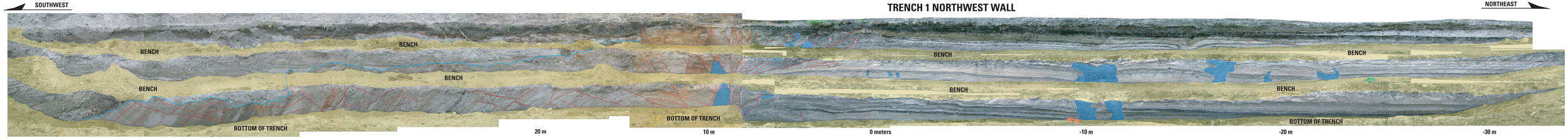
U. S. DEPARTMENT OF THE INTERIOR
U. S. GEOLOGICAL SURVEY

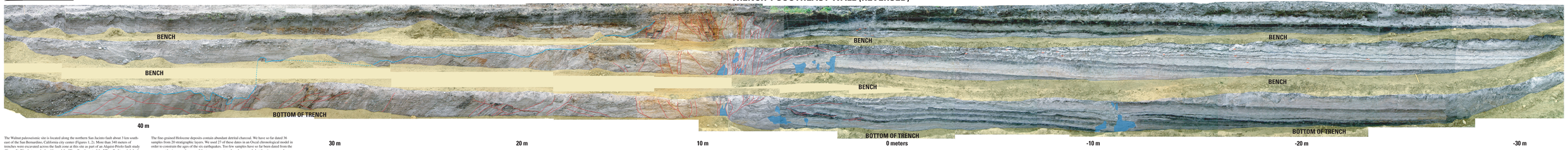
PHOTOMOSAICS OF TRENCHES AT THE WALNUT SITE, SAN JACINTO FAULT, SAN BERNARDINO, CALIFORNIA

THOMAS E. FUMAL and KATHERINE J. KENDRICK

TRENCH 1 NORTHWEST WALL



TRENCH 1 SOUTHEAST WALL (REVERSED)



The Walnut paleoseismic site is located along the northern San Jacinto fault about 3 km southeast of the San Bernardino, California city center (Figures 1, 2). More than 340 meters of trenches were excavated across the fault zone at this site as part of an Alquist-Priolo fault study (Figure 3). We photographed and logged the SE wall and most of the NE wall of trench 1, both walls of trenches 2 and 7, the NW walls of trenches 3 and 4 and the SE wall of trench 6. After carefully cleaning the trench walls we put up a 1m by 0.5m string and nail grid. For trenches 1, 2, 3, 4, and 6 we photographed the walls in 3 to 5 overlapping photo segments using non-rectified photos. These large-scale photos were later rectified to remove the distortion due to irregularities in the trench walls and slight distortion introduced by the camera lens. Field linework was then transferred to the rectified photomosaics.

We also took a set of overview photographs for each trench taken from the top of the trench towards the opposite wall. We spliced together these overview photos to make photomosaics of all of the trenches. Because the photos were taken at a downward angle, there is significant distortion. Some of this distortion has been corrected: an attempt was made to keep horizontal grid lines horizontal and there has been some horizontal scaling to align vertical lines between benches. Although the string and nail grid spacing is 1 meter by 0.5 meter, because of the distortion in the photos and subsequent adjustments, the scale is variable along the benches, from bench to bench and from trench to trench for these overview mosaics.

This report serves principally as a repository for the overview photomosaics. Sheet 1 shows the overview mosaics for both walls of trenches 1 and 2 along with some linework including most of the fault traces, a prominent unconformity within the fluvial deposits and the larger bodies of liquefied sand. Sheet 2 shows the overview mosaics for the SE wall of trench 3 and the NW wall of trench 4 along with photomosaics of both walls of trench 7 and the SE wall of trench 6 that were compiled from the rectified, large scale photos. No linework has been portrayed on these photomosaics. Sheet 3 shows the overview mosaics of both walls of trench 1 with the locations of detrital charcoal samples that were collected. A later version of this report will contain photomosaics for trenches 1 and 2 compiled from the individual, fully rectified photos covering each 1m by 0.5m area with detailed linework superimposed.

The trenches exposed a main, Holocene-active, fault zone about 5-12 m wide which juxtaposes Late Pleistocene (?) fluvial sand and gravel southwest of the fault against organic-rich, Holocene fine sand, silt and clay apparently deposited in a marsh. Most of the faults in the main zone appear to rupture to the ground surface, making it impossible to associate individual faults with specific events. The main fault zone is bordered by a 10 m wide zone in which faults with a slight upward and growth strata associated with this folding has recorded evidence for at least 6 late-Holocene earthquakes. Deformation due to liquefaction is further evidence of large earthquakes at these horizons.

The fine-grained Holocene deposits contain abundant detrital charcoal. We have so far dated 36 samples from 20 stratigraphic layers. We used 27 of these dates in an Oxcal chronological model in order to constrain the ages of the six earthquakes. Too few samples have so far been dated from the uppermost horizons so the ages of the two youngest earthquakes recorded at the site are poorly constrained. However, it appears that the youngest sediment at the site was deposited about 2000 years ago and the thick surface soil indicate that the two youngest earthquake recorded at the site may be about 1000 years old. The above dates provide good constraints on the ages of the four older earthquakes (Table 1). The ages of these four earthquakes suggest an average time interval between large earthquakes on the northern San Jacinto fault of 133 to 287 years.

EXPLANATION

DEPOSITS SOUTHWEST OF MAIN FAULT ZONE
recent fluvial sediments composed of interbedded, loose sand, gravelly sand and sandy gravel deposited within about the past 700 years

unconformity

older fluvial sediments composed of interbedded, weakly cemented, sand, gravelly sand and sandy gravel

DEPOSITS NORTHEAST OF MAIN FAULT ZONE
mid-Holocene marshlpond sediments composed of interbedded, firm, very dark grey organic clay and light brownish grey to dark greyish brown, silty to very well sorted, very fine to coarse sand silt. Marshlpond sediments grade laterally to the northeast to fluvial overbank sediments composed of weakly cemented, thickly bedded to massive, poorly-sorted sandy clay and clayey to silty sand. The oldest deposits exposed northeast of the main fault zone are about 7000 years old.

fault

liquefaction feature- typically composed of very well-sorted, very fine to medium sand. Larger, compound features may included blocks of pre-existing strata and sediments deposited between liquefaction episodes.

Linework adapted from detailed photologging by Katherine Kendrick and Thomas Fumal, U.S. Geological Survey

TABLE 1

AGES OF RECOGNIZED PREHISTORIC EARTHQUAKES AT THE WALNUT SITE

EVENT 1	304 B.C. to A.D. 1670
EVENT 2	859 B.C. to A.D. 1181
EVENT 3	1173 B.C. to 966 B.C.
EVENT 4	1261 B.C. to 1073 B.C.
EVENT 5	1371 B.C. to 1207 B.C.
EVENT 6	1828 B.C. to 1568 B.C.

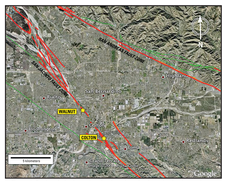
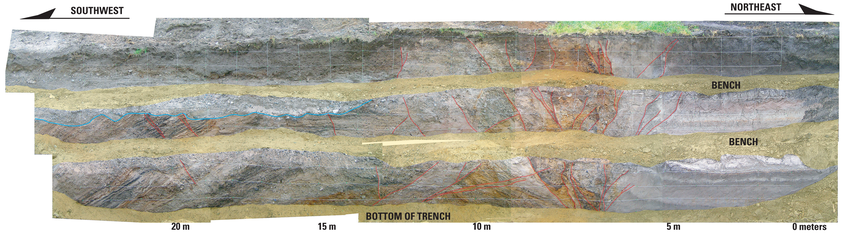
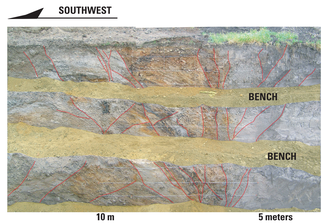


Figure 1. Regional air photo showing location of paleoseismic site on the northern San Jacinto fast zone and Late Pleistocene and Holocene (red) and Late Quaternary (green) active faults.

Figure 2. Air photo showing location of Walnut paleoseismic site, late Pleistocene and Holocene active faults (red), and prominent stream channels.

Figure 3. Air photo of Walnut Street property showing approximate locations of trenches and main fault Holocene active-fault zone (red arrows).

TRENCH 2 SOUTHEAST WALL (REVERSED)



TRENCH 2 NORTHWEST WALL