8700	5.6400	3.6800
037-33S	10.4000	8.8400	16.6600	9.0400	7.1200	5.7500	2.1400	2.3000	5.7600	2.8600
062-33S	13.8200	11.1200	14.1500	5.1700	5.4100	4.2200	1.3300	2.7400	4.7800	2.5900
073-33S	13.0500	9.3400	11.0600	6.5800	4.8100	5.5600	1.9500	2.1000	5.6700	3.6100
001-34S	10.6000	9.9000	19.8200	10.7600	11.6500	2.1000	0.8800	1.4300	2.8600	1.6600
014834S	10.4500	9.5000	17.2300	9.6000	7.7100	4.4600	1.6000	1.5700	6.9000	4.0600
032-34S	15.6400	10.3500	11.3000	6.8800	4.9200	2.7100	1.6100	2.2200	4.9300	3.1800
052-35S	13.5200	8.5000	9.3500	3.4900	2.6000	5.3900	1.2200	2.0800	9.8700	10.4700
273-35S	10.6300	9.8300	19.2500	10.6400	8.1600	3.7700	1.5400	1.5400	6.2200	3.7100
015-36S	12.6200	9.5900	11.6500	8.0200	5.5300	5.8700	1.8100	1.7700	8.0900	6.9400
036-36S	12.4900	11.1900	19.3000	8.2900	5.7700	3.3800	1.1700	1.3300	4.7800	4.3000
042-36S	17.3100	11.4900	13.9500	4.9500	4.3900	3.1100	1.8300	1.7000	5.4900	6.8600

SAMPLE	APA-6	APA-7	APA-8	APA-9	APA-10	APA-11	PCT ASH	AG		AS		AU	
088-35S	11.3100	20.6300	28.7700	14.4500	5.9300	2.4300	0.0100	0.0	N	0.0	N	0.0	N
070-01G	9.2500	19.2700	27.6500	14.8800	5.9400	2.4600	0.0139	0.0	N	0.0	N	0.0	N
056-01G	10.4000	23.8100	26.3900	11.4900	4.6500	2.4600	0.0116	0.0	N	0.0	N	0.0	N
058-01G	7.4700	21.6200	31.8200	18.4300	8.0700	3.0900	0.0145	0.0	N	0.0	N	0.0	N
016-02G	6.2200	13.0900	18.9200	21.3400	17.2200	8.0900	0.0076	0.0	N	0.0	N	0.0	N
056-02G	10.3800	20.5200	26.3900	12.0700	4.6300	1.3800	0.0093	0.0	N	0.0	N	0.0	N
025-03G	10.9900	17.9400	25.0400	13.8700	5.3900	2.3700	0.0083	0.0	N	0.0	N	0.0	N
078-04G	9.5600	18.4900	25.8300	14.3900	6.1100	2.5600	0.0089	0.0	N	0.0	N	0.0	N
028-08G	11.2600	17.4700	24.8900	15.3400	5.8100	2.4900	0.0082	0.0	N	0.0	N	0.0	N
075-08G	9.4500	19.4900	27.9200	15.1200	5.9300	2.5000	0.0095	0.0	N	0.0	N	0.0	N
055-09G	7.5200	14.9200	21.0300	21.8900	12.4200	4.2700	0.0067	0.0	N	0.0	N	0.0	N
057-09G	6.4700	15.2300	23.5700	23.2000	12.6600	5.0600	0.0122	0.0	N	0.0	N	0.0	N
061-09G	12.3300	20.6300	22.3200	10.1600	3.9000	1.5400	0.0096	0.0	N	0.0	N	0.0	N
063-09G	8.7200	17.7900	25.4700	16.7500	6.1300	2.2100	0.0099	0.0	N	0.0	N	0.0	N
026-10G	9.3100	19.6600	27.3000	15.2800	7.1200	3.8000	0.0115	0.0	N	0.0	N	0.0	N
046-10G	5.4700	20.1600	32.4900	19.2700	8.2300	3.2700	0.0126	0.0	N	0.0	N	0.0	N
066-10G	8.5000	25.6200	26.1100	11.8500	5.5100	3.4300	0.0299	0.0	N	0.0	N	0.0	N
086-10G	5.4300	23.3900	33.7500	16.5900	7.1700	2.9400	0.0184	0.0	N	0.0	N	0.0	N
035-11G	4.2900	13.0100	21.5200	23.6500	14.6200	13.1300	0.0149	0.0	N	0.0	N	0.0	N
055-11G	9.4900	27.8100	27.0100	10.4300	4.0800	2.3800	0.0160	0.0	N	0.0	N	0.0	N
024-12G	4.7100	19.8900	34.9600	20.5700	8.9100	3.8600	0.0298	0.0	N	700.0000		0.0	N
002-34S	14.6000	24.5600	22.2000	9.4400	4.2300	2.3600	0.0183	0.0	N	0.0	N	0.0	N
002-35S	12.0100	22.4800	26.3900	12.0300	5.4400	2.9900	0.0218	0.0	N	0.0	N	0.0	N
223-35S	9.3600	12.5400	25.5600	17.2800	7.0900	3.1200	0.0134	0.0	N	0.0	N	0.0	N
032-36S	6.2500	13.0600	21.6600	25.0000	16.4000	6.9300	0.0113	0.0	N	500.0000L		0.0	N
216-36S	9.8500	19.4700	26.3900	13.2800	5.3600	2.3700	0.0097	0.0	N	0.0	N	0.0	N
004J01G	13.1800	23.1700	19.5800	7.2300	2.6300	1.0100	0.0094	0.0	N	0.0	N	0.0	N
013-01G	6.3700	15.4500	24.8700	23.4500	12.3000	5.2100	0.0166	0.0	N	0.0	N	0.0	N
025-01G	7.2200	18.7500	30.7000	19.2100	8.6400	4.1000	0.0125	0.0	N	0.0	N	0.0	N
046-01G	10.9600	28.3300	26.5000	10.7100	4.3600	2.5500	0.0154	1.0000L		0.0	N	0.0	N
035-06G	9.1300	18.2700	31.8000	20.1800	9.2500	4.2800	0.0172	0.0	N	0.0	N	0.0	N
051-11G	5.3700	15.6500	26.4500	24.7700	12.9600	6.0400	0.0153	0.0	N	0.0	N	0.0	N
025-29S	12.8100	24.3100	23.4400	10.9700	5.0800	2.4400	0.0240	0.0	N	5000.0000		0.0	N
065-29S	10.6200	14.2000	20.4700	23.5500	14.8600	7.5900	0.0302	0.0	N	0.0	N	0.0	N
077-29S	17.9100	19.9700	22.3300	10.6400	4.7700	2.8600	0.0125	0.0	N	0.0	N	0.0	N
052-33S	5.8500	11.7500	20.0200	25.4500	18.8800	8.6100	0.0199	0.0	N	500.0000L		0.0	N
016-14R	9.0800	17.6400	23.8300	12.5800	5.1400	2.6200	0.0094	0.0	N	0.0	N	0.0	N
026-04G	13.3200	19.8200	29.4200	15.4200	5.7700	2.4400	0.0122	0.0	N	0.0	N	0.0	N
044-04G	8.7100	13.9500	24.8600	23.8500	13.0800	5.7600	0.0141	0.5000		0.0	N	0.0	N
033-01R	12.9300	2.9800	30.3000	19.9500	9.5200	6.4600	0.0248	0.0	N	0.0	N	0.0	N
042-01R	5.0500	22.0200	27.7900	16.9700	6.7600	2.4800	0.0250	0.0	N	5000.0000G		0.0	N
053-01R	7.9400	15.1200	25.8900	24.1100	11.3300	6.0000	0.0906	1.0000L		0.0	N	0.0	N
222-01R	12.4800	20.7500	28.4400	14.3000	5.9100	2.5000	0.0200	1.0000L		700.0000		0.0	N
064-23R	15.0000	26.7800	23.2000	13.0100	6.1500	4.6400	0.0303	0.0	N	0.0	N	0.0	N
084-23R	5.7200	18.3900	29.7900	22.5400	10.5500	4.9100	0.0276	0.0	N	0.0	N	0.0	N
046-24R	4.4000	13.2600	21.2700	27.2000	16.9700	8.2800	0.0281	0.0	N	0.0	N	0.0	N
086-24R	7.0000	18.4400	22.4600	22.2100	13.4900	7.8700	0.0281	0.0	N	0.0	N	0.0	N
016-34R	9.7600	19.0500	16.6100	6.3600	2.6800	1.1400	0.0190	0.0	N	0.0	N	0.0	N
041-30S	17.2500	22.8400	19.7600	10.5200	4.7200	3.4000	0.0256	0.0	N	0.0	N	0.0	N
031-32S	9.5800	10.3400	10.5900	7.4400	3.8200	1.4000	0.0039	0.5000L		700.0000		0.0	N

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SAMPLE	APA-6	APA-7	APA-8	APA-9	APA-10	APA-11	PCT ASH	AC		AS		AU	
026-28R	10.5700	15.9100	15.6400	7.4800	2.7500	1.0800	0.0146	1.5000		0.0	N	0.0	N
084-29R	11.7800	17.6100	16.6900	8.2000	2.9300	1.3100	0.0145	0.0	N	0.0	N	0.0	N
042-33R	10.0200	19.4700	20.3700	8.9000	3.2000	0.9900	0.0221	0.0	N	0.0	N	0.0	N
024-34R	8.8100	16.5600	15.1300	6.7200	2.1100	0.5600	0.0159	0.0	N	0.0	N	0.0	N
062-34R	9.5000	16.8600	16.0800	7.5100	3.2800	1.3500	0.0163	0.0	N	0.0	N	0.0	N
024-36R	14.6900	19.6500	19.3700	8.3800	3.0100	0.9700	0.0248	0.0	N	0.0	N	0.0	N
026-36R	9.0100	16.3200	20.8500	14.7500	6.7100	2.3200	0.0278	0.0	N	0.0	N	0.0	N
026-06	17.0600	23.8000	27.0300	11.7800	4.8900	2.6800	0.0129	0.0	N	0.0	N	0.0	N
118-27S	9.5200	18.6800	26.0000	15.7300	9.0300	2.4400	0.0161	0.0	N	0.0	N	0.0	N
248-27S	14.6600	23.1500	24.9500	12.0600	5.3000	2.7900	0.0181	0.0	N	0.0	N	0.0	N
076-28S	13.5100	16.7300	20.9300	18.9300	11.3600	9.6500	0.0444	0.0	N	0.0	N	0.0	N
078-28S	11.2300	24.0500	24.9200	13.1900	6.1300	3.2900	0.0236	0.0	N	0.0	N	0.0	N
038-29S	11.3500	16.1100	18.8000	13.5500	6.5700	2.8200	0.0150	0.0	N	0.0	N	0.0	N
083-30S	11.2200	19.6100	22.9200	14.4100	6.5300	2.6900	0.0244	0.0	N	0.0	N	0.0	N
037-33S	8.1300	15.5200	20.9100	21.6200	11.8900	3.0800	0.0127	0.0	N	0.0	N	0.0	N
062-33S	12.2300	19.4200	26.8100	14.7300	6.6100	4.5300	0.0188	0.0	N	0.0	N	0.0	N
073-33S	10.2200	19.4500	27.9500	14.4900	6.2500	2.7500	0.0162	0.0	N	0.0	N	0.0	N
001-34S	6.8800	12.6700	21.7800	24.6700	17.1400	8.8900	0.0210	0.0	N	0.0	N	0.0	N
014834S	8.0000	15.1000	21.9900	20.6200	11.4500	4.2000	0.0074	0.0	N	0.0	N	0.0	N
032-34S	13.2300	21.7600	27.3900	13.3000	6.2200	3.4500	0.0209	0.0	N	0.0	N	0.0	N
052-35S	13.8800	25.4600	20.1800	7.5800	2.9300	0.9300	0.0109	0.0	N	0.0	N	0.0	N
273-35S	7.1200	15.2600	22.2100	22.3600	12.1600	4.0400	0.0109	0.0	N	0.0	N	0.0	N
015-36S	9.6800	19.5100	25.6100	12.9700	5.2500	2.4700	0.0106	0.0	N	0.0	N	0.0	N
036-36S	8.7800	17.9900	28.6800	18.9600	7.5100	3.1300	0.0143	2.0000		500.0000L		0.0	N
042-36S	13.1200	24.4100	25.3100	11.1600	4.5600	2.4600	0.0164	1.0000L		0.0	N	0.0	N

SAMPLE	R	AA	AF	AI	CA	CD	CM	CP	CR	FE
031-32S		200.0000	7.0000	0.0 N	0.0 N	150.0000 N	0.0	1500.0000 N	10.0000	700.0000	5000.00006
041-30S		150.0000	5.00001	0.0700	0.0	200.0000 N	0.0	5000.00006 N	0.0 N	1500.0000	5000.00006
016-34R		300.0000	30.0000	0.3000	0.0	500.0000 N	0.0	5000.00006 N	20.0000L	5000.0000	5000.00006
026-24R		300.0000	0.0 N	0.0700	0.0	150.0000 N	0.0	5000.00006 N	20.0000	2000.0000	5000.00006
046-24R		300.0000	10.0000	0.1000	0.0	100.0000 N	0.0	5000.00006 N	20.0000L	300.0000	5000.00006
044-23R		500.0000	0.0 N	0.5000	0.0	700.0000 N	0.0	5000.00006 N	10.0000	700.0000	5000.00006
064-23R		300.0000	5.0000	0.5000	0.0	1000.0000 N	0.0	5000.00006 N	30.0000	700.0000	5000.00006
227-01R		200.0000	5.00001	0.0700	0.0	50.0000 N	0.0	5000.00006 N	30.0000	5000.00006	5000.00006
053-01R		100.0000	10.0000	0.0 N	0.0	5000.0000 N	0.0	5000.00006 N	0.0 N	5000.00006	5000.00006
042-01R		100.0000	0.0 N	0.2000	0.0	50.0000 N	0.0	5000.00006 N	50.0000	3000.0000	5000.00006
033-01R		150.0000	15.0000	0.0700	0.0	500.0000 N	0.0	5000.00006 N	30.0000	3000.0000	5000.00006
044-04G		300.0000	1.00001	0.0 N	0.0	50.00001 N	0.0	1500.0000 N	10.0000	5000.00006	5000.00006
024-04G		100.0000	5.00001	1.0000	0.0	200.0000 N	0.0	5000.00006 N	30.0000	1000.0000	5000.00006
014-14R		1500.0000	0.0 N	0.5000	0.0	1000.0000 N	0.0	5000.00006 N	0.0 N	5000.0000	5000.00006
052-33S		500.0000	10.0000	0.3000	0.0	50.0000 N	0.0	5000.00006 N	20.0000L	200.0000	5000.00006
071-29S		300.0000	5.0000	0.7000	0.0	100.0000 N	0.0	5000.00006 N	0.0 N	5000.0000	5000.00006
065-29S		300.0000	5.0000	0.2000	0.0	1000.0000 N	0.0	5000.00006 N	10.0000	5000.0000	5000.00006
025-29S		300.0000	5.0000	0.7000	0.0	7000.0000 N	0.0	5000.00006 N	30.0000	1000.0000	5000.00006
051-11G		200.0000	1.0000	0.0 N	0.0	50.0000 N	0.0	1500.0000 N	10.0000	700.0000	5000.00006
035-06G		300.0000	0.0 N	0.0700	0.0	100.0000 N	0.0	5000.00006 N	20.0000	5000.0000	5000.00006
046-01G		200.0000	7.0000	0.7000	0.0	200.0000 N	0.0	5000.00006 N	30.0000	700.0000	5000.00006
029-01G		200.0000	0.0 N	0.5000	0.0	150.0000 N	0.0	5000.00006 N	30.0000	500.0000	5000.00006
013-01G		300.0000	5.0000	0.0500	0.0	150.0000 N	0.0	5000.00006 N	20.0000L	200.0000	5000.00006
004J01G		100.0000	5.0000	0.5000	0.0	150.0000 N	0.0	5000.00006 N	30.0000	5000.00006	5000.00006
216-34S		200.0000	0.0 N	0.5000	0.0	150.0000 N	0.0	5000.00006 N	20.0000	1500.0000	5000.00006
032-34S		200.0000	5.0000	0.1000	0.0	50.00001 N	0.0	5000.00006 N	20.0000	1000.0000	5000.00006
223-35S		200.0000	5.0000	0.2000	0.0	50.0000 N	300.0000	5000.00006 N	20.0000	700.0000	5000.00006
007-35S		300.0000	1.0000	0.5000	0.0	1500.0000 N	0.0	5000.00006 N	20.0000	500.0000	5000.00006
002-34S		300.0000	5.00001	0.7000	0.0	150.0000 N	0.0	5000.00006 N	30.0000	700.0000	5000.00006
024-12R		500.0000	15.0000	0.5000	0.0	2000.0000 N	0.0	5000.00006 N	10.0000	1000.0000	5000.00006
055-11G		200.0000	5.0000	1.5000	0.0	700.0000 N	0.0	5000.00006 N	30.0000	500.0000	5000.00006
035-11G		300.0000	5.0000	0.3000	0.0	50.00001 N	0.0	5000.00006 N	20.0000L	200.0000	5000.00006
086-10G		700.0000	7.0000	0.5000	0.0	200.0000 N	0.0	5000.00006 N	30.0000	1000.0000	5000.00006
066-10G		150.0000	30.0000	0.5000	0.0	1000.0000 N	0.0	5000.00006 N	20.0000	500.0000	5000.00006
046-10G		1000.0000	0.0 N	1.0000	0.0	200.0000 N	0.0	5000.00006 N	50.0000	500.0000	5000.00006
026-10G		100.0000L	0.0 N	0.5000	0.0	150.0000 N	0.0	5000.00006 N	30.0000	300.0000	5000.00006
043-09G		300.0000	5.0000	0.2000	0.0	70.0000 N	300.0000	5000.00006 N	20.0000	1500.0000	5000.00006
041-09G		100.0000	0.0 N	0.2000	0.0	100.0000 N	0.0	5000.00006 N	30.0000	3000.0000	5000.00006
057-09G		300.0000	7.0000	0.3000	0.0	50.00001 N	0.0	5000.00006 N	20.0000	1500.0000	5000.00006
055-09G		100.0000	150.0000	0.0500L	0.0	200.0000 N	0.0	3000.0000 N	50.0000	700.0000	5000.00006
075-08G		300.0000	0.0 N	0.1000	0.0	150.0000 N	0.0	5000.00006 N	30.0000	2000.0000	5000.00006
028-08G		200.0000	5.0000	0.2000	0.0	50.00001 N	0.0	5000.00006 N	50.0000	5000.0000	5000.00006
078-04G		100.0000	0.0 N	0.3000	0.0	50.0000 N	0.0	5000.00006 N	50.0000	2000.0000	5000.00006
025-03G		150.0000	0.0 N	0.5000	0.0	50.0000 N	0.0	5000.00006 N	30.0000	3000.0000	5000.00006
056-02G		100.0000L	0.0 N	0.3000	0.0	700.0000 N	0.0	5000.00006 N	50.0000	1000.0000	5000.00006
016-02G		50.0000L	2.0000	0.0500L	0.0	150.0000 N	0.0	5000.00006 N	30.0000	150.0000	5000.00006
058-01G		200.0000	0.0 N	1.0000	0.0	70.0000 N	0.0	5000.00006 N	20.0000	1000.0000	5000.00006
056-01G		150.0000	10.0000	0.7000	0.0	200.0000 N	0.0	5000.00006 N	20.0000	1000.0000	5000.00006
070-01G		300.0000	5.00001	0.5000	0.0	1000.0000 N	0.0	5000.00006 N	20.0000	1000.0000	5000.00006
088-35S		0.0 N	5.00001	0.5000	0.0	150.0000 N	0.0	5000.00006 N	20.0000	300.0000	5000.00006

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SAMPLE	R	RA	RE	RI	CA	CD	CO	CR	CU	FE
026-28R	300.0000	0.0 N	0.2000	0.0 N	100.0000	0.0 N	5000.0000G	0.0 N	3000.0000	5000.0000G
084-29R	200.0000	5.0000	0.0700	0.0 N	200.0000	0.0 N	5000.0000G	20.0000L	3000.0000	5000.0000G
042-33R	-100.0000L	30.0000	0.3000	0.0 N	1500.0000	0.0 N	5000.0000G	20.0000L	3000.0000	5000.0000G
024-34R	150.0000	5.0000L	0.0500L	0.0 N	50.0000	200.0000L	5000.0000G	0.0 N	300.0000	5000.0000G
062-34R	300.0000	0.0 N	0.1000	0.0 N	70.0000	0.0 N	5000.0000G	0.0 N	2000.0000	5000.0000G
024-36R	500.0000	5.0000L	0.0700	0.0 N	70.0000	0.0 N	5000.0000G	0.0 N	5000.0000	5000.0000G
026-36R	200.0000	1.0000	0.0 N	0.0 N	50.0000L	0.0 N	1500.0000	0.0 N	3000.0000	5000.0000G
026-06G	100.0000	5.0000L	0.1000	0.0 N	70.0000	0.0 N	5000.0000G	50.0000	3000.0000	5000.0000G
118-27S	300.0000	5.0000L	0.1000	0.0 N	50.0000L	0.0 N	5000.0000G	20.0000L	1000.0000	5000.0000G
248-27S	100.0000	0.0 N	0.7000	0.0 N	100.0000	0.0 N	5000.0000G	20.0000L	1000.0000	5000.0000G
076-28S	200.0000	5.0000	0.7000	0.0 N	7000.0000	0.0 N	5000.0000G	20.0000	500.0000	5000.0000G
078-28S	300.0000	7.0000	0.3000	0.0 N	100.0000	200.0000	5000.0000G	0.0 N	200.0000	5000.0000G
038-29S	200.0000	1.0000	0.0 N	0.0 N	50.0000L	0.0 N	1500.0000	15.0000	5000.0000G	5000.0000G
083-30S	300.0000	7.0000	0.1000	0.0 N	50.0000	200.0000L	5000.0000G	20.0000L	500.0000	5000.0000G
037-33S	300.0000	7.0000	0.1000	0.0 N	200.0000	0.0 N	5000.0000G	30.0000	5000.0000G	5000.0000G
062-33S	100.0000	5.0000L	0.7000	0.0 N	70.0000	0.0 N	5000.0000G	20.0000L	700.0000	5000.0000G
073-33S	200.0000	0.0 N	0.5000	0.0 N	50.0000	0.0 N	5000.0000G	30.0000	5000.0000G	5000.0000G
001-34S	300.0000	7.0000	0.1000	0.0 N	50.0000L	0.0 N	5000.0000G	0.0 N	300.0000	5000.0000G
014B34S	50.0000	5.0000	0.0500	0.0 N	300.0000	0.0 N	5000.0000G	30.0000	100.0000	5000.0000G
032-34S	300.0000	5.0000	0.5000	0.0 N	500.0000	0.0 N	5000.0000G	20.0000	700.0000	5000.0000G
052-35S	300.0000	7.0000	0.0700	0.0 N	50.0000	300.0000	5000.0000G	20.0000	700.0000	5000.0000G
273-35S	50.0000L	1.0000	0.1500	0.0 N	150.0000	0.0 N	5000.0000G	50.0000	5000.0000G	5000.0000G
015-36S	200.0000	5.0000L	0.5000	0.0 N	1000.0000	0.0 N	5000.0000G	30.0000	3000.0000	5000.0000G
036-36S	300.0000	0.0 N	0.5000	0.0 N	300.0000	0.0 N	5000.0000G	30.0000	5000.0000G	5000.0000G
042-36S	150.0000	7.0000	0.3000	0.0 N	500.0000	0.0 N	5000.0000G	30.0000	3000.0000	5000.0000G

SAMPLE	LA		MG		MN		MO		NB		NI	PB		SB		SC		SN	
088-35S	0.0	N	0.0	N	0.0	N	0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
070-01G	0.0	N	500.0000		0.0	N	0.0	N	0.0	N	5000.0000G	1500.0000		0.0	N	0.0	N	0.0	N
056-01G	0.0	N	0.0	N	5.0000L		0.0	N	0.0	N	5000.0000G	500.0000		0.0	N	0.0	N	0.0	N
058-01G	0.0	N	0.0	N	5.0000L		0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
016-02G	0.0	N	0.0	N	0.0	N	0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
056-02G	0.0	N	0.0	N	0.0	N	0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
025-03G	0.0	N	0.0	N	0.0	N	0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
078-04G	0.0	N	0.0	N	0.0	N	0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
028-08G	0.0	N	0.0	N	0.0	N	0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
075-08G	0.0	N	0.0	N	0.0	N	0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	.0.0	N
055-09G	0.0	N	0.0	N	7.0000		0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
057-09G	0.0	N	0.0	N	5.0000L		0.0	N	0.0	N	5000.0000G	500.0000		0.0	N	0.0	N	0.0	N
061-09G	0.0	N	0.0	N	0.0	N	0.0	N	0.0	N	5000.0000G	200.0000		0.0	N	0.0	N	50.0000L	
063-09G	0.0	N	0.0	N	0.0	N	0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
026-10G	0.0	N	0.0	N	5.0000L		0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
046-10G	0.0	N	0.0	N	50.0000		0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
066-10G	0.0	N	1000.0000		5.0000		0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
086-10G	0.0	N	0.0	N	70.0000		0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
035-11G	0.0	N	0.0	N	0.0	N	0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
055-11G	0.0	N	0.0	N	30.0000		0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
024-12G	0.0	N	100.0000L		100.0000		0.0	N	0.0	N	5000.0000G	1500.0000		0.0	N	0.0	N	0.0	N
002-34S	0.0	N	0.0	N	0.0	N	0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
002-35S	0.0	N	300.0000		5.0000		0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
223-35S	0.0	N	0.0	N	0.0	N	0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
032-36S	0.0	N	0.0	N	5.0000L		0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
216-36S	0.0	N	0.0	N	0.0	N	0.0	N	0.0	N	5000.0000G	200.0000		0.0	N	0.0	N	0.0	N
004J01G	0.0	N	100.0000L		10.0000		0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
013-01G	0.0	N	100.0000		0.0	N	0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
025-01G	0.0	N	0.0	N	0.0	N	0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
046-01G	0.0	N	0.0	N	5.0000L		0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
035-06G	0.0	N	0.0	N	0.0	N	0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
051-11G	0.0	N	50.0000L		5.0000L		0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
025-29S	0.0	N	0.0	N	20.0000		0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
065-29S	0.0	N	200.0000		7.0000		0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	50.0000L	
077-29S	0.0	N	0.0	N	0.0	N	0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
052-33S	0.0	N	0.0	N	0.0	N	0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
016-14R	0.0	N	0.0	N	50.0000		0.0	N	0.0	N	5000.0000G	3000.0000		0.0	N	0.0	N	0.0	N
026-04G	0.0	N	0.0	N	0.0	N	0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
044-04G	0.0	N	50.0000		5.0000L		0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
033-01R	0.0	N	100.0000		5.0000L		0.0	N	0.0	N	5000.0000G	500.0000		0.0	N	0.0	N	0.0	N
042-01R	0.0	N	0.0	N	0.0	N	0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
053-01R	0.0	N	5000.0000		0.0	N	0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
222-01R	0.0	N	0.0	N	0.0	N	0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
064-23R	0.0	N	0.0	N	0.0	N	0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
084-23R	0.0	N	0.0	N	5.0000		0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
046-24R	0.0	N	0.0	N	0.0	N	0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
086-24R	0.0	N	0.0	N	0.0	N	0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
016-34R	0.0	N	0.0	N	30.0000		0.0	N	0.0	N	5000.0000G	3000.0000		0.0	N	0.0	N	0.0	N
041-30S	0.0	N	0.0	N	15.0000		0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
031-32S	0.0	N	50.0000L		5.0000		0.0	N	0.0	N	5000.0000G	200.0000		0.0	N	0.0	N	0.0	N

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SAMPLE	LA		MG		MN		MO		NB		NI	PB		SB		SC		SN	
026-28R	0.0	N	0.0	N	7.0000		0.0	N	0.0	N	5000.0000G	200.0000		0.0	N	0.0	N	0.0	N
084-29R	0.0	N	100.0000		10.0000		0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
042-33R	0.0	N	0.0	N	70.0000		0.0	N	0.0	N	5000.0000G	300.0000		0.0	N	0.0	N	0.0	N
024-34R	0.0	N	0.0	N	0.0	N	0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
062-34R	0.0	N	0.0	N	0.0	N	0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
024-36R	0.0	N	0.0	N	0.0	N	0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
026-36R	0.0	N	0.0	N	10.0000		0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
026-06G	0.0	N	0.0	N	0.0	N	0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
118-27S	0.0	N	0.0	N	5.0000L		0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
248-27S	0.0	N	0.0	N	5.0000		0.0	N	0.0	N	5000.0000G	200.0000		0.0	N	0.0	N	0.0	N
076-28S	0.0	N	1500.0000		10.0000		0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
078-28S	0.0	N	0.0	N	0.0	N	0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
038-29S	0.0	N	0.0	N	10.0000		0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
083-30S	0.0	N	0.0	N	0.0	N	0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
037-33S	0.0	N	0.0	N	5.0000L		0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	50.0000L	
062-33S	0.0	N	0.0	N	0.0	N	0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
073-33S	0.0	N	0.0	N	0.0	N	0.0	N	0.0	N	5000.0000G	300.0000		0.0	N	0.0	N	0.0	N
001-34S	0.0	N	0.0	N	0.0	N	0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
014834S	0.0	N	0.0	N	5.0000L		0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	50.0000L	
032-34S	0.0	N	100.0000		0.0	N	0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
052-35S	0.0	N	0.0	N	0.0	N	0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
273-35S	0.0	N	0.0	N	7.0000		0.0	N	0.0	N	5000.0000G	0.0	N	0.0	N	0.0	N	0.0	N
015-36S	0.0	N	100.0000L		20.0000		0.0	N	0.0	N	5000.0000G	500.0000		0.0	N	0.0	N	100.0000	
036-36S	0.0	N	0.0	N	0.0	N	0.0	N	0.0	N	5000.0000G	2000.0000		0.0	N	0.0	N	0.0	N
042-36S	0.0	N	100.0000L		30.0000		0.0	N	0.0	N	5000.0000G	500.0000		0.0	N	0.0	N	0.0	N

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SAMPLE	SR	TI	V	Y	Z	ZR	CU-1	CO-1	FE-1	NI-1
088-35S	1.0000L	700.0000	5000.0000G	0.0 N	100.0000	150.0000	1.9000	.3000	20.0000	30.0000
070-01G	20.0000	500.0000	5000.0000G	0.0 N	150.0000	100.0000	2.3000	0.3000	18.0000	24.0000
056-01G	1.0000	700.0000	5000.0000G	0.0 N	700.0000	200.0000	3.6000	0.3000	25.0000	30.0000
058-01G	0.0 N	700.0000	5000.0000G	0.0 N	200.0000	150.0000	3.5000	0.3000	26.0000	28.0000
016-02G	1.0000L	150.0000	5000.0000G	0.0 N	150.0000	100.0000	2.1000	0.4000	17.0000	30.0000
056-02G	7.0000	500.0000	5000.0000G	0.0 N	1500.0000	150.0000	1.8000	0.2000L	14.0000	26.0000
025-03G	0.0 N	500.0000	5000.0000G	0.0 N	3000.0000	150.0000	1.6000	0.7000	20.0000	38.0000
078-04G	3.0000	500.0000	5000.0000G	0.0 N	1500.0000	150.0000	1.5000	0.3000	14.0000	24.0000
028-08G	0.0 N	1000.0000	5000.0000G	0.0 N	5000.0000	200.0000	1.1000	0.3000	18.0000	24.0000
075-08G	1.0000L	700.0000	5000.0000G	0.0 N	1000.0000	150.0000	1.8000	0.3000	18.0000	30.0000
055-09G	1.0000L	150.0000	5000.0000G	0.0 N	700.0000	100.0000	1.4000	0.7000	15.0000	26.0000
057-09G	0.0 N	200.0000	5000.0000G	0.0 N	50.0000L	100.0000L	2.1000	0.5000	22.0000	29.0000
061-09G	0.0 N	500.0000	5000.0000G	0.0 N	5000.0000	200.0000	1.2000	0.4000	15.0000	29.0000
063-09G	1.0000L	150.0000	5000.0000G	0.0 N	150.0000	100.0000L	1.6000	0.4000	17.0000	30.0000
026-10G	0.0 N	500.0000	5000.0000G	0.0 N	200.0000	100.0000	3.1000	.3000	25.0000	31.0000
046-10G	1.0000	500.0000	5000.0000G	0.0 N	300.0000	300.0000	2.6000	0.1000L	22.0000	25.0000
066-10G	100.0000	300.0000	5000.0000G	0.0 N	50.0000L	100.0000	1.4000	.1000	12.0000	13.0000
086-10G	10.0000	500.0000	5000.0000G	0.0 N	700.0000	100.0000L	2.5000	0.1000L	32.0000	23.0000
035-11G	0.0 N	100.0000	3000.0000	0.0 N	50.0000L	100.0000L	3.1000	0.2000	27.0000	26.0000
055-11G	7.0000	500.0000	5000.0000G	0.0 N	300.0000	150.0000	2.9000	0.3000	29.0000	25.0000
024-12G	20.0000	200.0000	5000.0000G	0.0 N	2000.0000	100.0000	1.7000	0.1000	41.0000	14.0000
002-34S	1.0000L	500.0000	5000.0000G	0.0 N	300.0000	200.0000	3.1000	0.3000	34.0000	21.0000
002-35S	50.0000	500.0000	5000.0000G	0.0 N	300.0000	300.0000	1.8000	0.2000	20.0000	18.0000
223-35S	0.0 N	150.0000	5000.0000G	0.0 N	70.0000	100.0000L	2.2000	0.4000	17.0000	29.0000
032-36S	0.0 N	200.0000	5000.0000G	0.0 N	50.0000	100.0000L	2.6000	0.3000	20.0000	26.0000
216-36S	0.0 N	700.0000	5000.0000G	0.0 N	200.0000	150.0000	2.6000	0.5000	19.0000	27.0000
004J01G	1.0000	700.0000	5000.0000G	0.0 N	2000.0000	500.0000	2.3000	0.7000	20.0000	31.0000
013-01G	1.0000	50.0000	3000.0000	0.0 N	0.0 N	100.0000L	1.8000	0.2000	16.0000	18.0000
025-01G	1.0000L	500.0000	5000.0000G	0.0 N	100.0000	200.0000	2.9000	0.2000	20.0000	24.0000
046-01G	10.0000	700.0000	5000.0000G	0.0 N	700.0000	200.0000	1.5000	0.3000	15.0000	13.0000
035-06G	0.0 N	300.0000	5000.0000G	0.0 N	200.0000	100.0000L	2.7000	0.7000	34.0000	23.0000
051-11G	1.0000L	70.0000	1500.0000	0.0 N	100.0000L	70.0000	2.6000	0.3000	22.0000	22.0000
025-29S	15.0000	500.0000	5000.0000G	0.0 N	200.0000	100.0000	3.1000	0.3000	29.0000	17.0000
065-29S	10.0000	100.0000	5000.0000G	0.0 N	2000.0000	70.0000	3.1000	0.3000	29.0000	20.0000
077-29S	1.0000	700.0000	5000.0000G	0.0 N	1000.0000	100.0000L	3.9000	0.7000	34.0000	22.0000
052-33S	0.0 N	150.0000	5000.0000G	0.0 N	50.0000L	100.0000L	2.7000	0.2000	27.0000	21.0000
016-14R	7.0000	500.0000	5000.0000G	0.0 N	5000.0000G	200.0000	1.0000	0.3000	13.0000	20.0000
026-04G	0.0 N	700.0000	5000.0000G	0.0 N	70.0000	150.0000	0.6000	0.1000	5.6000	6.8000
044-04G	1.0000L	70.0000	1500.0000	0.0 N	100.0000L	70.0000	2.0000	0.4000	24.0000	22.0000
033-01R	7.0000	500.0000	5000.0000G	0.0 N	300.0000	100.0000	2.8000	0.4000	47.0000	20.0000
042-01R	1.0000L	700.0000	5000.0000G	0.0 N	1500.0000	100.0000	1.9000	0.5000	32.0000	16.0000
053-01R	150.0000	70.0000	5000.0000G	0.0 N	50.0000	100.0000L	0.6000	0.4000	12.0000	5.1000
222-01R	0.0 N	300.0000	5000.0000G	0.0 N	300.0000	100.0000L	2.1000	0.9000	17.0000	29.0000
064-23R	1.0000	500.0000	5000.0000G	0.0 N	70.0000	100.0000	2.4000	0.2000	36.0000	16.0000
084-23R	5.0000	700.0000	5000.0000G	0.0 N	200.0000	150.0000	2.5000	0.0500L	35.0000	17.0000
046-24R	0.0 N	200.0000	3000.0000	0.0 N	50.0000L	100.0000L	2.4000	0.2000	41.0000	16.0000
086-24R	1.0000L	500.0000	5000.0000	0.0 N	70.0000	100.0000L	2.6000	.2000	36.0000	16.0000
016-34R	7.0000	200.0000	2000.0000	0.0 N	5000.0000G	100.0000L	2.0000	0.4000	32.0000	17.0000
041-30S	0.0 N	300.0000	5000.0000G	0.0 N	100.0000	100.0000L	2.8000	0.2000	46.0000	17.0000
031-32S	1.0000L	70.0000	1000.0000	0.0 N	500.0000	50.0000	2.4000	0.8000	30.0000	17.0000

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SAMPLE	SR	TI	V	Y	ZN	ZR	CO-I	CO-I	FE-I	NI-I
026-28R	1.0000L	200.0000	5000.0000G	0.0 N	2000.0000	100.0000L	1.2000	0.5000	51.0000	16.0000
084-29R	1.5000	150.0000	5000.0000G	0.0 N	1500.0000	100.0000L	1.5000	0.4000	49.0000	15.0000
042-33R	30.0000	500.0000	5000.0000	0.0 N	3000.0000	100.0000L	0.7000	0.0600L	36.0000	9.7000
024-34R	0.0 N	100.0000	1500.0000	0.0 N	70.0000	100.0000L	1.1000	0.4000	45.0000	13.0000
062-34R	0.0 N	200.0000	5000.0000G	0.0 N	3000.0000	100.0000	1.5000	0.2000L	46.0000	14.0000
024-36R	0.0 N	200.0000	5000.0000G	0.0 N	500.0000	100.0000L	3.5000	0.4000	43.0000	16.0000
026-36R	1.0000L	70.0000	1000.0000	0.0 N	100.0000	50.0000	2.3000	0.3000	35.0000	11.0000
026-06G	0.0 N	500.0000	5000.0000G	0.0 N	100.0000	150.0000	0.0 B	0.0 B	0.0 B	0.0 B
118-27S	0.0 N	150.0000	5000.0000	0.0 N	50.0000L	100.0000L	0.0 B	0.0 B	0.0 B	0.0 B
248-27S	0.0 N	300.0000	5000.0000G	0.0 N	700.0000	100.0000	0.0 B	0.0 B	0.0 B	0.0 B
076-28S	70.0000	300.0000	5000.0000G	0.0 N	3000.0000	150.0000	0.0 B	0.0 B	0.0 B	0.0 B
078-28S	0.0 N	200.0000	5000.0000	0.0 N	200.0000	100.0000L	0.0 B	0.0 B	0.0 B	0.0 B
038-29S	1.0000L	70.0000	1000.0000	0.0 N	100.0000	50.0000	0.0 B	0.0 B	0.0 B	0.0 B
083-30S	1.0000L	150.0000	3000.0000	0.0 N	50.0000L	100.0000L	0.0 B	0.0 B	0.0 B	0.0 B
037-33S	1.0000	150.0000	5000.0000G	0.0 N	700.0000	70.0000	0.0 B	0.0 B	0.0 B	0.0 B
062-33S	0.0 N	500.0000	5000.0000G	0.0 N	100.0000	100.0000	0.0 B	0.0 B	0.0 B	0.0 B
073-33S	0.0 N	500.0000	5000.0000G	0.0 N	1500.0000	100.0000L	0.0 B	0.0 B	0.0 B	0.0 B
001-34S	0.0 N	100.0000	5000.0000	0.0 N	0.0 N	100.0000L	0.0 B	0.0 B	0.0 B	0.0 B
014834S	1.0000	150.0000	5000.0000G	0.0 N	300.0000	100.0000	0.0 B	0.0 B	0.0 B	0.0 B
032-34S	7.0000	500.0000	5000.0000G	0.0 N	150.0000	300.0000	0.0 B	0.0 B	0.0 B	0.0 B
052-35S	0.0 N	150.0000	5000.0000G	0.0 N	100.0000	100.0000L	0.0 B	0.0 B	0.0 B	0.0 B
273-35S	1.0000L	200.0000	5000.0000G	0.0 N	700.0000	70.0000	0.0 B	0.0 B	0.0 B	0.0 B
015-36S	7.0000	700.0000	5000.0000G	0.0 N	1500.0000	300.0000	0.0 B	0.0 B	0.0 B	0.0 B
036-36S	0.0 N	700.0000	5000.0000G	0.0 N	5000.0000G	100.0000	0.0 B	0.0 B	0.0 B	0.0 B
042-36S	3.0000	500.0000	5000.0000G	0.0 N	5000.0000G	150.0000	0.0 B	0.0 B	0.0 B	0.0 B

SAMPLE	V=1
088-35S	10.0000
070-01G	7.8000
056-01G	7.8000
058-01G	7.8000
016-02G	9.5000
056-02G	7.7000
025-03G	11.0000
078-04G	8.0000
028-08G	8.4000
075-08G	10.0000
055-09G	7.3000
057-09G	9.5000
061-09G	8.4000
063-09G	8.4000
026-10G	9.5000
046-10G	7.2000
066-10G	4.0000
086-10G	6.7000
035-11G	9.0000
055-11G	7.8000
024-12G	4.5000
002-34S	6.2000
002-35S	5.6000
223-35S	9.0000
032-36S	8.4000
216-36S	9.5000
004J01G	9.0000
013-01G	6.2000
025-01G	7.3000
046-01G	3.6000
035-06G	6.2000
051-11G	7.3000
025-29S	4.1000
065-29S	5.4000
077-29S	5.0000
052-33S	6.2000
016-14R	6.3000
026-04G	1.7000
044-04G	7.3000
033-01R	5.0000
042-01R	3.4000
053-01R	1.2000
222-01R	8.4000
064-23R	4.2000
084-23R	4.2000
046-24R	3.9000
086-24R	3.9000
016-34R	7.3000
041-30S	4.4000
031-32S	3.0000

SAMPLE	V-1	
026-28R	3.9000	
054-29R	2.7000	
042-33R	2.8000	
024-34R	3.1000	
052-34R	3.5000	
024-36R	3.9000	
026-36R	2.7000	
026-06S	0.0	R
118-27S	0.0	R
248-27S	0.0	R
076-28S	0.0	R
078-28S	0.0	R
038-29S	0.0	R
083-30S	0.0	R
037-33S	0.0	R
062-33S	0.0	R
073-33S	0.0	R
001-34S	0.0	R
014834S	0.0	R
032-34S	0.0	R
052-35S	0.0	R
274-35S	0.0	R
015-36S	0.0	R
036-36S	0.0	R
042-36S	0.0	R

EXPLANATION OF COLUMN HEADINGS

ZU and ZL -- the approximate depth, in feet, relative to sea level, of the perforations in the wells.

DIST FR -- the percent of crude oil distilling from ambient temperature and pressure to 100° C and 5 mm Hg.

PCT SAT 1 and PCT SAT 2 -- duplicate determinations of the percent saturated and aromatic hydrocarbons in the distillate, by the fluorescent indicator absorption method.

APS-1 through APS-10 -- gas-liquid chromatographic analysis of saturated hydrocarbon fraction of the distillate. Values are in area percent.

APA-1 through APA-11 -- gas-liquid chromatographic analysis of aromatic hydrocarbon fraction of the distillate. Values are in area percent.

PCT ASH -- percent ash in the crude oil.
Analysts for the above: Peter M. Gerrild, Tom G. Ging, Jr., Michael D. Jensen, and Lee D. Stewart

AG, AS, AU, etc., through ZR -- elements in the ash analyzed by emission spectrography. Values shown are in parts per million. Symbols are: N, not detected; L, detected, but less than minimum standard; and G, greater than the maximum standard.
Analyst: James M. Nishg.

CO-1, CU-1, FE-1, NI-1, and V-1 -- elements in the ash analyzed by X-ray fluorescence. Values shown are in percent.
Symbol: B, sample not analyzed for the element.
Analyst; James S. Wahlberg.