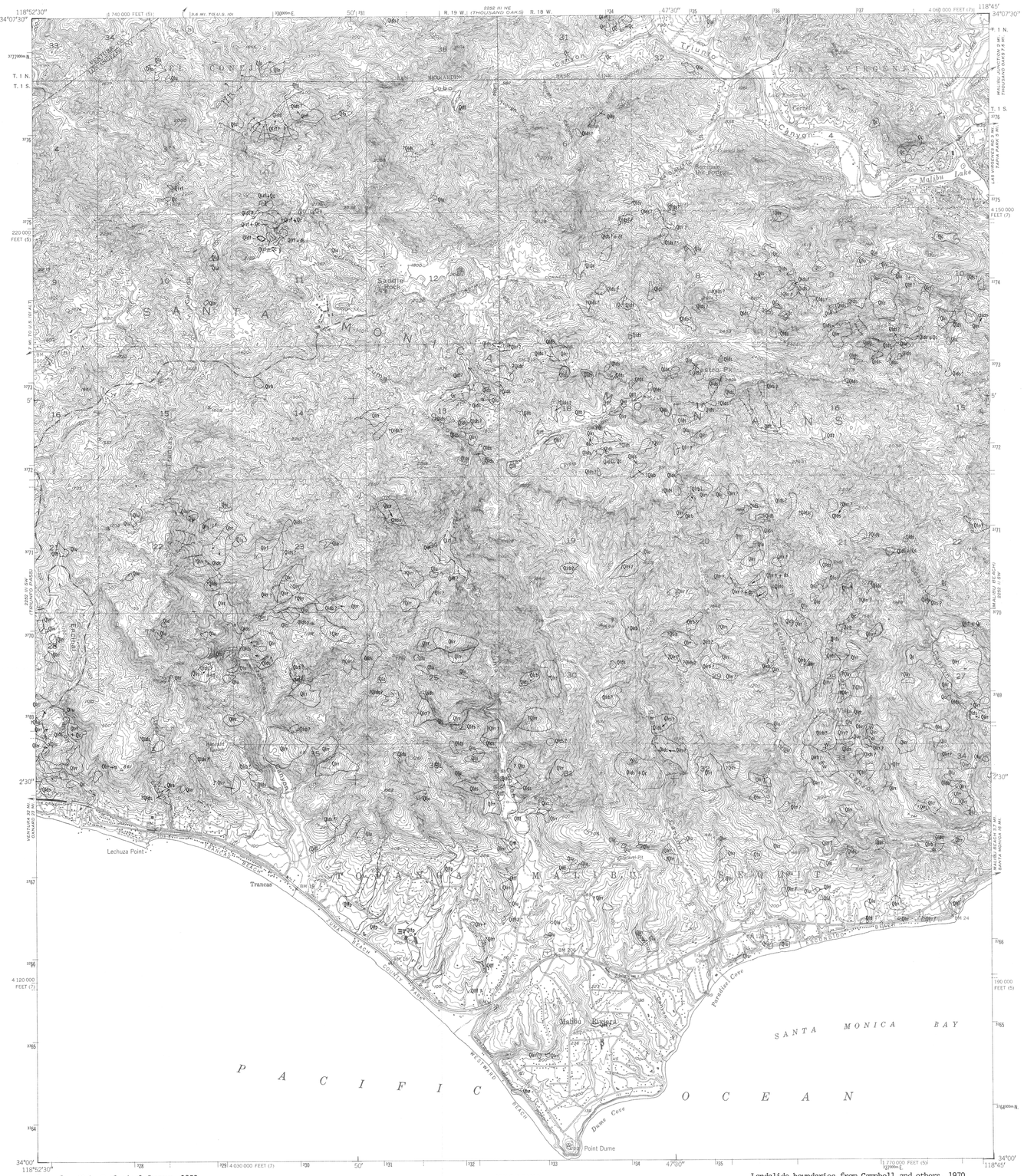
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

PREPARED IN COOPERATION WITH THE DEPARTMENT OF
THE COUNTY ENGINEER, LOS ANGELES COUNTY

MISCELLANEOUS FIELD STUDIES
MAP MF-1167
CAMPBELL—LANDSLIDE MAPS SHOWING FIELD CLASSIFICATION,
POINT DUME QUAD., CALIFORNIA



Base from U.S. Geological Survey, 1950
Photorevision as of 1967

Polyconic projection. 1927 North American datum
10,000-foot grids based on California coordinate system, zones 5 and 7
1000-meter Universal Transverse Mercator grid ticks, zone 11

UTM GRID AND 1967 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24000

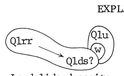
CONTOUR INTERVAL 25 FEET
DATUM IS MEAN SEA LEVEL

SHORELINE SHOWN REPRESENTS THE APPROXIMATE LINE OF MEAN HIGH WATER
THE AVERAGE RANGE OF TIDE IS APPROXIMATELY 4 FEET

Landslide boundaries from Campbell and others, 1970
Field classification of landslides by R. H. Campbell, 1975

QUADRANGLE LOCATION

EXPLANATION OF LANDSLIDE MAP



Landslide deposits

Avalanche scar

(Probable path of recent debris flow)

Arrows connecting two labels within one landslide boundary indicate a downslope change from initial failure assigned to one landslide class to subsequent movement dominated by another class; no arrows are shown where the inferred gradation is lateral.

Query preceding label (e.g., ?Qlds) indicates questionable identification of landform as landslide deposit; query following label (e.g., Olds?) indicates questionable landslide class assignment of deposit.

Plus symbol connecting two different labels (e.g., Qlds+Qc) indicates both classes of material are present within the landslide boundary.

Slash separating two labels (e.g., Qlrb/Qlrr) indicates dominant movement by the first mechanism (in the example, block glide) and subordinate movement by the second (in the example, rotation of subordinate blocks).

The symbol w stands for window exposing bedrock.

Table 1.--Summary of field recognition criteria and inferred mechanisms by which landslides were assigned to specific classes; shows landslide map symbols and isopleth map group number (I-IV)

Map symbol 1/	Landslide class 2/	Parent material	Mechanism: Geometry 3/	Mechanism: Transport 4/	Scar characteristics	Deposit characteristics
Qlrf (I)	Rockfall and rock topple	Consolidated bedrock	Irregular; very steep to vertical	Falling, rolling, sliding-T	Bare cliffs and steep bedrock slopes	Rock detritus -- talus blocks, rock trains
Qlrs (I)	Rockslide	do	Planar; steep	Sliding-T, rolling	Bare steep bedrock slopes and cliffs	Rock detritus -- debris sheets, debris lobes
Qlrb (III)	Bedrock block glide	do	Planar; dipping	Sliding-T	Linear breakaway, bare planar surface	Translated blocks
Qlrl (III)	Bedrock lateral spreading	do	Planar; nearly flat	Sliding-T, collapse, flow(?)	Linear or arcuate breakaway	do
Qlrr (II)	Bedrock slump	do	Curved	Sliding-R	Arcuate crown	Inward rotation of blocks
Qlds (I)	Debris slide	Natural rock detritus and soil	Planar	Sliding-T	do	Debris sheets, debris lobes
Qlsf (I)	Soilfall and soil topple	Unconsolidated deposits and soil	Irregular; very steep to vertical	Falling, rolling, sliding-T	Bare bluffs and steep slopes	Debris aprons with soil blocks
Qlsr (II)	Soil slump	do	Curved	Sliding-R, flow(?)	Arcuate crown	Inward rotation of blocks
Qlss (I)	Soil slip	Colluvial soil with vegetal cover	Planar	Sliding-T, flow	Thin planar slab	Various debris flow deposits (see below)
Qlfl (IV)	Debris flow	Soil slip detritus	Compound	Flow	Bare channel	Debris lobes
Qlfc (IV)	do	do	Channeled	do	do	Debris trains
Qlff (IV)	do	do	Expanding	do	do	Debris fans
Qlfp (IV)	do	do	do	do	do	Debris sheets
Qlu (II)	Unclassified (chiefly small bedrock slump/debris slide features)	Bedrock and surficial deposits	Compound	Chiefly sliding	Mostly arcuate crowns	Slumped blocks, rock detritus, and debris
Qc	Hill creep	Colluvium and subjacent bedrock	Planar	Compound	Commonly no scar	Colluvium

1/ Map symbols refer chiefly to deposits. Symbols consist of three parts: 1) the first two letters - Ql - identify the deposit as landslide of Quaternary age; 2) the third letter refers to parent material: bedrock (r), natural rock detritus (d), and soil (s), except for the family of debris flows, where (f) refers to the supply of flowing slurry; 3) the fourth letter refers to dominant mechanism — falls and topples (f), translational sliding of blocks (b), rotational sliding of blocks (r), translational sliding of surficial material (s), and lateral spreading to a free face (l) — except for the family of debris flows, in which the fourth letter refers to the form of the final debris deposit: lobes (l), trains (t), sheets (p), and fans (f). Roman numeral in parentheses refers to group assignment for construction of isopleth maps.

2/ Landslide class generally follows usage of HRB Special Paper 29 (Varnes, 1958).

3/ Geometry refers primarily to profile of slip surface. For debris flows, reference is to whether flow is confined to a channel, is expanding at the mouth of a confined channel, is sheet-like and unconfined, or is some combination ("compound").

4/ Transport refers to inferred dominant means of transportation downslope. Sliding-T refers to dominant translational sliding; sliding-R refers to dominant rotational sliding.

REFERENCES CITED

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Campbell, R. H., 1975, Soil slips, debris flows, and rainstorms in the Santa Monica Mountains and vicinity, southern California: U.S. Geological Survey Professional Paper 851, 51 p.

Varnes, D. J., 1958, Landslide types and processes, *in* Eckel, E. B., ed., Landslides and engineering practice: Highway Research Board Special Report 29, Washington, D.C., p. 20-47.

Wright, R. H., Campbell, R. H., and Nilsen, T. H., 1974, Preparation and use of isopleth maps of landslide deposits: Geology, v. 2, no. 10, p. 483-485.

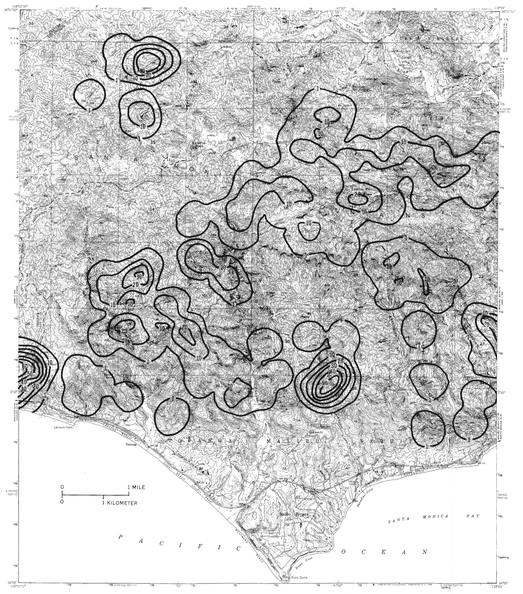

Figure 1.—Group I — Isopleths on landslide deposits that are characterized by movement parallel to topographic slope (rockfalls and topples, soilfalls and topples, debris slides, and soil slips).

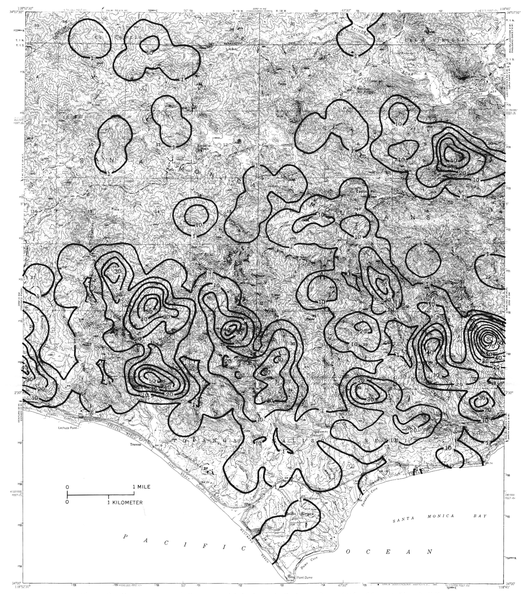

Figure 2.—Group II — Isopleths on landslide deposits that are characterized by rotational sliding movement, concave upward with respect to topographic slope (bedrock slump and soil slump; includes most unclassified landslides).

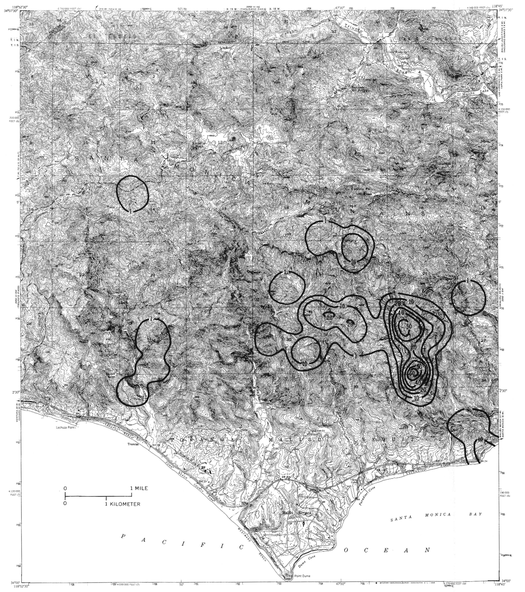

Figure 3.—Group III — Isopleths on landslide deposits that are characterized by translational sliding movement on pre-existing geologic surfaces such as bedding, faults, and joints (bedrock block glide, bedrock lateral spreading).

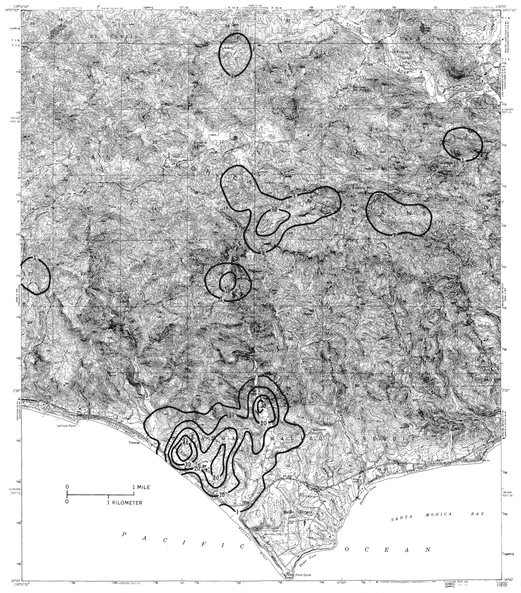

Figure 4.—Group IV — Isopleths on landslide deposits that are characterized by movement as flowing slurries (debris flows).

Figures 1–4.—Isopleth maps of selected groups of landslide deposits, showing that the distribution of each group is significantly different.

Isopleths by Janet Brown, 1976, using method of Campbell (1973).

EXPLANATION OF FIGURES 1-4

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Isopleth, showing percentage of area covered by landslide deposits in each of an infinite number of overlapping 92-acre circles. That is, any given point identifies the center of a 92-acre circle, and the numerical value of the point, as read from the isopleth interval, identifies the percentage of that circle that is covered by landslide deposits (see Campbell, 1973).

RATIONALE FOR GROUPING OF LANDSLIDE CLASSES

In an attempt to characterize the differences in distribution of landslides attributable to different dominant causal factors, each of the landslide classes shown on Table 1, and on the landslide map, was assigned to one of four major groups:

Group I - Rockfall (and topples), soilfall (and topples), debris slide, and soil slip.

Group II - Bedrock slump and soil slump (includes most unclassified landslides).

Group III - Bedrock block glide, bedrock lateral spreading.

Group IV - Debris flows.

Group I includes landslides in which the steepness of slope and the strength or cohesiveness of materials are major factors in resistance to failure.

Groups II and III both appear to be strongly influenced by bedrock strength. The two groups differ in that Group III landslides seem more related to preexisting structural and stratigraphic planes of weakness, whereas the geometry of Group II landslides seems to reflect a more nearly isotropic (equal in all directions) distribution of shear strength.

Group IV, flow deposits, are mostly found on slopes of less than 11 degrees. The depositional surfaces of the deposits form slopes that appear controlled by maximum clast sizes and by the fluidity (viscosity) of the matrix.

The distribution of each group is represented by an isopleth map in order to quantify the distributions for comparison, and to minimize the effects of errors in recognition and classification. The method of isopleth map construction is described in Campbell (1973).

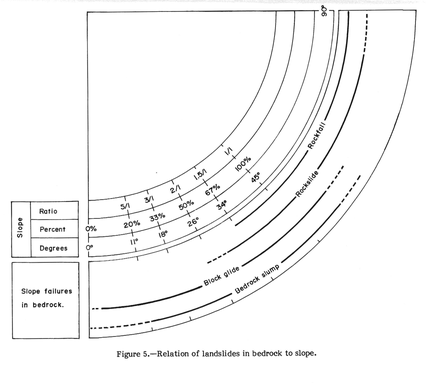

Figure 5.—Relation of landslides in bedrock to slope.

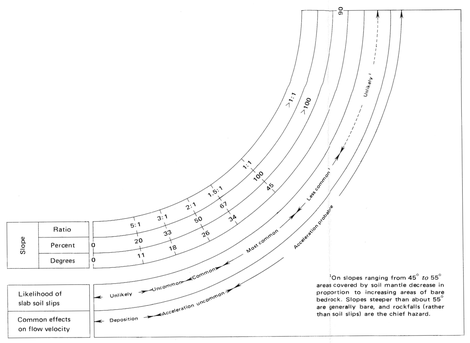

Figure 7.—Relation of soil slips and debris flows to slope. (From Campbell, 1975)

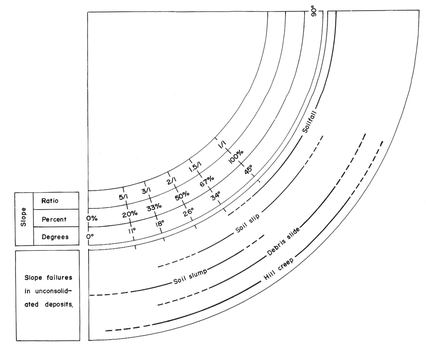

Figure 6.—Relation of landslides in unconsolidated material to slope.

Figures 5–7.—Diagrams summarizing the relation of slope to class of landslide in the Santa Monica Mountains.

LANDSLIDE MAPS SHOWING FIELD CLASSIFICATION, POINT DUME QUADRANGLE, CALIFORNIA

By

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1980

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