UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

Principal Facts for Gravity Stations in the Wolf Creek Anticline Area, Piceance Basin, Colorado

by

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TABLES

DATA COLLECTION

A Gravity survey was made across the Wolf Creek anticline in the Piceance basin, Colorado (fig. 1) in Sept 1988. Gravity observations were made using La Coste and Romberg gravity meter G-551. The gravity stations were referenced to the U.S. Department of Defense (Defense Mapping Agency, 1974) base at Carbondale, Colorado (Appendix A). Gravity loops were started and closed daily. Access to the survey area was by secondary roads.

ELEVATION CONTROL

The survey area is bounded by latitudes $39^{o}16'00"$ - $39^{o}23'00"$N and longitudes $107^{o}22'00"$ - $107^{o}28'00"$W. Thirty-four stations were obtained from locations on U.S. Geological Survey topographic maps, Quaker Mesa, and Stony Ridge, scale 1:24,000. The uncertainty of elevation is one-half the contour interval; the correction factor is .06 mGal/foot; thus on a map with 40 ft contour intervals, the maximum Bouguer and free-air correction error is estimated to be 20 ft x .06 mGal = 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 calculate principal facts and terrain-corrected gravity values. A program written by M. W. Webring (USGS, 1984, unpub. program) was used to reduce gravimeter readings to observed gravity values by calculating and correcting for earth-tides 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. A density of 2.67 g/cc 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/cc. The corrections and gravity anomaly values are listed in table 1.

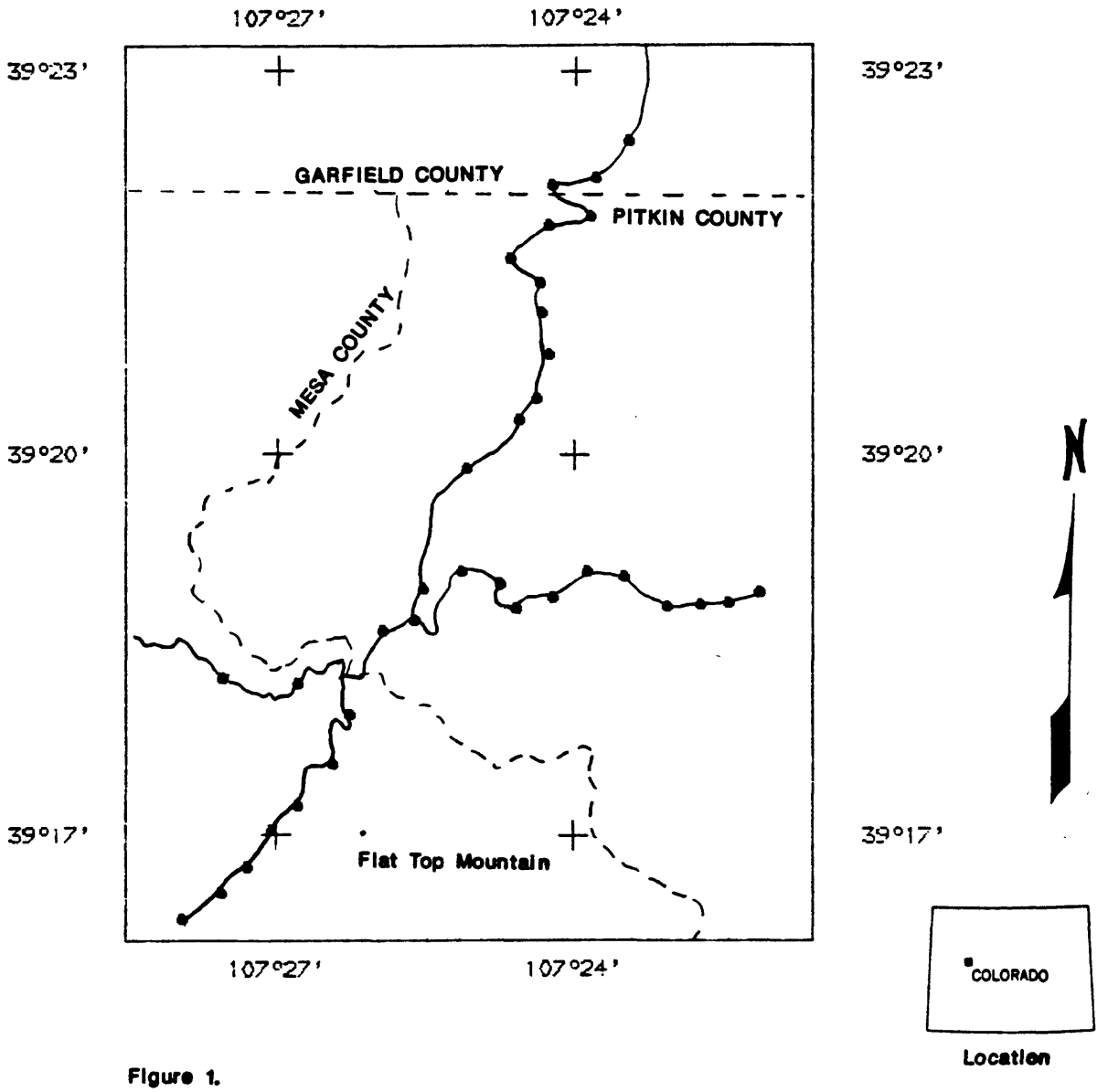

Figure 1.

WOLF CREEK ANTICLINE, GRAVITY STATIONS
scale 1:100,000

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 meters
st	Not used

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 d1 and d2
spec fields	Not used

BOUGUER GRAVITY DATA

WOLF CREEK ANTICLINE, CO
SEPT. 1988
2a-551 elev=f ou=.01 srt=tme a-h 1-x

STATION IDENTIFICATION proj	sta-id	LOCATIONS LATITUDE deg	min	LONGITUDE deg	min	ELE (in ft)	ST	GRAVITY OBSERVED	THEORETICAL	CORRECTIONS TERRAIN (d1=2.67)	BOUGUER	CURV	SPECIAL	ANOMALIES FREE AIR	COMPLETE-BOUGUER d1=2.67	d2=2.45	SPE FIEL
	:143	39	22.46	-107	23.46	9200.00	CO	979279.31	980113.35	2.55	-313.79	-1.33	0.00	30.74	-281.82	-256.07	
	:144	39	22.11	-107	24.24	9520.00	CO	979260.29	980112.84	3.56	-324.70	-1.27	0.00	42.29	-280.12	-253.56	
	:145	39	21.86	-107	23.86	9720.00	CO	979248.40	980112.47	4.53	-331.52	-1.24	0.00	49.55	-278.68	-251.63	
	:146	39	21.79	-107	24.28	9920.00	CO	979235.22	980112.36	6.26	-338.34	-1.20	0.00	55.27	-278.01	-250.55	
	:147	39	21.53	-107	24.66	9720.00	CO	979248.44	980111.98	3.81	-331.52	-1.24	0.00	50.08	-278.86	-251.76	
	:148	39	21.10	-107	24.34	9560.00	CO	979255.58	980111.34	3.14	-326.06	-1.27	0.00	42.83	-281.36	-254.65	
	:149	39	20.77	-107	24.28	9460.00	CO	979260.36	980110.86	2.98	-322.65	-1.29	0.00	38.70	-282.26	-255.81	
	:150	39	20.27	-107	24.57	9160.00	CO	979277.94	980110.12	2.33	-312.42	-1.33	0.00	28.84	-282.58	-256.92	
	:151	39	19.88	-107	25.10	9210.00	CO	979275.02	980109.54	2.93	-314.13	-1.33	0.00	31.20	-281.32	-255.57	
	:152	39	18.69	-107	25.62	9505.00	CO	979254.92	980107.78	3.03	-324.19	-1.28	0.00	40.57	-281.87	-255.30	
	:153	39	22.17	-107	23.80	9320.00	CO	979267.87	980112.92	3.05	-317.88	-1.31	0.00	31.00	-285.14	-259.09	
	:154	39	21.34	-107	24.37	9600.00	CO	979253.67	980111.70	3.30	-327.43	-1.26	0.00	44.33	-281.06	-254.25	
	:155	39	20.44	-107	24.39	9280.00	CO	979270.07	980110.37	3.03	-316.51	-1.32	0.00	32.00	-282.80	-256.86	
	:156	39	18.94	-107	25.53	9460.00	CO	979255.24	980108.15	2.94	-322.65	-1.29	0.00	36.30	-284.70	-258.25	
	:157	39	18.60	-107	25.93	9560.00	CO	979252.46	980107.65	3.42	-326.06	-1.27	0.00	43.41	-280.50	-253.81	
	:158	39	17.94	-107	26.27	9620.00	CO	979250.24	980106.67	6.35	-328.11	-1.26	0.00	47.80	-275.22	-248.60	
	:159	39	17.55	-107	26.44	9200.00	CO	979276.21	980106.09	4.76	-313.79	-1.33	0.00	34.90	-275.46	-249.88	
	:160	39	17.23	-107	26.80	8840.00	CO	979297.02	980105.63	3.68	-301.51	-1.38	0.00	22.36	-276.85	-252.19	
	:161	39	17.03	-107	27.05	8680.00	CO	979306.38	980105.33	3.09	-296.05	-1.40	0.00	16.99	-277.38	-253.12	
	:162	39	16.33	-107	27.96	8360.00	CO	979326.88	980104.30	3.30	-285.14	-1.44	0.00	8.45	-274.82	-251.48	
	:163	39	16.54	-107	27.57	8440.00	CO	979320.55	980104.60	3.54	-287.86	-1.43	0.00	9.33	-276.42	-252.88	
	:164	39	16.74	-107	27.31	8540.00	CO	979314.41	980104.90	3.20	-291.27	-1.42	0.00	12.29	-277.21	-253.35	
	:165	39	18.92	-107	22.12	9640.00	CO	979244.55	980108.13	5.31	-328.79	-1.25	0.00	42.53	-282.20	-255.45	
	:166	39	18.84	-107	22.44	9760.00	CO	979237.78	980108.00	5.66	-332.89	-1.23	0.00	47.16	-281.29	-254.23	
	:167	39	18.82	-107	22.72	9840.00	CO	979229.74	980107.98	6.51	-335.61	-1.21	0.00	46.66	-283.66	-256.44	
	:168	39	18.80	-107	23.06	9880.00	CO	979228.45	980107.95	6.26	-336.98	-1.21	0.00	49.16	-282.76	-255.41	
	:169	39	19.03	-107	23.51	9880.00	CO	979227.42	980108.28	7.35	-336.98	-1.21	0.00	47.79	-283.04	-255.78	
	:170	39	19.08	-107	23.87	9880.00	CO	979227.46	980108.36	7.58	-336.98	-1.21	0.00	47.75	-282.85	-255.61	
	:171	39	18.87	-107	24.23	9880.00	CO	979231.95	980108.05	4.99	-336.98	-1.21	0.00	52.56	-280.64	-253.18	
	:172	39	18.78	-107	24.59	9920.00	CO	979229.45	980107.91	5.42	-338.34	-1.20	0.00	53.95	-280.17	-252.64	
	:173	39	18.98	-107	24.76	9820.00	CO	979237.57	980108.21	4.64	-334.93	-1.22	0.00	52.38	-279.13	-251.82	
	:174	39	19.07	-107	25.14	9760.00	CO	979238.90	980108.34	6.12	-332.89	-1.23	0.00	47.94	-280.06	-253.03	
	:175	39	18.19	-107	26.80	9520.00	CO	979253.69	980107.04	5.56	-324.70	-1.27	0.00	41.49	-278.93	-252.53	
	:176	39	18.22	-107	27.56	9360.00	CO	979265.09	980107.09	7.70	-319.24	-1.30	0.00	37.82	-275.03	-249.25	

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International Association of Geodesy, 1971, Geodetic Reference System, 1967, International Association of Geodesy, Special Publication, no. 3, 116 p.

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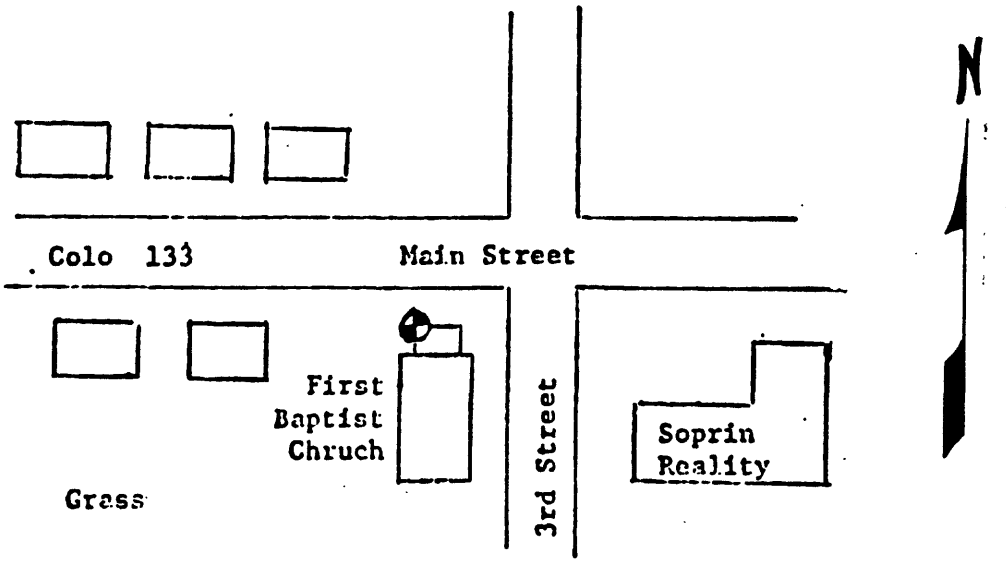
Appendix A

GRAVITY BASE STATION

LATITUDE: 39° 24.04'N (1)	STATION DESIGNATION: CARBONDALE
LONGITUDE: 107° 12.71'W (1)	
ELEVATION: 6170.2 ft 1880.6 METERS (1)	COUNTRY/STATE: USA/Colorado
REFERENCE CODE NUMBERS: ACIC 4651-1; IGB 11997D	ADOPTED GRAVITY VALUE: g= 979459.34 mgals
	ESTIMATED ACCURACY: ± 0.1 mgals
	DATE — MONTH/YEAR: 10/71

DESCRIPTION AND/OR SKETCH

The station is located in Carbondale, on the southwest corner of Main Street and 3rd Street, at the First Baptist Church, in the northwest corner of the building on the sidewalk. (1)



(1)

REFERENCE SOURCE

(1) 03405