UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

Gravity survey data and a Bouguer gravity anomaly map of the Lake City caldera area, Hinsdale County, Colorado

by

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Studies related to Wilderness

The Wilderness Act (Public Law 88-577, September 3, 1964) and related acts require the U.S. Geological Survey and the U.S. Bureau of Mines to survey certain areas on Federal lands to determine the mineral values, if any, that may be present. Results must be made available to the public and be submitted to the President and the Congress. This report presents the data from a gravity survey of the Redcloud Peak and Handies Peak proposed Wilderness areas in the Lake City caldera, south central Colorado.

Introduction

This report presents part of the work undertaken by the U.S. Geological Survey to evaluate the mineral-resource potential of the Redcloud Peak and Handies Peak proposed wilderness areas near the Lake City caldera. During the summer field seasons of 1981 and 1984, 156 new gravity stations were established in the Lake City caldera area, Hinsdale county, Colorado (fig. 1). This report presents the principal facts for these data and includes a complete Bouguer gravity anomaly map (plate 1).

Data Collection

Gravity data were collected in 1981 using LaCoste-Romberg gravity meter G-159 and in 1984 using LaCoste-Romberg meter G-2. All gravity stations were referenced to the U.S. Department of Defense (DOD) base at Lake City School (Appendix A), which is part of the International Gravity Standardization Net (IGSN-71; Defense Mapping Agency, 1974). An additional base was tied to this primary base (Appendix A). Gravity loops were started and closed daily by making repeat observations at the base. Access was by helicopter and ground traverses into the roadless areas and by vehicle along highways and secondary roads outside of the wilderness area. Data collected previously were retrieved from the DOD data bank (NOAA National Geophysical Data Center) and are not listed in this report but are included in the Bouguer anomaly map (plate 1).

Elevation Control

The station elevations were obtained from spot elevations on 1:24,000-scale USGS topographic maps, from elevations surveyed by a laser distance meter in the field (1984 survey only), or from elevations determined from airphoto locations by a Kern PT-2 photogrammetric plotter. The uncertainty of elevations based on spot elevations marked in black, on 1:24,000-scale maps with a 40-ft contour interval, is assumed to be three ft. Elevations surveyed by the laser distance meter may have errors in this area as much as 6 feet, and those determined from airphotos can have errors varying from 10 to 20 feet depending on the quality of the airphotos and plotter setup. The maximum error in gravity from incorrect elevations is approximately 1 mgal.

Errors in the estimation of terrain corrections generally give rise to the greatest uncertainty in Bouguer values. Computer-generated terrain corrections in mountainous areas like the Lake City caldera area are generally accurate to within 1 mgal.

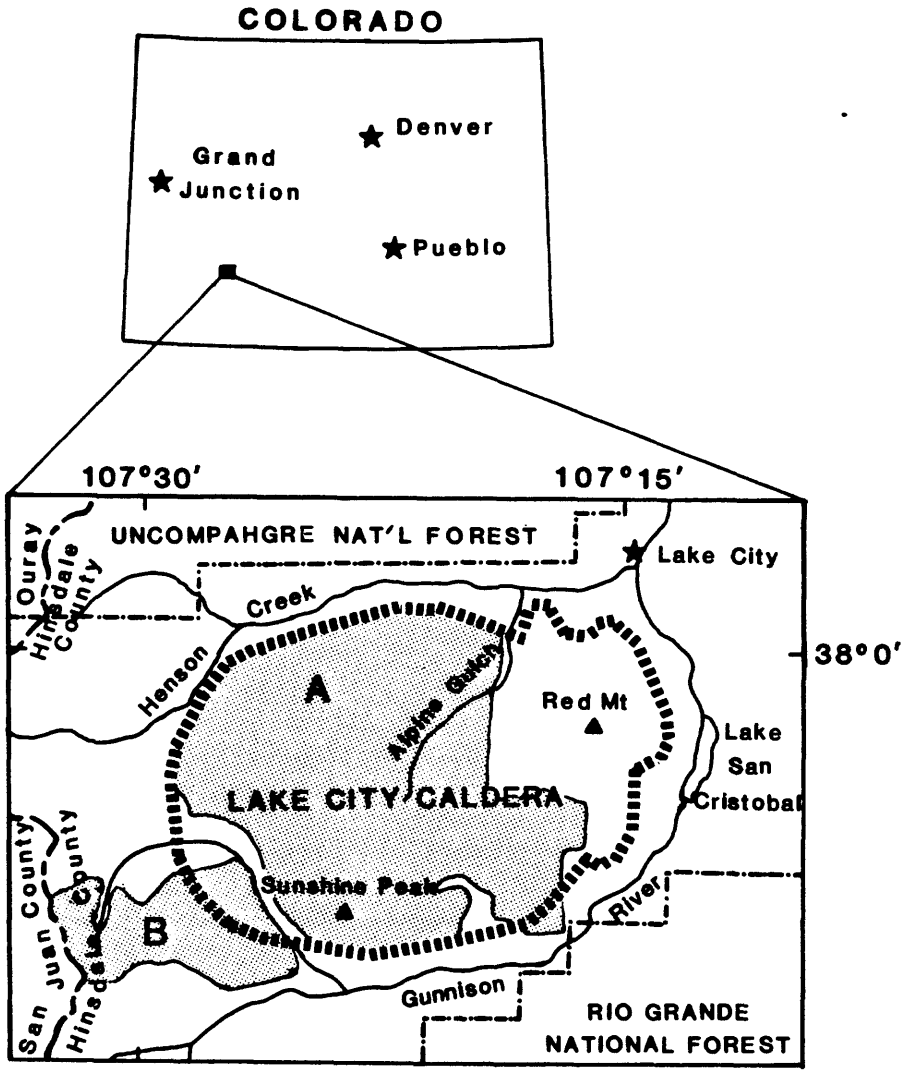

Figure 1. Map showing location of the Lake City caldera study area. Redcloud Peak Wilderness Study Area (A) and Handies Peak Wilderness Study area (B) are stippled.

Data Reduction

Computer programs existing on the USGS DEC VAX 11-750 computer system were used to obtain principal facts and terrain-corrected gravity values. A program written by M. Webring and R. Wahl (USGS, unpub. program, 1983) was used to reduce gravity meter-readings to observed-gravity values by calculating and correcting for earth-tide and linear meter-drift. The theoretical gravity value was calculated using the 1967 formula of the Geodetic Reference System (International Association of Geodesy, 1967). Mathematical equations are given in Cordell (1982).

Outer-zone terrain corrections were computed using a program by R. H. Godson (USGS, unpub. program, 1978), correcting for the gravity effects of terrain from a radius of 0.865 km to a radius 166.7 km away from each station using the method of Plouff (1977). Godson's program also calculates earth-curvature corrections and complete (terrain-corrected) Bouguer anomaly values. These computed terrain corrections use mean-elevation data digitized on a 15-second grid for corrections from 0.865 to 5 km, 1-minute terrain data for corrections from 5 to 21 km, and 3-minute terrain data for corrections from 21 to 166.7 km.

Near-station (0 to .865 km) corrections for the 1984 survey were calculated using a method of M. Webring (USGS, unpublished, 1984). This method incorporates the minimum curvature gridding algorithm of Briggs (1974) to define the topographic surface close to the station using hand-digitized data and calculates the gravity effects of small cylindrical sections of the Hammer zones using the method of Olivier and Simard (1980). Near-station terrain corrections for the 1981 survey were calculated for Hammer zones by hand (Hammer, 1939).

Densities of 2.67 and 2.40 g/cm^3 were both used to calculate Bouguer and terrain corrections. It was decided that 2.40 g/cm^3 best represents the average density of the terrain in the Lake City caldera area based on results from Nettleton's profiling technique and the method of Parasnis (both described by Telford and others, 1976), and from rock density measurements. Thus 2.40 g/cm^3 was used to calculate the Bouguer anomalies contoured on plate 1 and listed in Appendix B. The first column of Appendix B lists the year of the Survey in which the station was collected.

The Bouguer anomaly values (reduced at 2.40 g/cm^3) from the 1981 and 1984 surveys and the DOD data bank were combined and edited, then gridded at a 0.25 km interval using the program "MINC" (Webring, 1981). "MINC" forms a surface of minimum curvature (Briggs, 1974) through existing data points. Computer plotted contour maps of the gridded data were produced using program "CONTOUR" (Godson and Webring, 1982), which uses a linear-interpolation technique for positioning contours.

Acknowledgements

We are grateful to Randy Mackie who calculated hand terrain corrections for the 1981 survey data and Ann Kramer who assisted in the field during the 1984 survey.

References

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Telford, W. M., and others, 1976, Applied Geophysics: Cambridge University Press: Cambridge.

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Appendix A. Gravity base station descriptions.

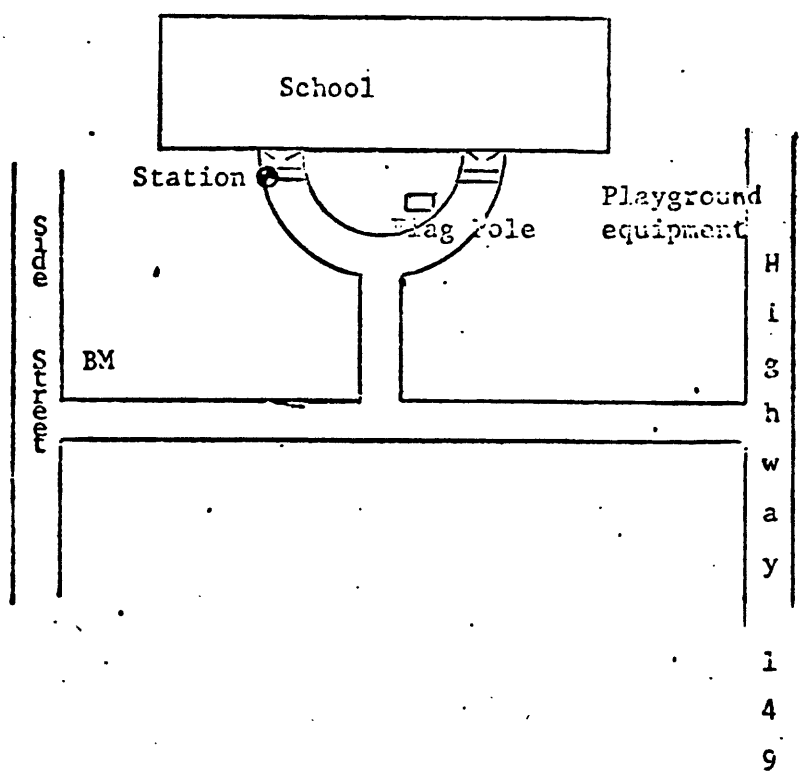
GRAVITY BASE STATION

LATITUDE: 38° 01.97'N (1)	STATION DESIGNATION: LAKE CITY
LONGITUDE: 107° 18.86'W (1)	
ELEVATION: 2638.97 METERS (1)	COUNTRY/STATE: USA/Colorado

REFERENCE CODE NUMBERS		ADOPTED GRAVITY VALUE	
ACIC 4015-1		g= 979153.00 mgals	
IGB 11987E			
		ESTIMATED ACCURACY	DATE
		± 0.1 mgals	MONTH/YEAR 10/70

DESCRIPTION AND/OR SKETCH

Station is located at the Lake City public school, one-half block west of Highway 149 on the second step of the west set of stairs leading to the front entrance. The station is monumented with USAF Disc. (1)



(1)

REFERENCE SOURCE

(1) 03405

Appendix A cont'd

GRAVITY BASE STATION
U.S. GEOLOGICAL SURVEY

STATE/COUNTRY	STATION DESIGNATION	OBSERVED GRAVITY
Colorado	Alpine Gulch	979123.5
NEAREST TOWN	**LONGITUDE**	**LATITUDE**
Lake City	107° 21.52'	38° 1.2'
ELEVATION	**TOPOGRAPHIC MAP(S)**	
9030 feet	Lake City 7.5 minute quad	

DATE	OBSERVER	METER	REFERENCE STATION	REFERENCE VALUE
8/28/81	Campbell	G-159	Lake City DOD	979153.00

DESCRIPTION/SKETCH

At northwest corner of crossing of Henson Creek road over Crystal Creek, which is just west of the bottom of the Alpine Gulch trail. Lake City is to the east.

Appendix B: Principal Facts of Gravity Data

Explanation of headings

Identification	
proj	Year of survey
sta id	Gravity station identification number.
Location	
latitude	North latitude in degrees, decimal minutes.
longitude	West longitude in degrees, decimal minutes.
ele	Station elevation in feet.
st	State
Gravity	
observed	Observed gravity in milligals.
theoretical	Theoretical gravity in milligals.
Corrections	
Terrain	Total terrain correction, 166.7 km radius, in milligals, shown for density of 2.67 g/cc.
Bouguer	Simple Bouguer slab correction in milligals, shown for density of 2.67 g/cc.
curv	Curvature correction in milligals.
special	Not used.
Anomalies	
free-air	Free-air anomaly in milligals.
complete-Bouguer	Complete Bouguer anomaly in milligals for designated density.

Lake City Caldera Area
Gravity Surveys 1981 and 1984
Meter used: G-159 and G-2

STATION IDENTIFICATION		LOCATIONS				ELE	ST	GRAVITY		CORRECTIONS			ANOMALIES		
		LATITUDE		LONGITUDE				OBSERVED	THEORETICAL	TERRAIN	BOUGUER 2.67 g/cc	CURV	SPECIAL	FREE AIR	COMPLETE-BOUGUER 2.40 g/cc
proj	sta-id	deg	min	deg	min	(in ft)									
1981	8-27-a	37	57.21	-107	24.34	12980.00	CO	978870.26	979988.02	11.75	-442.71	-0.26	0.00	102.04	-285.58
1981	8-27-b	37	57.39	-107	24.22	12640.00	CO	978894.10	979988.28	9.51	-431.11	-0.40	0.00	93.70	-285.63
1981	8-27-c	37	57.53	-107	24.18	12350.00	CO	978913.57	979988.48	9.63	-421.22	-0.51	0.00	85.73	-284.70
1981	8-27-f	37	58.91	-107	23.17	10380.00	CO	979032.42	979990.50	15.09	-354.03	-1.10	0.00	17.56	-288.09
1981	8-27-g	37	59.21	-107	22.73	10090.00	CO	979049.71	979990.95	15.76	-344.14	-1.16	0.00	7.17	-289.05
1981	8-27-h	37	59.41	-107	21.98	9770.00	CO	979070.80	979991.24	13.15	-333.23	-1.23	0.00	-2.09	-290.90
1981	8-27-i	37	59.65	-107	21.82	9635.00	CO	979079.38	979991.59	13.26	-328.62	-1.25	0.00	-6.53	-291.13
1981	8-27-j	38	0.06	-107	21.77	9440.00	CO	979093.38	979992.19	14.95	-321.97	-1.29	0.00	-11.45	-288.58
1981	8-27-k	38	0.33	-107	21.75	9320.00	CO	979098.60	979992.58	16.53	-317.88	-1.31	0.00	-17.90	-289.94
1981	8-27-l	38	0.68	-107	21.64	9200.00	CO	979107.35	979993.09	16.42	-313.79	-1.33	0.00	-20.94	-289.43
1981	se	38	0.29	-107	27.88	9700.00	CO	979080.11	979992.52	15.43	-330.84	-1.24	0.00	-0.56	-285.22
1981	9-01-a	37	57.87	-107	25.04	13688.00	CO	978819.27	979988.98	23.93	-466.86	0.04	0.00	116.56	-281.54
1981	9-01-c	37	57.65	-107	25.87	13297.00	CO	978852.97	979988.66	17.41	-453.52	-0.13	0.00	113.89	-278.24
1981	9-01-d	37	57.62	-107	26.33	13116.00	CO	978867.93	979988.62	14.88	-447.35	-0.21	0.00	111.88	-277.04
1981	9-01-e	37	57.84	-107	26.28	13220.00	CO	978854.89	979988.95	18.23	-450.90	-0.17	0.00	108.28	-280.78
1981	9-01-f	37	57.69	-107	26.15	13452.00	CO	978839.61	979988.72	22.47	-458.81	-0.07	0.00	115.04	-277.24
1981	9-01-g	37	57.65	-107	24.86	13440.00	CO	978840.56	979988.66	17.86	-458.40	-0.07	0.00	114.89	-281.16
1981	9-02-a	37	58.13	-107	24.92	13525.00	CO	978831.20	979989.36	22.11	-461.30	-0.03	0.00	112.81	-282.00
1981	9-02-b	37	58.43	-107	25.25	13220.00	CO	978859.91	979989.80	15.58	-450.90	-0.17	0.00	112.44	-279.01
1981	9-02-c	37	58.73	-107	25.54	13691.00	CO	978816.88	979990.24	30.34	-466.96	0.04	0.00	113.19	-279.24
1981	9-02-d	37	58.86	-107	25.92	13484.00	CO	978834.11	979990.43	26.27	-459.90	-0.05	0.00	110.80	-279.02
1981	9-02-e	37	58.79	-107	26.48	12860.00	CO	978884.45	979990.33	13.88	-438.62	-0.31	0.00	102.66	-279.41
1981	9-02-f	37	58.91	-107	26.69	13131.00	CO	978856.37	979990.50	25.59	-447.86	-0.20	0.00	99.84	-279.92
1981	9-02-g	37	58.62	-107	27.29	12750.00	CO	978893.55	979990.08	11.36	-434.87	-0.36	0.00	101.68	-279.33
1981	9-02-h	37	56.75	-107	24.88	13020.00	CO	978867.54	979987.34	12.62	-444.07	-0.25	0.00	103.75	-284.30
1981	9-02-i	37	57.16	-107	25.09	12236.00	CO	978918.40	979987.95	9.74	-417.33	-0.55	0.00	80.46	-286.43
1981	9-02-j	37	57.25	-107	25.30	12153.00	CO	978923.69	979988.09	10.23	-414.50	-0.58	0.00	77.76	-286.15
1981	9-02-k	37	57.15	-107	25.68	11869.00	CO	978940.19	979987.93	10.84	-404.82	-0.67	0.00	67.74	-287.00
1981	9-02-l	37	57.07	-107	26.07	11555.00	CO	978957.31	979987.82	12.90	-394.11	-0.78	0.00	55.54	-287.83
1981	9-02-m	37	56.92	-107	26.35	11318.00	CO	978971.90	979987.60	13.52	-386.02	-0.85	0.00	48.10	-287.51
1981	9-02-n	37	56.77	-107	26.64	11135.00	CO	978982.12	979987.38	12.67	-379.78	-0.90	0.00	41.37	-289.45
1981	9-02-o	37	56.45	-107	27.22	10768.00	CO	979003.17	979986.91	11.93	-367.27	-1.00	0.00	28.37	-291.94
1981	9-03-a	37	56.13	-107	27.50	10400.00	CO	979025.36	979986.45	14.64	-354.71	-1.09	0.00	16.44	-290.23
1981	9-03-c	37	55.25	-107	29.85	12740.00	CO	978888.00	979985.16	8.46	-434.52	-0.36	0.00	100.11	-283.19
1981	9-03-d	37	55.34	-107	29.35	12000.00	CO	978930.21	979985.28	8.30	-409.29	-0.63	0.00	72.71	-288.30
1981	9-03-e	37	55.37	-107	29.10	11830.00	CO	978940.64	979985.33	8.79	-403.49	-0.69	0.00	67.13	-288.28
1981	9-03-f	37	55.57	-107	28.84	11460.00	CO	978960.03	979985.63	12.03	-390.87	-0.81	0.00	51.48	-289.77
1981	9-03-g	37	55.74	-107	28.64	11310.00	CO	978969.98	979985.86	11.82	-385.75	-0.85	0.00	47.09	-289.79
1981	9-03-h	37	55.85	-107	28.53	11220.00	CO	978977.48	979986.03	11.80	-382.68	-0.88	0.00	45.98	-288.18
1981	9-03-i	37	55.93	-107	28.36	11140.00	CO	978984.57	979986.16	10.43	-379.95	-0.90	0.00	45.45	-287.52

Lake City Caldera Area
Gravity Surveys 1981 and 1984
Meter used: G-159 and G-2

STATION IDENTIFICATION		LOCATIONS				GRAVITY			CORRECTIONS			ANOMALIES		
		LATITUDE		LONGITUDE		ELE	ST	OBSERVED	THEORETICAL	TERRAIN	BOUGUER	CURV	SPECIAL	FREE	COMPLETE-BOUGUER
proj	sta-id	deg	min	deg	min	(in ft)				2.67 g/cc				AIR	2.40 g/cc
1981	9-03-1	37	56.34	-107	27.76	10478.00	CO	979023.52	979986.75	12.23	-357.37	-1.07	0.00	21.62	-289.58
1981	9-03-k	37	56.07	-107	27.47	10409.00	CO	979023.79	979986.35	14.00	-355.02	-1.09	0.00	15.81	-291.70
1981	9-04-a	37	59.17	-107	27.26	12363.00	CO	978917.81	979990.89	13.30	-421.67	-0.50	0.00	88.84	-278.70
1981	9-04-b	37	59.32	-107	27.14	12226.00	CO	978923.32	979991.11	15.73	-416.99	-0.55	0.00	81.28	-279.92
1981	9-04-c	37	59.53	-107	27.32	11422.00	CO	978979.97	979991.41	10.06	-389.57	-0.82	0.00	62.14	-279.76
1981	9-04-e'	37	59.82	-107	27.50	10927.00	CO	979010.15	979991.84	8.21	-372.69	-0.96	0.00	45.41	-283.10
1981	9-04-f	37	59.96	-107	27.65	10533.00	CO	979032.10	979992.04	11.59	-359.25	-1.06	0.00	30.13	-283.34
1981	9-04-g	38	0.09	-107	27.70	10382.00	CO	979040.94	979992.23	11.69	-354.10	-1.10	0.00	24.60	-284.19
1981	9-05-a	37	59.69	-107	19.24	11825.00	CO	978938.41	979991.64	22.06	-403.32	-0.69	0.00	58.11	-285.22
1981	9-06-a	37	57.50	-107	20.86	12457.00	CO	978904.91	979988.45	13.15	-424.87	-0.47	0.00	87.16	-283.35
1981	9-06-b	37	56.65	-107	22.32	12483.00	CO	978899.18	979987.20	13.58	-425.76	-0.46	0.00	85.12	-285.79
1981	9-06-c	37	58.21	-107	25.87	12045.00	CO	978937.26	979989.48	9.44	-410.82	-0.62	0.00	79.78	-281.56
1981	9-06-d	37	58.56	-107	20.29	12260.00	CO	978918.16	979989.99	13.51	-418.15	-0.54	0.00	80.36	-283.85
1984	b5	37	58.72	-107	27.56	13365.00	CO	978841.80	979990.23	25.28	-455.84	-0.10	0.00	107.56	-279.57
1984	b4	37	58.78	-107	26.46	12856.00	CO	978884.27	979990.32	13.91	-438.48	-0.31	0.00	102.20	-279.74
1984	b1	37	58.00	-107	28.18	13312.00	CO	978842.70	979989.16	26.04	-454.03	-0.13	0.00	104.50	-280.33
1984	b2	37	57.64	-107	29.26	12896.00	CO	978875.34	979988.65	15.11	-439.85	-0.30	0.00	98.61	-283.44
1984	b0	37	58.47	-107	27.58	13566.00	CO	978826.34	979989.86	27.64	-462.70	-0.02	0.00	111.30	-279.77
1984	c1	37	57.28	-107	22.65	13813.00	CO	978800.39	979988.13	32.36	-471.12	0.10	0.00	110.32	-284.00
1984	f7	37	56.87	-107	23.38	13629.00	CO	978815.92	979987.52	26.03	-464.85	0.01	0.00	109.21	-285.24
1984	a6	37	56.94	-107	23.98	13652.00	CO	978818.33	979987.63	22.30	-465.63	0.02	0.00	113.66	-284.84
1984	c4	37	59.60	-107	23.93	13104.00	CO	978857.83	979991.52	27.79	-446.94	-0.21	0.00	97.81	-279.16
1984	c5	37	58.73	-107	24.45	12873.00	CO	978877.05	979990.24	17.96	-439.06	-0.31	0.00	96.58	-282.22
1984	c3	37	57.82	-107	22.50	12490.00	CO	978904.31	979988.91	12.55	-426.00	-0.46	0.00	89.21	-282.84
1984	hh2	37	59.40	-107	24.68	11584.00	CO	978968.18	979991.22	12.20	-395.10	-0.77	0.00	65.75	-279.14
1984	hh3	37	58.63	-107	24.98	12492.00	CO	978910.18	979990.10	9.81	-426.07	-0.45	0.00	94.11	-280.48
1984	hh4	37	59.27	-107	25.54	12145.00	CO	978932.60	979991.03	11.14	-414.23	-0.58	0.00	82.97	-279.88
1984	hh5	37	59.20	-107	26.50	11915.00	CO	978947.89	979990.93	10.08	-406.39	-0.66	0.00	76.76	-280.06
1984	hh6	37	59.99	-107	26.72	10620.00	CO	979027.92	979992.09	12.38	-362.22	-1.04	0.00	34.02	-281.37
1984	hh8	38	0.01	-107	22.90	12070.00	CO	978928.62	979992.12	18.70	-411.67	-0.61	0.00	70.86	-282.92
1984	hh11	37	55.91	-107	20.12	10365.00	CO	979031.63	979986.12	12.73	-353.52	-1.10	0.00	19.75	-287.57
1984	hh10a	37	57.07	-107	20.74	11996.00	CO	978931.44	979987.82	11.74	-409.15	-0.63	0.00	71.04	-286.76
1984	hh10b	37	56.60	-107	20.36	10830.00	CO	979008.56	979987.13	7.68	-369.38	-0.98	0.00	39.34	-286.66
1984	hh12	37	56.02	-107	20.64	10690.00	CO	979012.59	979986.28	9.67	-364.61	-1.02	0.00	31.08	-288.88
1984	hh9	37	57.43	-107	18.40	9725.00	CO	979075.62	979988.34	11.40	-331.69	-1.24	0.00	1.40	-287.62
1984	qr5	38	0.77	-107	19.42	9565.00	CO	979095.34	979993.22	8.96	-326.23	-1.27	0.00	1.21	-285.12
1984	qr6	38	0.23	-107	19.28	10280.00	CO	979048.35	979992.43	9.28	-350.62	-1.12	0.00	22.17	-285.66
1984	qr8	37	59.12	-107	18.89	11382.00	CO	978977.59	979990.61	10.36	-388.21	-0.83	0.00	56.60	-283.80
1984	a10	37	57.69	-107	25.48	13452.00	CO	978836.17	979988.72	21.54	-458.81	-0.07	0.00	111.63	-281.50
1984	a3	37	57.26	-107	26.91	13002.00	CO	978863.89	979988.09	19.78	-443.46	-0.26	0.00	97.71	-283.37

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STATION IDENTIFICATION		LOCATIONS				GRAVITY			CORRECTIONS			ANOMALIES		
		LATITUDE		LONGITUDE		ELE	ST	OBSERVED	THEORETICAL	TERRAIN	BOUGUER	CURV	SPECIAL	FREE	COMPLETE-BOUGUER
proj	sta-id	deg	min	deg	min	(in ft)				2.67 g/cc				AIR	2.40 g/cc
1984	a2	37	55.92	-107	26.28	13429.00	CO	978823.42	979986.13	31.19	-458.02	-0.08	0.00	99.30	-284.46
1984	a1	37	55.47	-107	25.85	13311.00	CO	978835.88	979985.48	23.29	-454.00	-0.13	0.00	101.37	-285.93
1984	a9	37	55.69	-107	24.46	12788.00	CO	978874.61	979985.80	16.41	-436.16	-0.34	0.00	90.67	-286.97
1984	a8	37	56.96	-107	24.49	13316.00	CO	978845.98	979987.66	16.59	-454.17	-0.13	0.00	109.75	-283.72
1984	a11	37	57.48	-107	25.55	12829.00	CO	978883.59	979988.41	11.38	-437.56	-0.33	0.00	100.82	-282.56
1984	a5	37	57.37	-107	25.80	12749.00	CO	978887.19	979988.26	12.06	-434.83	-0.36	0.00	97.05	-283.29
1984	a4	37	56.41	-107	26.36	12347.00	CO	978906.93	979986.85	14.12	-421.12	-0.51	0.00	80.45	-285.85
1984	a0	37	56.45	-107	25.27	14034.00	CO	978784.50	979986.91	33.26	-478.66	0.20	0.00	116.34	-283.84
1984	qr13	37	57.96	-107	23.98	11680.00	CO	978955.41	979989.12	12.28	-398.37	-0.74	0.00	64.02	-283.68
1984	qr14	37	58.55	-107	23.65	10845.00	CO	979003.69	979989.98	16.21	-369.89	-0.98	0.00	33.03	-285.77
1984	qr15	37	58.90	-107	23.15	10377.00	CO	979032.73	979990.49	15.52	-353.93	-1.10	0.00	17.62	-287.57
1984	d0	37	55.00	-107	28.45	13502.00	CO	978823.08	979984.80	26.67	-460.51	-0.04	0.00	107.10	-282.91
1984	d9	37	54.78	-107	30.23	14048.00	CO	978787.46	979984.47	31.88	-479.14	0.21	0.00	123.06	-278.78
1984	d1	37	54.57	-107	28.99	13627.00	CO	978819.34	979984.16	20.94	-464.78	0.01	0.00	115.73	-283.22
1984	d2	37	54.41	-107	27.76	13447.00	CO	978819.41	979983.93	31.97	-458.64	-0.07	0.00	99.13	-284.46
1984	d3	37	55.50	-107	29.82	12975.00	CO	978869.44	979985.52	13.27	-442.54	-0.27	0.00	103.30	-282.82
1984	d4	37	55.99	-107	29.02	12506.00	CO	978898.68	979986.24	13.69	-426.54	-0.45	0.00	87.80	-283.72
1984	d5	37	55.44	-107	28.27	12791.00	CO	978871.31	979985.44	21.38	-436.26	-0.34	0.00	87.94	-285.30
1984	d6	37	54.79	-107	27.69	12710.00	CO	978872.35	979984.48	21.89	-433.50	-0.37	0.00	82.32	-288.00
1984	d7	37	54.43	-107	28.35	12777.00	CO	978881.15	979983.96	10.64	-435.79	-0.35	0.00	97.94	-284.52
1984	d8	37	55.07	-107	29.12	12962.00	CO	978866.49	979984.89	16.83	-442.10	-0.27	0.00	99.77	-282.76
1984	qr16	37	58.15	-107	25.88	12013.00	CO	978937.36	979989.40	10.34	-409.73	-0.63	0.00	76.97	-282.60
1984	qr17	37	58.29	-107	26.07	11922.00	CO	978944.04	979989.60	9.93	-406.63	-0.66	0.00	74.97	-282.23
1984	qr18	37	58.04	-107	26.96	11538.00	CO	978964.27	979989.23	11.66	-393.53	-0.78	0.00	59.51	-284.46
1984	qr19	37	57.37	-107	27.74	11160.00	CO	978984.50	979988.26	12.06	-380.64	-0.89	0.00	45.15	-286.96
1984	e0	37	58.41	-107	20.47	12595.00	CO	978890.15	979989.77	22.81	-429.58	-0.42	0.00	84.03	-281.98
1984	e1	37	58.82	-107	20.12	12634.00	CO	978887.68	979990.38	23.54	-430.91	-0.40	0.00	84.65	-281.89
1984	e2	37	57.74	-107	20.88	12393.00	CO	978908.72	979988.79	14.96	-422.69	-0.49	0.00	84.61	-282.33
1984	e3	37	57.97	-107	21.41	12227.00	CO	978921.64	979989.13	12.70	-417.03	-0.55	0.00	81.64	-282.31
1984	e4	37	58.03	-107	22.15	12072.00	CO	978933.56	979989.22	10.56	-411.74	-0.61	0.00	78.90	-282.26
1984	e5	37	58.72	-107	21.96	10846.00	CO	979011.03	979990.23	7.95	-369.93	-0.98	0.00	40.22	-286.04
1984	e6	37	59.19	-107	21.38	11113.00	CO	978991.87	979990.91	11.31	-379.03	-0.91	0.00	45.46	-285.90
1984	e7	37	59.40	-107	20.88	10812.00	CO	979015.40	979991.22	6.98	-368.77	-0.99	0.00	40.40	-285.69
1984	qr3	38	0.43	-107	20.74	10880.00	CO	979011.04	979992.73	12.64	-371.09	-0.97	0.00	40.92	-282.15
1984	qr2	37	59.78	-107	20.83	11380.00	CO	978977.54	979991.77	11.85	-388.14	-0.83	0.00	55.32	-283.66
1984	f0	37	56.65	-107	22.32	12483.00	CO	978899.19	979987.20	13.98	-425.76	-0.46	0.00	85.12	-285.42
1984	f4	37	57.40	-107	21.64	12880.00	CO	978873.37	979988.30	18.32	-439.30	-0.31	0.00	95.51	-283.18
1984	f5	37	57.17	-107	22.32	13244.00	CO	978848.53	979987.96	19.97	-451.71	-0.16	0.00	105.22	-283.03
1984	f6	37	56.91	-107	22.67	13067.00	CO	978860.82	979987.59	17.66	-445.68	-0.23	0.00	101.28	-283.68
1984	f8	37	56.42	-107	23.34	12762.00	CO	978879.17	979986.87	15.97	-435.28	-0.35	0.00	91.70	-285.54

Lake City Caldera Area
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STATION IDENTIFICATION		LOCATIONS					GRAVITY		CORRECTIONS			ANOMALIES		
		LATITUDE		LONGITUDE		ELE	ST	OBSERVED	THEORETICAL	TERRAIN	BOUGUER CURV	SPECIAL	FREE	COMPLETE-BOUGUER
proj	sta-id	deg	min	deg	min	(in ft)				2.67 g/cc			AIR	2.40 g/cc
1984	f9	37	56.13	-107	23.60	12244.00	CO	978913.24	979986.45	12.64	-417.61 -0.55	0.00	77.58	-286.95
1984	f3	37	57.19	-107	21.43	12363.00	CO	978910.18	979987.99	12.86	-421.67 -0.50	0.00	84.14	-283.81
1984	f2	37	57.16	-107	20.12	11922.00	CO	978936.83	979987.95	13.29	-406.63 -0.66	0.00	69.41	-284.77
1984	f1	37	56.79	-107	21.01	11756.00	CO	978946.84	979987.41	10.74	-400.96 -0.71	0.00	64.36	-287.06
1984	f10	37	56.23	-107	22.36	12193.00	CO	978915.79	979986.59	13.21	-415.87 -0.56	0.00	75.12	-287.32
1984	qr26	37	55.89	-107	21.88	11250.00	CO	978979.22	979986.09	8.79	-383.71 -0.87	0.00	50.48	-287.30
1984	qr27	37	55.19	-107	22.12	10395.00	CO	979032.63	979985.06	6.79	-354.54 -1.09	0.00	24.62	-288.95
1984	qr12	37	55.36	-107	21.14	9821.00	CO	979066.26	979985.32	11.32	-334.97 -1.22	0.00	4.15	-287.89
1984	qr21	37	59.90	-107	23.59	13049.00	CO	978858.48	979991.95	30.84	-445.06 -0.24	0.00	92.87	-279.71
1984	qr22	38	0.21	-107	23.57	12500.00	CO	978895.74	979992.41	27.29	-426.34 -0.45	0.00	78.13	-280.99
1984	qr23	38	0.47	-107	23.84	12090.00	CO	978929.18	979992.78	22.16	-412.36 -0.60	0.00	72.63	-278.65
1984	c0	37	58.05	-107	23.45	12691.00	CO	978886.19	979989.25	18.23	-432.85 -0.38	0.00	89.61	-283.43
1984	c2	37	57.66	-107	22.86	12715.00	CO	978885.80	979988.66	15.54	-433.67 -0.37	0.00	92.12	-284.09
1984	c6	37	57.21	-107	23.44	12614.00	CO	978896.46	979988.02	9.84	-430.23 -0.41	0.00	93.92	-284.34
1984	qr24	37	59.98	-107	25.14	12760.00	CO	978882.02	979992.07	26.12	-435.21 -0.35	0.00	89.10	-278.94
1984	qr25	38	0.67	-107	24.73	11045.00	CO	979000.35	979993.08	12.97	-376.71 -0.93	0.00	45.37	-282.41
1984	hh13	37	56.85	-107	26.36	11420.00	CO	978969.77	979987.49	10.32	-389.50 -0.82	0.00	55.60	-285.97
1984	nn1	37	55.22	-107	24.56	12555.00	CO	978894.09	979985.11	13.86	-428.21 -0.43	0.00	88.88	-283.96
1984	hh7	37	58.57	-107	18.37	10835.00	CO	979010.21	979990.02	10.67	-369.55 -0.98	0.00	38.58	-284.89
1984	qr20	37	56.66	-107	28.64	10651.00	CO	979014.11	979987.21	12.78	-363.27 -1.03	0.00	27.99	-287.99
1984	qr33	37	59.70	-107	28.61	9905.00	CO	979064.20	979991.66	15.89	-337.83 -1.20	0.00	3.57	-286.89
1984	qr29	38	0.65	-107	26.00	9590.00	CO	979082.60	979993.05	19.55	-327.09 -1.26	0.00	-9.00	-286.57
1984	qr31	38	1.18	-107	24.86	9387.00	CO	979094.92	979993.83	21.35	-320.16 -1.30	0.00	-16.50	-286.27
1984	qr32	38	1.97	-107	23.95	9840.00	CO	979071.96	979994.98	13.97	-335.61 -1.21	0.00	1.91	-288.30
1984	qr40	38	1.19	-107	21.50	9010.00	CO	979122.96	979993.84	16.64	-307.31 -1.36	0.00	-23.92	-286.41
1984	qr30	38	1.18	-107	20.11	8770.00	CO	979136.84	979993.83	16.86	-299.12 -1.39	0.00	-32.57	-287.54
1984	qr34	37	53.83	-107	27.52	10196.00	CO	979019.96	979983.09	25.36	-347.76 -1.14	0.00	-4.68	-295.53
1984	qr35	37	53.79	-107	25.98	9827.00	CO	979049.69	979983.02	22.50	-335.17 -1.22	0.00	-9.62	-291.77
1984	qr37	37	57.97	-107	16.10	10560.00	CO	979029.73	979989.13	7.06	-360.17 -1.05	0.00	33.15	-285.21
1984	qr38	37	58.60	-107	16.46	10266.00	CO	979050.67	979990.05	8.63	-350.14 -1.12	0.00	25.61	-282.39
1984	qr39	38	0.11	-107	17.54	8945.00	CO	979128.56	979992.26	13.57	-305.09 -1.37	0.00	-22.84	-286.11
1984	qr36	37	53.90	-107	21.84	9950.00	CO	979053.41	979983.18	14.20	-339.37 -1.19	0.00	5.48	-287.88
1984	qr4	38	0.87	-107	20.23	9631.00	CO	979089.03	979993.38	12.04	-328.49 -1.25	0.00	1.01	-284.58
1984	qr11	37	57.77	-107	19.45	10520.00	CO	979028.68	979988.84	8.87	-358.81 -1.06	0.00	28.64	-286.87
1984	qr10	37	57.31	-107	19.16	10500.00	CO	979031.55	979988.17	8.35	-358.12 -1.07	0.00	30.30	-285.06
1984	qr9	37	56.79	-107	18.65	9725.00	CO	979077.04	979987.41	9.02	-331.69 -1.24	0.00	3.76	-287.40