EXPLANATION

Qal | Qsr | Qf | Qm | Qd | Qls | Qb | Qaf

Surficial deposits

Qal; alluvium; gravel, sand, silt, and clay
Qsr; slope wash and ravine fill or colluvium; gravel, sand, silt, and clay
Qf; alluvial fans; gravel, sand, silt, and clay
Qm; San Francisco Bay mud
Qd; wind-blown sand
Qls; landslide debris
Qb; beach sand and minor gravel
Qaf; artificial fill

Qoal

Older alluvium

Gravel, sand, silt, and clay

Qtt

Terrace deposit

Predominantly sand; some silt, clay, and gravel. Subscripts refer to different levels in local areas

UNCONFORMITY

QTs

Santa Clara Formation

Poorly, consolidated conglomerate, sandstone, siltstone, and claystone. Minor lignite and lake deposits

UNCONFORMITY

WEST OF SAN ANDREAS FAULT

Tp: Tptu | Tpl | Tpsg | Tpp | Tpt

Purisima Formation

Tp; Purisima Formation, undivided
Tptu; Tunitas Sandstone Member of Cummings and others (1962)
Tpl; Lobitos Mudstone Member of Cummings and others (1962)
Tpsg; San Gregorio Sandstone Member of Cummings and others (1962)
Tpp; Pomponio Siltstone Member of Cummings and others (1962)
Tpt; Tahana Sandstone and Siltstone Member of Cummings and others (1962)

Tsc

Santa Cruz Mudstone of Clark (1966b)

Tsm

Santa Margarita Sandstone

UNCONFORMITY

Tm

Monterey Shale

Middle Miocene, Luisian and Relizian age (Cummings and others, 1962, p. 195)

Tlo

Lompico Sandstone of Clark (1966b)

Middle Miocene, Luisian or Relizian age (Clark, 1968, p. 169)

UNCONFORMITY

EAST OF SAN ANDREAS FAULT

QTm

Merced Formation

Poorly consolidated sandstone, siltstone, claystone, and conglomerate

UNCONFORMITY

Tm

Monterey Shale

Middle Miocene, Relizian age (Cummings and others, 1962, p. 195)

Tus

Unnamed sandstone

Middle Miocene, Luisian or Relizian age (Clark, 1968, p. 175)

Tsp

Page Mill Basalt

Middle Miocene, Luisian or Relizian age (Clark, 1968, p. 177)

UNCONFORMITY

Tla | Tvq | Tz | Tsr | Tst | Tsl | Tdb | Tos

Sandstone, shale, and volcanic rocks

Tla; Lambert Shale; Oligocene and (or) Miocene, Zemorrian and Saucesian age (Dibblee, 1966; Weaver and others, 1944)
Tvq; Vaqueros Sandstone; Oligocene and (or) Miocene, Zemorrian and Saucesian age (Clark, 1968, p. 173; Weaver and others, 1944)
Tz; Zayante Sandstone of Clark (1966b); Oligocene and (or) Miocene, Zemorrian age (Clark, 1968, p. 173; Weaver and others, 1944)
Tnb; Mindego Basalt and other volcanic rocks; Oligocene and (or) Miocene, Zemorrian and Saucesian age (Cummings and others, 1962, p. 193)
Tsr; Rices Mudstone Member of San Lorenzo Formation of Brabb (1964); Eocene and Oligocene, Refugian and Zemorrian age (Brabb, 1964, p. 675)
Tst; Twobar Shale Member of San Lorenzo Formation of Brabb (1964); late Eocene Narizian age (Brabb, 1964, p. 671)
Tos; Lambert and San Lorenzo Formations, undivided

Tebs | Tebc

Butano Sandstone

Teb; Butano Sandstone, undivided; early, middle, and late Eocene, Penutian, Ulatisian, and Narizian age (Clark, 1968, p. 170)
Tebs; shale
Tebc; conglomerate

UNCONFORMITY

Tl

Locatelli Formation of Cummings and others (1962)

Paleocene, Yrezian age (Cummings and others, 1962, p. 184)

UNCONFORMITY

WEST OF SAN GREGORIO FAULT

Kpp

Pigeon Point Formation

Sandstone, shale, and conglomerate

Kv

Unnamed volcanic rocks

Age and spatial relations uncertain but they seem to underlie Pigeon Point Formation and they may possibly be of Cretaceous age

BETWEEN SAN GREGORIO AND PILARCITOS-SAN ANDREAS FAULTS

gr | qd | gb

Igneous rocks

gr; granite and adamellite
qd; quartz diorite
gb; gabbro

sch | m | gn

Metamorphic rocks

sch; schist and quartzite
m; marble
gn; gneiss

EAST OF SAN ANDREAS-PILARCITOS FAULTS

Great Valley Sequence

unk

Unnamed shale near Palo Alto

Late Cretaceous, Campanian (Graham and Church, 1963)

sp

Serpentine and ultramafic rocks

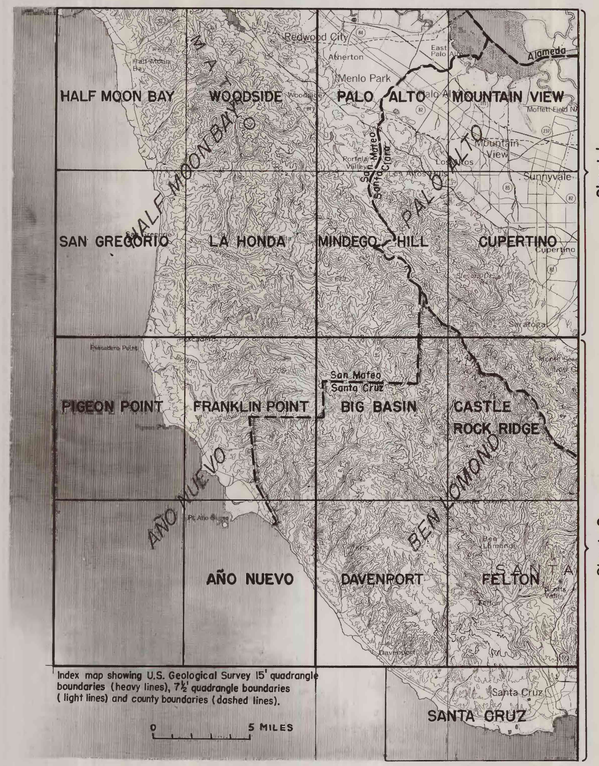
Kfj | fs | fh | fg | fc | fl | fm | fsr

Franciscan Formation

Kfj; undivided Franciscan Formation mostly sandstone and shale
fs; predominantly sandstone, minor shale
fh; predominantly shale, minor sandstone
fg; greenstone (altered basalt and diabase)
fc; chert
fl; limestone
fm; metamorphic rocks of blueschist facies
fsr; sheared rocks; hard rounded masses or "knockers" of sedimentary, metamorphic, and volcanic rocks in a softer matrix of clay minerals

Pleistocene and Holocene — Pliocene — Miocene — Oligocene — Eocene — Paleocene — Upper Cretaceous

QUATERNARY — TERTIARY — JURASSIC AND CRETACEOUS — PALEOZOIC(?)



INDEX MAP

MAP SYMBOLS

Contact

Fault

Dashed where approximate; dotted where concealed. U, upthrown side. D, downthrown side. Query indicates that further extent of fault is unknown.

Small fault

Fault too small to show on map but significant because displacement apparently occurred within about the last 100,000 years.

San Andreas fault zone

Surface breaks can be expected anywhere within this zone during future major earthquakes. The margins of the fault zone are gradational and some surface breaks may occur outside the zone.

-1800- Bedrock contour

Depth below mean sea level to top of Franciscan Formation inferred from geophysical and well data. See Calif. Dept. Water Resources (1967) and Robbins (1969). Shown only in part of the Palo Alto quadrangle.

35 Inclined | Vertical | Overturned | Horizontal

Strike and dip of beds

Anticline | Syncline

Fold axis showing trace of axial plane and plunge. Dashed where approximately located.

35 Inclined | Vertical

Strike and dip of foliation

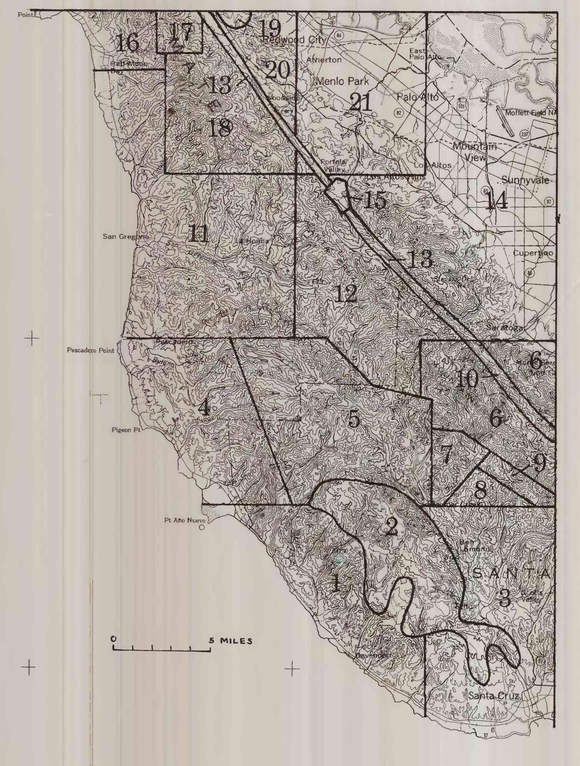
Large landslide deposit

Larger than 500 feet in maximum dimension. Boundaries approximate. Activity and stability uncertain. Many of these landslide deposits are inferred from features on aerial photographs and have not been field checked. Other large landslides may have been overlooked. Therefore, the areas not mapped as landslide deposits are not necessarily stable or inactive.

Small landslide deposit

50 to 500 feet in maximum dimension. Few of these landslides have been mapped--they probably number in the thousands within the map area.

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



INDEX OF DATA SOURCES

SOURCES OF COMPILATION DATA

1. Clark (1970). See also Page and Holmes (1945).
2. Leo (1961). Contacts between igneous and metamorphic rocks and overlying sedimentary rocks extensively modified by Clark (1970). See also Leo (1967).
3. Clark (1966a).
4. Unpublished geologic mapping, scale 1:24,000 by S. A. Brooks and R. Fiske, Union Oil Company of California, 1956. Additional field work by T. W. Dibblee, Jr., 1947-9, and J. C. Clark and E. E. Brabb, 1969-70. See also report by Hall and others (1959).
5. Brabb (1960). See also Cummings and others (1962), and Brabb (1964).
6. Field work by E. E. Brabb 1968-70; T. W. Dibblee, Jr., 1947-9; and T. R. Rogers, 1970.
7. Burchfiel (1958) and (1964).
8. Travers (1959) and field work by J. C. Clark, 1960-5.
9. McCollom (1959).
10. R. E. Wallace.
11. Touring (1959). See also report by Cummings and others (1962). Bedrock geology modified from unpublished maps, scale 1:24,000, by F. J. Noble, S. A. Brooks, Eugene Borax, K. F. Oles, R. S. Fiske, H. L. Fothergill, R. H. Hacker, and J. H. van Amringe, Union Oil Company of California 1951-7. Additional field work by T. W. Dibblee, Jr., 1947-9 and E. E. Brabb, 1958, 1968-9. Landslides modified or added from photo interpretation by E. E. Brabb, 1969.
12. Dibblee (1966) modified from data by Cummings (1960) and Cummings and others (1962).
13. Schlocker and others (1965) and R. E. Wallace.
14. Dibblee (1966). Depth to Franciscan Formation and inferred faults from California Department Water Resources (1967) and from data in Robbins (1969). Surficial deposits bordering San Francisco Bay in Mountain View quadrangle mapped by E. E. Brabb from 1956 and 1966 Soil Conservation Service aerial photographs, scale 1:20,000.
15. Sources (13) and (14) above and Johnson (1969).
16. Unpublished geologic mapping by S. A. Brooks, K. F. Oles, and Eugene Borax, Union Oil Company of California, 1956, scale 1:24,000; some data from Classen (1959). Additional field work by T. W. Dibblee, Jr., 1947-9, and by E. E. Brabb, 1968-9.
17. Burtner (1959) modified from extensive field checking by E. E. Brabb, 1968-9.
18. Esser (1958) and Mack (1959) modified from field reconnaissance and photo interpretation of landslides by E. E. Brabb, 1968-9.
19. McLaughlin (1969); some field checking by E. E. Brabb, 1969.
20. Thomas (1951) and extensive field reconnaissance by E. E. Brabb, 1969.
21. Source (14) plus data from Pampeyan (1970).

ADDITIONAL ACKNOWLEDGMENTS

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U.S. GEOLOGICAL SURVEY
OPEN FILE MAP

FIGURE 7c

PRELIMINARY GEOLOGIC MAP OF THE CENTRAL SANTA CRUZ MOUNTAINS, CALIFORNIA

Compiled by

Earl E. Brabb

1970

REFERENCES

(Scale refers to geologic map in report used for compilation. Reports asterisked are available for study at the U.S. Geological Survey, 345 Middlefield Road, Menlo Park, California. The remaining reports are in the Branner Geological Library, Stanford University.)

* Brabb, E. E., 1960, Geology of the Big Basin area, Santa Cruz Mountains, California: Stanford Univ. unpub. Ph.D. thesis, scale 1:24,000.

* _____ 1964, Subdivision of San Lorenzo formation (Eocene-Oligocene), west-central California: Am. Assoc. Petroleum Geologists, Bull., v. 48, no. 5, p. 670-697, scale about 1:62,000.

* Burchfiel, B. C., 1958, Geology of the Two Bar Creek area, Boulder Creek, California: Stanford Univ. unpub. MS thesis, scale 1:12,000.

* _____ 1964, Stratigraphic reassignment of four species in the lower Miocene rocks of the Bear Creek area, Santa Cruz County, California: Jour. Paleont., v. 38, no. 2, p. 401-405, scale about 1:35,000.

Burtner, R. L., 1959, Geology of the upper Crystal Springs Reservoir-Cahill Ridge area, San Mateo County, California: Stanford Univ., unpub. School of Mineral Sci. Dept., scale 1:24,000.

* California Dept. Water Resources, 1967, Evaluation of ground water resources, South Bay--App. A, Geology: California Dept. Water Resources Bull. 118-1, 153 p., scale 1:125,000.

Clark, J. C., 1966a, Tertiary stratigraphy of the Felton-Santa Cruz area, Santa Cruz Mountains, California: Stanford Univ. unpub. Ph.D. thesis, scale 1:24,000.

* _____ 1966b, Tertiary stratigraphy of the Felton-Santa Cruz area, Santa Cruz Mountains, California: Dissert. Abs., v. 27, no. 6, p. 1184B.

* _____ 1967, Correlation of the Santa Cruz Mountains Tertiary. Implications for San Andreas history, in Conf. on geologic problems of San Andreas fault system, Stanford, Calif., Proc.: Stanford Univ. Pubs. Geol. Sci., v. 11, p. 166-180.

* _____ 1970, Geologic map of the Davenport area, Santa Cruz County, California: U.S. Geol. Survey open-file report, scale 1:24,000.

Classen, J. S., 1959, Geology of a portion of the Half Moon Bay Quadrangle, San Mateo County, California: Stanford Univ. unpub. MS thesis, scale 1:21,000.

Cummings, J. C., 1960, Geology of the Langley Hill-Waterman Gap area, Santa Cruz Mountains, California: Stanford Univ. unpub. Ph.D. thesis, scale 1:24,000.

* Cummings, J. C., Touring, R. M., and Brabb, E. E., 1962, Geology of the northern Santa Cruz Mountains, California: California Div. Mines and Geology Bull. 181, p. 179-220, scale 1:48,000.

* Dibblee, T. W., Jr., 1966, Geology of the Palo Alto quadrangle, Santa Clara and San Mateo Counties, California: California Div. Mines and Geology Map 8, scale 1:62,500.

Esser, R. W., 1958, The reconnaissance geology of a part of the Woodside quadrangle northeast of Skyline Boulevard, San Mateo County, California: Stanford Univ. unpub. MS thesis, scale 1:24,000.

* Grahame, J. J., and Church, J. C., 1963, Campanian Foraminifera from Stanford Univ. campus: Stanford Univ. Pub. Geol. Sci., v. 8, no. 1, 106 p.

* Hall, C. A., Jr., D. L. Jones, and S. A. Brooks, 1959, Pigeon Point formation of late Cretaceous age, San Mateo County, California: Am. Assoc. Petroleum Geologists, Bull., v. 43, no. 11, p. 2855-2859, scale about 1:175,000.

* Johnson, A. M., and Ellen, S. D., 1968, Preliminary evaluation of the interaction between engineering development and natural geologic processes on the Bovet property, town of Portola Valley, California, ... with a section on the San Andreas Fault, by William R. Dickinson: report prepared for city of Portola Valley, California, scale about 1:2,400.

Leo, G. W., 1961, The plutonic and metamorphic rocks of Ben Lomond Mountain, Santa Cruz County, California: Stanford Univ. unpub. Ph.D. thesis, scale 1:24,000.

* _____ 1967, The plutonic and metamorphic rocks of the Ben Lomond Mountain area, Santa Cruz County, California, in Short contributions to California geology: California Div. Mines and Geology Spec. Rept. 91, p. 27-43, scale 1:62,500.

Mack, J. E., 1959, Reconnaissance geology of part of the Woodside quadrangle, San Mateo County: Stanford Univ. unpub. MS thesis, scale 1:24,000.

McCollom, R. M., Jr., 1959, Lithofacies study of the Vaqueros Formation, Santa Cruz Mountains, California: Stanford Univ. unpub. MS thesis, scale 1:18,000.

* McLaughlin, R. J., 1969, The Franciscan series and Eocene(?) rocks west of San Carlos and Belmont, California: San Jose State College unpub. rept., scale 1:12,000.

* Page, B. M., and Holmes, C. N., 1945, Bituminous sandstone deposits near Santa Cruz, Santa Cruz County, California: U.S. Geol. Survey Oil and Gas Inv. Map 27, scale about 1:7,600.

* Pampeyan, E. H., 1970, Geologic map of the Palo Alto 7-1/2' quadrangle, San Mateo and Santa Clara Counties, California: U.S. Geol. Survey open-file rept., scale 1:12,000.

* Robbins, S. L., 1969, Gravity and magnetic data in the vicinity of the Calaveras, Hayward and Silver Creek faults near San Jose, California: San Jose State College, unpub. MA thesis, scale 1:62,500.

* Schlocker, J., Pampeyan, E. H., and Bonilla, M. G., 1965, Approximate trace of the main surface rupture in the San Andreas fault zone between Pacifica and the vicinity of Saratoga, California, formed during the earthquake of April 18, 1906: U.S. Geol. Survey open-file report, scale 1:62,500.

* Thomas, R. G., 1951, An example of reinstitution of serpentine: Am. Geophys. Union Trans., v. 32, no. 3, p. 462-465, scale about 1:37,500.

* Touring, R. M., 1959, Structure and stratigraphy of the La Honda and San Gregorio quadrangles, San Mateo County, California: Stanford Univ. unpub. Ph.D. thesis, scale 1:24,000.

Travers, W. B., 1959, Geology of the Newell Creek area, Boulder Creek, California: Stanford Univ. unpub. MS thesis, scale about 1:12,000.

* Weaver, C. E., and others, 1944, Correlation of the marine Cenozoic formations of western North America: Geol. Soc. America Bull., v. 55, p. 569-598.

NOTE

This map provides basic geologic data for a Department of Housing and Urban Development-U.S. Geological Survey study of the physical environment and resources of the San Francisco Bay region. The map is only the first stage in a program to develop concepts, products and procedures which can significantly improve regional planning and development, and it is designed therefore primarily for use by other geologists. Maps and reports interpreting these geologic data for non-geologist users, such as planners, developers, engineers, public officials, and the general public are in progress.
The map is compiled from sources of variable quality and completeness and its accuracy, therefore, is uneven. The map is, therefore, a progress report giving the status of geologic knowledge in 1970--substantial map changes may be made as more information is collected during the course of the 3 1/2 year study.