

**Department of the Interior
United States Geological Survey**

**High-precision stations for monitoring gravity
changes in Long Valley caldera, California**

by

Carter W. Roberts, Robert C. Jachens, and Robert L. Morin ¹

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

¹ U.S. Geological Survey, Menlo Park, California

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INTRODUCTION

This report gives descriptions and observed gravity values for 61 high-precision gravity stations established beginning in June 1980 for the purpose of monitoring gravity changes associated with the seismic and magmatic activity in Long Valley, California. The network consists of a series of primary station pairs and also stations without alternates that are primarily on benchmarks. The locations of these stations are shown in figures 1 and 2.

To minimize the risk of bad readings and possible loss of a station, all primary stations have 2 reading sites, both of which should be read on each occupation. All sites have been read using a standard LaCoste & Romberg baseplate unless otherwise indicated. All leg holes for the standard baseplates have been star drilled. Unless otherwise indicated the primary site in each station pair is marked with a standard hexagonal gravity marker. The alternate site may be marked only by the leg holes for the baseplate unless otherwise indicated. The gravity marker is not necessarily located in the center of the gravity station — look for the leg holes! Because a standard baseplate can not be placed over many benchmarks, some benchmark stations were read with a special baseplate that consists of a flat aluminum plate with 3 closely spaced legs that rest directly on the benchmark. This plate stands 1.7 in above the benchmark. Some sites have an arrow indicating the direction to face when reading the meter. At all sites the reading direction is approximately north.

Gravity values given in this report are based on a value of 979,312.160 mGal at the primary reference station MLEQB1 at Toms Place, California, determined by direct double looped ties with 3 gravity meters to 2 locations within the caldera where gravity was measured during 1985 with an absolute gravity meter (Glenn Sasagawa, written commun., 1985). In each case relative measurements were made one day after the absolute measurements. All high-precision gravity stations were measured relative to MLEQB1 and MLEQB1A along two closed loops with 3 gravity meters. Unless otherwise indicated, values given are those determined during the 1982 occupation when the network was greatly expanded and the total network occupation was most complete.

The time separation between the 1982 network occupation and the 1985 ties to the absolute gravity measurement sites makes it difficult to assign, with confidence, uncertainty limits to the gravity values of the network stations. However, most individual steps in the process of determining values at the network stations are well constrained and associated uncertainties are as follows:

- 1) absolute gravity values at the two sites have uncertainties of 0.009 to 0.013 mGal (Glenn Sasagawa, written commun., 1985);
- 2) ties between the absolute gravity measurement sites and primary reference station MLEQB1 yielded an uncertainty of 0.004 mGal (1 standard error);
- 3) gravity values at network stations relative to MLEQB1 have typical uncertainties of 0.007 mGal (1 standard error).

Verifying stability of gravity at MLEQB1 between 1982 and 1985 is not possible because in 1982 we were not able to tie this station either to a site of known stability (if such a site exists) or to an absolute gravity measurement. We do have ties spanning

1980 to 1985 between MLEQB1 and a number of sites on crystalline basement far removed from the sources of gravity change within Long Valley. These data suggest that any gravity changes at MLEQB1 over the period were, conservatively, less than 0.015 mGal. Therefore, we estimate that the gravity values reported here for the 1982 network occupation have uncertainties relative to an absolute datum of less than about 0.03 mGal.

PRIME BASE STATION

MLEQB1 37° 33.80' 118° 41.68' 979,312.160 mGal

Station is located 0.85 mi west along old U.S. Highway 395 from the intersection with Rock Creek Road at Toms Place, then 0.2 mi north along a gravel road to power pole *1854184E*, then N50°W about 200 ft to an 8 by 12-ft quartz monzonite boulder at the base of a rocky hill on the north side of a meadow. Site is midway along top of rock, about 6 ft above meadow, and marked with a standard hexagonal gravity marker stamped *MLEQB1 1980*. Read with meter facing north.

MLEQB1A 979,311.776 mGal

46 ft N80°W from MLEQB1 to a 5 by 6-ft rock projecting about 3 ft above slope, S45°W 15 ft from a 6-in diameter pine tree, and marked with a standard hexagonal gravity mark stamped *MLEQB1A 1980 - .384*. Read with meter facing north.

SECONDARY BASE STATION

MLEQB2 37° 33.62' 118° 41.73' 979,308.227 mGal

Station is located on U.S. Geological Survey (USGS) benchmark (BM) *3DOR 1975* which is 260 ft east-northeast of BM *F124 1992* (see MLEQB2A below), 150 ft north of and 6 ft lower than the old highway, in the top of a large granite outcrop. Read with meter facing north.

MLEQB2A (F124) 37° 33.62' 118° 41.73' 979,307.303 mGal

Station is located on U.S. Coast and Geodetic Survey (USC&GS) BM *F124 1992* which is 0.9 mi west along former U.S. Highway 395 from the concrete bridge over Rock Creek at Toms Place, at a cut bank, at the east end of a bladed turnout, in the top of a large granite boulder, 55.5 ft north of the centerline of the highway, and about 3 ft above the ground. Read with meter facing north with special baseplate that rests directly on the BM.

PRIMARY STATION PAIRS

MLEQ01 37° 38.90' 118° 48.56' 979,275.916 mGal

1.2 mi northeast along Benton Crossing Road from U.S. Highway 395 to a junction, then north 1.05 mi to a crest, 83 ft northwest of the center of road, due south of the most prominent tuff outcrop, on low tuff ledge about 1 ft above ground level. Read with meter facing north (chiseled arrow in rock). 1 $\frac{3}{8}$ in diameter brass marker is 1 ft south.

MLEQ01A 979,276.016 mGal

70.0 ft N15°W from MLEQ01 on low tuff ledge about 1 ft above ground, and marked with a 1 $\frac{3}{8}$ in diameter brass marker. Read with meter facing north (chiseled arrow in rock). Steel rebar set between stations on line N20°W, 28.65 ft from MLEQ01 and 41.35 ft from MLEQ01A.

MLEQ02 37° 39.60' 118° 55.50' 979,258.701 mGal

1.45 mi north along U.S. Highway 395 from the junction with State Highway 203, on east side of highway, on large outcrop, S27°E 24.7 ft from USC&GS BM *W911 1957* and marked with a standard hexagonal gravity marker stamped *MLEQ02*. Read with meter facing north.

MLEQ02A 979,259.000 mGal

About 60 ft south of MLEQ02 on ledge about 7 ft above valley floor, 8 ft southwest of a 7 ft vertical face, and marked with a 1 $\frac{3}{8}$ in diameter brass disc stamped *MLEQ02A*. Read with meter facing north.

MLEQ03 37° 43.73' 118° 56.79' 979,192.378 mGal

About 5.8 mi northwest along U.S. Highway 395 from the junction with State Highway 203 at Casa Diablo Hot Springs to the junction with the Lookout Mountain Road, 0.3 mi north-northeast along road to a junction, then left up U.S. Forest Service Road 2S02 about 2 mi to the top of Lookout Mountain. Station is located near the south end of the top of the mountain, northwest of the most southerly Jeffrey pine tree on U.S. Army, Corps of Engineers (USCE) BM *PINE TOP*. Read with meter facing north, with special baseplate that rests on BM. This BM was destroyed during 1983.

MLEQ03A 979,192.608 mGal

97 ft S40°E of MLEQ03, 57.5ft S12°E from 2.5 ft diameter Jeffrey pine and 69.2 ft S65°E from vertical pipe in rock-and-mortar foundation that formerly held a sign, over USGS BM *LOOKOUT MTN*. Leg Holes not drilled. Requires LaCoste & Romberg base plate without level bubble. Read with meter facing north.

MLEQ04 37° 37.25' 119° 00.05' 979,188.754 mGal

0.5 mi south along Lake Mary road from the outlet of Twin Lakes, on top of rocky bluff northeast of road. 17 ft S45°W from a 3-ft diameter pine tree (the pine is about 15 ft southwest of a very tall thin pine tree). Marked by a standard hexagonal gravity marker stamped *MLEQ04*. Read with meter facing north.

MLEQ04A 979,188.401 mGal

41 ft N35°W from MLEQ04 and 41 ft N60°W from a 3 ft pine tree. No gravity marker. Marked only by the 3 star drilled leg holes. Read with meter facing north.

MLEQ05 37° 45.80' 118° 56.65' 979,287.558 mGal

About 7.9 mi north along U.S. Highway 395 from the junction with State Highway 203, then 2.1 mi east along Owens River Road, then north past Big Spring Campground 1.3 mi along road to Bald Mountain Lookout, approximately 200 ft west-southwest of road across small gully, on granite outcrop, at northwest end of large granite shelf (approximately 50 ft long and 8 to 10 ft high), slightly higher than road, 37 ft S75°W from a 3 ft Jeffrey pine (largest in vicinity), and marked by a standard hexagonal gravity marker stamped *MLEQ05*. Read with meter facing north.

MLEQ05A 979,287.121 mGal

38 ft N55°W of MLEQ05, 12 ft N20°E from a 3-ft diameter Jeffrey pine on top of a granitic boulder and marked only by 3 leg holes for baseplate. Read with meter facing north.

MLEQ06 37° 55.92' 119° 09.73' 979,311.270 mGal

3.3 mi west of U.S. Highway 395 along State Highway 120 to sign approximately 500 ft before point of winter closure and just before road to Big Bend campground, on large sloping quartz monzonite outcrop north of road. Station is at the eastern end of the top of the outcrop approximately 300 ft north of the centerline of the highway. Marked by a standard hexagonal gravity marker stamped *MLEQ06*. Read with meter facing north.

MLEQ06A 979,311.324 mGal

20 ft S75°W from MLEQ06 at about the center of the outcrop, 40 ft N45°E from the large pine tree at the base of the outcrop, about 2.5 ft east of a small bush, and marked only by legholes for the baseplate. Read with meter facing north.

MLEQ07 37° 21.60' 118° 41.40' 979,222.313 mGal

9.3 mi west along Pine Creek Road from U.S. Highway 395 to a road to Pine Creek Pack Station. Gravity station is located on large concrete foundation from Brownstone Mill visible to southwest. Station is on northeast end of northwesternmost of two-5 by 8-ft concrete foundations rising 2 ft above concrete slab just northwest of a pit in slab, and marked with a $1\frac{3}{8}$ in diameter brass marker stamped *MLEQ07 1980*. Read with meter facing uphill (SW).

MLEQ07A 979,222.477 mGal

22.5 ft northeast from MLEQ07 on the center of a 1.5 by 4-ft concrete foundation, and marked by a concrete nail in center and a $1\frac{3}{8}$ in diameter brass marker stamped *MLEQ07A*. Read with meter facing north.

MLEQ08 37° 23.20' 118° 31.38' 979,430.143 mGal

1.7 mi west from U.S. Highway 395 along Pine Creek road to the Round Valley School, then south and east 3.7 mi on Round Valley road, then east 1.35 miles on a dirt road (north of new gravel pit and south of old gravel pit) to first drainage southeast of a prominent outcrop. Station is on a granitic outcrop 16 ft north of drainage about 105 ft southwest of the more southerly of two dirt roads and 225 ft S20°W from power pole *345845-S*, and marked by a standard hexagonal gravity marker stamped *MLEQ08*. Read with meter facing north.

MLEQ08A 979,430.090 mGal

14.6 ft N65°W from MLEQ08, and marked by a $1\frac{3}{8}$ in diameter brass disc stamped *MLEQ08A 1980*. Read with meter facing north.

MLEQ09 37° 24.43' 118° 17.18' 979,423.321 mGal

3.35 mi up Silver Creek Canyon from the railroad station at Laws, about 0.1 mile past the third ford of the creek, to the first large cottonwood tree on south side of canyon and a City of Los Angeles Department of Water and Power stream-gauging station. Gravity station is in the overflow chute of the gauging station with baseplate centered 13 in north of the southward 24 in high wing wall and 50 in east of the west edge of the chute, and marked with a standard hexagonal gravity marker stamped *MLEQ09*. Read with meter facing north.

MLEQ09A 979,422.889 mGal

32 ft south of MLEQ09 on rock ledge, about 6 ft above base of cliff and about 1 ft north of the base of a 5 ft high overhanging rock face, and marked with a $1\frac{3}{8}$ in diameter brass marker stamped *MLEQ09A 1980*. Read with meter facing north.

MLEQ10A 37° 30.84' 118° 37.69' 979,336.017 mGal

On USGS BM *6432 B 1905* 3.8 mi southeast on Old Sherwin Grade Road from Hwy 395 (junction about 1 mi east of Toms Place exit), about 250 ft south of the summit of Sherwin Hill, about 170 ft east of the centerline of the road, about 30 ft higher than the road, and set in the top of the northeast corner of a large volcanic rock formation about 4 ft above the ground. Read with meter facing north with special baseplate that rests directly on the BM. There is no gravity marker.

MLEQ10 979,336.276 mGal

Approximately 16 ft S20°E of MLEQ10A on corner of same outcrop, and marked with a standard hexagonal gravity marker stamped *MLEQ10*. Read with meter facing north.

MLEQ11 37° 27.33' 118° 44.12' 979,128.322 mGal

8.5 mi south from Toms Place along Rock Creek Road, at the outlet of Rock Creek Lake, 45 ft northwest of the former parking area just northwest of the outlet, 20 ft N70°E from the top of the highest rock outcrop adjacent to the lake, on a 5 by 6-ft quartz monzonite outcrop projecting 1 ft, and marked by a hexagonal gravity marker stamped *MLEQ11*. Read with meter facing north (chiseled arrow).

MLEQ11A 979,128.287 mGal

43 ft N10°W from MLEQ11 and N20°E from tallest rock on an 8 by 20-ft outcrop. Station is about 4 ft east of highest point on rock. Station is marked only by 3 legholes and a chiseled arrow indicating reading direction (north).

MLEQ12 37° 33.75' 118° 47.16' 979,259.107 mGal

2.1 mi southwest along McGee Creek Road from the junction with U.S. Highway 395 to the top of the Hilton Creek Fault scarp, then walk south on former road along top of scarp about 175 ft until road turns left. Station is on 6-ft diameter boulder projecting 3 ft above ground, about 30 ft to right and 60 ft back from scarp, and marked with a hexagonal gravity marker stamped *MLEQ12*. Read with meter facing north (chiseled arrow).

MLEQ12A 979,262.617 mGal

East of MLEQ12 in campground on northeast side of Hilton Creek fault trace. Take paved road 0.22 mi into campground to right turn before turnaround circle. Station is inside turn about 30 ft from the edge of the pavement, N15°W of the tallest pine tree, N75°W of the second tallest pine tree, and about 125 ft from fault scarp, on a 6 by 8-ft boulder that projects 2 ft above ground, and marked with a hexagonal gravity marker stamped *MLEQ12A*. Read with meter facing north (chiseled arrow).

MLEQ12B 979,259.304 mGal (1984 value, when MLEQ12 was 979,259.092 mGal)

28.6 ft N60°E from MLEQ12 on a 2-ft diameter boulder projecting 0.6 ft above ground. No marker. Read with meter facing north.

MLEQ13 37° 39.00' 118° 36.00' 979,324.249 mGal

11.8 mi southeast from Benton Crossing along Watterson Canyon road, 3.1 miles east of the junction of Long Valley Dam road and Watterson Canyon road, 0.9 mi northeast of the road junction in the center of sec 36, T3S, R30E, about 50 ft south of the center of road, about 90 ft east of the most prominent pine tree on south side of road, about 15 ft N25°W from a pinyon pine tree, on a 4 by 4-ft quartz monzonite boulder that projects 1 ft, and marked with a standard hexagonal gravity marker stamped *MLEQ13*. Read with meter facing north (arrow chiseled in rock).

MLEQ13A 979,324.255 mGal

21.5 ft south of MLEQ13 on a 6 by 7-ft quartz monzonite boulder projecting 1.5 ft, and approximately 15 ft S60°W of a pine tree, and marked with a 1 $\frac{3}{8}$ in diameter brass marker stamped *MLEQ13A*. Read with meter facing north (chiseled arrow).

MLEQ14 37° 37.72' 118° 56.11' 979,244.579 mGal

About 0.08 mi southeast along the Sherwin Creek Road from the Sherwin Creek Campground, about 200 ft northeast of road on largest rock outcrop on north edge of lava flow over-looking campground. Station is in ledge on south side of and about 4 ft below top of outcrop, and about 5 ft east of a small pine tree. Station was marked by a 1 $\frac{3}{8}$ in diameter brass marker which has been stolen.

MLEQ14A 979,244.867 mGal

37.3 ft S70°W of MLEQ14 on outcrop about 2 ft above ground level, 14.5 ft N20°E of a juniper tree, about 25 ft from a large stump which is visible from the road, and approximately 15 ft above road. Station was marked by a $1\frac{3}{8}$ in diameter brass marker which has been stolen. Read with meter facing north.

MLEQ15 37° 40.77' 119° 00.41' 979,214.034 mGal

From U.S. Highway 395 go southwest 3.2 mi along Mammoth Scenic Road to the junction with the road to Inyo Craters, then west (right) 0.75 mi to a junction, then left 0.21 mi on 3S23. Station is located about 50 ft northwest of road on 6 by 12-ft rock (the only large rock in area) projecting 3 ft above ground and marked by a gravity marker stamped *MLEQ15*. Read with meter facing north.

MLEQ15A 979,213.953 mGal

5 ft west of MLEQ15 on top of rock. Read with meter facing north.

MLEQ16 37° 36.63' 118° 54.98' 979,205.706 mGal

Along Laurel Canyon road, at first crest in road at top of moraine, on 4 ft diameter flat rock 61 ft north of the centerline of road. Rock projects approximately 1 ft above ground. Read with meter facing north.

MLEQ16A 979,205.771 mGal

On rounded rock approximately 2 ft above ground 87.5 ft N20°E from MLEQ16. Read with meter facing north.

FLOWY 37° 37.85' 118° 53.75' 979,264.502 mGal

0.7 mi southeast and then southwest along Sherwin Creek Road from the junction with U.S. Highway 395, where a dirt track runs northwest along the west edge of a marsh, northwest of the road and southwest of the track on a lava outcrop, on a USGS BM stamped "Y". BM is one of three in a triangular pattern for monitoring tilt (Sylvester, 1984). Read with special baseplate that rests directly on the mark with meter facing north.

FLOWX 979,264.428 mGal

S44°W 92.8 ft from FLOWY on BM "X". Read with special baseplate which rests on BM, with meter facing north.

HOTX 37° 39.02' 118° 50.28' 979,272.713 mGal

From U.S. Highway 395, go north and then east 1.8 mi to a junction, then continue north 0.6 mi to a dirt track to the left. Station is located northwest of the road and southwest of the track on a lava outcrop, on a USGS BM stamped "Y". BM is one of three in a triangular pattern for monitoring tilt (Sylvester 1984). Read with special baseplate that rests directly on the mark with meter facing north.

HOTY 979,273.120 mGal

S2°W 137.8 ft from HOTX on BM "Y". Read with special baseplate that rests directly on the BM with meter facing north.

STATIONS WITHOUT ALTERNATES

SHERWIN CREEK ROAD AND VICINITY

MLV01 37° 37.39' 118° 54.79' 979,259.597 mGal

1.9 mi west along Sherwin Creek Road from the junction with U.S. Highway 395, east of and 65.3 ft from pipe culvert under road, 36 ft north of the center of creek on north side of road, on a basalt outcrop, and marked with a $1\frac{3}{8}$ in diameter brass disc stamped *MLV01*. Read with meter facing north.

MLV02 37° 37.52' 118° 55.42' 979,252.711 mGal

2.6 mi west along the Sherwin Creek Road from the junction with U.S. Highway 395, 125 ft west of road intersection to Los Angeles YMCA Camp, on basalt outcrop 37 ft south of the centerline of road, 5.8 ft above ground, and marked with a $1\frac{3}{8}$ in diameter brass disc stamped *MLV02*. Read with meter facing north.

MLV03 37° 37.76' 118° 56.59' 979,239.840 mGal

3.9 mi west along Sherwin Creek Road from the junction with U.S. Highway 395, 0.4 mi west of the Sherwin Creek Campground, 122 ft south of the center line of the road, on flat-topped 5 by 3-ft boulder projecting 2.5 ft above ground surface, and marked with a $1\frac{3}{8}$ in diameter brass disc stamped *MLV03*. Read with meter facing north.

MLV04 37° 37.73' 118° 57.24' 979,230.346 mGal

4.5 mi west along Sherwin Creek Road from the junction with U.S. Highway 395, 1.0 mi west of the Sherwin Creek Campground, at top of rise, on most prominent rock on ridge north of road, 99 ft north of centerline of road, over USFS marker *M2* which is set in the top of an 8 by 8-ft rock projecting 3 ft above road. Read with meter facing north.

MLV05 37° 37.82' 118° 57.72' 979,232.080 mGal

4.9 mi west along Sherwin Creek Road from the junction with U.S. Highway 395, 1.4 mi west of the Sherwin Creek Campground, and 0.45 mi south of the junction with Old Mammoth Road, on top of large (13 by 10-ft) rock, 34 ft northeast of the centerline of road, approximately 5 ft above road level, and marked with a $1\frac{3}{8}$ in diameter brass disc stamped *MLV05*. Read with meter facing north.

MLV06 37° 37.79' 118° 58.84' 979,228.358 mGal

0.85 mi south along Old Mammoth Road from the junction with State Highway 203 in Mammoth Lakes, to the junction with Sherwin Creek Road, then west 1.0 mile along Old Mammoth Road, 182 ft north of the centerline of Old Mammoth Road across from house 241815, 67.5 ft southwest of creek, 88 ft east of most prominent rock, 8 in above ground on west end of 7 by 13-ft rock that projects 2 ft above ground, and marked with a $1\frac{3}{8}$ in diameter brass disc stamped *MLV06*. Read with meter facing north.

MLV07 37° 37.89' 118° 56.91' 979,238.270 mGal

0.99 mi east along road just north of Mammoth Creek (the former State Highway) from intersection with Old Mammoth Road, on a 10 by 15-ft rock projecting about 2 ft above ground level, 31 ft north of the centerline of road, approximately 5 ft above road, and marked with a $1\frac{3}{8}$ in diameter brass marker stamped *MLV07*. Read with meter facing north.

MLV08 37° 37.21' 118° 57.06' 979,231.622 mGal

At Sherwin Creek Motocross, approximately 300 ft south of entrance, at south edge of sandy parking area, on flat 3 by 4-ft boulder at east edge of tongue of granitic boulders. Boulder projects approximately 1 ft above ground. Marked with a $1\frac{3}{8}$ in diameter brass disk stamped *MLV08*. Read with meter facing north.

STATE HIGHWAY 203 LEVEL LINE

1JCM82 37° 38.41' 118° 55.60' 979,255.221 mGal

0.55 mi west along State Highway 203 from the junction with U.S. Highway 395, 40 ft north of the centerline of the road, about 5 ft higher than the road, set in the top of a small rock outcrop projecting about 0.5 ft and marked by a USGS BM *1 JCM 1982*. Read with baseplate which rests on BM, with meter facing north.

BPR969 37° 38.37' 118° 56.14' 979,249.155 mGal

1.0 mi west along State Highway 203 from the junction with U.S. Highway 395, 17 in N40°W from Department of Agriculture Bureau of Public Roads BM *969+0312 7551.48*, and marked only by the three leg holes for a standard baseplate. Read with meter facing north.

2JCM82 37° 38.50' 118° 56.56' 979,242.013 mGal

1.5 mi west along State Highway 203 from the junction with U.S. Highway 395, to a paved side road on left, 200 ft southwest of the intersection and 73 ft south of the paved side road, in the top of an 8-ft high granite boulder and marked by a USGS BM *2 JCM 1982*. Read with baseplate which rests on BM with meter facing north.

MLV09 37° 38.75' 118° 56.93' 979,235.435 mGal

About 1.9 mi west along State Highway 203 from the junction with U.S. Highway 395, on the north side of State Highway 203 about 200 ft west of a Caltrans monument and about 125 ft north of highway on northwest of 3 boulders, (actually the NW segment of one broken boulder) that projects about 4 ft above ground, and marked with a $1\frac{3}{8}$ in diameter brass disk stamped *MLV09*. Read with meter facing north.

3JCM82 37° 38.85' 118° 57.53' 979,232.661 mGal

At the U.S. Forest Service Visitor Center at Mammoth Lakes, 180 ft southeast of the main entrance to the building, 22.5 ft northwest of the exit road from the visitors parking lot, 15 ft northeast of the sidewalk to the visitor center, in the top of a 3-ft granite boulder and marked by a USGS BM *3 JCM 1982*. Read with baseplate which rests on BM, with meter facing north.

4JCM82 37° 38.92' 118° 58.91' 979,220.466 mGal

In Mammoth Lakes, at the intersection of Lake Mary Road and State Highway 203, where 203 makes a right-angle turn to Minaret Summit, in the northeast corner of the intersection, about 60 ft north of the centerline of the east-west portion of Highway 203, in the top of a large boulder about 1.5 ft lower than the road and marked with a USGS BM *4 JCM 1982*. Read with baseplate which rests on BM, with meter facing north.

5JCM82 37° 39.36' 118° 59.47' 979,206.986 mGal

North and west 0.9 mi along State Highway 203 from the junction with Lake Mary Road in Mammoth Lakes, on the right side of the highway, on the outside of a sharp curve to the left, in the top of a 5 by 5-ft rock projecting about 1 ft and marked with a USGS BM *5 JCM 1982*. Read with baseplate which rests on BM, with meter facing north.

6JCM82 37° 39.10' 119° 00.01' 979,187.677 mGal

North and west 1.9 mi along State Highway 203 from the junction with Lake Mary Road in Mammoth Lakes, to the Earthquake Fault Road to right, 94 ft north of the highway and 42 ft east of the side road in the top of a 3-ft high boulder and marked with a USGS BM *6 JCM 1982*. Read with baseplate which rests on BM, with meter facing north.

8JCM82 37° 39.00' 119° 01.27' 979,175.456 mGal

North and west 3.4 mi along State Highway 203 from the junction with Lake Mary Road in Mammoth Lakes, 206 ft before reaching a National Forest Ski Area sign, 78 ft south of the road (left), on the top of a large boulder and marked by a USGS BM *8 JCM 1982*. Read with baseplate which rests on BM, with meter facing north.

U.S. HIGHWAY 395 LEVEL LINE

2CLADWP 37° 46.27' 118° 00.45' 979,256.355 mGal

2.1 mi northwest along U.S. Highway 395 from the Caltrans maintenance station at Crestview, at Deadman Summit, 261 ft south of Deadman Summit highway sign, 71 ft southwest of the centerline of the southbound lanes of the highway, 7.5 ft southeast of a 30-in pine tree with a triangular blaze, 1.2 ft southeast of a witness post, about 1.5 ft higher than the highway, and riveted on the top of a 2.5-in iron pipe encased in concrete and projecting 0.4 ft above the ground. Read with meter facing north.

X123 $37^{\circ} 44.42' 118^{\circ} 58.39'$ 979,275.298 mGal

1.0 mi southeast along U.S. Highway 395 from the Caltrans maintenance station at Crestview, on the top of the south bank of a deep dry wash, 56 ft southwest of the centerline of the highway, 46.85 ft northeast of triangulation station CRESTVIEW, about level with the highway, and set in the top of a concrete post projecting 0.4 ft above the ground. Read with baseplate which rests on BM, with meter facing north.

D916 $37^{\circ} 42.19' 118^{\circ} 56.99'$ 979,242.451 mGal

4.0 mi southeast along U.S. Highway 395 from the Caltrans maintenance station at Crestview, 273 ft northwest of the center of the southwest end of 24-inch corrugated metal pipe culvert *E-233-50*, in line with a row of telephone poles, 103 ft southwest of the centerline of the highway, 31.5 ft east of the centerline of a track road leading south to a graded road, 4.5 ft northwest of telephone pole *M17202V*, 1.6 ft southeast of a witness post, about 3 ft lower than the highway, and set in the top of a concrete post projecting 0.2 ft above the ground. Read with baseplate which rests on BM, with meter facing north.

Y123 $37^{\circ} 41.36' 118^{\circ} 56.51'$ 979,240.707 mGal

3.7 mi northwest along U.S. Highway 395 from the junction with State Highway 203, in R 27 E, T 3 S, in the southwest corner of the northeast quarter of section 13, 0.2 mi southeast of a curve, 137 ft south of and across the highway from telephone pole *M17170V*, 58.5 ft southwest of the centerline of the highway, 0.7 ft northeast of a witness post, 1.5 ft higher than the highway, and set in the top of a concrete post projecting 0.5 ft above the ground. Read with baseplate which rests on BM, with meter facing north.

12DOR75 $37^{\circ} 40.82' 118^{\circ} 55.97'$ 979,242.333 mGal

4.5 mi southeast of Crestview Maintenance Station along U.S. Highway 395 and a former alignment of Highway 395, about 1.0 mi south and 0.5 mi east of Highway 395, 160 ft east of old Highway 395, 18 ft east of a road, between two poles *A 380* of a double wooden pole transmission line, set on a copper-coated rod encased in a plastic pipe and marked with a USGS BM stamped *12 DOR 1975*. Read with standard baseplate resting on plastic pipe with center of BM 11 cm below plate, with meter facing north.

W911 $37^{\circ} 39.60' 118^{\circ} 55.50'$

See MLEQ02 (p. 3) which is 25 ft south.

CH225 (Z123) $37^{\circ} 38.76' 118^{\circ} 54.80'$ 979,263.512 mGal

This is station 225 in the gravity base station report by Chapman (1966). It is on USC&GS BM *Z123 1932* which is located at Casa Diablo Hot Springs, along old U.S. Highway 395 0.3 mi northwest of the former junction with State Highway 203, across the highway from the transformers at a geothermal power plant, 85 ft northeast of the centerline of the former highway, 55.2 ft N25°E of a fireplug, 38.1 ft N10°E of the northwest gatepost on a dirt road that passes south of the station, 38 ft S35°E of a power pole, 6.0 ft S20°E of a witness post, and set in the top of a concrete post projecting 0.3 ft above the ground.

Note: Chapman (1966) reports "Station on ground 0.3' below disc." This is thought to be in error (Chapman, oral commun., 1985). Readings should be taken on top of the post. Read with meter facing north.

A124REST 37° 37.76' 118° 51.84' 979,268.816 mGal

3.0 mi southeast along U.S. Highway 395 from the junction with State Highway 203, to the junction with the road to the Hot Creek Fish Hatchery and the Mammoth Lakes Airport, 85 ft southwest of the centerline of the southbound of the highway, 165 ft northwest of the road leading to a gravel pit, about 1 ft northeast of the fence along the edge of the highway right-of-way, and marked by California Division of Highways BM *A124 RESET 1967*, which is set in the top of a concrete post projecting about 0.1 ft above ground level. Read with meter facing north.

70661905 37° 37.40' 118° 49.79' 979,275.899 mGal

This station is on USGS BM *7066 1905* which is located at the ft of the southwest end of a high ridge, in the top of a large lava outcrop which projects 4.5 ft above the ground. This mark is shown as *BM 7066 B* on the Convict Lake 7.5' quadrangle. Extension of the runway of Mammoth Lakes Airport during 1984 has made access difficult and the former BM description invalid. Read with baseplate which rests on BM, with meter facing north.

CONVICT 37° 36.90' 118° 48.61' 979,284.162 mGal

6.5 mi southeast along U.S. Highway 395 from the junction with State Highway 203, on the outside of a curve at the top of a grade, 117 ft northeast of the centerline of the northbound lanes, on the top at the southeast end of a low flat ridge which projects above the highway, on USC&GS triangulation station *CONVICT 1956*, which is set in the top of a concrete post projecting 0.1 ft above the ground. Read with special baseplate that rests on mark, with meter facing north.

6DOR75 37° 35.17' 118° 46.96' 979,299.354 mGal

Station is located on USGS BM *6 DOR 1975* which is 6.6 mi west along old U.S. Highway 395 from the bridge over Rock Creek at Toms Place to the bridge over McGee Creek, 260 ft northwest of McGee Creek Lodge, in west concrete headwall of bridge. Read with special baseplate which rests directly on mark, with meter facing north.

D124 37° 34.39' 118° 45.54' 979,301.911 mGal

Station is located on USC&GS BM *D124 1992* which is 5.0 mi northwest along old U.S. Highway 395 from the concrete bridge over Rock Creek at Toms Place, 0.35 mi northwest of the "T" junction of a graded dirt road leading south to Hilton Lakes, in R 29 E, T 4 S, near the center of section 7, in the top of a large granite boulder, 380 ft northwest of the "T" junction of a track road leading southwest, 85.5 ft southwest of the centerline of the old highway, about 4.5 ft higher than the highway, and about 1.5 ft above the ground. Read with baseplate which rests on BM, with meter facing north.

E124 37° 33.83' 118° 43.51' 979,283.020 mGal

Station is located on USC&GS BM *E124 1932* which is located 2.8 miles west along old U.S. Highway 395 from the concrete bridge over Rock Creek at Toms Place, about 150 ft west of the summit of a hill between Hilton Creek and Little Round Valley, on the outside of a curve, in the top of a large volcanic outcrop, 84 ft north of the centerline of the highway, 34 ft northeast of the northeast one of double power line pole A-227, about level with the highway and about 2.5 ft above the ground. Read with meter facing north.

F124 37° 33.61' 118° 41.76'

See base station MLEQB2A (page2).

H124 37° 32.45' 118° 38.66' 979,334.678 mGal

Station is located on USC&GS BM *H124 1932* which is 1.0 mi east along U.S. Highway 395 from the junction with Rock Creek Road at Toms Place, then 1.6 miles south along a former alignment of the highway, 0.4 mi north of concrete bridge 47-02 over Rock Creek, in a small draw, in the top of a large granite boulder, 77 ft west of the centerline of the road, about 20 ft above the road and about 3.5 ft above the ground. Read with baseplate that rests on BM, with meter facing north.

6432 37° 30.84' 118° 37.69'

See MLEQ10A in primary station pairs section (page 5).

K124 37° 30.11' 118° 36.02' 979,374.369 mGal

Station is located on USC&GS BM *K124 1932* which is 2.7 mi northwest along old U.S. Highway 395 from the bridge over Rock Creek at Paradise Camp, near the southwest bank of Rock Creek Canyon, on the outside of a sharp curve, in the top of a long narrow lava rock, 33.5 ft northeast of the centerline of the old highway, 12.2 ft east of the fifth post south of the north end of a long wooden guardrail, and about 2.5 ft lower than the road. Read with meter facing north.

L124 37° 28.80' 118° 36.43' 979,400.805 mGal

Station is located on USC&GS BM *L124 1932* which is 0.4 mi west along old U.S. Highway 395 from the bridge over Rock Creek at Paradise Camp, on the outside of a sharp curve, on the south bank of a draw, in the top of a lava outcrop, 69 ft south of and across the draw from the centerline of the road, about level with the road. Read with meter facing north.

B911 37° 25.20' 118° 33.37' 979,423.679 mGal

Station is located on USC&GS BM *B911 1957* which is 5.1 mi southeast along old U.S. Highway 395 from the bridge over Rock Creek at Paradise Camp, at the junction of Evans Lane leading west (the road to Rovana and Pine Creek), on a rocky knoll, in the top of a flat embedded rock, 57 ft north of the center line of the lane, 206 ft southwest of the centerline of the old highway, about 3½ ft higher than the lane, and flush with the ground. Read with meter facing north.

T124REST 37° 30.00' 118° 30.00' This station was not measured in 1982. In 1980 the value was 979,441.097 mGal

Station is located on BM *T124 RESET 1974* which is 4.3 mi northwest along U.S. Highway 395 from the Bank of America at Bishop, on the north side of the highway and northwest of the northwest corner of the concrete bridge over Owens River Canal. Mark was reset by California Division of Highways. Read with standard baseplate, with meter facing north.

OWENS RIVER ROAD AND BENTON CROSSING LEVEL LINES

1JD1952 37° 37.92' 118° 48.62' 979,279.875 mGal

1.12 mi northeast along Benton Crossing Road from U.S. Highway 395, east of Whitmore Hot Springs, about 200 ft south of the junction of a road east to Crowley Lake, southeast of an unpaved road on USGS BM *1 JD 1952 6982* which is set in the top of a concrete post. Read with special baseplate that rests on BM, with meter facing north.

2JD1952 37° 40.26' 118° 48.67' 979,277.161 mGal

1.2 mi northeast along Benton Crossing Road from U.S. Highway 395, then north 2.8 mi on an unpaved road, 0.1 mi north of the junction with the road along Hot Creek, on USGS BM *2 JD 1952 6961* which is set in the top of a 3 by 8-ft boulder southeast of the road. Read with special baseplate that rests on BM, with meter facing north.

3JD1952 37° 41.31' 118° 47.26' 979,276.013 mGal

1.2 mi northeast along Benton Crossing Road from U.S. Highway 395, then north 4.8 mi on an unpaved road, at west break of ridge, 50 ft north of center of road on USGS BM *3 JD 1952 6916* which is set in the top of a concrete post. Read with special baseplate that rests on BM, with meter facing north.

4JD1952 37° 41.98' 118° 45.72' 979,285.712 mGal

Station is located on USGS BM *4 JD 1952 6818* which is at Benton Crossing, 370 ft east of the old bridge across the Owens River, 49 ft east of the centerline of a road heading north and approximately 100 ft north of the centerline of east-west road. Read with meter facing north with special baseplate that rests directly on the BM.

39DOR75 37° 43.44' 118° 48.84' 979,276.264 mGal

Station is located on USGS BM *39 DOR 1975* which is 1.4 mi southeast along U.S. Highway 395 from the Crestview Maintenance Station, then 9.8 miles east along Owens River Road, 0.17 mi southeast of power line crossing, 50 ft east of and 2 ft lower than road at a cattleguard, 27 ft north of a road heading east, 0.5 ft south of a fence and set on a copper-coated rod encased in a white plastic pipe. Read with special baseplate that rests on BM, with meter facing north.

24DOR75 37° 44.56' 118° 51.39' 979,286.631 mGal

Station is located on USGS BM *24 DOR 1975* which is 1.4 mi southeast along U.S. Highway 395 from the Crestview Maintenance Station, then 6.75 miles east along Owens River Road, 0.19 mi east of Y-road leading southeast to gravel pit, 50 ft north of and 1 ft lower than road and set on copper-coated rod encased in white plastic pipe. Read on standard baseplate with center resting on BM, with meter facing north.

E916 37° 44.98' 118° 55.78' 979,290.229 mGal

Station is located on USC&GS BM *E 916 1957* which is 1.4 miles southeast along U.S. Highway 395 from the Crestview Maintenance Station, then 2.5 mi east along Owens River Road, on the outside of a sharp curve, at the "T" junction of a former alignment of the road with a dim track road leading north, 57 ft northeast of the centerline of the old road (measured from the center of the junction), 16 ft north of a 6-inch pine tree with a triangular blaze, 14 ft east of the centerline of the track road, 1.7 ft south of a witness post, about 6.5 ft higher than the old road, and set in the top of a concrete post projecting 0.3 ft above the ground. Read with meter facing north.

LEVEL LINES BETWEEN U.S. 395 AND OWENS RIVER RD.

This line begins near Casa Diablo Hot Springs, goes northeast to a spur east across Little Antelope Valley, then continues northwest, then west to a point just southeast of Lookout Mountain.

23JCM82 37° 39.78' 118° 54.47' 979,237.917 mGal

Station is located on USGS BM *23JCM 1982* which is 0.1 mi east along State Highway 203 from the junction with U.S. Highway 395 to the east service road which parallels 395, then north along the service road 0.9 mi to the end of pavement and a gravel road on right with a sign "Antelope Springs Road", then east 1.3 mi to the top of a rise, about 85 ft north of and about 15 ft higher than the road, on a rhyolite outcrop. Read with meter facing north, with baseplate that rests on mark.

22JCM82 37° 40.38' 118° 54.16' 979,236.305 mGal

Station is located on USGS BM *22JCM 1982* which is 0.1 mi east along State Highway 203 from the junction with U.S. Highway 395 to the east service road which parallels 395, then north along the service road 0.9 mi to the end of pavement and a gravel road right with a sign "Antelope Springs Road", then east 2.2 mi to a rock outcrop on the left, 16 ft north of and about 4 ft higher than the centerline of the road. Read with meter with meter facing north, with baseplate that rests on BM.

17JCM82 37° 40.88' 118° 53.20' 979,257.768 mGal

Station is located on USGS BM *17JCM 1982* which is 0.1 mi east along State Highway 203 from the junction with U.S. Highway 395 to the east service road which parallels 395, then north along the service road 0.9 mi to the end of pavement and a gravel road right with a sign "Antelope Springs Road", then east 3.9 mi to a "T" junction at the bottom

of a steep grade, 80 ft west of the center of the road at the west edge of a graded flat turnout, and set in an 8 inch diameter white plastic pipe. Read with meter facing north, with standard baseplate resting on the plastic pipe.

Spur line east across Little Antelope Valley

18JCM82 37° 40.89' 118° 52.33' 979,269.880 mGal

Station is located on USGS BM *18JCM 1982* which is 0.1 mi east along State Highway 203 from the junction with U.S. Highway 395 to the east service road which parallels 395, then north along the service road 0.9 mi to the end of pavement and a gravel road right with a sign "Antelope Springs Road", then east 3.9 mi to a "T" junction at the bottom of a steep grade, then right along Antelope Springs Road 0.9 mi to where the road climbs out of Little Antelope Valley, on the top of a rhyolite outcrop about 1 ft high, 65 ft west (left) of and about 15 ft below the road, and 20 ft east of the most southerly of 3 large outcroppings. Read with meter facing north, with baseplate that rests on BM.

25JCM82 37° 41.25' 118° 51.55' 979,266.463 mGal

Station is located on USGS BM *25JCM 1982* which is 0.1 mi east along State Highway 203 from the junction with U.S. Highway 395 to the east service road which parallels 395, then north along the service road 0.9 mi to the end of pavement and a gravel road right with a sign "Antelope Springs Road", then east 3.9 mi to a "T" junction at the bottom of a steep grade, then right along Antelope Springs Road 1.9 mi to the beginning of a down grade, where there are rock outcrops on both sides of the road, 60 ft south of and about 8 ft higher than the road, on the top of a rhyolite outcrop. Read with meter facing north, with baseplate that rests on mark.

End of spur line

16JCM82 37° 41.80' 118° 53.29' 979,253.378 mGal

Station is located on USGS BM *16JCM 1982* which is 1.3 mi north of station 17JCM82 along the road that leads toward Chalk Bluffs, where a double wooden pole power line crosses the road, 35 ft west of the road, midway between 2 wooden power poles and set inside an 8 inch diameter white plastic pipe. Read with meter facing north, with regular baseplate resting on the plastic pipe.

15JCM82 37° 42.22' 118° 53.80' 979,234.052 mGal

Station is located on USGS BM *15JCM 1982* which is 0.8 mi north of 16JCM1982 and 2.1 mi north of 17JCM1982 on the east side of the road just before the top of a grade, 45 ft east of and 12 ft below the center of the road and set on the top of a small outcrop. Read with meter facing north, with baseplate that rests on BM.

12JCM82 37° 42.64' 118° 55.66' 979,250.950 mGal

Station is located on USGS BM *12JCM 1982* which is 3.8 mi north along U.S. Highway 395 from the junction with State Highway 203 to a gravel road on right – Smokey Bear Flat Road, then right 1.0 mi to a “Y” junction, then bear right and continue east for 0.4 mi to a dirt side road on right. Continue east on Smokey Bear Flats Road for 1.05 mi toward Chalk Bluffs to a point past the crest of a small hill, about 50 ft west (left) of the road on a rock outcrop. Read with meter facing north, with baseplate that rests on BM.

REFERENCES

Chapman, R. H., 1966, The California Division of Mines and Geology gravity base station network: California Division of Mines and Geology Special Report 90, 49p.

Sylvester, A. G., 1984, Crustal tilt in Long Valley, California: Marine Science Institute and Department of Geological Sciences, University of California, Santa Barbara Technical Report, 53 p.

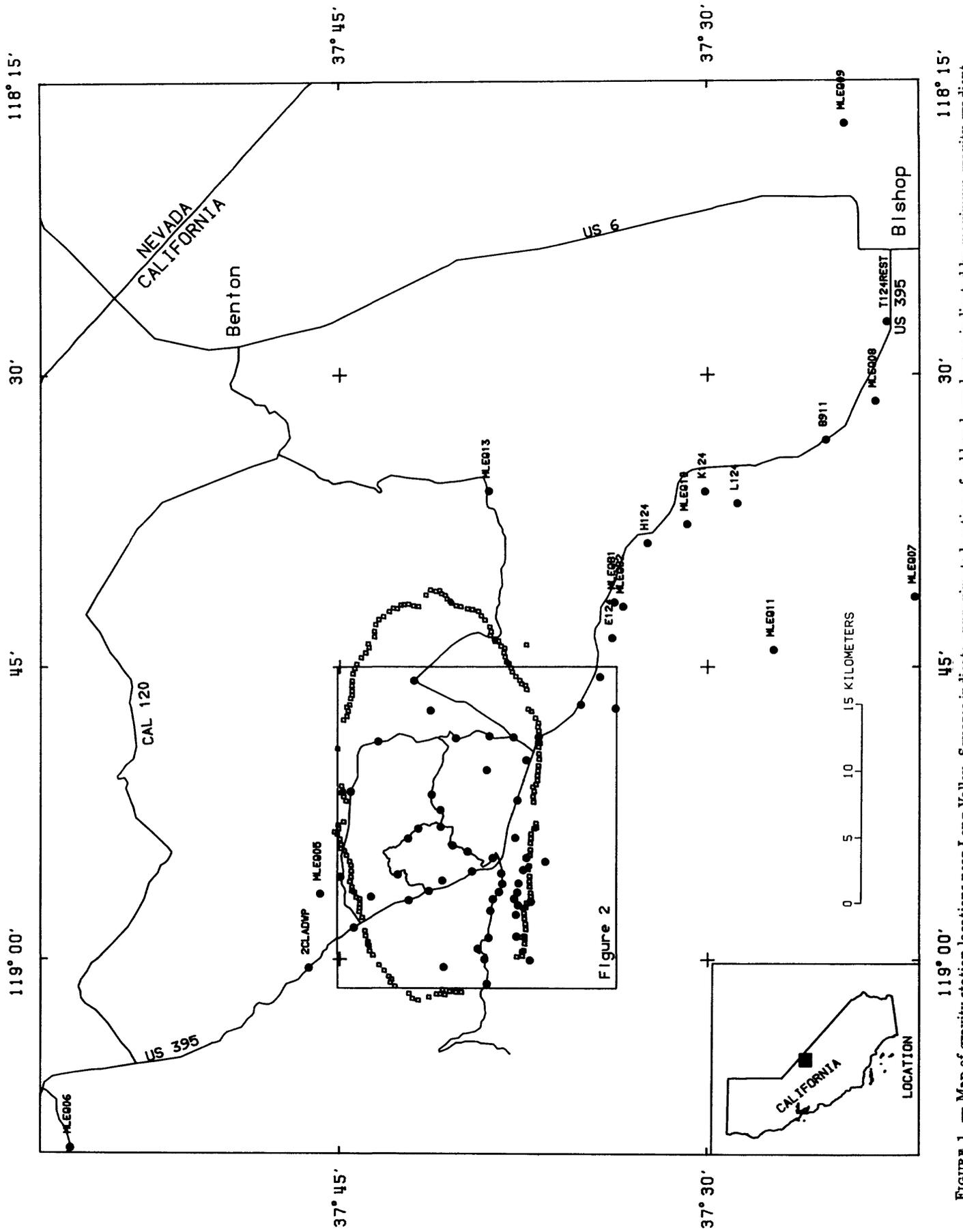


FIGURE 1. — Map of gravity station locations near Long Valley. Squares indicate approximate location of caldera boundary as indicated by maximum gravity gradient.

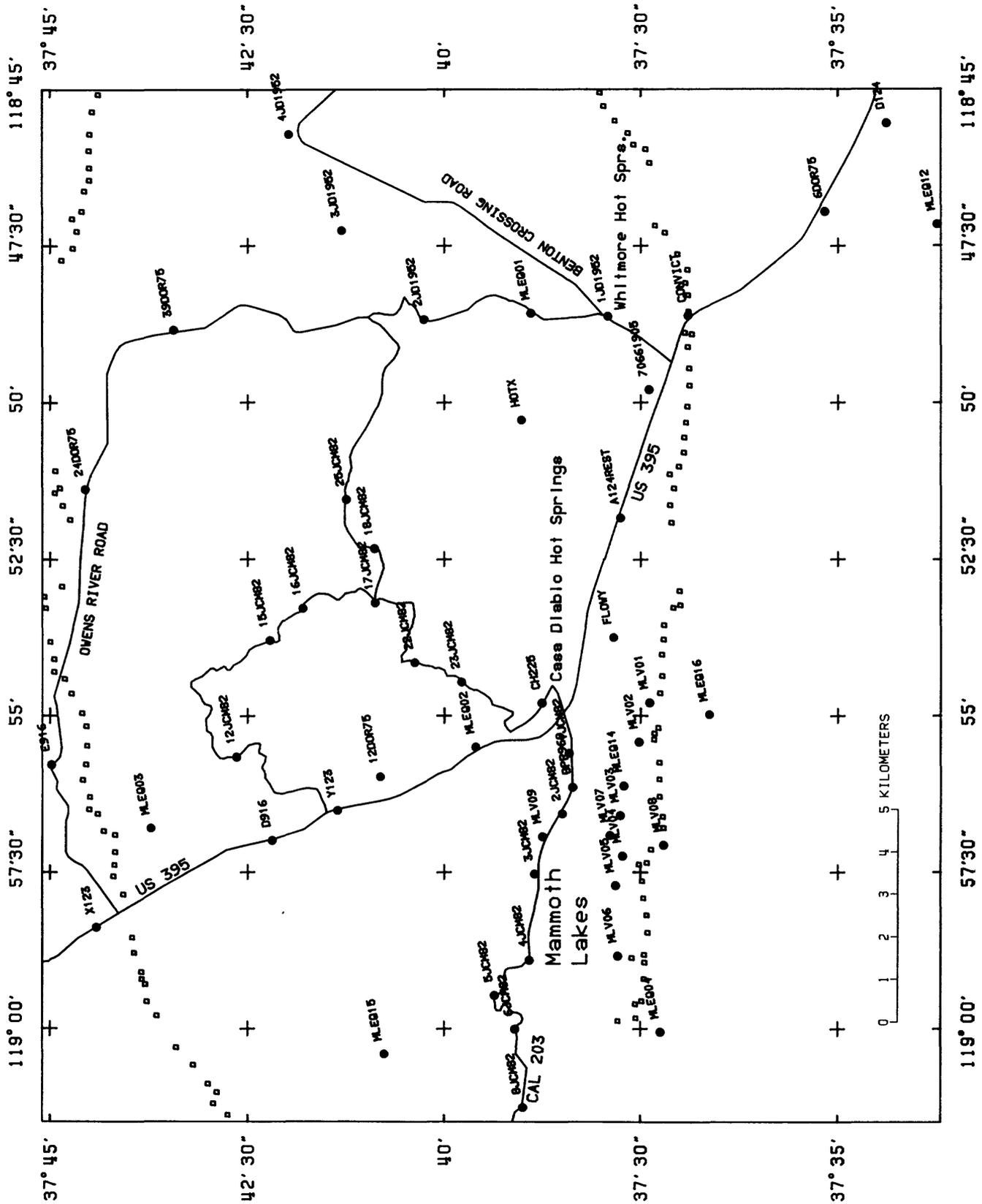


FIGURE 2. — Map of gravity station locations in Long Valley caldera. Squares indicate approximate location of caldera boundary as indicated by maximum gravity gradient.