UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

Principal Facts for Gravity Stations in the Vicinity of Mount St. Helens, Skamania County, Washington

by

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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.

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DATA COLLECTION

Several gravity surveys were made by David L. Williams, Carol Finn, Daniel Dzurisin, Daniel Johnson and Roger Denlinger in the vicinity of Mount St. Helens, Washington after the May 1980 eruption. The Volcanic Hazards Program sponsored the surveys. Gravity observations were made using LaCoste and Romberg gravity meters G-8, G-24, G-550. The gravity stations (fig. 1) were referenced to the U.S. Department of Defense (Defence Mapping Agency, 1974) bases at Portland, Oregon (Appendix A) and at Pearson Airpark, Vancouver (Appendix B). Access to the survey area was by secondary roads, jeep trails, and helicopter.

ELEVATION CONTROL

The survey area is bounded by latitudes $46^{\circ}00'00"$-$46^{\circ}15'00"$N and longitudes $122^{\circ}01'00"$-$122^{\circ}22'30"$W. Two hundred eleven station elevations were surveyed with a laser theodolyte and are accurate to the nearest tenth of a foot. Thirty two station elevations (station ID's 1-15, t, msh) 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, Denver, 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. 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 the Table.

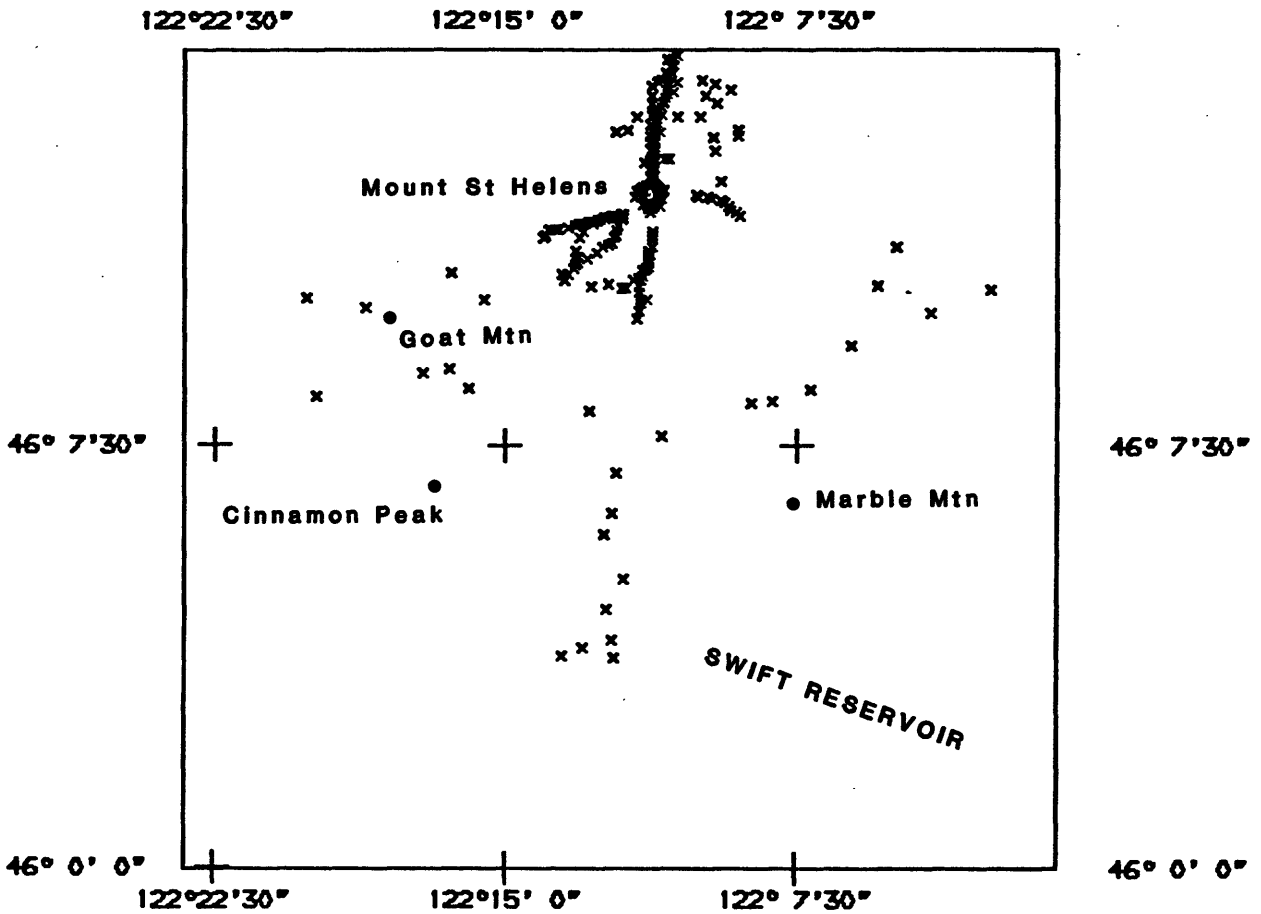
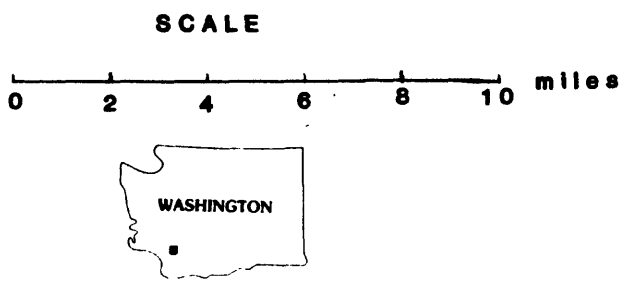


Figure 1.
Location of Gravity Stations



Location Map

Table: 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 d1 and d2
spec fields	Not used

BOUGUER GRAVITY DATA

mt. st. helens
gravity

STATION IDENTIFICATION proj	sta-id	LOCATIONS LATITUDE deg	min	LONGITUDE deg	min	ELE (in mt)	ST	GRAVITY OBSERVED	THEORETICAL	CORRECTIONS TERRAIN (d1=2.67)	BOUGUER	CURV	SPECIAL	ANOMALIES FREE AIR	COMPLETE-BOUGUER d1=2.67	d2=2.45	SPEC FIELDS
	:1	46	8.50	-122	7.13	853.74		980486.20	980722.36	2.52	-95.53	-0.99	0.00	27.21	-66.80	-59.05	
	:2	46	9.30	-122	6.12	893.98		980473.64	980723.57	2.53	-100.04	-1.03	0.00	25.84	-72.69	-64.57	
	:3	46	9.88	-122	4.05	732.43		980506.54	980724.45	2.81	-81.96	-0.88	0.00	8.04	-71.99	-65.40	
	:4	46	11.04	-122	4.94	727.86		980507.08	980726.20	4.26	-81.45	-0.88	0.00	5.42	-72.65	-66.21	
	:5	46	10.36	-122	5.39	862.28		980480.80	980725.16	3.86	-96.49	-1.00	0.00	21.63	-72.00	-64.29	
	:6	46	10.29	-122	2.48	543.15		980541.21	980725.06	3.90	-60.78	-0.69	0.00	-16.29	-73.86	-69.11	
	:7	46	9.98	-122	0.26	897.94		980464.67	980724.59	4.30	-100.48	-1.03	0.00	17.07	-80.14	-72.13	
	:8	46	9.95	-122	18.65	982.68		980458.27	980724.55	5.79	-109.96	-1.10	0.00	36.85	-68.42	-59.74	
	:9	46	10.12	-122	20.15	823.57		980493.58	980724.80	5.65	-92.16	-0.97	0.00	22.83	-64.64	-57.44	
	:10	46	8.36	-122	19.88	630.33		980533.92	980722.15	3.35	-70.53	-0.78	0.00	6.23	-61.74	-56.14	
	:11	46	8.78	-122	17.14	774.80		980500.90	980722.78	5.49	-86.70	-0.92	0.00	17.13	-65.00	-58.23	
	:12	46	8.86	-122	16.47	822.05		980493.34	980722.91	3.21	-91.99	-0.96	0.00	24.03	-65.72	-58.32	
	:13	46	10.57	-122	16.40	969.57		980460.35	980725.48	6.03	-108.49	-1.09	0.00	33.95	-69.60	-61.07	
	:14	46	10.11	-122	15.59	979.32		980458.22	980724.79	3.93	-109.59	-1.09	0.00	35.52	-71.23	-62.43	
4	:15	46	8.54	-122	15.96	823.57		980493.31	980722.42	3.36	-92.16	-0.97	0.00	24.95	-64.82	-57.42	
	:647t	46	3.76	-122	13.53	197.20		980614.86	980715.22	6.28	-22.07	-0.27	0.00	-39.52	-55.58	-54.26	
	:652t	46	3.73	-122	12.20	198.70		980616.68	980715.17	7.97	-22.23	-0.28	0.00	-37.19	-51.73	-50.53	
	:824t	46	3.91	-122	12.99	251.20		980606.15	980715.45	4.95	-28.11	-0.35	0.00	-31.80	-55.30	-53.36	
	:1064t	46	4.03	-122	12.23	324.30		980591.63	980715.63	4.03	-36.29	-0.44	0.00	-23.94	-56.64	-53.94	
	:1398t	46	4.57	-122	12.39	426.10		980573.58	980716.44	2.75	-47.68	-0.56	0.00	-11.40	-56.89	-53.14	
	:1471t	46	5.15	-122	11.94	448.40		980571.60	980717.31	4.15	-50.18	-0.59	0.00	-7.38	-53.99	-50.15	
	:1889t	46	5.94	-122	12.43	575.80		980544.75	980718.50	2.77	-64.43	-0.73	0.00	3.88	-58.50	-53.36	
	:2025t	46	6.30	-122	12.23	617.20		980536.05	980719.05	2.80	-69.06	-0.77	0.00	7.40	-59.63	-54.11	
	:2275t	46	7.01	-122	12.17	693.40		980520.95	980720.12	3.35	-77.59	-0.85	0.00	14.74	-60.34	-54.16	
	:2873t	46	8.11	-122	12.85	875.70		980483.09	980721.77	3.58	-97.99	-1.01	0.00	31.45	-63.97	-56.10	
	:2422t	46	7.67	-122	11.00	738.20		980512.60	980721.11	3.96	-82.60	-0.89	0.00	19.22	-60.31	-53.76	
	:2763t	46	8.25	-122	8.66	842.20		980492.52	980721.98	3.15	-94.24	-0.98	0.00	30.34	-61.73	-54.15	
	:2854t	46	8.29	-122	8.14	869.90		980484.27	980722.05	2.71	-97.34	-1.01	0.00	30.57	-65.07	-57.19	
	:647t	46	3.76	-122	13.53	197.20		980614.84	980715.22	6.28	-22.07	-0.27	0.00	-39.53	-55.59	-54.27	
	:cvos03	46	11.32	-122	11.25	2453.25		980103.98	980726.62	54.66	-274.52	-1.47	0.00	133.85	-87.47	-69.23	
	:cvos04	46	11.26	-122	11.25	2405.29		980118.10	980726.52	51.29	-269.15	-1.48	0.00	133.29	-86.05	-67.98	
	:cvos05	46	11.18	-122	11.26	2346.66		980134.59	980726.41	47.69	-262.59	-1.49	0.00	131.83	-84.56	-66.73	
	:cvos06	46	11.05	-122	11.26	2255.98		980157.66	980726.20	42.10	-252.44	-1.51	0.00	127.15	-84.70	-67.24	
	:cvos07	46	10.97	-122	11.31	2196.99		980172.58	980726.09	40.98	-245.84	-1.51	0.00	124.01	-82.37	-65.36	
	:cvos08	46	10.89	-122	11.33	2145.26		980185.35	980725.97	37.88	-240.05	-1.52	0.00	120.95	-82.74	-65.95	
	:cvos09	46	10.80	-122	11.31	2093.68		980198.12	980725.83	35.47	-234.28	-1.52	0.00	117.96	-82.37	-65.86	
	:cvos10	46	10.68	-122	11.31	2010.13		980219.68	980725.65	33.55	-224.93	-1.52	0.00	113.95	-78.95	-63.06	
	:cvos11	46	10.61	-122	11.43	1930.07		980240.02	980725.55	28.34	-215.97	-1.51	0.00	109.71	-79.43	-63.85	
	:cvos12	46	10.53	-122	11.47	1866.50		980255.12	980725.42	26.38	-208.86	-1.50	0.00	105.34	-78.65	-63.49	
	:cvos13	46	10.45	-122	11.52	1808.56		980268.94	980725.30	24.57	-202.38	-1.49	0.00	101.41	-77.89	-63.11	

BOUGUER GRAVITY DATA

mt. st. helens
gravity

STATION IDENTIFICATION proj	sta-id	LOCATIONS LATITUDE deg	min	LONGITUDE deg	min	ELE (in mt)	ST	GRAVITY OBSERVED	THEORETICAL	CORRECTIONS TERRAIN (d1=2.67)	BOUGUER	CURV	SPECIAL	ANOMALIES FREE AIR	COMPLETE-BOUGUER d1=2.67	d2=2.45	SPEC FIELDS
	:cvos14	46	10.35	-122	11.56	1754.36		980280.98	980725.15	22.76	-196.31	-1.48	0.00	96.90	-78.14	-63.71	
	:cvos15	46	10.26	-122	11.58	1686.25		980297.02	980725.02	21.41	-188.69	-1.46	0.00	92.08	-76.67	-62.76	
	:cvos16	46	10.12	-122	11.55	1615.83		980313.15	980724.80	19.31	-180.81	-1.44	0.00	86.71	-76.24	-62.81	
	:cvos17	46	10.03	-122	11.55	1554.07		980327.78	980724.67	16.79	-173.90	-1.42	0.00	82.43	-76.10	-63.04	
	:cvos18	46	9.90	-122	11.56	1446.50		980354.25	980724.48	13.17	-161.86	-1.38	0.00	75.93	-74.14	-61.78	
	:cvos19	46	9.78	-122	11.64	1416.53		980361.09	980724.29	12.60	-158.51	-1.36	0.00	73.72	-73.56	-61.42	
	:cvoe01	46	11.95	-122	10.12	2237.19		980161.34	980727.56	42.58	-250.34	-1.51	0.00	123.69	-85.58	-68.34	
	:cvoe02	46	11.93	-122	10.05	2184.74		980174.96	980727.53	40.34	-244.47	-1.51	0.00	121.17	-84.48	-67.53	
	:cvoe03	46	11.94	-122	9.82	2030.24		980214.41	980727.55	32.76	-227.18	-1.52	0.00	112.97	-82.97	-66.82	
	:cvoe04	46	11.90	-122	9.71	1936.62		980237.83	980727.48	29.28	-216.71	-1.51	0.00	107.60	-81.34	-65.77	
	:cvoe05	46	11.87	-122	9.47	1810.92		980269.06	980727.45	24.80	-202.64	-1.49	0.00	100.12	-79.21	-64.43	
	:cvoe06	46	11.82	-122	9.35	1724.92		980289.94	980727.37	20.93	-193.02	-1.47	0.00	94.56	-79.00	-64.70	
	:cvoe07	46	11.75	-122	9.27	1653.28		980307.51	980727.27	18.49	-185.00	-1.45	0.00	90.15	-77.82	-63.98	
	:cvoe08	46	11.69	-122	9.22	1601.81		980320.48	980727.17	16.85	-179.24	-1.44	0.00	87.34	-76.49	-62.99	
	:cvoe09	46	11.65	-122	9.09	1548.08		980332.52	980727.11	15.07	-173.23	-1.42	0.00	82.89	-76.69	-63.54	
	:cvoe10	46	11.60	-122	8.96	1496.59		980345.51	980727.04	13.73	-167.47	-1.40	0.00	80.07	-75.07	-62.29	
	:cvob01	46	11.40	-122	12.12	2289.46		980147.62	980726.73	46.80	-256.19	-1.50	0.00	126.90	-83.99	-66.62	
	:cvob02	46	11.35	-122	12.15	2245.48		980159.67	980726.66	43.52	-251.27	-1.51	0.00	125.47	-83.78	-66.54	
	:cvob03	46	11.23	-122	12.19	2116.70		980194.06	980726.48	36.15	-236.86	-1.52	0.00	120.35	-81.87	-65.21	
	:cvob04	46	11.20	-122	12.24	2072.11		980204.90	980726.43	34.50	-231.87	-1.52	0.00	117.49	-81.40	-65.01	
	:cvob05	46	11.10	-122	12.27	2022.21		980216.28	980726.28	33.00	-226.29	-1.52	0.00	113.64	-81.16	-65.11	
	:cvob06	46	11.08	-122	12.37	1949.10		980234.04	980726.25	29.25	-218.10	-1.51	0.00	108.89	-81.47	-65.79	
	:cvob07	46	11.02	-122	12.51	1823.49		980265.35	980726.16	24.47	-204.05	-1.50	0.00	101.57	-79.50	-64.58	
	:cvob08	46	10.92	-122	12.67	1694.89		980297.79	980726.01	19.53	-189.66	-1.47	0.00	94.52	-77.08	-62.94	
	:cvob09	46	10.82	-122	12.90	1591.44		980322.21	980725.86	15.99	-178.08	-1.44	0.00	87.19	-76.33	-62.86	
	:cvob10	46	10.77	-122	13.14	1486.52		980346.47	980725.78	13.30	-166.34	-1.40	0.00	79.18	-75.26	-62.53	
	:cvob11	46	10.44	-122	13.48	1385.27		980371.90	980725.29	9.71	-155.01	-1.35	0.00	73.88	-72.77	-60.68	
	:cvow01	46	11.63	-122	11.96	2456.99		980101.26	980727.08	58.08	-274.94	-1.46	0.00	131.83	-86.50	-68.51	
	:cvow02	46	11.62	-122	12.02	2414.78		980114.17	980727.06	53.02	-270.21	-1.48	0.00	131.75	-86.92	-68.90	
	:cvow03	46	11.60	-122	12.08	2367.53		980128.05	980727.04	48.88	-264.93	-1.49	0.00	131.08	-86.45	-68.52	
	:cvow04	46	11.59	-122	12.18	2315.16		980142.15	980727.02	46.73	-259.07	-1.50	0.00	129.06	-84.77	-67.15	
	:cvow05	46	11.57	-122	12.25	2248.61		980159.85	980726.99	43.59	-251.62	-1.51	0.00	126.28	-83.25	-65.99	
	:cvow06	46	11.55	-122	12.36	2168.62		980177.97	980726.96	38.02	-242.67	-1.51	0.00	119.78	-86.39	-69.40	
	:cvow07	46	11.51	-122	12.49	2091.94		980199.93	980726.90	35.04	-234.09	-1.52	0.00	118.17	-82.40	-65.87	
	:cvow08	46	11.51	-122	12.55	2039.06		980213.06	980726.90	32.24	-228.17	-1.52	0.00	115.00	-82.45	-66.18	
	:cvow09	46	11.49	-122	12.65	1958.98		980233.59	980726.87	29.07	-219.21	-1.51	0.00	110.88	-80.78	-64.99	
	:cvow10	46	11.49	-122	12.77	1917.02		980243.96	980726.87	27.24	-214.51	-1.51	0.00	108.31	-80.47	-64.92	
	:cvow11	46	11.48	-122	12.87	1866.59		980256.21	980726.85	25.86	-208.87	-1.50	0.00	105.03	-79.49	-64.28	
	:cvow12	46	11.45	-122	13.02	1789.26		980275.21	980726.81	22.43	-200.22	-1.49	0.00	100.23	-79.05	-64.28	
	:cvow13	46	11.43	-122	13.11	1728.60		980289.42	980726.78	20.33	-193.43	-1.48	0.00	95.77	-78.81	-64.42	

BOUGUER GRAVITY DATA

mt. st. helens
gravity

STATION IDENTIFICATION proj	sta-id	LOCATIONS LATITUDE deg	min	LONGITUDE deg	min	ELE (in mt)	ST	GRAVITY OBSERVED	THEORETICAL	CORRECTIONS TERRAIN (d1=2.67)	BOUGUER	CURV	SPECIAL	ANOMALIES FREE AIR	COMPLETE-BOUGUER d1=2.67	d2=2.45	SPEC FIELDS
	:cvow14	46	11.40	-122	13.23	1651.90		980308.05	980726.73	18.11	-184.85	-1.45	0.00	90.79	-77.40	-63.54	
	:cvow15	46	11.36	-122	13.43	1580.02		980324.72	980726.67	15.51	-176.80	-1.43	0.00	85.37	-77.36	-63.95	
	:cvow16	46	11.35	-122	13.64	1496.29		980343.91	980726.66	12.86	-167.43	-1.40	0.00	78.76	-77.22	-64.37	
	:cvow17	46	11.35	-122	13.75	1459.48		980352.03	980726.66	12.23	-163.32	-1.38	0.00	75.53	-76.94	-64.38	
	:cvow18	46	11.33	-122	13.88	1414.81		980362.30	980726.63	10.63	-158.32	-1.36	0.00	72.05	-77.00	-64.72	
	:cvow19	46	11.25	-122	14.00	1380.33		980370.19	980726.51	9.73	-154.46	-1.35	0.00	69.43	-76.65	-64.61	
	:cvow20	46	11.19	-122	14.07	1358.36		980374.97	980726.41	9.34	-152.00	-1.34	0.00	67.53	-76.47	-64.60	
	:cvoc01	46	12.33	-122	11.25	1795.67		980278.77	980728.13	18.68	-200.94	-1.49	0.00	104.45	-79.30	-64.16	
	:cvoc02	46	12.26	-122	11.28	1825.18		980271.33	980728.03	19.54	-204.24	-1.50	0.00	106.20	-79.99	-64.65	
	:cvoc03	46	12.39	-122	11.26	1779.63		980282.91	980728.23	18.12	-199.14	-1.49	0.00	103.54	-78.97	-63.93	
	:cvoc04	46	12.55	-122	11.29	1749.84		980290.27	980728.47	17.06	-195.81	-1.48	0.00	101.48	-78.75	-63.90	
	:cvoc05	46	12.59	-122	11.28	1739.01		980293.06	980728.53	16.72	-194.60	-1.48	0.00	100.87	-78.48	-63.71	
	:cvoc06	46	12.65	-122	11.26	1725.13		980296.34	980728.62	16.19	-193.04	-1.47	0.00	99.79	-78.54	-63.85	
	:cvoc07	46	12.75	-122	11.23	1704.01		980301.20	980728.77	15.36	-190.68	-1.47	0.00	97.98	-78.80	-64.24	
	:cvoc08	46	12.83	-122	11.21	1683.93		980305.75	980728.89	14.72	-188.43	-1.46	0.00	96.22	-78.96	-64.53	
	:cvoc09	46	12.92	-122	11.18	1666.85		980309.50	980729.02	14.14	-186.52	-1.46	0.00	94.57	-79.27	-64.95	
	:cvoc10	46	13.03	-122	11.17	1604.72		980323.61	980729.20	13.04	-179.57	-1.44	0.00	89.35	-78.62	-64.78	
	:cvoc11	46	13.08	-122	11.18	1586.30		980327.74	980729.27	12.55	-177.51	-1.43	0.00	87.73	-78.66	-64.95	
	:cvoc12	46	13.15	-122	11.19	1565.68		980332.48	980729.38	12.22	-175.20	-1.43	0.00	86.00	-78.40	-64.86	
	:cvoc13	46	13.21	-122	11.16	1546.88		980336.47	980729.46	12.20	-173.10	-1.42	0.00	84.11	-78.20	-64.83	
	:cvoc14	46	13.26	-122	11.15	1537.66		980338.35	980729.54	11.61	-172.06	-1.42	0.00	83.07	-78.80	-65.46	
	:cvoc15	46	13.35	-122	11.15	1523.94		980341.24	980729.67	11.18	-170.53	-1.41	0.00	81.60	-79.16	-65.91	
	:cvoc16	46	13.42	-122	11.16	1515.61		980342.71	980729.78	11.26	-169.60	-1.41	0.00	80.39	-79.35	-66.19	
	:cvoc17	46	13.48	-122	11.14	1511.08		980342.88	980729.87	11.67	-169.09	-1.41	0.00	79.08	-79.74	-66.66	
	:cvon02	46	13.55	-122	11.02	1465.88		980351.64	980729.98	10.99	-164.03	-1.39	0.00	73.79	-80.64	-67.91	
	:cvon03	46	13.61	-122	10.96	1426.94		980359.96	980730.06	9.93	-159.67	-1.37	0.00	70.02	-81.09	-68.64	
	:cvon04	46	13.66	-122	10.94	1386.48		980368.94	980730.14	9.20	-155.15	-1.35	0.00	66.44	-80.85	-68.72	
	:cvon05	46	13.72	-122	10.88	1340.62		980379.72	980730.23	9.41	-150.02	-1.33	0.00	62.99	-78.94	-67.25	
	:cvon06	46	13.78	-122	10.86	1312.45		980385.99	980730.32	8.60	-146.86	-1.31	0.00	60.49	-79.08	-67.58	
	:cvon07	46	13.84	-122	10.85	1283.91		980392.58	980730.41	7.63	-143.67	-1.30	0.00	58.18	-79.15	-67.84	
	:cvon08	46	13.91	-122	10.86	1266.90		980396.32	980730.52	7.15	-141.77	-1.29	0.00	56.58	-79.32	-68.13	
	:cvon09	46	13.98	-122	10.85	1245.83		980400.99	980730.63	7.03	-139.41	-1.28	0.00	54.64	-79.01	-68.00	
	:cvon10	46	14.08	-122	10.79	1226.03		980405.58	980730.77	6.23	-137.19	-1.26	0.00	52.98	-79.25	-68.36	
	:cvon11	46	14.15	-122	10.76	1200.20		980411.19	980730.88	5.65	-134.30	-1.25	0.00	50.51	-79.39	-68.69	
	:cvon12	46	14.26	-122	10.73	1182.18		980414.96	980731.05	5.19	-132.29	-1.24	0.00	48.56	-79.77	-69.19	
	:cvon13	46	14.31	-122	10.71	1161.55		980419.65	980731.12	4.92	-129.98	-1.22	0.00	46.82	-79.46	-69.06	
	:cvon14	46	14.39	-122	10.68	1148.79		980422.76	980731.24	4.59	-128.55	-1.22	0.00	45.87	-79.31	-68.99	
	:cvon15	46	14.48	-122	10.63	1144.16		980424.11	980731.38	4.29	-128.03	-1.21	0.00	45.66	-79.29	-69.00	
	:cvon16	46	14.60	-122	10.57	1135.70		980426.15	980731.55	3.92	-127.08	-1.21	0.00	44.91	-79.46	-69.21	
	:cvon17	46	14.73	-122	10.50	1124.63		980428.99	980731.76	3.69	-125.85	-1.20	0.00	44.14	-79.22	-69.05	

BOUGUER GRAVITY DATA

mt. st. helens
gravity

STATION IDENTIFICATION proj	sta-id	LOCATIONS LATITUDE deg	min	LONGITUDE deg	min	ELE (in mt)	GRAVITY ST OBSERVED	THEORETICAL	CORRECTIONS TERRAIN (d1=2.67)	BOUGUER	CURV	SPECIAL	ANOMALIES FREE AIR	COMPLETE-BOUGUER d1=2.67	d2=2.45	SPEC FIELDS
	:cvon18	46	14.83	-122	10.44	1115.84	980430.83	980731.91	3.51	-124.86	-1.19	0.00	43.11	-79.43	-69.33	
	:cvon19	46	14.98	-122	10.38	1089.72	980436.88	980732.13	3.44	-121.94	-1.18	0.00	40.89	-78.79	-68.93	
	:swr101	46	11.56	-122	11.99	2419.72	980112.46	980726.98	53.42	-270.77	-1.47	0.00	131.65	-87.18	-69.15	
	:swr102	46	11.50	-122	12.02	2382.93	980122.82	980726.88	50.84	-266.65	-1.48	0.00	130.76	-86.53	-68.63	
	:swr103	46	11.56	-122	12.07	2361.56	980129.42	980726.98	48.51	-264.26	-1.49	0.00	130.68	-86.55	-68.65	
	:swr104	46	11.57	-122	12.11	2336.14	980136.37	980726.99	46.94	-261.41	-1.49	0.00	129.78	-86.19	-68.39	
	:swr105	46	11.56	-122	12.21	2264.73	980155.68	980726.98	43.44	-253.42	-1.50	0.00	127.10	-84.39	-66.97	
	:swr106	46	11.55	-122	12.31	2197.79	980173.01	980726.96	39.78	-245.93	-1.51	0.00	123.81	-83.86	-66.75	
	:swr107	46	11.55	-122	12.49	2074.32	980203.96	980726.96	33.39	-232.12	-1.52	0.00	116.70	-83.54	-67.04	
	:swr108	46	11.51	-122	12.62	1988.42	980225.82	980726.90	30.11	-222.50	-1.51	0.00	112.15	-81.76	-65.79	
	:swr109	46	11.43	-122	12.78	1854.53	980259.08	980726.78	24.46	-207.52	-1.50	0.00	104.25	-80.31	-65.11	
	:swr110	46	11.30	-122	13.01	1697.83	980296.96	980726.59	19.49	-189.99	-1.47	0.00	94.02	-77.95	-63.78	
	:swr111	46	11.20	-122	13.09	1625.32	980314.15	980726.43	17.24	-181.87	-1.45	0.00	89.01	-77.07	-63.39	
	:swr112	46	10.98	-122	13.19	1556.83	980329.70	980726.10	14.90	-174.21	-1.42	0.00	83.77	-76.96	-63.72	
	:swr113	46	10.85	-122	13.17	1504.92	980341.56	980725.91	13.55	-168.40	-1.40	0.00	79.82	-76.43	-63.56	
	:swr114	46	10.72	-122	13.20	1449.26	980355.47	980725.71	12.04	-162.17	-1.38	0.00	76.76	-74.75	-62.27	
	:swr115	46	10.64	-122	13.25	1424.39	980361.73	980725.59	11.29	-159.39	-1.37	0.00	75.48	-73.99	-61.67	
	:swr116	46	10.57	-122	13.40	1398.33	980367.73	980725.48	10.07	-156.47	-1.36	0.00	73.54	-74.22	-62.04	
	:sr101	46	10.89	-122	11.30	2142.84	980184.83	980725.97	37.64	-239.78	-1.52	0.00	119.68	-83.98	-67.20	
	:sr102	46.	10.75	-122	11.31	2047.13	980209.79	980725.76	33.80	-229.07	-1.52	0.00	115.35	-81.44	-65.22	
	:sr103	46	10.67	-122	11.40	1951.63	980234.84	980725.63	28.83	-218.39	-1.51	0.00	111.09	-79.97	-64.23	
	:sr104	46	10.62	-122	11.49	1890.52	980249.18	980725.55	26.23	-211.55	-1.51	0.00	106.67	-80.15	-64.76	
	:sr105	46	10.50	-122	11.58	1795.94	980271.86	980725.38	23.48	-200.97	-1.49	0.00	100.37	-78.60	-63.86	
	:sr106	46	10.46	-122	11.74	1726.84	980287.90	980725.32	21.17	-193.23	-1.47	0.00	95.16	-78.37	-64.07	
	:sr107	46	10.33	-122	11.93	1631.93	980309.22	980725.13	18.30	-182.61	-1.45	0.00	87.42	-78.34	-64.68	
	:sr108	46	10.30	-122	12.00	1565.42	980324.99	980725.08	16.95	-175.17	-1.43	0.00	82.73	-76.91	-63.76	
	:sr110	46	10.40	-122	12.37	1524.64	980335.90	980725.23	15.14	-170.61	-1.41	0.00	80.92	-75.96	-63.03	
	:sr111	46	10.36	-122	12.79	1439.63	980356.93	980725.16	12.05	-161.09	-1.38	0.00	75.80	-74.62	-62.22	
	:msh09	46	10.10	-122	11.36	1620.43	980312.39	980724.77	21.05	-181.33	-1.44	0.00	87.40	-74.32	-61.00	
	:msh07	46	10.80	-122	11.35	2099.62	980198.09	980725.83	36.02	-234.95	-1.52	0.00	119.77	-80.68	-64.16	
	:msh08	46	10.55	-122	13.55	1393.53	980370.49	980725.45	9.79	-155.94	-1.35	0.00	74.86	-72.64	-60.49	
	:np102	46	12.79	-122	11.24	1698.90	980301.08	980728.83	15.18	-190.11	-1.47	0.00	96.22	-80.17	-65.64	
	:np103	46	12.93	-122	11.31	1647.00	980312.81	980729.04	13.97	-184.30	-1.45	0.00	91.74	-80.04	-65.88	
	:np104	46	13.03	-122	11.31	1613.50	980320.77	980729.20	13.19	-180.55	-1.44	0.00	89.22	-79.58	-65.67	
	:np105	46	13.22	-122	11.28	1563.80	980331.76	980729.48	11.93	-174.99	-1.43	0.00	84.60	-79.88	-66.33	
	:np106	46	13.39	-122	11.24	1519.90	980341.42	980729.73	11.27	-170.08	-1.41	0.00	80.47	-79.74	-66.54	
	:np107	46	13.49	-122	11.20	1505.40	980343.78	980729.88	11.48	-168.45	-1.40	0.00	78.21	-80.17	-67.12	
	:np108	46	13.60	-122	11.24	1441.90	980358.26	980730.05	9.99	-161.35	-1.38	0.00	72.95	-79.79	-67.20	
	:np109	46	13.76	-122	11.25	1359.80	980376.86	980730.29	9.24	-152.16	-1.34	0.00	65.99	-78.27	-66.38	
	:np110	46	13.91	-122	11.26	1292.50	980391.52	980730.52	7.61	-144.63	-1.30	0.00	59.68	-78.65	-67.25	

mt. st. helens
gravity

STATION IDENTIFICATION proj	sta-id	LOCATIONS LATITUDE deg	min	LONGITUDE deg	min	ELE (in mt)	GRAVITY ST OBSERVED	THEORETICAL	CORRECTIONS TERRAIN (d1=2.67)	BOUGUER	CURV	SPECIAL	ANOMALIES FREE AIR	COMPLETE-BOUGUER d1=2.67	d2=2.45	SPEC FIELDS
	:np111	46	13.98	-122	11.09	1257.20	980398.31	980730.63	7.26	-140.68	-1.28	0.00	55.47	-79.23	-68.13	
	:np112	46	14.01	-122	11.02	1214.10	980407.72	980730.67	6.97	-135.86	-1.26	0.00	51.54	-78.60	-67.88	
	:np113	46	14.15	-122	10.92	1174.00	980416.59	980730.88	5.91	-131.37	-1.23	0.00	47.84	-78.85	-68.42	
	:np114	46	14.39	-122	10.87	1151.50	980421.84	980731.24	4.60	-128.85	-1.22	0.00	45.79	-79.68	-69.34	
	:np115	46	14.77	-122	10.68	1130.60	980425.85	980731.81	3.63	-126.51	-1.20	0.00	42.78	-81.30	-71.08	
	:nf101	46	13.10	-122	11.04	1637.60	980315.81	980729.30	13.85	-183.25	-1.45	0.00	91.59	-79.26	-65.18	
	:nf103	46	13.36	-122	10.61	1496.98	980346.39	980729.69	11.44	-167.51	-1.40	0.00	78.42	-79.05	-66.08	
	:nf104	46	13.42	-122	10.98	1514.24	980343.80	980729.78	11.28	-169.44	-1.41	0.00	81.06	-78.52	-65.37	
	:nf105	46	13.13	-122	11.90	1700.17	980299.02	980729.34	17.31	-190.25	-1.47	0.00	94.04	-80.36	-65.99	
	:nf106	46	13.11	-122	12.20	1697.09	980297.89	980729.31	19.75	-189.90	-1.47	0.00	91.99	-79.63	-65.49	
	:nf107	46	13.80	-122	10.69	1328.30	980384.21	980730.35	8.20	-148.64	-1.32	0.00	63.57	-78.19	-66.51	
	:nf108	46	13.99	-122	10.60	1253.40	980400.80	980730.64	6.76	-140.26	-1.28	0.00	56.77	-78.01	-66.90	
	:nf109	46	13.03	-122	9.02	1537.52	980340.07	980729.20	14.79	-172.05	-1.42	0.00	85.09	-73.58	-60.51	
	:nf110	46	13.15	-122	9.01	1487.93	980352.42	980729.38	12.52	-166.50	-1.40	0.00	81.97	-73.40	-60.60	
	:nf111	46	13.60	-122	9.55	1320.11	980388.36	980730.05	7.55	-147.72	-1.32	0.00	65.49	-75.99	-64.33	
	:nf112	46	13.76	-122	9.85	1305.82	980390.17	980730.29	7.26	-146.12	-1.31	0.00	62.66	-77.51	-65.96	
	:nf113	46	13.38	-122	10.01	1480.60	980350.23	980729.72	11.04	-165.68	-1.39	0.00	77.18	-78.86	-66.00	
	:nf114	46	12.75	-122	9.63	1714.17	980297.03	980728.77	18.31	-191.82	-1.47	0.00	96.95	-78.03	-63.61	
	:nf115	46	12.22	-122	9.48	1737.90	980289.06	980727.97	21.21	-194.47	-1.48	0.00	97.09	-77.65	-63.25	
	:nf116	46	13.01	-122	9.68	1571.78	980331.01	980729.16	14.52	-175.88	-1.43	0.00	86.62	-76.17	-62.75	
	:nf118	46	13.36	-122	11.63	1610.90	980320.02	980729.69	14.78	-180.26	-1.44	0.00	87.18	-79.74	-65.99	
	:nf120	46	14.04	-122	9.94	1247.91	980403.30	980730.71	5.72	-139.64	-1.28	0.00	57.50	-77.69	-66.55	
	:nf121	46	13.84	-122	9.24	1269.97	980401.23	980730.41	6.19	-142.11	-1.29	0.00	62.53	-74.68	-63.37	
	:nf122	46	13.94	-122	9.63	1262.41	980401.33	980730.56	5.88	-141.26	-1.29	0.00	60.16	-76.51	-65.25	
	:h92	46	12.08	-122	11.20	1904.37	980250.58	980727.76	21.66	-213.10	-1.51	0.00	110.13	-82.81	-66.91	
	:h91	46	12.09	-122	11.15	1898.73	980252.35	980727.77	21.63	-212.47	-1.51	0.00	110.15	-82.19	-66.34	
	:h120	46	12.13	-122	11.15	1880.51	980256.84	980727.84	20.86	-210.43	-1.50	0.00	108.97	-82.11	-66.36	
	:h90	46	12.10	-122	11.08	1881.89	980255.78	980727.79	21.56	-210.58	-1.50	0.00	108.38	-82.15	-66.45	
	:h101	46	12.03	-122	11.11	1909.26	980247.34	980727.69	22.51	-213.65	-1.51	0.00	108.48	-84.17	-68.29	
	:h107	46	11.87	-122	11.10	1909.26	980247.99	980727.45	24.49	-213.65	-1.51	0.00	109.37	-81.29	-65.58	
	:h108	46	11.84	-122	11.14	1908.94	980247.71	980727.40	24.83	-213.61	-1.51	0.00	109.04	-81.25	-65.57	
	:h109	46	11.80	-122	11.17	1910.19	980247.06	980727.34	25.74	-213.75	-1.51	0.00	108.84	-80.68	-65.07	
	:h112	46	11.76	-122	11.21	1911.66	980246.17	980727.27	27.12	-213.91	-1.51	0.00	108.46	-79.84	-64.33	
	:h114	46	11.72	-122	11.25	1909.60	980245.60	980727.22	29.79	-213.68	-1.51	0.00	107.31	-78.09	-62.82	
	:h113	46	11.67	-122	11.29	1918.60	980241.57	980727.14	32.26	-214.69	-1.51	0.00	106.13	-77.81	-62.65	
	:h116	46	11.72	-122	11.33	1907.49	980245.91	980727.22	30.78	-213.45	-1.51	0.00	106.96	-77.21	-62.04	
	:h117	46	11.77	-122	11.36	1903.78	980247.82	980727.29	27.76	-213.03	-1.51	0.00	107.66	-79.12	-63.73	
	:h131	46	11.80	-122	11.51	1911.73	980245.81	980727.34	27.68	-213.92	-1.51	0.00	108.06	-79.69	-64.22	
	:h128	46	11.94	-122	11.66	1933.10	980241.23	980727.55	27.06	-216.31	-1.51	0.00	109.85	-80.91	-65.19	
	:ho94	46	12.03	-122	11.61	1929.03	980243.63	980727.69	24.81	-215.86	-1.51	0.00	110.86	-81.70	-65.83	

BOUGUER GRAVITY DATA

mt. st. helens
gravity

STATION IDENTIFICATION proj	sta-id	LOCATIONS LATITUDE deg	min	LONGITUDE deg	min	ELE (in mt)	ST	GRAVITY OBSERVED	THEORETICAL	CORRECTIONS TERRAIN (d1=2.67)	BOUGUER	CURV	SPECIAL	ANOMALIES FREE AIR	COMPLETE-BOUGUER d1=2.67	d2=2.45	SPEC FIELDS
	:no95	46	12.03	-122	11.56	1921.04		980245.97	980727.69	23.89	-214.96	-1.51	0.00	110.73	-81.85	-65.98	
	:h125	46	12.10	-122	11.51	1884.18		980255.11	980727.79	22.79	-210.84	-1.50	0.00	108.41	-81.14	-65.52	
	:h126	46	12.08	-122	11.56	1897.34		980251.98	980727.76	23.69	-212.31	-1.51	0.00	109.37	-80.76	-65.10	
	:h124	46	12.12	-122	11.38	1870.92		980258.70	980727.82	20.90	-209.36	-1.50	0.00	107.89	-82.07	-66.42	
	:no90	46	12.10	-122	11.08	1881.89		980256.36	980727.79	21.56	-210.58	-1.50	0.00	108.96	-81.57	-65.87	
	:no91	46	12.09	-122	11.15	1898.73		980252.40	980727.77	21.63	-212.47	-1.51	0.00	110.20	-82.14	-66.29	
	:no93	46	12.56	-122	11.44	1751.08		980287.13	980728.48	18.36	-195.95	-1.48	0.00	98.71	-80.36	-65.60	
	:no84	46	12.58	-122	11.20	1730.83		980292.62	980728.52	16.49	-193.68	-1.48	0.00	97.92	-80.75	-66.03	
	:no85	46	12.62	-122	11.20	1725.32		980294.23	980728.57	16.18	-193.06	-1.47	0.00	97.77	-80.58	-65.89	
	:no86	46	12.68	-122	11.19	1715.43		980296.37	980728.66	15.73	-191.96	-1.47	0.00	96.77	-80.93	-66.29	
	:no87	46	12.74	-122	11.17	1704.75		980298.85	980728.76	15.38	-190.76	-1.47	0.00	95.87	-80.98	-66.41	
	:n88	46	12.08	-122	10.92	1913.71		980247.99	980727.76	24.60	-214.14	-1.51	0.00	110.43	-80.62	-64.88	
	:n89	46	12.08	-122	11.02	1889.95		980254.23	980727.76	22.60	-211.49	-1.51	0.00	109.34	-81.05	-65.36	
	:n102	46	12.04	-122	10.95	1901.90		980250.77	980727.70	24.15	-212.82	-1.51	0.00	109.62	-80.56	-64.89	
	:n103	46	12.00	-122	10.99	1903.90		980249.89	980727.64	23.49	-213.05	-1.51	0.00	109.42	-81.64	-65.90	
	:n104	46	11.96	-122	11.03	1908.76		980248.65	980727.58	23.57	-213.59	-1.51	0.00	109.74	-81.79	-66.01	
	:n106	46	11.92	-122	11.07	1909.23		980248.21	980727.52	23.83	-213.64	-1.51	0.00	109.51	-81.81	-66.05	
	:n105	46	11.91	-122	10.97	1910.80		980247.59	980727.50	25.76	-213.82	-1.51	0.00	109.39	-80.18	-64.56	
	:n111	46	11.75	-122	11.03	1919.60		980243.58	980727.27	28.84	-214.80	-1.51	0.00	108.32	-79.15	-63.70	
	:n110	46	11.79	-122	11.08	1908.40		980246.96	980727.32	26.73	-213.55	-1.51	0.00	108.20	-80.13	-64.61	
	:n115	46	11.80	-122	11.27	1908.30		980246.94	980727.34	25.50	-213.54	-1.51	0.00	108.13	-81.42	-65.80	
	:n117	46	11.77	-122	11.36	1903.78		980247.61	980727.29	27.76	-213.03	-1.51	0.00	107.45	-79.33	-63.94	
	:n118	46	11.80	-122	11.38	1904.60		980247.96	980727.34	26.42	-213.12	-1.51	0.00	108.01	-80.20	-64.69	
	:n119	46	11.84	-122	11.41	1907.81		980247.63	980727.40	25.21	-213.48	-1.51	0.00	108.61	-81.17	-65.53	
	:n130	46	11.92	-122	11.47	1913.25		980246.93	980727.52	23.81	-214.09	-1.51	0.00	109.47	-82.32	-66.52	
	:n129	46	11.93	-122	11.55	1916.23		980246.15	980727.53	24.86	-214.43	-1.51	0.00	109.59	-81.49	-65.74	
	:n127	46	11.97	-122	11.49	1917.29		980246.56	980727.59	23.36	-214.54	-1.51	0.00	110.27	-82.43	-66.55	
	:n96	46	12.04	-122	11.49	1913.68		980247.81	980727.70	22.80	-214.14	-1.51	0.00	110.29	-82.55	-66.66	
	:n97	46	12.04	-122	11.43	1919.46		980246.29	980727.70	23.04	-214.79	-1.51	0.00	110.55	-82.70	-66.78	
	:scarph98	46	12.13	-122	11.30	1868.90		980259.16	980727.84	20.39	-209.13	-1.50	0.00	107.70	-82.54	-66.87	
	:n121	46	12.14	-122	11.24	1875.80		980257.79	980727.85	20.51	-209.90	-1.50	0.00	108.44	-82.45	-66.72	
	:n22	46	12.17	-122	11.30	1843.83		980265.20	980727.90	19.96	-206.32	-1.50	0.00	105.96	-81.91	-66.43	
	:n102	46	12.04	-122	10.95	1901.90		980250.70	980727.70	24.15	-212.82	-1.51	0.00	109.55	-80.63	-64.96	
	:n100	46	12.32	-122	11.18	1795.82		980277.21	980728.13	18.74	-200.95	-1.49	0.00	102.94	-80.76	-65.63	
	:n78	46	12.29	-122	11.27	1801.18		980275.66	980728.08	19.05	-201.55	-1.49	0.00	103.08	-80.91	-65.75	
	:n79	46	12.35	-122	11.25	1785.03		980279.51	980728.16	18.38	-199.74	-1.49	0.00	101.87	-80.98	-65.92	
	:n80	46	12.42	-122	11.24	1766.68		980284.30	980728.27	17.77	-197.69	-1.48	0.00	100.89	-80.51	-65.57	
	:n81	46	12.49	-122	11.23	1748.22		980288.31	980728.38	17.25	-195.63	-1.48	0.00	99.11	-80.74	-65.92	
	:n82	46	12.54	-122	11.22	1739.40		980290.72	980728.45	16.84	-194.64	-1.48	0.00	98.72	-80.55	-65.78	
	:n83	46	12.55	-122	11.21	1735.64		980291.29	980728.47	16.74	-194.22	-1.48	0.00	98.12	-80.84	-66.09	
	:n76	46	12.63	-122	10.82	1742.03		980289.29	980728.59	19.60	-194.93	-1.48	0.00	97.97	-78.84	-64.27	
	:n75	46	12.63	-122	10.87	1728.30		980292.80	980728.59	18.46	-193.40	-1.48	0.00	97.25	-79.17	-64.63	
	:n73	46	12.61	-122	10.96	1717.71		980295.09	980728.55	17.35	-192.21	-1.47	0.00	96.31	-80.02	-65.49	

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APPENDIX A

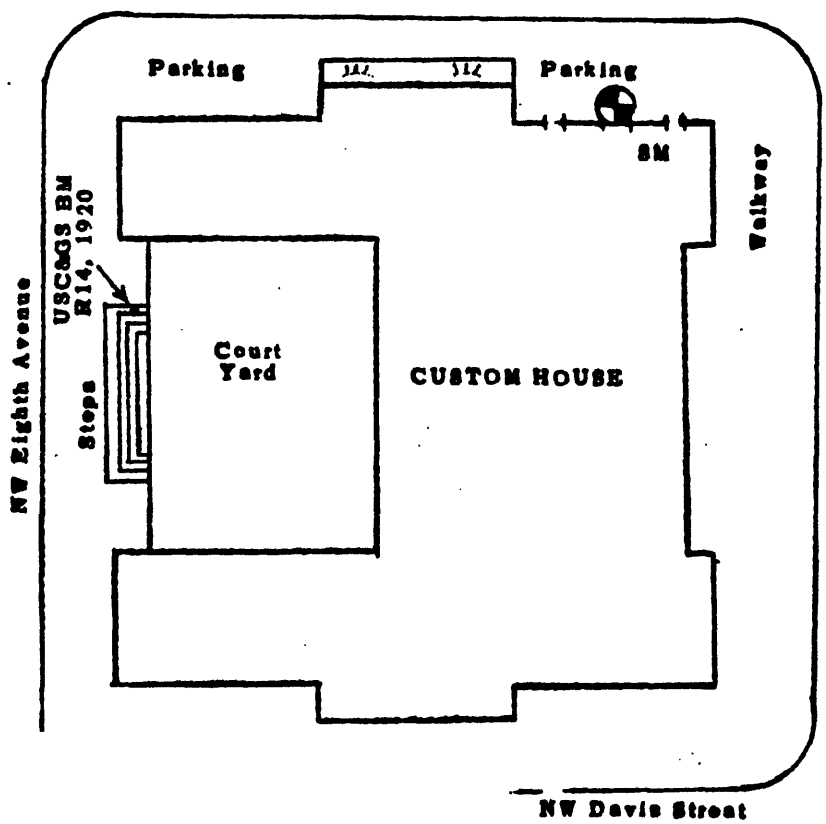
GRAVITY BASE STATION

LATITUDE: 45° 31.40' N (1)	STATION DESIGNATION: PORTLAND
LONGITUDE: 122° 40.70' W (1)	
ELEVATION: 9.10 METERS (1)	COUNTRY/STATE: USA/Oregon

REFERENCE CODE NUMBERS		ADOPTED GRAVITY VALUE	
ACIC 0392-2		g= 980 632.66 mgals	
IGC 15752B			
		ESTIMATED ACCURACY	DATE
		± 0.1 mgals	MONTH/YEAR 1971

DESCRIPTION AND/OR SKETCH

The station is in downtown Portland at the Custom House (at the southeast corner of NW Everett St. and NW Broadway), outside the second window west of the northeast corner (about eight meters west of the corner), about 0.6 meter north of the window, in the parking area, on the asphalt. The station is about 30 meters east and 1.52 meters above USC&GS Pendulum Station 229. (1)



(1)

REFERENCE SOURCE

(1) 02733

APPENDIX B

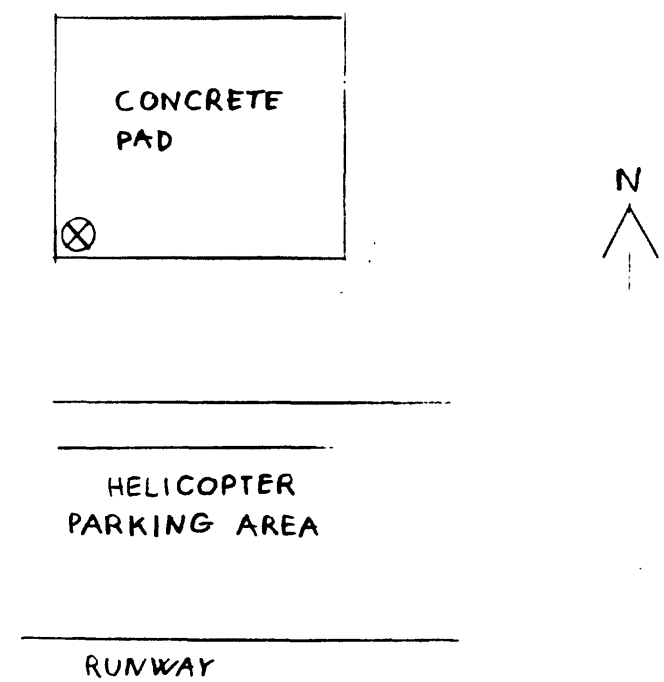
GRAVITY BASE STATION

LATITUDE: 45°37.35'N (1)	STATION DESIGNATION: PEARSON, VANCOUVER
LONGITUDE: 122°39.26'W (1)	
ELEVATION: 8 meters (1)	COUNTRY/STATE: U.S.A/WASHINGTON

REFERENCE CODE NUMBERS		ADOPTED GRAVITY VALUE	
		g= 980 633.64 mgals	
		ESTIMATED ACCURACY	DATE
		± 0.1 mgals	MONTH/YEAR 1971

DESCRIPTION AND/OR SKETCH

The station is located at PEARSON AIRPARK at the southwest corner on the concrete pad, 71 feet south of building with sign AIRCRAFT SPECIALTIES, 430 feet north of runway and 100 feet north of road leading to helicopter parking area.



REFERENCE SOURCE