New Faults

- Most common in unconsolidated deposits, particularly where slip surfaces have been buried
  - refraction at material interfaces
  - no prior geomorphic expression

- Some possible examples in literature of coseismic rupture propagating into unfaulted bedrock

- Less energy required for existing planes, when properly oriented, to fail.

Likelihood of New Faulting

- Primary Tectonic - seismogenic, coseismic rupture

- Repeatability of Faulting
  - Scale - Space (Time)
    - Major long-term zones of crustal weakness
    - Map scale
    - Outcrop scale

ELATION OF SURFACE RUPTURE TO PREEXISTING FAULTS

Of the main faults in 108 examples of worldwide historic surface faultin on land, 91 percent occurred or probably occurred on preexisting faults, 8 pe cent are indeterminate in this regard based on available data, and 1 percent (1 example) apparently occurred where no fault existed previously. In a few other cases the main or subsidiary faults apparently penetrated unbroken mate- to a limited extent. The correspondence in position of the historic rup tures with prehistoric ruptures has ranged from exact to approximate, and in places the surface rupture has elected to follow one of two or more available preexisting faults.

Bonilla (1979)

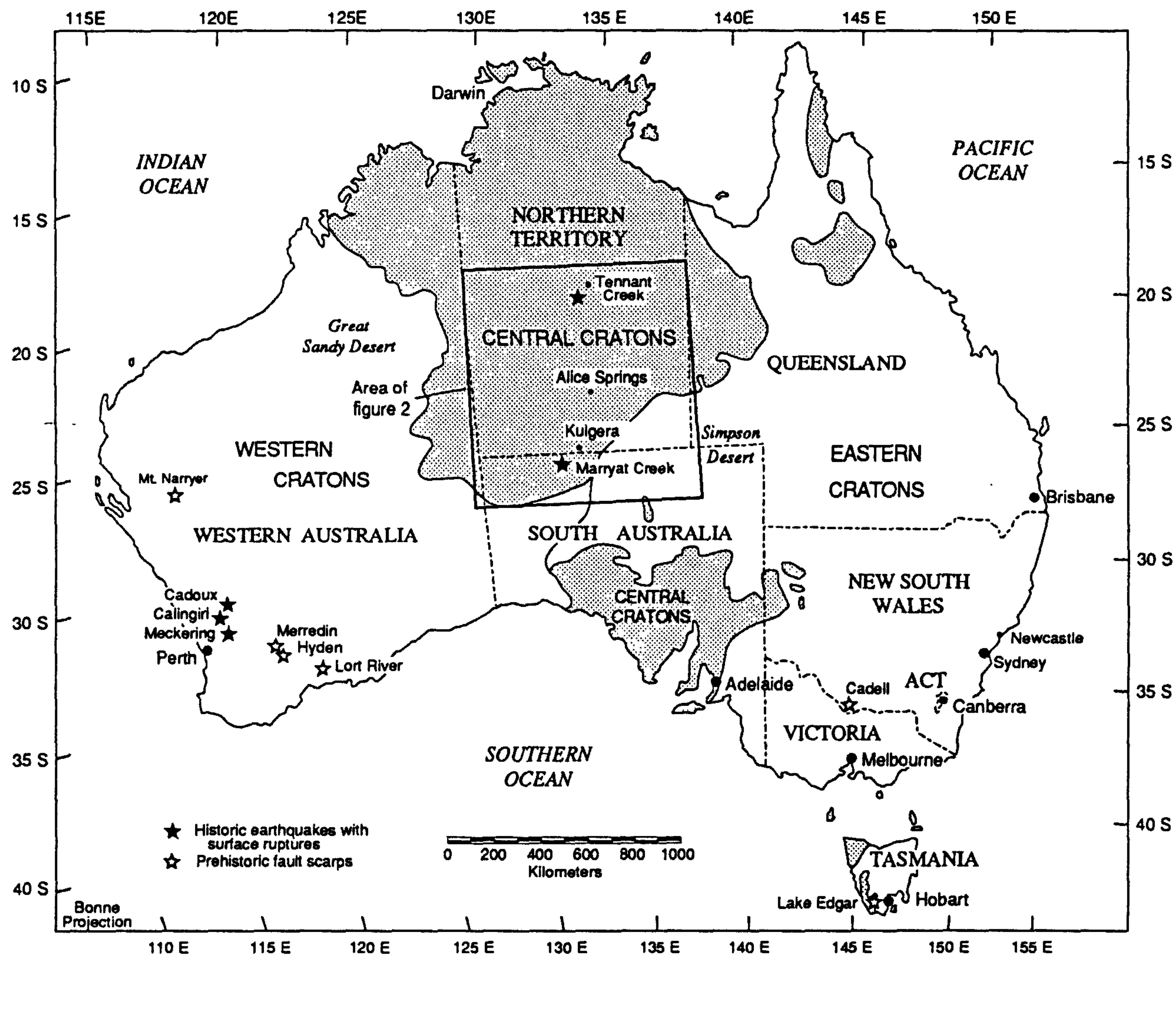
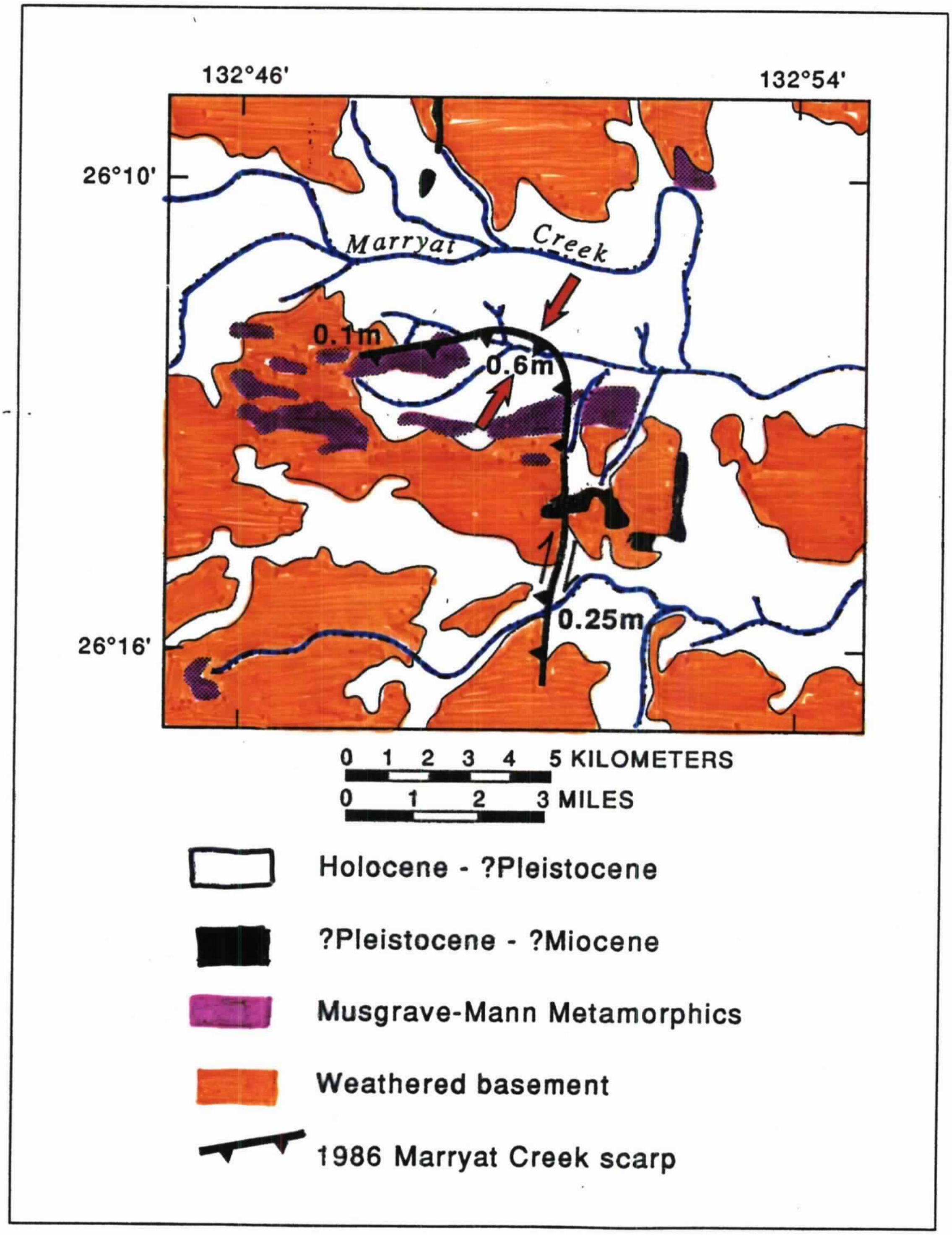


Figure 1. Index map of Australia showing features mentioned in the text and the location of historic earthquakes that produced surface ruptures and prehistoric fault scarps as tabulated by McCue (1990). Shaded area shows extent of Central Craton province (modified from Palfreyman, 1984).

From Crone & Machette (in press)


132°46'
132°54'
26°10'
26°16'
Marryat Creek
0.1m
0.6m
0.25m
0 1 2 3 4 5 KILOMETERS
0 1 2 3 MILES
Holocene - ?Pleistocene
?Pleistocene - ?Miocene
Musgrave-Mann Metamorphics
Weathered basement
1986 Marryat Creek scarp

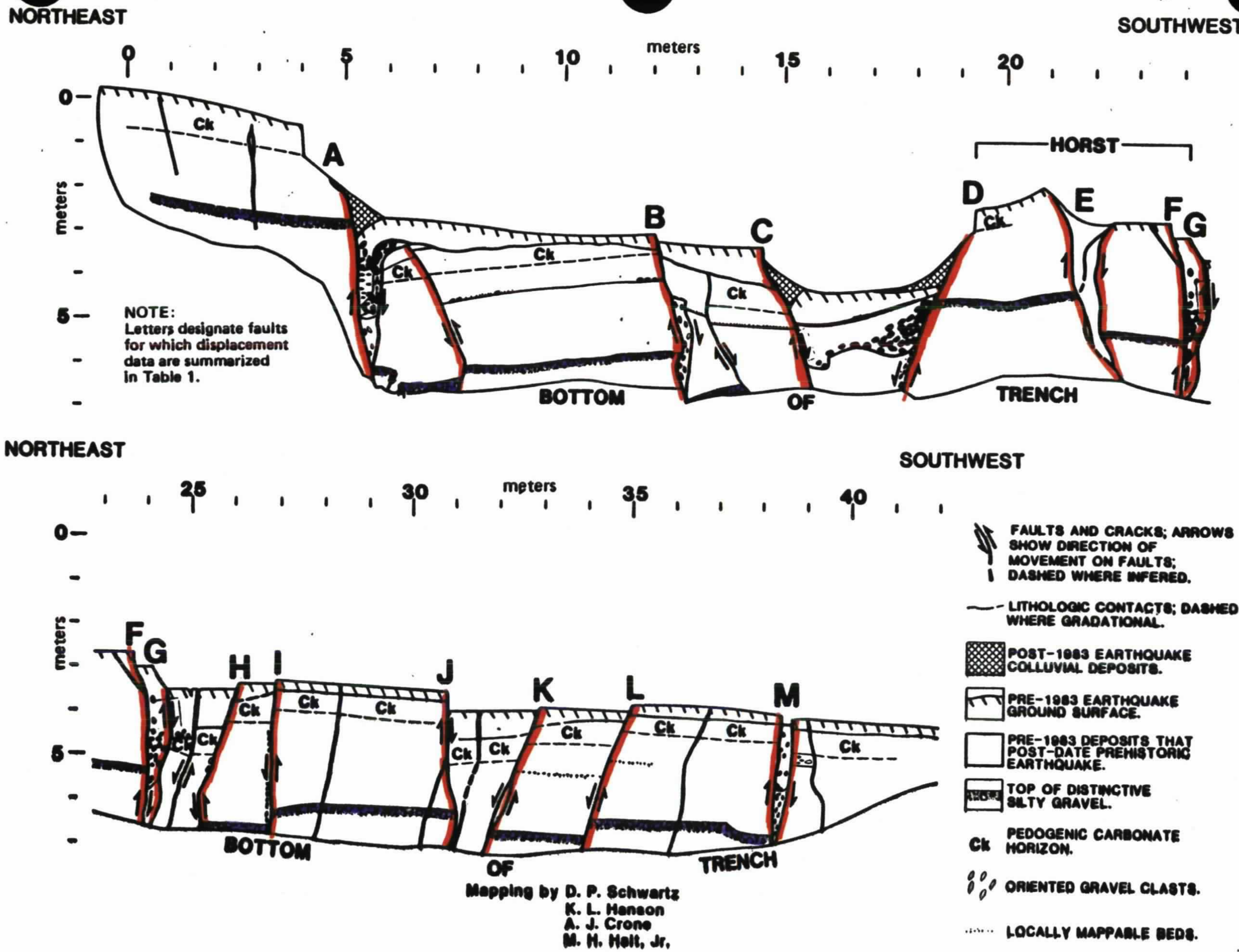
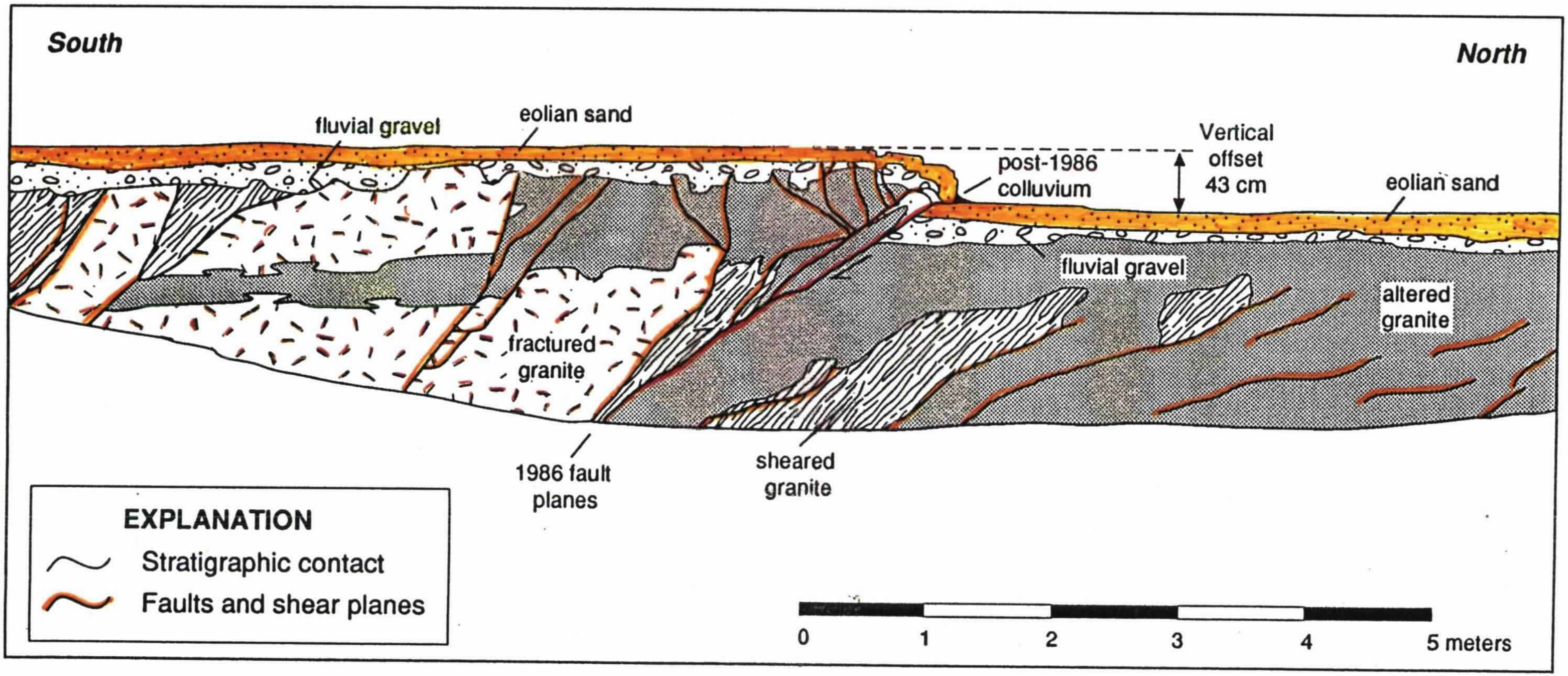


Figure 2. PRELIMINARY TRENCH LOG ACROSS 1983 SURFACE RUPTURE AT DOUBLESPRING PASS ROAD.



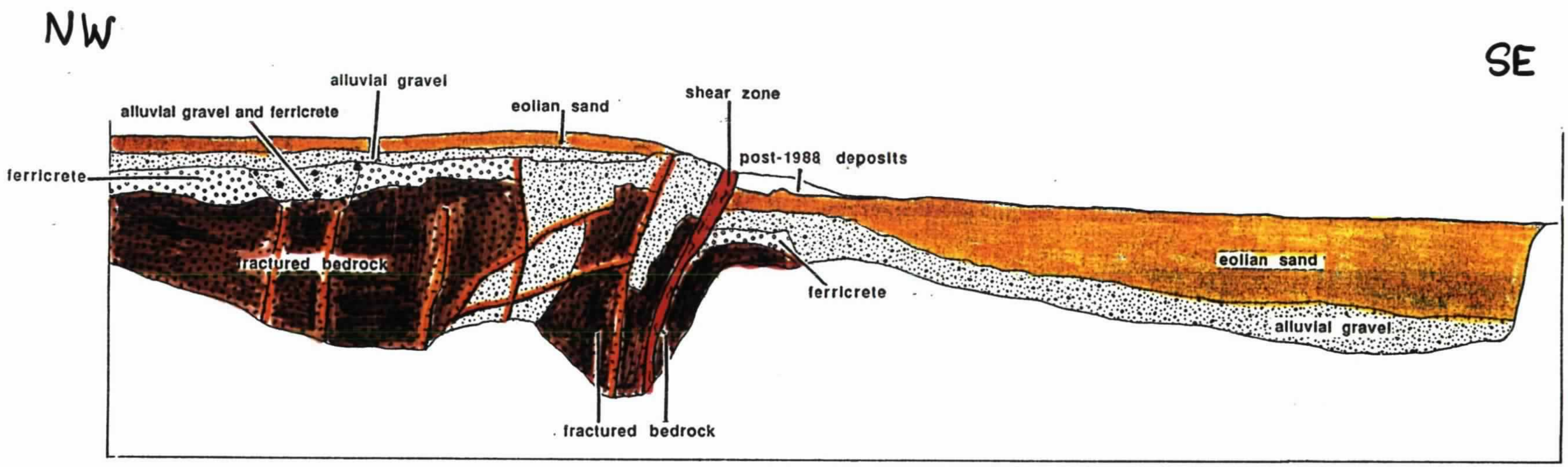
PART OF MARRYAT CREEK WEST TRENCH

Faults in orange = old faults that did not slip in 1986

Faults in red = slip planes in 1986 Earthquake

Granite is perf in age. Amount/density of shearing and fracturing in granite dimishes with increasing distance from fault plane activated in 1986.

From Crone and Machette (in press)



SCALE

0 1 2 3 meters

vertical and horizontal scales are equal

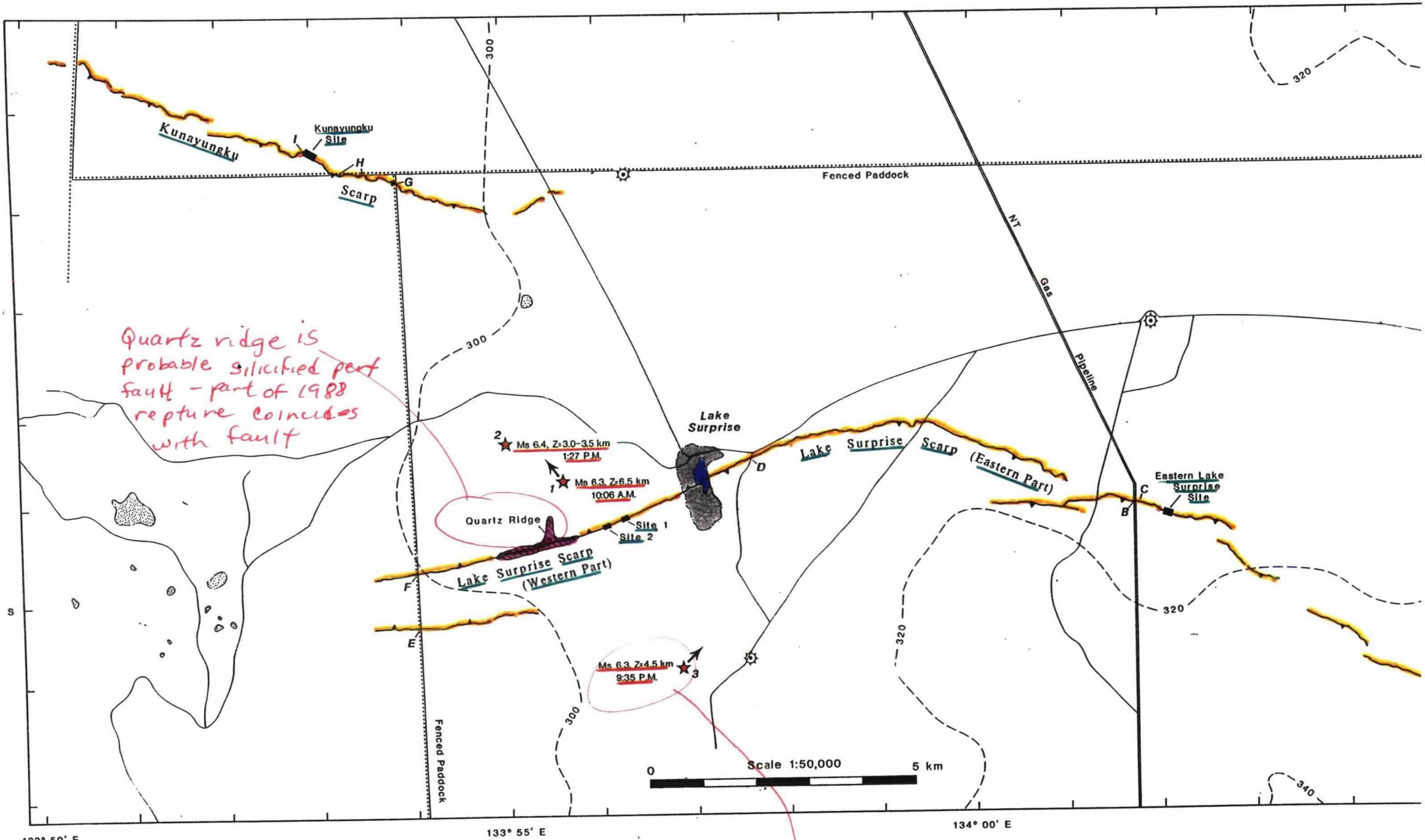
EXPLANATION

stratigraphic contact

faults and fractures

1988 Tennant Creek,
NT Earthquake

Western Lake Surprise Scarp
Site 2



MAP OF TENNANT CREEK FAULT SCARPS

Three sections of scarps.

- EQ #1 probably formed Kunayungko scarp which is Northerly directed thrust.
- EQ #2 probably formed Western part of Lake Surprise scarp, which is southerly directed thrust
- EQ #3 probably formed Eastern part of Lake Surprise scarp, which is Northerly directed thrust

magnitude, depth & time (local) of 3 major EQs in series. Arrow indicates probable propagation direction.

From Crone and Machette (in press)

The collective geologic experience is that future slip on faults is most likely to occur along fault planes that have been active during the present stress regime or on planes that are favorably oriented with respect to it. The possibility that new faulting will occur in previously unfaulted bedrock cannot be ruled out, particularly at the propagating ends of faults. While there is no quantitative basis for defining the likelihood of new faulting in bedrock, qualitatively the likelihood is extremely low.