

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Principal Facts for Gravity Stations in the Vicinity of
Creede, Mineral County, Colorado

by

G. A. Abrams, D. L. Williams, C. A. Finn,
J. D. Hendricks, and S. S. Priest

Open-File Report 85-658
1985

This report is preliminary and has not been edited or reviewed for conformity with the U.S. Geological Survey editorial standards. Any use of trade names is for descriptive purposes only and does not imply endorsement by the U.S. Geological Survey.

Table of Contents

Data Collection.....	1
Elevation Control.....	1
Data Reduction.....	1
Location Map, Figure 1.....	2
Location of Gravity Stations, Figure 2.....	2
Table 1	
Principal Facts of Gravity Data.....	3
Bouguer Gravity Data.....	4
References Cited.....	10
Appendix A	
Gravity Base Station Description.....	11
Appendix B	
Secondary Gravity Base Station Description.....	12

DATA COLLECTION

A gravity survey was made in the vicinity of Creede, Colorado (fig. 1) in June, 1985. Gravity observations were made using LaCoste and Romberg gravity meters G-2 and G-24. The gravity stations were referenced to the U.S. Department of Defense (Defense Mapping Agency, 1974) base at Alamosa, Colorado (Appendix A). Gravity loops were started and closed daily by making repeat observations at a secondary base in Creede (Appendix B). Access to the survey area was by secondary roads and jeep trails.

ELEVATION CONTROL

The survey area is bounded by latitudes $37^{\circ}45'00''$ – $37^{\circ}57'30''$ N and longitudes $106^{\circ}46'00''$ – $107^{\circ}07'30''$ W. One hundred forty seven station elevations (station ID of 1000 or greater) were surveyed with a laser theodolite and are accurate to the nearest tenth of a foot. The laser theodolite was placed at stations with identification prefix "loc". One hundred four station elevations (station ID with letter prefix) were obtained from benchmarks, spot elevations and section corners on 1:24,000 scale USGS topographic maps. The greatest elevation uncertainty occurs at spot elevations, where the elevation uncertainty is one-half the contour interval; thus on a map with 40-ft contour intervals, the maximum Bouguer and free-air correction error would be 1.2 mgals.

DATA REDUCTION

Computer programs existing on the USGS Branch of Geophysics Digital Equipment Corporation 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, 1984, unpub. program) was used to reduce gravimeter 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, 1971). Terrain corrections were computed using a program by R. H. Godson (USGS, 1978, unpub. program) correcting for the gravity effects of terrain from each station to a radius of 166.7 km using the method of Plouff (1977). Godson's program also calculates earth curvature corrections and complete (terrain corrected) Bouguer gravity anomaly values. For a complete description of gravity reduction equations and approximations used by the Branch of Geophysics see Cordell and others (1982). These computed terrain corrections use mean elevation digital data on a 15-second grid for corrections from 0.59 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. Terrain located less than 0.59 km from a station may not be corrected for by the above procedure due to the coarseness of the terrain model. No hand terrain corrections were done on the present dataset. A density of 2.67 g/cm^3 was used to calculate terrain corrections, giving one complete Bouguer gravity anomaly value per station. The second complete Bouguer gravity anomaly value was calculated by using a reduction density of 2.45 g/cm^3 . The corrections and gravity anomaly values are listed in table 1.

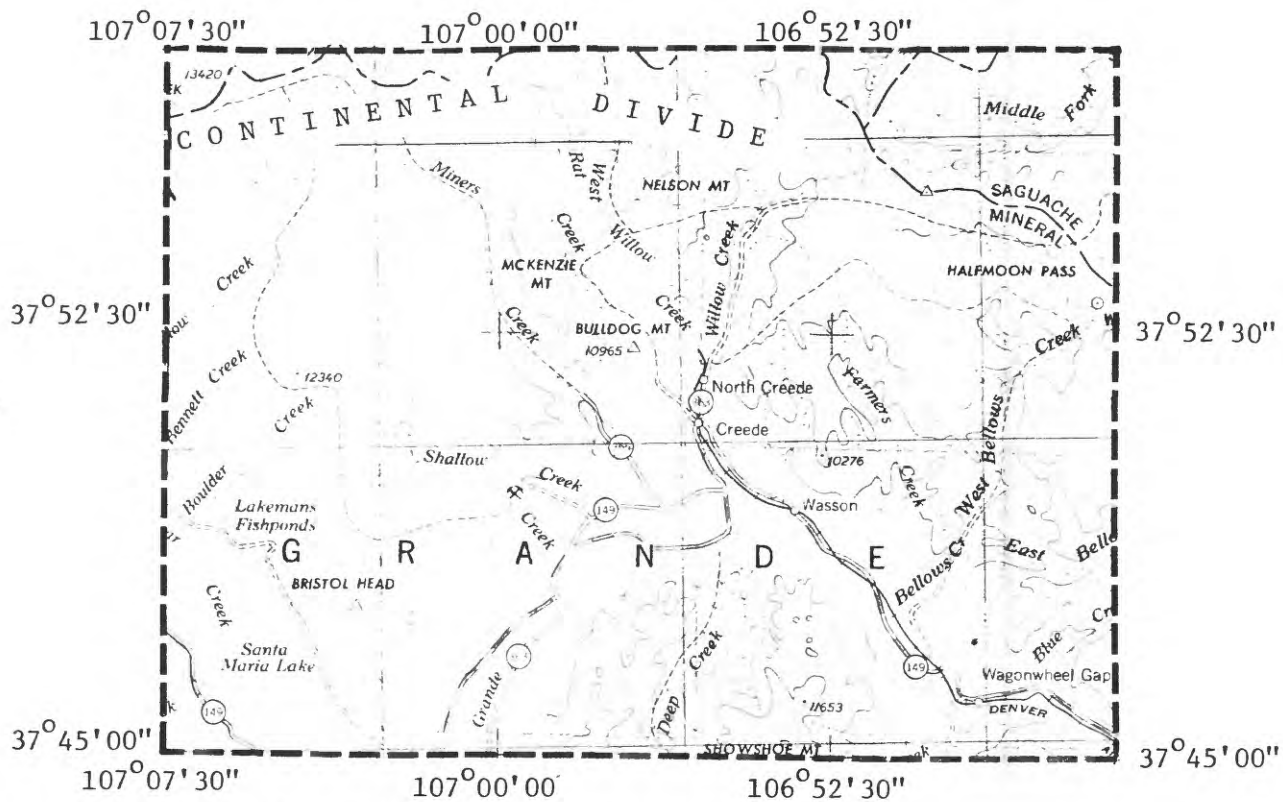


Figure 1. Location Map

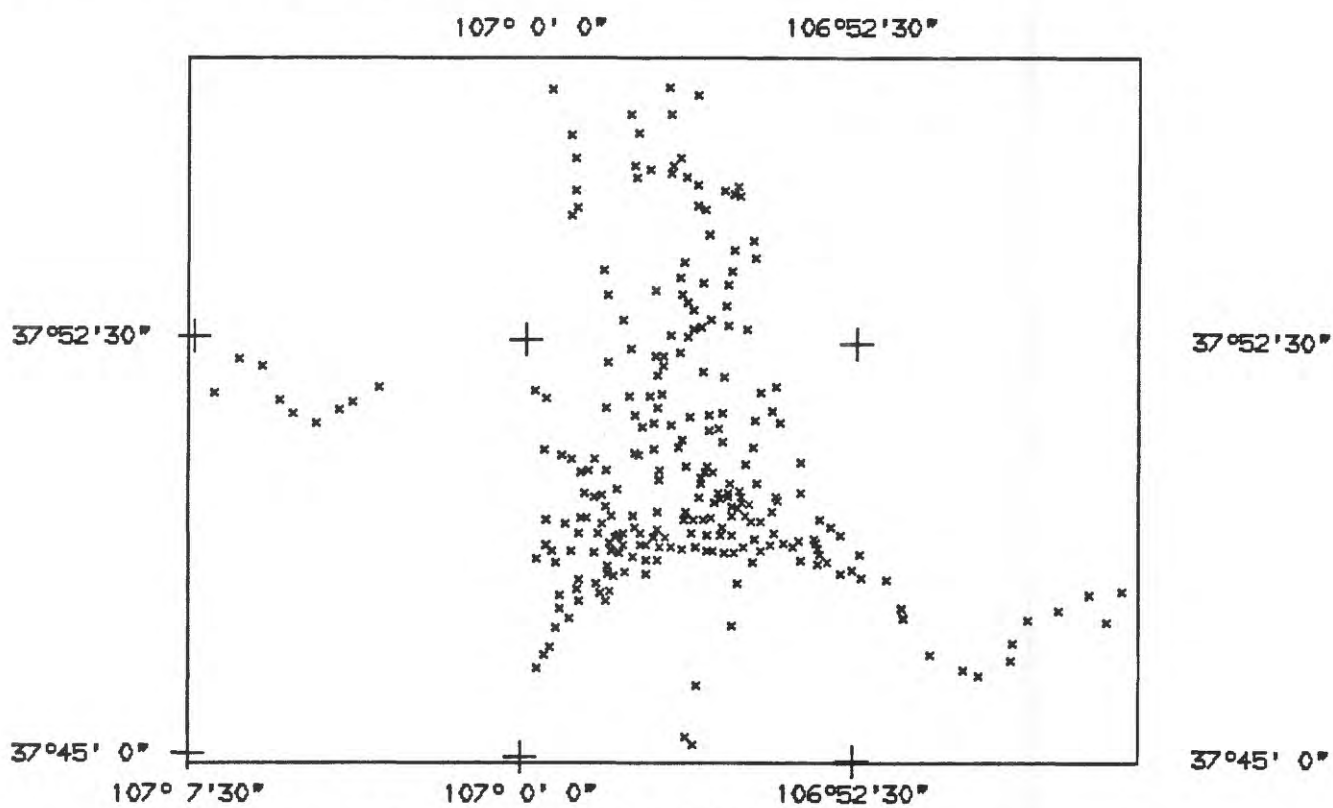
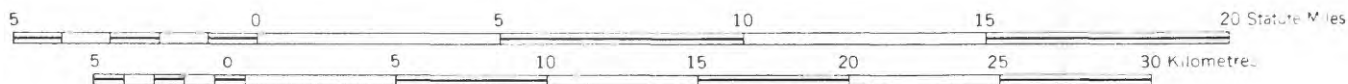


Figure 2. Location of Gravity Stations

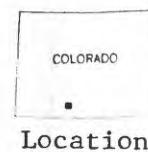


Table 1: Principal Facts of Gravity Data

Explanation of headings

Identification

proj	Not used
sta-id	Gravity station identification number

Locations

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	Terrain correction, 166.7 km radius, in milligals
Bouguer	Simple Bouguer slab correction in milligals
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 densities d_1 and d_2
spec fields	Not used

BOUGUER GRAVITY DATA

Creede, Colorado
gravity

STATION IDENTIFICATION proj sta-id	L O C A T I O N		ELEV (in ft)	ST OBSERVED	G R A V I T Y THEORETICAL	C U R R E C T I O N S		FREE AIR	A N O M A L I E S	
	LATITUDE deg min	LONGITUDE deg min				TERRAIN BOUGUER CURV (d1=2.67)	SPECIAL		COMPLETE-BOUGUER d1=2.67 d2=2.45	SPEC FIELDS
:b-6	37 48.98	-106 57.86	8689.00	CO	979137.01	979976.00	5.05	-296.36	-1.40	0.00
:loc11001	37 49.73	-106 55.63	8630.10	CO	979125.12	979977.09	3.61	-301.17	-1.38	0.00
:c-2	37 50.21	-106 55.89	9202.00	CO	979103.91	979977.80	4.95	-313.85	-1.33	0.00
:c-3	37 50.13	-106 55.93	9167.80	CO	979105.96	979977.68	4.46	-312.68	-1.33	0.00
:c-4	37 50.02	-106 56.00	9041.00	CO	979113.81	979977.52	3.57	-308.36	-1.35	0.00
:c-5	37 49.92	-106 55.02	8978.40	CO	979117.14	979977.38	3.61	-306.23	-1.36	0.00
:c-6	37 50.12	-106 55.76	9074.10	CO	979110.79	979977.66	3.95	-309.49	-1.35	0.00
:c-7	37 49.68	-106 56.05	8996.90	CO	979116.30	979977.02	4.17	-306.86	-1.36	0.00
:c-8	37 49.91	-106 55.38	8890.30	CO	979122.06	979977.36	3.89	-303.22	-1.37	0.00
:c-9	37 49.77	-106 55.15	8835.00	CO	979125.32	979977.16	3.84	-301.34	-1.38	0.00
:c-10	37 49.54	-106 54.93	8642.10	CO	979138.66	979976.82	4.46	-294.76	-1.41	0.00
:c-11	37 49.25	-106 54.88	8617.60	CO	979140.85	979976.39	4.45	-293.92	-1.41	0.00
:c-12	37 48.93	-106 54.81	8605.00	CO	979144.40	979975.93	5.13	-293.49	-1.41	0.00
:c-13	37 48.71	-106 54.68	8713.90	CO	979139.22	979975.61	5.02	-297.21	-1.40	0.00
:c-14	37 48.84	-106 54.46	8716.50	CO	979139.11	979975.40	4.87	-297.29	-1.40	0.00
:c-15	37 48.82	-106 54.12	8683.10	CO	979140.88	979975.63	5.87	-296.16	-1.40	0.00
:c-16	37 48.78	-106 53.93	8754.50	CO	979136.59	979975.71	5.76	-298.59	-1.39	0.00
:c-17	37 48.57	-106 53.76	8925.20	CO	979129.91	979975.40	6.74	-304.41	-1.37	0.00
:c-18	37 48.89	-106 53.78	8683.20	CO	979140.65	979975.87	5.59	-296.16	-1.40	0.00
:c-19	37 48.94	-106 53.46	8656.30	CO	979140.21	979975.95	5.51	-295.24	-1.40	0.00
:c-20	37 48.76	-106 53.36	8749.70	CO	979135.16	979975.68	6.10	-298.43	-1.39	0.00
:c-21	37 49.02	-106 54.35	8685.80	CO	979140.25	979976.05	4.63	-296.25	-1.40	0.00
:c-22	37 48.99	-106 55.29	8634.30	CO	979141.61	979976.02	4.69	-294.49	-1.41	0.00
:c-23	37 48.97	-106 55.56	8628.50	CO	979142.43	979975.98	5.12	-294.29	-1.41	0.00
:c-24	37 48.99	-106 55.87	8644.60	CO	979141.26	979976.02	5.28	-294.84	-1.41	0.00
:c-25	37 49.03	-106 56.21	8660.50	CO	979139.13	979976.07	4.83	-295.38	-1.40	0.00
:c-26	37 49.64	-106 55.57	8678.70	CO	979134.73	979976.96	4.60	-296.01	-1.40	0.00
:c-27	37 49.58	-106 55.72	8673.00	CO	979135.10	979976.88	4.65	-295.81	-1.40	0.00
:c-28	37 49.63	-106 54.27	8644.30	CO	979139.95	979976.95	4.59	-294.83	-1.41	0.00
:c-29	37 49.43	-106 54.39	8613.50	CO	979142.24	979976.66	4.56	-293.78	-1.41	0.00
:c-30	37 49.58	-106 55.10	8638.90	CO	979138.11	979976.86	4.70	-294.65	-1.41	0.00
:c-31	37 49.47	-106 55.17	8630.30	CO	979138.66	979976.72	4.60	-294.35	-1.41	0.00
:c-32	37 49.24	-106 54.87	8616.70	CO	979141.02	979976.38	4.45	-293.89	-1.41	0.00
:c-33	37 49.25	-106 54.68	8615.20	CO	979142.40	979976.39	4.47	-293.84	-1.41	0.00
:c-34	37 49.31	-106 56.04	8739.30	CO	979133.43	979976.48	4.71	-298.07	-1.39	0.00
:c-35	37 49.48	-106 58.19	8781.00	CO	979131.20	979976.73	4.76	-299.49	-1.39	0.00
:c-36	37 49.66	-106 58.42	8828.00	CO	979129.43	979976.99	5.17	-301.10	-1.38	0.00
:c-37	37 49.72	-106 58.64	8841.80	CO	979129.66	979977.08	5.85	-301.57	-1.38	0.00
:c-38	37 49.69	-106 58.24	8876.70	CO	979125.66	979977.04	4.65	-302.76	-1.38	0.00
:c-39	37 49.80	-106 57.92	8913.20	CO	979122.90	979977.20	4.19	-304.00	-1.37	0.00
:c-40	37 50.15	-106 58.18	9176.70	CO	979109.57	979977.71	4.33	-312.99	-1.33	0.00
:c-41	37 50.12	-106 58.56	9156.70	CO	979098.57	979977.66	4.64	-319.13	-1.30	0.00
:c-42	37 50.09	-106 58.74	9481.90	CO	979090.63	979977.62	5.67	-323.40	-1.28	0.00
:c-43	37 50.33	-106 58.98	9569.20	CO	979086.66	979977.97	4.51	-326.38	-1.27	0.00
:c-44	37 50.42	-106 59.20	9826.70	CO	979070.55	979978.10	5.48	-335.16	-1.22	0.00

BOUGUER GRAVITY DATA

creede, colorado
gravity

STATION IDENTIFICATION proj sta-id	L U C A T I O N		ELE (in ft)	ST	OBSERVED THEORETICAL	C O R R E C T I O N S		A N O M A L I E S	
	LATITUDE deg	LONGITUDE deg min				FERRAIN BOUGUER CURV (d1=2.67)	SPECIAL	FREE AIR	COMPLETE-BOUGUER d1=2.67 d2=2.45
:C-45	37 50.49	-106 59.57	10214.00	CO	979044.85	979978.20	0.00	26.71	-310.21 -282.45
:1046	37 51.56	-106 59.81	10752.00	CO	979009.86	979979.77	0.00	40.68	-320.43 -290.68
:1047	37 51.42	-106 59.56	10700.00	CO	979015.03	979979.50	0.00	41.17	-317.34 -287.80
:1048	37 50.35	-106 58.44	9116.00	CO	979115.70	979978.00	0.00	-5.38	-311.74 -286.50
:1049	37 50.46	-106 57.53	8836.00	CO	979130.11	979978.16	0.00	-17.44	-314.72 -290.23
:1050	37 50.43	-106 57.45	8836.00	CO	979127.94	979978.12	0.00	-19.56	-317.11 -292.59
:1051	37 51.29	-106 58.22	8996.00	CO	979117.44	979979.38	0.00	-16.29	-315.52 -290.86
:1052	37 51.13	-106 57.56	9020.00	CO	979113.11	979979.14	0.00	-18.13	-319.63 -294.79
:1053	37 51.50	-106 57.66	9293.00	CO	979099.97	979979.68	0.00	-6.17	-318.44 -292.71
:C-54	37 50.94	-106 57.39	9389.70	CO	979094.17	979978.86	0.00	-2.06	-318.05 -292.01
:C-55	37 51.02	-106 57.10	9542.10	CO	979084.73	979978.98	0.00	2.70	-319.56 -293.01
:C-56	37 51.27	-106 57.02	9689.50	CO	979075.32	979979.34	0.00	6.77	-320.64 -293.66
:C-57	37 51.52	-106 56.92	9901.30	CO	979061.83	979979.71	0.00	12.80	-321.32 -293.79
:C-58	37 51.50	-106 57.20	10033.10	CO	979053.08	979979.68	0.00	16.46	-319.55 -291.86
:C-59	37 51.85	-106 57.02	10289.30	CO	979037.41	979980.19	0.00	24.35	-321.56 -293.06
:C-60	37 52.04	-106 56.93	10460.60	CO	979026.58	979980.47	0.00	29.33	-322.61 -293.61
:C-61	37 50.51	-106 57.12	9065.00	CO	979113.82	979978.23	0.00	-12.29	-318.25 -293.04
:C-62	37 50.97	-106 56.70	9315.40	CO	979098.33	979978.91	0.00	-4.93	-319.99 -294.03
:C-63	37 50.70	-106 56.45	9344.90	CO	979095.38	979978.51	0.00	-4.70	-320.38 -294.37
:C-64	37 50.58	-106 56.55	9177.70	CO	979106.19	979978.34	0.00	-9.43	-320.14 -294.54
:C-65	37 50.21	-106 56.35	8993.90	CO	979116.45	979977.80	0.00	-15.89	-320.37 -295.28
:C-66	37 50.16	-106 56.96	9132.40	CO	979107.32	979977.72	0.00	-11.94	-318.80 -293.51
:3040	37 50.26	-106 55.01	8726.00	CO	979133.39	979977.87	0.00	-24.20	-318.07 -293.86
:3041	37 49.70	-106 54.33	8631.00	CO	979139.94	979977.05	0.00	-25.76	-316.73 -292.75
:3042	37 49.29	-106 53.32	8568.00	CO	979144.76	979976.45	0.00	-26.26	-314.66 -292.90
:3043	37 49.15	-106 53.06	8564.00	CO	979144.98	979976.25	0.00	-26.21	-314.33 -290.59
:3044	37 48.67	-106 52.42	8523.00	CO	979146.75	979975.55	0.00	-27.59	-313.24 -289.70
:3045	37 48.23	-106 51.78	8513.00	CO	979148.05	979974.91	0.00	-26.59	-312.18 -288.65
:3046	37 47.72	-106 51.45	8517.00	CO	979147.84	979974.16	0.00	-25.67	-310.83 -287.34
:3047	37 47.53	-106 51.40	8505.00	CO	979148.51	979973.88	0.00	-25.86	-309.80 -286.40
:3048	37 46.88	-106 50.79	8479.00	CO	979150.67	979972.94	0.00	-25.19	-308.56 -285.21
:q-49	37 48.86	-106 53.41	8739.10	CO	979135.18	979975.83	0.00	-19.14	-313.46 -289.20
:q-50	37 48.49	-106 53.34	9005.90	CO	979121.61	979975.28	0.00	-7.10	-307.48 -282.73
:q-51	37 48.67	-106 53.31	8833.80	CO	979130.26	979975.55	0.00	-14.88	-311.15 -286.74
:q-52	37 48.51	-106 53.15	8894.60	CO	979127.16	979975.31	0.00	-12.04	-307.25 -282.92
:q-53	37 48.33	-106 52.85	9010.80	CO	979129.78	979975.05	0.00	1.76	-296.83 -272.22
:q-54	37 48.40	-106 52.58	8801.30	CO	979131.94	979975.16	0.00	-16.26	-310.77 -286.51
:q-55	37 48.26	-106 52.35	8836.70	CO	979128.93	979974.95	0.00	-15.27	-311.63 -287.21
:q-56	37 49.02	-106 52.86	8559.90	CO	979145.71	979976.05	0.00	-25.67	-313.46 -289.74
:q-57	37 49.92	-106 54.76	8056.30	CO	979138.21	979977.38	0.00	-25.43	-317.00 -292.97
:q-58	37 50.90	-106 55.63	8863.40	CO	979126.05	979978.80	0.00	-19.57	-316.99 -292.48
:q-59	37 50.69	-106 55.56	8806.80	CO	979129.19	979978.50	0.00	-21.44	-317.12 -292.76
:q-60	37 51.14	-106 55.87	9054.30	CO	979115.40	979979.16	0.00	-12.64	-317.65 -292.52
:q-61	37 50.87	-106 55.87	8983.10	CO	979118.99	979978.76	0.00	-15.33	-318.29 -293.33
:q-62	37 51.10	-106 56.31	9172.50	CO	979107.82	979979.09	0.00	-9.05	-318.59 -293.08

BOUGUER GRAVITY DATA

creede, colorado
gravity

STATION IDENTIFICATION proj sta-id	L O C A T I O N		ELEV (in ft)	S T	G R A V I T Y OBSERVED	TERRAIN BOUGUER CURV (d1=2.67)	C O R R E C T I O N S		FREE AIR	A N O M A L I E S			
	LATITUDE deg min	LONGITUDE deg min					SPECIAL	COMPLETE-BOUGUER d1=2.67 d2=2.45 FIELDS					
:10c41076	37 57.04	-106 56.84	13241.00	CO	978858.80	979987.77	17.18	-451.61	-0.16	0.00	115.33	-319.26	-283.45
:c-77	37 56.89	-106 56.19	13137.30	CO	978864.05	979987.55	15.45	-448.08	-0.20	0.00	111.06	-321.76	-286.10
:1079	37 55.53	-106 57.25	11850.00	CO	978949.25	979985.56	11.29	-404.17	-0.68	0.00	77.39	-316.17	-283.74
:1083	37 51.95	-106 55.99	10292.00	CO	979036.80	979980.34	8.36	-351.03	-1.12	0.00	23.84	-319.94	-291.62
:c-d5	37 52.74	-106 56.05	10720.10	CO	979013.66	979961.49	7.24	-365.63	-1.01	0.00	39.76	-319.65	-290.04
:c-86	37 53.18	-106 56.36	10641.10	CO	979020.96	979982.13	5.40	-362.94	-1.03	0.00	39.00	-319.57	-290.03
:c-87	37 53.90	-106 56.45	10492.70	CO	979032.17	979983.19	4.12	-357.88	-1.07	0.00	35.22	-319.61	-290.37
:c-89	37 52.87	-106 55.82	9949.30	CO	979061.64	979981.68	5.97	-339.34	-1.19	0.00	15.16	-319.41	-291.84
:c-90	37 53.03	-106 56.21	10311.40	CO	979045.18	979981.91	4.35	-351.69	-1.11	0.00	32.47	-315.98	-287.27
:1092	37 51.46	-107 7.02	11429.00	CO	978963.11	979979.62	5.73	-389.81	-0.81	0.00	57.66	-327.23	-295.52
:1093	37 52.09	-107 6.49	11398.00	CO	978968.00	979980.54	3.91	-388.75	-0.82	0.00	58.72	-326.95	-295.17
:1094	37 51.96	-107 5.95	11302.00	CO	978974.20	979980.35	3.69	-385.48	-0.85	0.00	56.09	-326.55	-295.02
:1095	37 51.34	-107 5.56	11362.00	CO	978966.97	979979.45	4.06	-387.53	-0.83	0.00	55.40	-328.90	-297.24
:1096	37 51.10	-107 5.24	11390.00	CO	978969.72	979979.09	4.34	-388.48	-0.83	0.00	61.13	-323.84	-292.12
:1097	37 50.95	-107 4.73	11425.00	CO	978968.91	979978.66	3.77	-389.67	-0.82	0.00	63.82	-322.90	-291.03
:1098	37 51.19	-107 4.21	11444.00	CO	978969.55	979979.23	4.15	-390.32	-0.81	0.00	65.90	-321.09	-289.20
:1099	37 51.33	-107 3.93	11506.00	CO	978966.65	979979.43	4.27	-392.44	-0.79	0.00	70.62	-318.34	-286.29
:1100	37 51.62	-107 3.31	11784.00	CO	978948.27	979979.85	4.66	-401.92	-0.70	0.00	75.93	-322.03	-289.24
:1101	37 54.70	-106 59.01	11271.00	CO	978981.23	979984.35	4.20	-384.42	-0.86	0.00	56.20	-324.88	-293.48
:1102	37 54.85	-106 58.90	11268.00	CO	978982.09	979984.57	4.56	-384.32	-0.86	0.00	56.57	-324.05	-292.69
:1103	37 55.16	-106 58.95	11341.00	CO	978977.03	979985.02	4.88	-386.81	-0.84	0.00	57.91	-324.86	-293.32
:1104	37 55.73	-106 58.97	11371.00	CO	978973.55	979985.86	6.51	-387.83	-0.83	0.00	56.41	-325.75	-294.26
:1105	37 56.14	-106 59.03	11658.70	CO	978961.80	979986.46	4.75	-397.64	-0.74	0.00	71.07	-322.57	-290.13
:1106	37 56.96	-106 59.50	12297.00	CO	978926.48	979987.66	8.67	-419.42	-0.53	0.00	94.49	-316.78	-282.89
:1107	37 53.75	-106 58.28	11386.30	CO	978970.16	979982.97	7.35	-388.35	-0.83	0.00	57.34	-324.49	-293.03
:1108	37 52.84	-106 57.84	10203.50	CO	979043.20	979981.63	7.23	-348.01	-1.14	0.00	20.64	-321.28	-293.11
:1109	37 53.29	-106 58.19	10632.00	CO	979017.17	979982.30	6.05	-362.63	-1.04	0.00	34.19	-323.42	-293.95
:1110	37 50.59	-106 54.86	9057.00	CO	979115.01	979978.35	4.55	-308.91	-1.35	0.00	-11.97	-317.68	-292.49
:1111	37 51.05	-106 54.83	9314.00	CO	979104.34	979979.02	5.67	-317.67	-1.31	0.00	0.84	-312.47	-286.66
:1112	37 51.02	-106 54.24	9816.00	CO	979069.47	979978.98	6.05	-334.80	-1.22	0.00	13.17	-316.80	-289.61
:1113	37 51.58	-106 54.68	10408.00	CO	979028.83	979979.80	8.64	-354.99	-1.09	0.00	27.31	-320.13	-291.50
:1114	37 51.09	-106 54.35	10921.00	CO	978992.38	979979.95	13.37	-372.48	-0.96	0.00	38.89	-321.18	-291.52
:10c31115	37 51.22	-106 54.43	10041.10	CO	979054.46	979979.27	7.38	-342.47	-1.17	0.00	19.01	-317.26	-289.55
:1116	37 49.39	-106 56.36	8670.00	CO	979135.07	979976.60	4.86	-295.71	-1.40	0.00	-26.51	-318.76	-294.68
:1117	37 49.99	-106 56.98	8788.00	CO	979130.02	979977.48	4.20	-299.73	-1.39	0.00	-21.35	-318.27	-293.80
:1118	37 52.33	-106 57.63	10121.00	CO	979048.30	979980.89	5.09	-345.20	-1.16	0.00	18.73	-322.54	-294.42
:1119	37 52.11	-106 58.16	10300.00	CO	979037.59	979980.57	6.27	-351.30	-1.12	0.00	25.16	-320.99	-292.47

6

BOUGUER GRAVITY DATA

creede, colorado
gravity

STATION IDENTIFICATION proj sta-ld	L U C		A T I O N S ELE (in ft)	ST OBSERVED	G R A V I T Y THEORETICAL	TERRAIN BOUGUER CURV (dl=2.67)		SPECIAL	FREE AIR	A N D M A L I E S COMPLETE-BOUGUER dl=2.67 d2=2.45		SPEC FIELDS				
	deg	min				deg	min			deg	min					
:s-1	37	48.80	-106	55.07	8703.00	CO	979139.70	979975.73	4.48	-296.83	-1.40	0.00	-17.91	-311.66	-287.46	
:s-2	37	48.67	-106	55.26	8700.80	CO	979140.25	979975.55	5.02	-296.76	-1.40	0.00	-17.38	-310.52	-286.37	
:s-3	37	48.69	-106	55.50	8708.40	CO	979139.79	979975.58	4.75	-297.02	-1.40	0.00	-17.16	-310.83	-286.63	
:s-4	37	48.70	-106	55.73	8705.70	CO	979139.66	979975.59	4.80	-296.93	-1.40	0.00	-17.56	-311.09	-286.90	
:s-5	37	48.71	-106	55.86	8700.80	CO	979140.02	979975.61	5.03	-296.76	-1.40	0.00	-17.67	-310.80	-286.65	
:s-6	37	48.78	-106	56.13	8731.30	CO	979137.03	979975.71	4.48	-297.80	-1.39	0.00	-17.90	-312.61	-288.33	
:s-7	37	48.73	-106	56.42	8665.20	CO	979141.67	979975.63	5.44	-295.55	-1.40	0.00	-19.39	-310.90	-286.88	
:s-8	37	48.77	-106	56.70	8674.70	CO	979140.47	979975.70	5.04	-295.87	-1.40	0.00	-19.76	-312.00	-287.92	
:s-9	37	48.78	-106	56.96	8685.10	CO	979139.44	979975.71	4.84	-296.22	-1.40	0.00	-19.83	-312.62	-288.49	
:s-10	37	48.79	-106	57.25	8698.20	CO	979138.95	979975.73	4.67	-296.67	-1.40	0.00	-19.10	-312.50	-288.33	
:s-11	37	48.94	-106	57.10	8678.50	CO	979138.10	979975.95	4.92	-296.00	-1.40	0.00	-22.02	-314.50	-290.41	
:s-12	37	48.95	-106	56.83	8664.40	CO	979138.80	979975.95	5.03	-295.52	-1.40	0.00	-22.66	-314.55	-290.50	
:s-13	37	48.54	-106	57.24	8724.90	CO	979138.45	979975.36	4.79	-297.58	-1.40	0.00	-16.73	-310.91	-286.87	
:s-14	37	48.30	-106	57.26	8887.00	CO	979129.33	979975.01	4.55	-303.11	-1.37	0.00	-10.27	-310.21	-285.49	
:s-15	37	48.52	-106	56.99	8710.30	CO	979139.43	979975.33	5.16	-297.08	-1.40	0.00	-17.09	-310.41	-286.24	
:s-16	37	48.80	-106	57.40	8703.10	CO	979138.33	979975.73	4.73	-296.84	-1.40	0.00	-19.28	-312.78	-288.60	
:s-17	37	48.81	-106	57.78	8718.10	CO	979136.19	979975.75	4.57	-297.35	-1.40	0.00	-20.02	-314.20	-289.96	
:s-18	37	48.67	-106	57.84	8726.30	CO	979136.28	979975.55	4.65	-297.63	-1.40	0.00	-18.96	-313.33	-289.07	
:s-19	37	48.68	-106	58.02	8722.30	CO	979136.26	979975.56	4.74	-297.49	-1.40	0.00	-19.37	-313.52	-289.28	
:s-20	37	48.82	-106	58.07	8718.20	CO	979136.17	979975.77	4.82	-297.35	-1.40	0.00	-20.04	-313.97	-289.75	
:s-21	37	48.94	-106	57.94	8720.30	CO	979135.76	979975.95	4.66	-297.42	-1.40	0.00	-20.44	-314.60	-290.36	
:s-22	37	48.67	-106	58.12	8730.60	CO	979135.77	979975.55	5.13	-297.78	-1.39	0.00	-19.04	-313.09	-288.86	
:s-23	37	49.76	-106	55.40	8697.30	CO	979133.40	979977.14	4.48	-296.64	-1.40	0.00	-26.16	-319.72	-295.53	
:s-24	37	49.69	-106	55.08	8666.00	CO	979136.13	979977.04	4.46	-295.59	-1.40	0.00	-26.21	-318.74	-294.64	
:s-25	37	49.34	-106	55.01	8626.60	CO	979139.45	979976.52	4.46	-294.23	-1.41	0.00	-26.13	-317.30	-293.31	
:s-26	37	49.33	-106	55.30	8635.10	CO	979138.54	979976.51	4.58	-294.52	-1.41	0.00	-26.23	-317.57	-293.57	
:s-27	37	49.14	-106	55.54	8645.50	CO	979138.07	979976.23	4.77	-294.87	-1.41	0.00	-25.45	-316.95	-292.93	
:s-28	37	49.29	-106	55.77	8648.70	CO	979137.79	979976.45	4.73	-294.98	-1.40	0.00	-25.64	-317.30	-293.27	
:s-29	37	49.28	-106	55.96	8654.70	CO	979137.48	979976.44	4.76	-295.19	-1.40	0.00	-25.38	-317.21	-293.16	
:s-30	37	49.26	-106	56.17	8664.20	CO	979136.93	979976.41	4.78	-295.51	-1.40	0.00	-25.00	-317.13	-293.06	
:s-31	37	49.25	-106	56.41	8673.50	CO	979135.96	979976.39	4.60	-295.83	-1.40	0.00	-25.08	-317.71	-293.60	
:s-32	37	49.09	-106	56.99	8684.70	CO	979136.19	979976.16	4.69	-296.21	-1.40	0.00	-23.58	-316.50	-292.36	
:s-33	37	49.02	-106	57.37	8683.20	CO	979137.75	979976.05	4.88	-296.16	-1.40	0.00	-22.04	-314.72	-290.61	
:s-34	37	49.66	-106	55.41	8660.30	CO	979135.83	979976.99	4.80	-295.38	-1.40	0.00	-27.05	-319.04	-294.98	
:s-35	37	49.50	-106	55.32	8633.40	CO	979138.05	979976.76	4.71	-294.46	-1.41	0.00	-27.13	-318.29	-294.30	
:LOC23001	37	49.18	-106	58.26	8854.70	CO	979126.00	979976.29	4.28	-302.01	-1.38	0.00	-17.92	-317.02	-292.38	
:g-2	37	48.99	-106	58.33	8684.90	CO	979137.51	979976.02	5.79	-296.22	-1.40	0.00	-22.09	-313.91	-289.87	
:g-3	37	48.16	-106	58.78	8749.30	CO	979135.58	979974.80	5.43	-298.41	-1.39	0.00	-16.76	-311.13	-286.88	
:g-4	37	48.01	-106	58.79	8749.10	CO	979136.01	979974.59	5.45	-298.41	-1.39	0.00	-16.13	-310.48	-286.22	
:3005	37	47.78	-106	58.74	8769.00	CO	979135.89	979974.25	5.43	-299.09	-1.39	0.00	-14.04	-309.08	-284.77	
:3006	37	47.49	-106	58.97	8780.00	CO	979136.13	979973.63	5.59	-299.46	-1.39	0.00	-12.34	-307.60	-283.27	
:g-7	37	47.64	-106	59.17	8776.60	CO	979135.81	979974.05	5.97	-299.34	-1.39	0.00	-13.20	-307.96	-283.67	
:3008	37	47.90	-106	59.17	8776.00	CO	979136.01	979974.42	6.17	-299.32	-1.39	0.00	-13.43	-307.98	-283.71	
:g-9	37	47.32	-106	59.28	8793.20	CO	979135.70	979973.58	5.68	-299.91	-1.39	0.00	-11.28	-306.90	-282.54	

creede, colorado
gravity

STATION IDENTIFICATION proj sta-id	L O C A T I O N LATITUDE LONGITUDE deg min deg min	ELE (in ft)	G R A V I T Y ST OBSERVED THEORETICAL	FERRAIN BOUGUER CURV (dl=2.67)	C O R R E C T I O N S SPECIAL	A N O M A L I E S FREE COMPLETE-BOUGUER SPEC AIR dl=2.67 dz=2.45 FIELDS
:g-10	37 46.97 -106 59.36	8790.40	CO 979135.98	979973.07	5.77 -299.82 -1.39	0.00 -10.76 -306.19 -281.85
:g-11	37 46.81 -106 59.52	8820.50	CO 979136.21	979972.64	5.52 -300.84 -1.38	0.00 -7.46 -304.17 -279.72
:g-12	37 46.57 -106 59.70	8832.20	CO 979133.79	979972.48	5.54 -301.24 -1.38	0.00 -8.44 -305.52 -281.04
:g-13	37 49.27 -106 58.62	8958.60	CO 979121.93	979976.42	4.54 -305.55 -1.36	0.00 -12.36 -314.74 -289.82
:g-14	37 49.15 -106 59.08	9203.60	CO 979108.75	979976.25	4.78 -313.91 -1.33	0.00 -2.35 -312.81 -287.23
:g-15	37 49.24 -106 59.51	9633.20	CO 979081.74	979976.38	5.20 -328.56 -1.25	0.00 10.86 -313.75 -287.00
:g-16	37 48.79 -106 59.51	9156.00	CO 979111.64	979975.73	7.54 -312.28 -1.33	0.00 -3.41 -309.49 -284.27
:g-17	37 48.67 -106 59.37	8983.30	CO 979121.16	979975.55	7.99 -306.39 -1.36	0.00 -9.94 -309.70 -285.00
:g-18	37 48.56 -106 59.70	9247.60	CO 979106.06	979975.39	7.69 -315.41 -1.32	0.00 -0.05 -309.09 -283.62
:g-19	37 48.46 -106 59.29	9014.40	CO 979118.48	979975.24	5.60 -307.46 -1.36	0.00 -9.39 -312.60 -287.62
:g-20	37 48.67 -106 58.95	8909.30	CO 979124.64	979975.55	5.28 -303.87 -1.37	0.00 -13.40 -313.37 -288.65
:g-21	37 49.00 -106 58.75	8918.60	CO 979124.31	979976.03	4.94 -304.19 -1.37	0.00 -13.29 -313.91 -289.14
:g-22	37 49.27 -106 58.75	8994.40	CO 979120.51	979976.42	4.75 -306.77 -1.36	0.00 -10.42 -313.80 -288.80
:g-23	37 48.43 -106 58.13	8722.30	CO 979136.52	979975.20	5.08 -297.49 -1.40	0.00 -18.74 -312.55 -288.34
:g-24	37 48.29 -106 58.10	8737.80	CO 979136.66	979974.99	5.04 -298.02 -1.39	0.00 -16.95 -311.27 -287.02
:g-25	37 48.11 -106 58.36	8743.00	CO 979136.19	979974.73	5.34 -298.20 -1.39	0.00 -16.66 -310.91 -286.67
:g-26	37 47.93 -106 58.29	8923.90	CO 979126.08	979974.47	5.05 -304.37 -1.37	0.00 -9.52 -310.20 -285.43
:g-27	37 47.79 -106 58.16	9171.00	CO 979111.11	979974.27	7.25 -313.00 -1.33	0.00 -0.51 -307.59 -282.29
:g-28	37 47.98 -106 58.06	8971.60	CO 979122.93	979974.54	5.29 -306.00 -1.36	0.00 -8.25 -310.32 -285.43
:g-29	37 48.24 -106 57.97	8733.90	CO 979136.79	979974.92	5.32 -297.89 -1.39	0.00 -17.11 -311.07 -286.85
:g-30	37 48.32 -106 57.73	8721.40	CO 979138.06	979975.04	4.95 -296.90 -1.40	0.00 -17.13 -310.63 -286.45
:g-31	37 48.58 -106 57.55	8704.90	CO 979139.23	979975.41	4.74 -296.50 -1.40	0.00 -17.89 -311.28 -287.10
:g-32	37 49.30 -106 57.56	8694.90	CO 979135.38	979976.47	4.79 -296.44 -1.40	0.00 -23.73 -316.94 -292.78
:g-33	37 49.11 -106 57.53	8691.40	CO 979136.34	979976.19	4.79 -296.44 -1.40	0.00 -22.81 -315.86 -291.71
:g-34	37 49.40 -106 57.02	8691.00	CO 979134.45	979976.62	4.61 -296.42 -1.40	0.00 -25.17 -318.39 -294.23
:brod-p-6	37 49.01 -106 57.76	8689.00	CO 979136.98	979976.05	4.79 -296.36 -1.40	0.00 -22.26 -315.23 -291.09
:1068	37 45.23 -106 56.12	9890.00	CO 979070.10	979970.53	6.60 -337.32 -1.20	0.00 29.20 -302.73 -275.38
:1069	37 45.36 -106 56.29	9807.00	CO 979073.64	979970.72	7.25 -334.49 -1.22	0.00 24.75 -303.71 -276.64
:1070	37 46.08 -106 56.15	9758.00	CO 979091.90	979971.77	5.01 -332.82 -1.23	0.00 37.36 -291.68 -264.57
:1071	37 46.29 -106 56.04	9492.00	CO 979097.46	979972.07	7.68 -323.74 -1.28	0.00 17.63 -299.71 -273.56
:1073	37 47.38 -106 55.30	9115.00	CO 979114.02	979973.66	11.49 -310.89 -1.34	0.00 -2.81 -303.55 -278.77
:1074	37 48.12 -106 55.17	8902.00	CO 979127.02	979974.74	6.39 -303.62 -1.37	0.00 -10.90 -309.51 -284.90
:1075	37 48.50 -106 54.82	8751.00	CO 979137.22	979975.30	5.62 -298.47 -1.39	0.00 -15.45 -309.69 -285.45
:s-100	37 55.40 -106 57.54	10950.40	CO 979004.40	979985.38	6.08 -373.49 -0.95	0.00 48.24 -320.12 -289.76
:s-101	37 55.62 -106 57.59	10955.60	CO 979004.83	979985.70	6.30 -373.66 -0.95	0.00 48.84 -319.41 -289.07
:2102	37 56.19 -106 57.53	11121.00	CO 978994.50	979986.53	9.16 -379.31 -0.90	0.00 53.21 -317.84 -287.27
:2103	37 56.52 -106 57.69	11195.00	CO 978991.78	979987.02	9.07 -381.83 -0.88	0.00 56.96 -316.69 -285.90
:2105	37 53.62 -106 56.54	10449.00	CO 979035.12	979982.77	3.97 -356.39 -1.08	0.00 34.47 -319.02 -289.90
:2106	37 53.31 -106 56.49	10539.00	CO 979027.40	979982.32	3.79 -359.45 -1.06	0.00 35.66 -321.06 -291.67
:2107	37 52.71 -106 56.20	10712.00	CO 979015.69	979981.45	5.68 -365.36 -1.02	0.00 41.07 -319.62 -289.90
:2108	37 52.57 -106 56.36	10526.00	CO 979027.06	979981.24	4.00 -359.01 -1.06	0.00 35.18 -320.89 -291.55
:2143	37 53.73 -106 55.36	10597.00	CO 979026.83	979982.94	3.95 -361.43 -1.04	0.00 39.92 -318.61 -289.07
:2109	37 52.28 -106 56.53	10289.00	CO 979041.43	979980.62	4.24 -350.93 -1.12	0.00 27.77 -320.03 -291.37
:2110	37 52.59 -106 56.75	10370.00	CO 979035.79	979981.27	4.70 -353.69 -1.10	0.00 29.22 -320.87 -292.02
:2111	37 53.39 -106 57.11	10850.00	CO 979011.01	979982.44	3.77 -370.06 -0.98	0.00 48.36 -318.91 -288.65

BOUGUER GRAVITY DATA

creede, colorado
gravity

STATION IDENTIFICATION proj sta-id	L O C A T I O N		E L E (in ft)	S I	O B S E R V E D	T H E O R E T I C A L	C O R R E C T I O N S		S P E C I A L	A N O M A L I E S	
	deg	min					T E R R A I N	BOUGUER CURV (d1=2.07)		F R E E A I R	C O M P L E T E - B O U G U E R d1=2.67 d2=2.45 F I E L D S
:s-112	37 52.22	-106 56.90	10805.60	CO	979003.87	979980.73	9.46	-368.55	-0.99	38.75	-321.32 -291.66
:s-113	37 52.22	-106 57.09	10963.00	CO	978990.85	979980.73	13.15	-373.92	-0.95	40.52	-321.19 -291.39
:2114	37 46.62	-106 50.03	8464.00	CO	979151.44	979972.55	7.15	-288.68	-1.43	-25.45	-308.41 -285.09
:2115	37 46.51	-106 49.68	9142.00	CO	979111.88	979972.40	8.11	-311.81	-1.34	-1.15	-306.19 -281.05
:2116	37 46.81	-106 48.96	9356.00	CO	979100.89	979972.84	4.61	-319.11	-1.30	7.52	-308.28 -282.26
:2117	37 47.10	-106 48.94	9491.00	CO	979092.55	979973.26	3.97	-323.71	-1.28	11.44	-309.58 -283.13
:2118	37 47.52	-106 48.56	9692.00	CO	979080.85	979973.87	3.74	-330.57	-1.24	18.01	-310.06 -283.03
:2119	37 47.71	-106 47.89	10061.00	CO	979057.48	979974.15	4.02	-343.15	-1.17	29.02	-311.28 -283.24
:2120	37 48.00	-106 47.19	10218.00	CO	979046.67	979974.57	5.01	-348.51	-1.13	32.54	-312.09 -283.70
:2121	37 47.49	-106 46.80	10384.00	CO	979032.34	979973.83	14.18	-354.17	-1.10	34.54	-306.54 -278.44
:2122	37 48.06	-106 46.45	10421.00	CO	979035.90	979974.66	4.51	-355.43	-1.09	40.74	-311.26 -282.26
:2128	37 53.53	-106 56.03	10381.50	CO	979040.80	979982.64	3.81	-354.08	-1.10	33.95	-317.42 -288.47
:2129	37 55.27	-106 56.16	11881.20	CO	978946.97	979985.19	6.06	-405.23	-0.67	78.41	-321.43 -288.49
:2130	37 54.91	-106 56.18	12090.00	CO	978929.00	979984.66	12.21	-412.36	-0.60	80.58	-320.16 -287.14
:2131	37 54.83	-106 56.00	12039.00	CO	978929.67	979984.55	11.71	-410.62	-0.62	76.57	-322.95 -290.03
:2132	37 55.18	-106 55.58	11852.50	CO	978946.08	979985.05	6.82	-404.25	-0.68	74.96	-323.16 -290.35
:2133	37 55.12	-106 55.34	11909.00	CO	978938.60	979984.97	8.77	-406.18	-0.66	72.87	-325.20 -292.40
:2134	37 55.09	-106 55.23	11918.00	CO	978936.99	979984.92	10.50	-406.39	-0.66	72.16	-324.49 -291.81
:2135	37 55.26	-106 55.26	11915.00	CO	978940.16	979985.17	8.21	-406.64	-0.64	74.79	-324.05 -291.18
:2136	37 55.42	-106 56.42	11981.00	CO	978941.02	979985.41	6.57	-408.64	-0.64	81.62	-321.09 -287.90
:2137	37 55.74	-106 56.58	11949.00	CO	978942.04	979985.88	6.58	-407.55	-0.65	79.16	-322.45 -289.36
:2138	37 55.62	-106 56.75	11932.00	CO	978945.89	979985.70	8.24	-406.97	-0.65	81.60	-317.78 -284.88
:2139	37 55.48	-106 56.79	11934.00	CO	978944.22	979985.49	8.40	-407.03	-0.65	80.31	-318.97 -286.07
:2140	37 54.37	-106 55.91	11246.50	CO	978986.60	979983.67	5.71	-383.59	-0.87	59.76	-318.98 -287.78
:2141	37 53.49	-106 55.44	10904.00	CO	979007.94	979982.59	9.15	-371.90	-0.96	46.42	-317.30 -287.33
:2142	37 54.10	-106 55.34	10871.00	CO	979004.14	979983.48	5.67	-370.78	-0.97	46.22	-319.86 -289.69
:2144	37 54.28	-106 54.84	10016.00	CO	979059.42	979983.74	9.11	-341.62	-1.18	17.14	-316.55 -289.05
:2145	37 53.98	-106 54.84	9703.00	CO	979076.01	979983.30	14.04	-330.94	-1.24	17.14	-313.38 -287.17
:4001	37 51.18	-106 55.57	8848.00	CO	979128.16	979979.21	8.13	-301.78	-1.38	-19.31	-314.34 -290.03
:4002	37 51.83	-106 55.50	8952.00	CO	979115.43	979980.16	21.49	-305.33	-1.37	-23.22	-308.42 -284.92
:4003	37 52.71	-106 55.00	9242.00	CO	979094.90	979981.45	20.55	-315.22	-1.32	-17.79	-313.78 -289.39
:4004	37 53.11	-106 55.47	10562.50	CO	979026.79	979982.03	5.95	-360.26	-1.05	37.55	-317.81 -288.53
:10C54005	37 52.76	-106 55.42	10687.00	CO	979013.69	979981.52	12.06	-364.50	-1.02	36.65	-316.81 -287.69
:4006	37 49.75	-106 53.74	8642.00	CO	979142.45	979977.13	5.19	-294.75	-1.41	-22.28	-313.25 -289.28
:4007	37 50.31	-106 53.77	8832.00	CO	979129.75	979977.95	6.25	-301.23	-1.38	-17.96	-314.32 -289.90

REFERENCES CITED

- Cordell, Lindrith, Keller, G. R., and Hildenbrand, T. G., 1982, Bouguer Gravity Map of the Rio Grande Rift, Colorado, New Mexico, and Texas, U.S. Geological Survey GP-949.
- Defense Mapping Agency, 1974, World Relative Gravity Reference Network, North America, Part 2: Defense Mapping Agency Aerospace Center Reference Publication 25, with supplement updating gravity values to the International Gravity Standardization Net 1971, Aerospace Center, St. Louis, AFS, MO, 1635 p.
- International Association of Geodesy, 1971, Geodetic Reference System, 1967, International Association of Geodesy, Special Publication, no. 3, 116 p.
- Plouff, D., 1977, Preliminary documentation for a FORTRAN program to compute gravity terrain corrections based on topography digitized on a geographic grid: U.S. Geological Survey Open-File Report 77-535, 43 p.

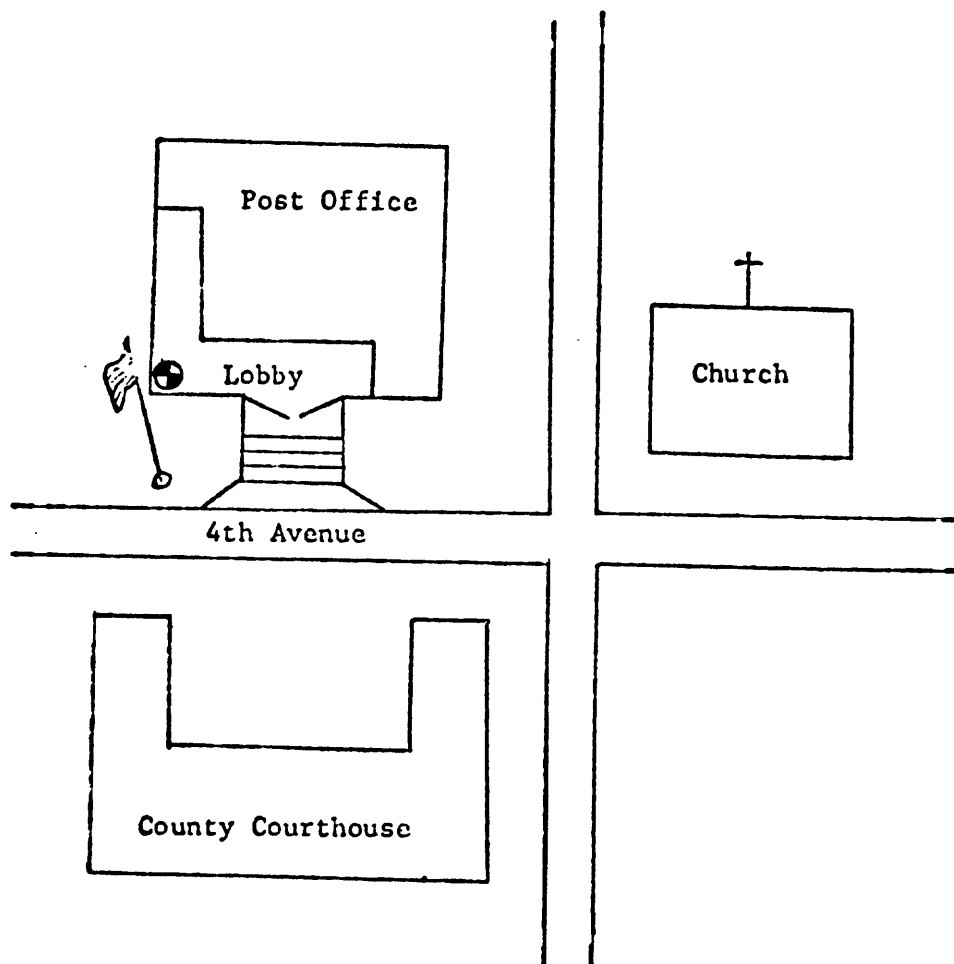
APPENDIX A

GRAVITY BASE STATION

LATITUDE		37° 28.21'N (1)	STATION DESIGNATION	
LONGITUDE		105° 52.16'W (1)	ALAMOSA	
ELEVATION		2300.9 METERS (1)	COUNTRY/STATE	
			USA/Colorado	
REFERENCE CODE NUMBERS			ADOPTED GRAVITY VALUE	
ACIC 4016-1			g = 979 234.98 mgals	
IGB 71975B				
			ESTIMATED ACCURACY	DATE
			± 0.1 mgals	MONTH/YEAR
				1971

DESCRIPTION AND/OR SKETCH

The station is located at the Post Office in Alamosa, on the corner of San Juan Avenue and 4th Avenue, in the southwest corner of the Post Office lobby. It is marked with a USAF Gravity disc. (1)



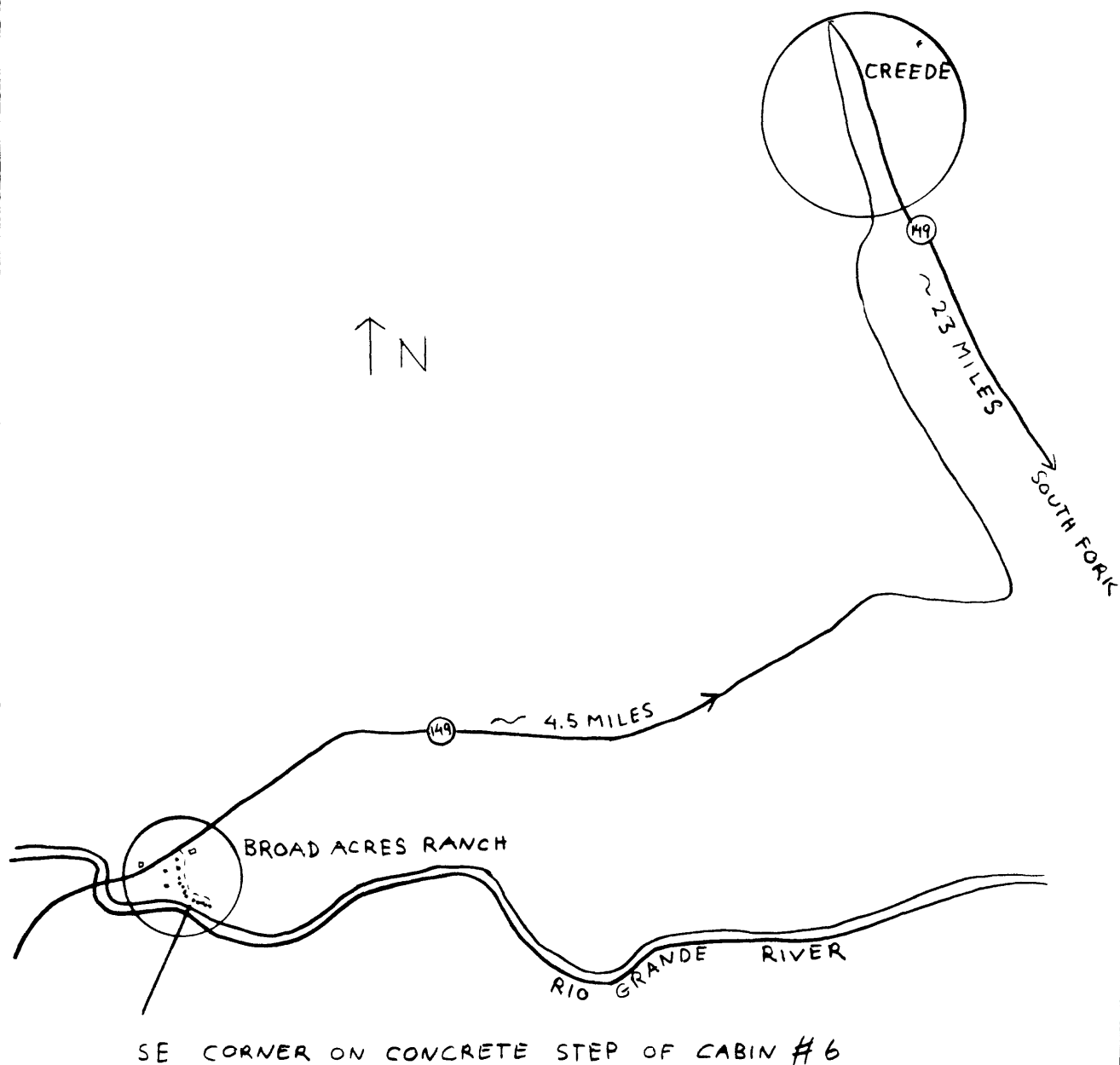
(1)

APPENDIX B

SECONDARY GRAVITY BASE STATION

LATITUDE	37°48.98'N (1)	STATION DESIGNATION CREEDE	
LONGITUDE	106°57.86'W (1)		
ELEVATION	8689 ft METERS (1)	COUNTRY/STATE USA/Colorado	
REFERENCE CODE NUMBERS		ADOPTED GRAVITY VALUE	
		$g =$ 979137.01 mgals	
		ESTIMATED ACCURACY	DATE
		\pm 0.1 mgals	MONTH/YEAR 5/1985

DESCRIPTION AND/OR SKETCH



REFERENCE SOURCE

12

(1)