CALIFORNIA DIVISION OF MINES AND GEOLOGY

Fault Evaluation Report FER-36

April 18, 1977

1. Name of fault: Big Pine fault (western segment).

2. Location of fault: Santa Barbara County, California (see figure 1).

3. Reason for evaluation: Located in 1976 study area of the 10-year program for fault evaluation in the state. Santa Barbara County seismic safety element classifies fault as active (Moore and Taber, 1974).

4. List of references:

a) Carman, M.F., Jr., Geology of the Lockwood Valley area: California Division of Mines and Geology Special Report 81, 62 p., 4 pl., map scale 1" = 975'.

b) Crowell, J.C., 1968, Movement histories of faults in the Transverse Ranges and speculations on the tectonic history of California in Proceedings of conference on geologic problems of San Andreas fault system, Dickinson, W.R., and Grantz, A., editors: Stanford University Publications, Geological Sciences, v. XI, p. 323-341.

c) Crowell, J.C., 1962, Displacement along the San Andreas fault, California: Geological Society of America, Special Paper no. 71, 61 p.

d) Hill, M.L., and Dibblee, T.W., Jr., April 1953, San Andreas, Garlock, and Big Pine faults, California: Geological Society of America Bulletin, v. 64, p. 443-458.

e) Jennings, C.W., 1975, Fault Map of California with locations of volcanoes, thermal springs, and thermal wells: California Division of Mines and Geology, California Geologic Data Map Series, Map no. 1, scale 1:750,000.

From Jennings (1975)

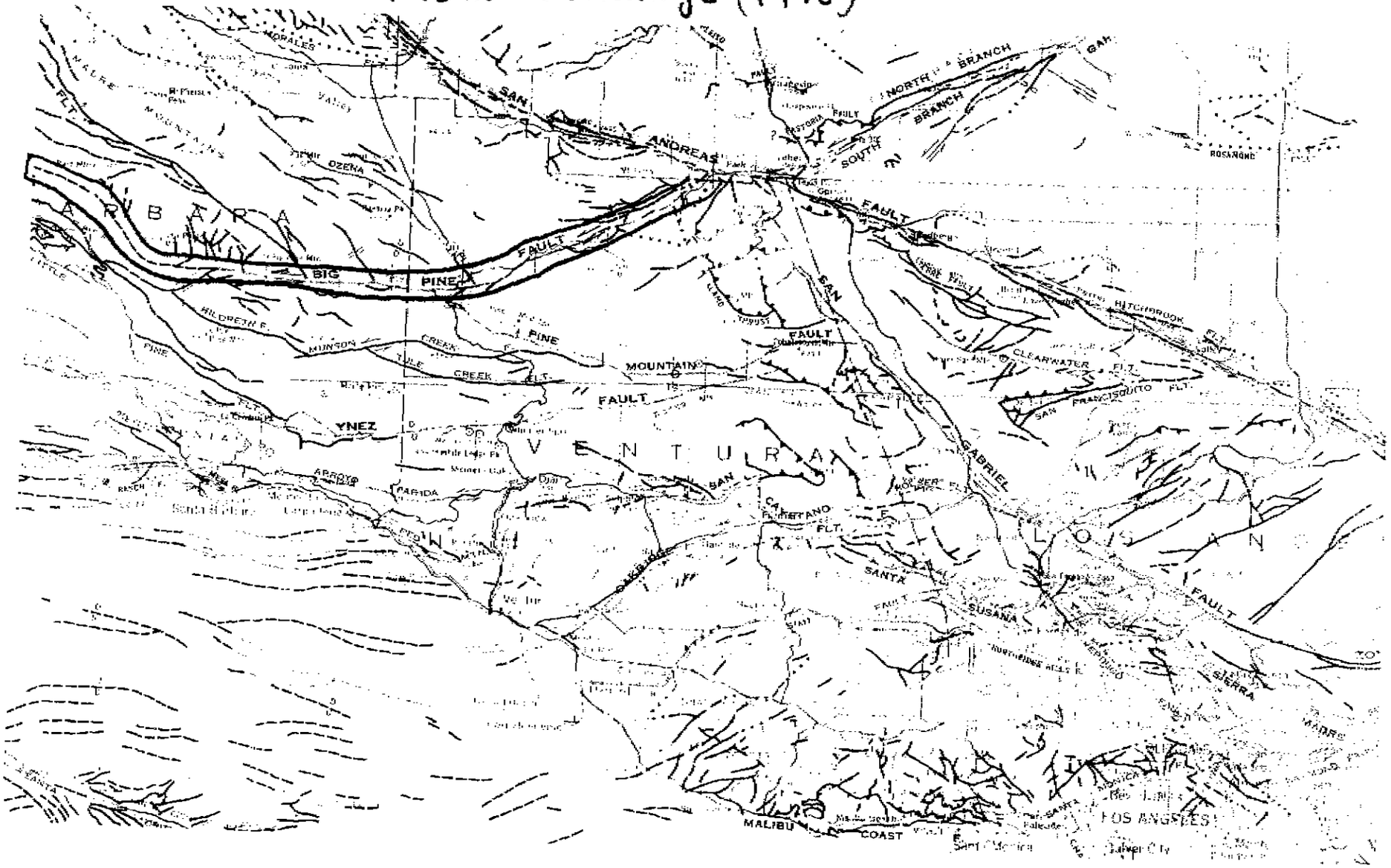

Fig 1

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f) Jennings, C.W., and Strand, R.G., 1969, Geologic map of California, Los Angeles sheet: California Division of Mines and Geology, scale 1:250,000.

g) Kahle, J.E., 1966, Megabreccias and sedimentary structures of the Plush Ranch Formation, northern Ventura County, California: Master thesis, University of California at Los Angeles, 125 p.

h) Moore and Taber, 1974, Seismic Safety Element of Santa Barbara County Comprehensive Plan, 93 p.

i) Smith, T.C., 1977, Big Pine fault (eastern segment), California Division of Mines and Geology, Fault Evaluation Report FER-17.

j) Townley, S.D., and Allen, M.W., 1939, Descriptive catalog of earthquakes of the Pacific Coast of the United States, 1869 to 1928: Seismological Society of America Bulletin, v. 29, no. 1, p. 297.

k) Vedder, J.G., Dibblee, T.W., Jr., and Brown, R.D., Jr., 1973, Geologic map of the upper Mono Creek-Pine Mountain area, California showing rock units and structures offset by the Big Pine fault: U.S. Geological Survey, Miscellaneous Geologic Investigations Map I-752, scale 1:48,000.

l) NASA, 1973, U-2 false color IR aerial photographs, flight no. 73-194, roll 01541, frames 6519-6521 (scale 1:125,000).

5. Summary of available data:

Moore and Taber (1974) summarize their interpretation of the geometry, amounts of offset, and recency of the Big Pine fault in their report to the County of Santa Barbara. An excerpt from this report follows:

"The east-west to northeast trending Big Pine fault forms the approximate boundary between northwest striking faults and physiographic trend of the Coast Ranges to the north and east-west structures of the Transverse Ranges to the south. The Big Pine fault has been traced 53 miles to the south-west from its intersection with the San Andreas fault; it is a reverse fault with left-lateral slip. According to Jennings and Strand (1969), in central Santa Barbara County, the west end of the Big Pine fault curves to the northwest and intersects the northwest trending Camuesa fault.

Jennings (1972) indicates that the eastern 43 miles of the Big Pine fault has had displacement during historic time. The displacement is believed to have occurred in 1852. Townley and Allen (1939) report that during 27-30 November 1852, continued shocks disturbed an area of over 900 square miles from San Luis Obispo to San Diego and east to the Colorado River. A zone of fissures at least thirty miles long was opened in Lockwood Valley located near the east end of the Big Pine fault. A rupture length of 30 miles long suggests an earthquake with a magnitude of about 7 (figure 9). Horizontal stream offsets of up to 3000 feet occur along the central and eastern portion of the Big Pine fault (Hill and Dibblee, 1953).

Hill and Dibblee (1953) suggest 8 miles (13 km), Crowell (1962), 5 to 10 miles (8 to 16 km), and Carman (1964) 4 miles (6 km) of horizontal displacement since late Pliocene."

In another publication by Crowell (1968), he shows the Big Pine fault to be active in latest Pleistocene but ceasing activity before historic (last 200 years) time (see Crowell's figure reproduced at the back of this report as figure 2).

Smith (1977) has recently done a thorough literature search for the Big Pine fault, including some parts in Santa Barbara County, but primarily in the Lockwood Valley area. He states that there is no good evidence for historic rupture in Lockwood Valley. He feels there are two other possible locations for the 1852 event, both located along the San Andreas fault.

Vedder, Dibblee, and Brown (1973) show the fault as concealed beneath Holocene alluvium in Santa Barbara County. Their section B-B' clearly shows no offset at the base of the Holocene alluvium.

6. Air photo interpretation:

Only NASA, high altitude photos were checked at a scale of 1:125,000. No obvious, recent, fault related geomorphology was observed along the Big Pine fault in Santa Barbara County.

7. Field observations:

Time did not permit ~~[illegible]~~ field work to be done.

8. Conclusions:

The evidence for historic rupture along the Big Pine fault is inconclusive and contradictory. No recent workers have been able to find any evidence of Holocene activity, let alone Historic activity.

Fig. 2

After Crowell (1968)

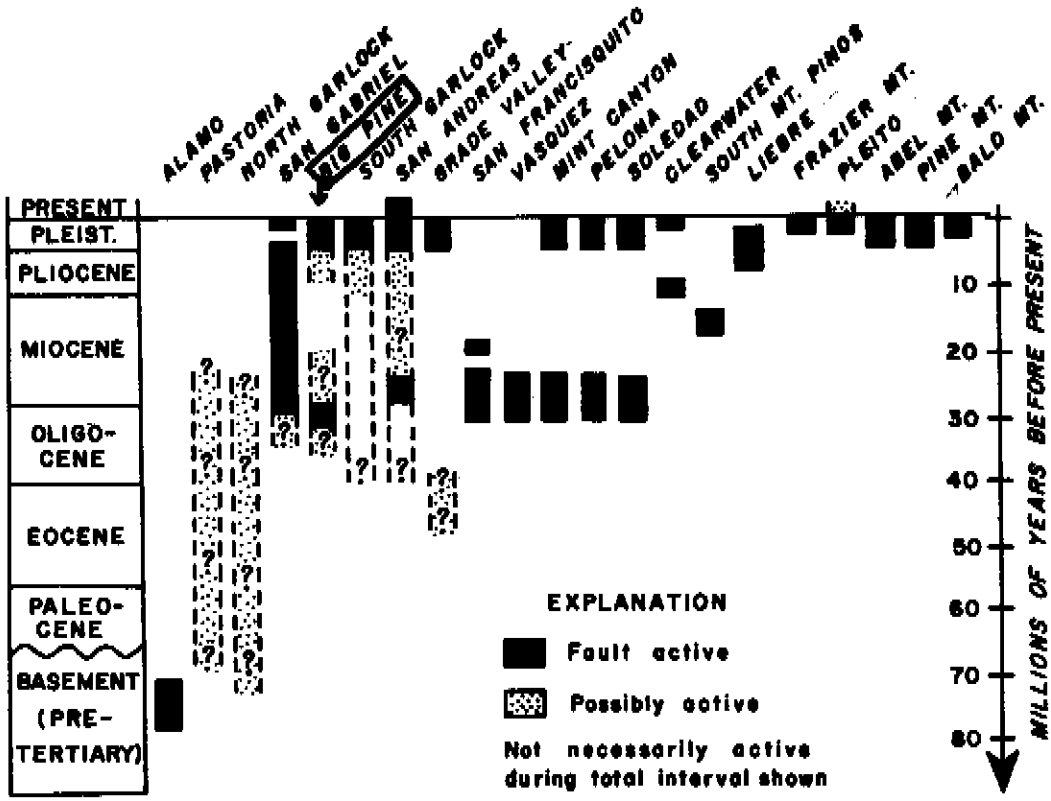

Figure 3.--Time of faulting for some major faults of the Tejon Pass and Soledad Basin regions, southern California.

9. Recommendations:

I recommend that the Big Pine fault should not be zoned for special studies at this time. Further mapping is necessary in the Quaternary units in order to determine the most recent activity along this fault.

10. Investigating geologist's name; date:

Edward J Bortugno

EDWARD J. BORTUGNO
Geologist
April 18, 1977

I agree with recommendations.
Ellis
4/20/77