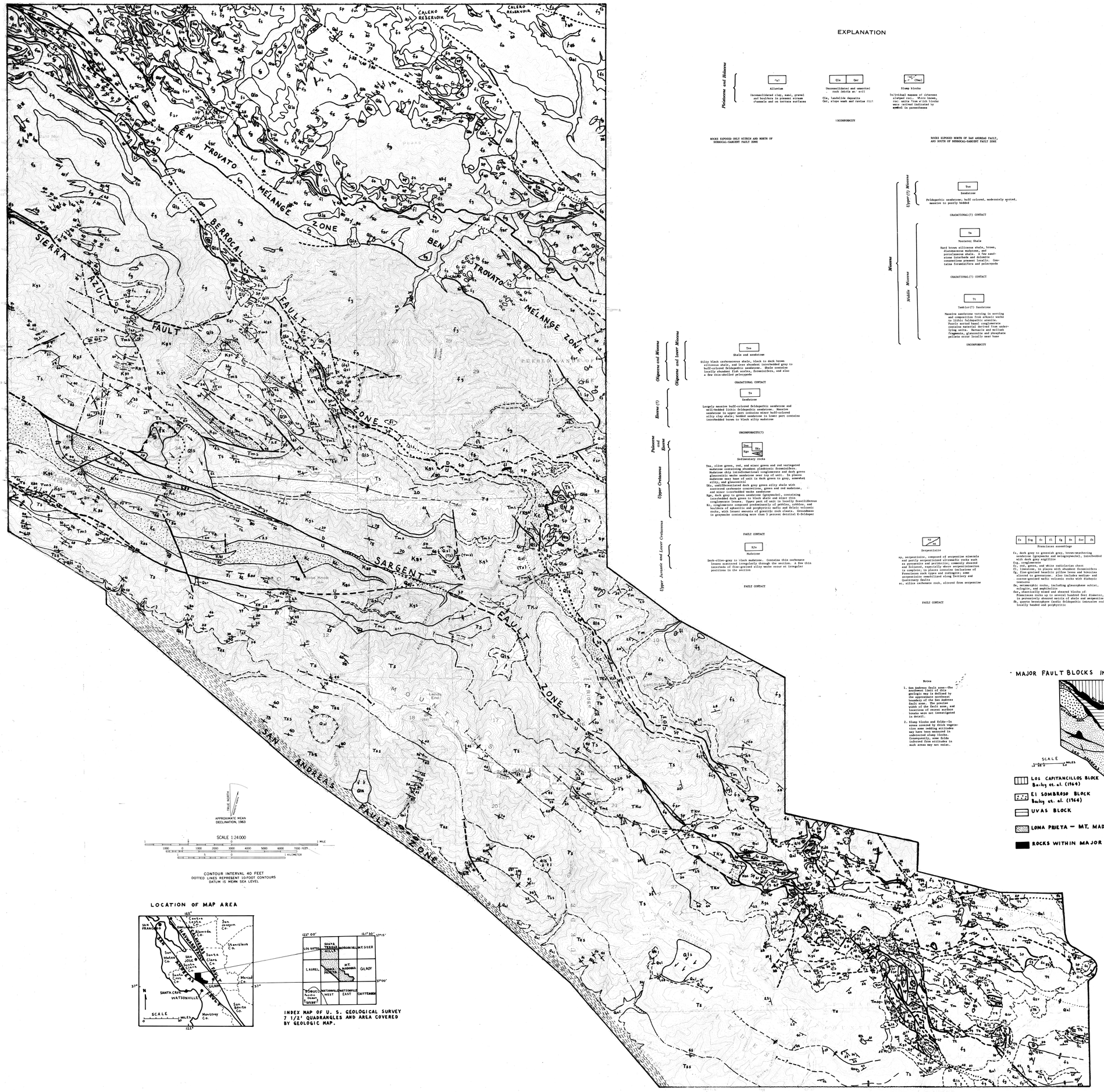
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY



EXPLANATION

Pleistocene and Holocene

Qal — Alluvium
Unconsolidated clay, sand, gravel and boulders in present active channels and on terrace surfaces

Qls — Unconsolidated and unsorted rock debris as: soil
Qls, landslide deposits
Qwr, slope wash and revine fill

Qls / (Tms) — Slump blocks
Individual masses of coherent rock large enough to show on map; units from which blocks were derived indicated by symbol in parentheses

UNCONFORMITY

ROCKS EXPOSED ONLY WITHIN AND NORTH OF BERROCAL-SARGENT FAULT ZONE

ROCKS EXPOSED NORTH OF SAN ANDREAS FAULT, AND SOUTH OF BERROCAL-SARGENT FAULT ZONE

Miocene — *Upper(?) Miocene*

Tss — Sandstone
Feldspathic sandstone; buff colored, moderately sorted, massive to poorly bedded

GRADATIONAL(?) CONTACT

Miocene — *Middle Miocene*

Tm — Monterey Shale
Hard brown siliceous shale, brown, diatomaceous mudstone, and porcelanous shale. Thin sandstone interbeds are present locally. Contains foraminifera and pelecypods

GRADATIONAL(?) CONTACT

Tt — Temblor(?) Sandstone
Massive sandstone varying in sorting and composition from arkosic wacke to lithic feldspathic arenite. Poorly sorted basal conglomerate contains clasts derived from underlying units. Barnacle and mollusk fragments, glauconite and phosphate pellets occur locally near base

UNCONFORMITY

Oligocene and lower Miocene

Tss — Shale and sandstone
Silty black carbonaceous shale, black to dark brown siliceous shale, and lees abundant interbedded gray to buff-colored feldspathic sandstone. Shale contains locally abundant fish scales, foraminifers, and also a few chin-shelled pelecypods

GRADATIONAL CONTACT

Eocene (?)

Ts — Sandstone
Largely massive buff-colored feldspathic sandstone and well-bedded lithic feldspathic sandstone. Massive sandstone in upper part contains minor buff-colored silty clay shale; bedded sandstone in lower part contains interbedded brown to black silty mudstone

UNCONFORMITY(?)

Paleocene and Eocene

Tms / TKu — Sedimentary rocks
Tms, olive green, red, and minor green and red variegated mudstone containing abundant planktonic foraminifers. Mudstone chip intraformational conglomerate and dark green glauconitic wacke sandstone near top of unit. In places mudstone near base of unit is dark green to gray, somewhat silty, and glauconitic
TKu, undifferentiated dark gray green silty shale with minor interbedded sandstone, green and red mudstone, and minor interbedded wacke sandstone
Kgs, dark gray to green sandstone (graywacke), containing interbedded dark green to gray silty shale and minor conglomerate. Lower part of unit is locally fossiliferous
Kc, conglomerate composed predominantly of pebbles, cobbles, and boulders of aphanitic and porphyritic mafic and felsic volcanic rocks, with lesser amounts of granitic rock clasts. Groundmass is graywacke containing more than 5 percent detrital K-feldspar

FAULT CONTACT

Upper Cretaceous

Ksm — Mudstone
Dark-olive-gray to black mudstone. Contains thin carbonate lenses scattered irregularly through the section. A few thin interbeds of fine-grained silty wacke occur at irregular positions in the section

FAULT CONTACT

Upper Jurassic and Lower Cretaceous

Sp — Serpentinite
sp, serpentinite, composed of serpentine minerals and partly serpentinized ultramafic rocks such as pyroxenite and peridotite. Some serpentinite has foliated, especially where serpentinization has been incomplete. Serpentinite contains inclusions of Franciscan rock types and rodingite; some serpentinite remobilized along Tertiary and Quaternary faults
sc, silica carbonate rock, altered from serpentine

FAULT CONTACT

fs | fsg | fc | fl | fg | fm | fss | fk — Franciscan assemblage
fs, dark gray to greenish gray, brown-weathering sandstone (graywacke and metagraywacke), interbedded with dark gray argillite
fsg, sandstone-shale
fc, red, green, and white radiolarian chert
fl, limestone, in places with abundant foraminifera
fg, fine-grained basaltic pillow lava and breccias altered to greenstone. Also includes medium- and coarse-grained mafic volcanic rocks with diabasic textures
fm, metamorphic rocks, including glaucophane schist, eclogite, and amphibolite
fsr, chaotically mixed and sheared blocks of: Franciscan rocks up to several hundred feet diameter, in pervasively sheared matrix of shale and serpentine
fk, quartz keratophyre (sodic feldspathic intrusive rock) locally banded and porphyritic

QUATERNARY

TERTIARY

JURASSIC AND CRETACEOUS

MAP SYMBOLS

- Contact, showing dip — Dashed where approximately located; dotted where concealed; queried where doubtful
- Contact interpreted from air photographs
- Fault, showing dip — Dashed where approximately located; dotted where concealed; queried where doubtful
- High-angle fault — U, upthrown side; D, downthrown side
- Thrust fault — Sawteeth on upper plate
- Strike-slip fault — Showing relative horizontal movement
- Fault interpreted from air photographs
- Anticline — Showing crestline and direction of plunge; long dashed where approximately located; short dashed where inferred; dotted where concealed; queried where doubtful
- Overturned anticline — Showing direction of dip of limbs
- Syncline — Showing crossline and direction of plunge; long dashed where approximately located; short dashed where inferred; dotted where concealed; queried where doubtful
- Overturned syncline — Showing direction of dip of limbs
- Strike and dip of beds
- Top of beds known from sedimentary features
- Strike and dip of beds
- Approximate strike and dip direction of beds
- Strike of vertical beds
- Strike and dip of overturned beds
- Strike and dip of slip cleavage foliation
- Strike of vertical slip cleavage foliation
- Landslide boundary — Arrows indicate general direction of movement
- Slump block boundary
- Gas seeps
- Fault zone
- Fossil locality

FOSSIL COLLECTIONS

Map No.	Field No.	Collector	Year	Dominant Fossils	Age	Stage	Identified by
1	8MR-3-71	McLaughlin	1971	foraminifers	middle of early Eocene	upper Penutian-lower Ulatisian	Rau
2	71LP634	Simoni	1971	crinoids	Cretaceous		Durham
3	70LP275	Simoni	1970	foraminifers	Eocene or older		Pierce
4	70LP273	Simoni	1970	foraminifers	Late Paleocene or early Eocene		Pierce
5	70LP273A	Simoni	1970	foraminifers	same as 70LP273		Pierce
6	70LP295	Simoni	1970	foraminifers	late Paleocene or early Eocene		Pierce
7	70LP366	Simoni	1970	oyster	not diagnostic		-----
8	70LP315	Simoni	1970	foraminifers	late Paleocene or early Eocene		Pierce
9	70LP315A	Simoni	1970	foraminifers	same as 70LP315		Pierce
10	70LP282	Simoni	1970	foraminifers	Late Cretaceous		Jones
11	8MR-15-71	McLaughlin	1971	foraminifers	middle or early Eocene	upper Penutian-lower Ulatisian	Rau
12	71LP118	Simoni	1971	mollusk	Late Jurassic		Jones
13	69LP61	Simoni	1969	foraminifers	Paleocene or lower Eocene		Pierce
14	69RB672	Brabb	1969	oyster	not diagnostic		-----
15	69RB566	Brabb	1969	mollusk	Late Cretaceous		Jones
16	71LP597	Simoni	1971	mollusk	Late Cretaceous		Jones
17	69RB566	Brabb	1969	foraminifers	Paleocene		Pierce
18	69RB567	Brabb	1969	foraminifers	Paleocene-Eocene		Pierce
19	SD 6-4	Osbun	1970	foraminifers	lower Eocene or older		Pierce
20	SD 7-1	Osbun	1970	foraminifers	lower Eocene or older		Pierce
21	8MR-55-71	McLaughlin	1971	foraminifers fish scales	Lower Miocene	Saucesian or Zemorrian; possibly late Zemorrian	Pierce
22	71CR-932	Bauer	1971	barnacles, mollusks	middle Miocene or younger		Addicott
23	SF-7-9	McLaughlin	1969	foraminifers	middle or early Eocene	Ulatisian or Penutian	Pierce
24	SF-39-69	McLaughlin	1969	foraminifers	early Eocene, Paleocene, or Cretaceous		Narvo, Pierce
25	SF-100-69	McLaughlin	1969	foraminifers	probable Paleocene		Narvo
26	SF-33-69	McLaughlin	1969	foraminifers	Late Cretaceous		Jones
27	SF-80-69	McLaughlin	1969	foraminifers	middle Eocene or older	Ulatisian, Penutian or Bulitian	Pierce, Narvo
28	SF-33-69	McLaughlin	1969	mollusks	Early Cretaceous or older		Jones
29	SF-60-69	McLaughlin	1969	mollusks	Early Cretaceous or older		Jones
30	SF-133-70	McLaughlin	1970	mollusks	Tithonian and Early Cretaceous		Jones
31	SF-293-70	McLaughlin	1970	mollusks, barnacles	middle or late Miocene(?)		Addicott
32	SF-265-70	McLaughlin	1970	mollusks, barnacles	Miocene or younger		Addicott
33	SF-263-70	McLaughlin	1970	foraminifers, mollusks	middle Miocene	Zemorrian, Saucesian or Relizian	Pierce, Addicott
34	SF-395-70	McLaughlin	1970	foraminifers	early Miocene or older	possibly Zemorrian	Pierce
35	SF-396-70	McLaughlin	1970	foraminifers	early Miocene or older	possibly Zemorrian or Saucesian	Pierce
36	SF-282-70	McLaughlin	1970	mollusks, barnacles	probably same as SF-293-70		
37	SF-145-70	McLaughlin	1970	foraminifers	late Paleocene or early Eocene		Pierce, Narvo
38	SF-151-70	McLaughlin	1970	foraminifers	late Paleocene or early Eocene	Penutian or Bulitian	Pierce, Narvo
39	SF-144-70	McLaughlin	1970	foraminifers	Early Tertiary		Narvo
40	SF-143	McLaughlin	1970	pelecypod	not diagnostic		Jones
41	69-CR-542	Brabb	1969	foraminifers	Paleocene or Cretaceous		Pierce
42	69-CR-541	Brabb	1969	foraminifers	Cretaceous		Pierce
43	SF-437-70	McLaughlin	1970	oysters	not diagnostic		-----
44	69-CR-537	Brabb	1969	foraminifers	Paleocene or Cretaceous		Pierce
45	SF-18-69	McLaughlin	1969	mollusks	lower Cretaceous	probably Berriasian	Jones
46	SF-109-69	McLaughlin	1969	mollusks	Lower Cretaceous	Valanginian	Jones
47	SF-424-70	McLaughlin	1970	mollusks	Early Cretaceous or older		Jones

IDENTIFICATION OF FOSSILS

U. S. Geological Survey
V. C. Addicott
D. L. Jones
E. L. Pierce
V. W. Rau

University of California, Berkeley
V. W. Durham

Mobil Oil Company
R. W. Narvo
A. D. Warren

REFERENCES

Bailey, E. H., Irwin, W. P., and Jones, D. L., 1964, Franciscan and related rocks, and their significance in the geology of western California: California Div. Mines and Geology Bull. 183, p. 113, table 15.

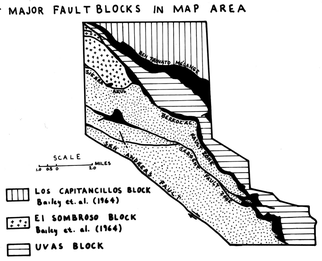
Kleinpell, R. M., 1938, Miocene stratigraphy of California: Tulsa, Okla., Am. Assoc. Petroleum Geologists, 450 p.

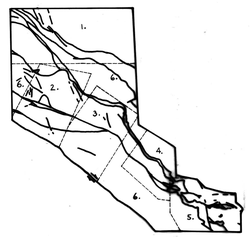
Mallory, V. S., 1959, Lower Tertiary biostratigraphy of the California Coast Ranges: Tulsa, Okla., Am. Assoc. Petroleum Geologists, 416 p.

Notes

1. San Andreas fault zone--The extent of the San Andreas fault on this geologic map is defined by the approximate northeast boundary of the Franciscan assemblage. The precise width of the fault zone, and locations of recent surface breaks were not investigated in detail.
2. Slump blocks and folds--In areas covered by thick vegetation some inferred attitudes may be influenced by undetected slump blocks. Consequently, some folds inferred from attitudes in such areas may not exist.

MAJOR FAULT BLOCKS IN MAP AREA





Sources of Compiled Geology

1. Bailey, E. H., and Everhart, D. L., 1964, Geology and Quicksilver deposits of the New Almaden district, Santa Clara County, California: U.S. Geol. Survey Prof. Paper 360, 206 p.
2. Simoni, T. R., Jr., unpublished M.S. thesis, San Jose State College, California: in progress, 1971.
3. Osbun, E. D., unpublished M.S. thesis, San Jose State College, California: in progress, 1971.
4. Bauer, P. G., 1971, unpublished M.S. thesis, San Jose State College, California.
5. McLaughlin, R. J., 1971, Geologic map of the Sargent fault zone in the vicinity of Mount Madonna, Santa Clara County, California: U.S. Geol. Survey San Francisco Bay Region Environment and Resources Planning Study, Basic Data Contrib. 13.
6. ____, reconnaissance field investigation, 1971.

LOCATION OF MAP AREA

INDEX MAP OF U. S. GEOLOGICAL SURVEY 7 1/2' QUADRANGLES AND AREA COVERED BY GEOLOGIC MAP.

PRELIMINARY GEOLOGIC MAP OF THE LOMA PRIETA-MOUNT MADONNA AREA, SANTA CLARA AND SANTA CRUZ COUNTIES, CALIFORNIA

by
Robert J. McLaughlin, Tully R. Simoni, Eric D. Osbun, and
Paul G. Bauer
1971

Base from U. S. Geological Survey Mt. Madonna, 1955, Loma Prieta, 1955, Santa Teresa Hills, 1953. All quads photorevised 1968.

This map is preliminary and has not been reviewed for conformity with U.S. Geological Survey standards