# FAULT HAZARD INVESTIGATION
on
Former UNOCAL Station Site
11976 Dublin Boulevard
Dublin, California
for
UNOCAL

By

TERRASEARCH, INC.

Project No. 6858
28 October 1994

GEOTECHNICAL ENGINEERS AND GEOLOGISTS
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Project No. 6858
28 October 1994

Mr. Adadu Yemane
UNOCAL
2000 Crow Canyon Place, Suite 450
San Ramon, CA 94583

Subject: Former UNOCAL Station Site
11976 Dublin Boulevard
Dublin, California
**FAULT HAZARD INVESTIGATION**

Dear Mr. Yemane:

In accordance with your authorization, TERRASEARCH, INC., has performed a fault hazard investigated at the subject site located at the northwest corner of the intersection of Dublin Boulevard and San Ramon Road in Dublin, California.

The accompanying report presents our conclusions and recommendations based on our investigation. The Calaveras Fault is mapped in close proximity to the property. However, our findings indicate that the fault does not occur within the site. It is our opinion that the former station site is geologically suitable for future improvements provided the recommended Building Setback Zone, identified in this report is considered in future development plans.

Should you have any questions relating to the contents of this report or should you require additional information, please do not hesitate to contact our office at your convenience.

Very truly yours,
TERRASEARCH, INC.

Reviewed by:

Douglas G. King, P.E.
Senior Engineer

Gary A. Smith, C.E.G.
Senior Geologist

/tf

Copies: 6 to UNOCAL

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# FAULT HAZARD INVESTIGATION

## Purpose and Scope

The subject site, in Dublin, California, is located within the State of California, Division of Mines and Geology Special Study Zone (SSZ) for the Calaveras Fault. State law requires that fault evaluation studies be conducted for properties located within an SSZ to evaluate the potential seismic hazard to planned development.

The purpose of the investigation for the vacant commercial lot was to evaluate the seismic hazard associated with the Calaveras fault which was mapped in the vicinity of the site. Our investigation included the following:

a. review of published maps and literature concerning the Calaveras fault zone, and the geology of the site and its vicinity;
b. review of recent geologic explorations near the site;
c. exploratory trenching in the portion of the site near where the fault was mapped;
d. preparation of this report presenting the findings of our exploration.

## Site Location and Description

The project site is located in the northwest corner of the intersection of Dublin Boulevard and San Ramon Road in Dublin, California. The site is shown in the site plan, Figure 1. The property is the former site of a UNOCAL Station. The station and the underground facilities have been removed. Currently the site is a level vacant lot.

## Seismic Setting

The subject site is located within the SSZ for the Calaveras Fault. See the location map, Figure 1, for the site location and the limits of SSZ. The Calaveras Fault is one of the major fault systems in the greater San Francisco Bay Area. The fault appears to be divided into distinct segments which have historically ruptured independently (Simpson, 1993). The Sunol to San Ramon segment is represented in the area of the site. This segment is considered active. Since 1969 virtually no seismicity has occurred on the northern portion of the fault between Calaveras Reservoir and Danville, which includes the local segment. For this reason, the fault is assumed to be accumulating elastic strain energy which may increase the probability of a significant earthquake of magnitude 6, somewhere along the fault, to about 30 percent over the next 30 years (Oppenheimer, 1993). Based on a fault segment model, the maximum magnitude earthquake for the segment of the fault in the site vicinity, is magnitude 6.25 to 6.5.

## Nearby Investigations

Because the approximate location of the fault in the Dublin area has been known for some time and the area has been developed with commercial and multi-family residential projects, there are several existing investigations along the fault near the project site. These studies provide generally consistent information regarding the location and nature of the fault. The nearest investigations are just to the north of the UNOCAL site. The adjoining development to the north is The Springs, an apartment complex occupying about 9 acres. Geologic investigations on this property included seismic refraction survey lines, test borings, test pits and two trenches across the alignment of the Calaveras fault. The fault was located along the eastern portion

of the property trending about N5°W. The fault zone was well defined consisting of a distinct near vertical feature along the eastern side of a shear zone, which consisted of clay gouge and was on the order of 10 feet in width. The shear zone extended to the surface. An abrupt change in soil color and composition occurred on either side of the fault trace and ground water seepage was evident along the sheared surface of the trace. Ground water seepage was common west of the fault, while east of the fault, the soil deposits were generally dry. A natural spring exists west of the fault location on the apartment complex property. The development did not disturb the spring which currently exists as a small pond up to 100 feet from the fault. The studies also indicated that the Calaveras fault in this area consists of a single trace located near the property frontages, roughly parallel to San Ramon Road. Considerable study was done on the properties to the north of the site, including trenches and geophysical surveys, to explore for fault traces west of the single mapped fault trace. No other features were found to exist west of the primary trace.

Test trenches from nearby investigations are shown on Figure 4. The trench locations are compiled from a number of reports which vary in scale and degree of accuracy of the original plotting. The relative positions of the plotted trenches on the air photo based map on Figure 4 are as accurate as the existing data allows.

## Trench Excavation

A review of existing studies indicated that if the fault existed on the property, it would be located near the eastern boundary. Two trenches were excavated perpendicular to the trend of the fault along the northern and southern property lines. A tractor mounted backhoe with a 24 inch bucket was used for excavating the trenches. The locations of the exploratory Trenches 1 and 2 (T-1 and T-2) are shown on the Site Plan, Figure 2. The side walls of the trenches were scraped to eliminate surface smearing from the backhoe bucket and the trenches were logged by a TERRASEARCH, INC. geologist.

Trench 1 located in the southeast corner of the property, was 40 feet in length and 7 to 10 feet in depth. The excavation disclosed undisturbed alluvial soil deposits throughout the depth of the trench. The alluvial materials, occurred in somewhat irregular horizontal layers, consisted mainly of silty and sandy clay, but included granular channel deposits in the lower portion of

the trench. The soils were generally damp and fairly uniform in moisture content throughout the area exposed. No evidence of faulting was observed.

Trench 2, which was located in the northeast corner of the property, was 60 feet in length and 7 to 10 feet in depth. Materials encountered were similar to those in Trench 1 but displayed some variation, as would be expected in alluvial deposits. Minor seepage of subsurface water occurred at a depth of about 6 feet in the western end of the trench. The remainder of the soils were uniformly damp except the first 10 feet at the east end of the trench where the moisture content was considerably higher. Scattered small pockets of carbonates were also observed in this portion of the trench. No discernable fault related features were found in the trench. The increased moisture content in the east end of the trench and the presence of disseminated carbonates in that area, may indicate a close proximity to the fault, indicating that the fault is located a short distance to the east of the trench, i.e., east of the property line.

The logs of the two trenches are shown on Figure 3.

# CONCLUSIONS AND RECOMMENDATIONS

1. Based on the results of our investigation, the site was found to be free of the main trace of the Calaveras fault which is known to be located in the very near vicinity.

2. In this area, the Calaveras fault zone includes one trace of the fault located just west of San Ramon Road, approximately parallel to that street. Nearby studies show that there are no additional shear zones or secondary traces of the fault crossing the property.

3. The site is located in the seismically active San Francisco Bay Area and is therefore subject to ground shaking due to a large earthquake on one of the regional faults. The maximum probable moment magnitude for an earthquake on the Sunol to San Ramon segment of the Calaveras fault is 6.25 to 6.5. Because of the immediate proximity of the fault, the peak horizontal acceleration for the subject property is estimated at 0.6g.

4. In addition to the seismic hazard of ground shaking, the hazard of surface rupture also exists due to the presence of the Calaveras fault immediately adjacent to the property. It was determined in this study that the fault does not cross the site. However, it must be assumed that the single main trace of the fault is located just to the east of the property. The site plan, Figure 2, shows the assumed alignment of the fault at the nearest possible location to the site. Based on this assumed location, a 50-foot wide Building Restriction Zone is recommended along the west side of the assumed alignment of the fault. The northern property line is roughly perpendicular to the alignment of the N10$^{0}$W trending fault. The 50-foot zone can therefore be measured parallel to the northern property line and should begin at the northeast property corner.

5. It is recommended that no permanent habitable structures be placed within the Building Restriction Zone. Landscape areas, driveways, parking areas, and unoccupied structures may be placed within the Building Restriction Zone.

6. Other areas of site, outside the Building Restriction Zone, do not have any restrictions to development due to seismic hazards.

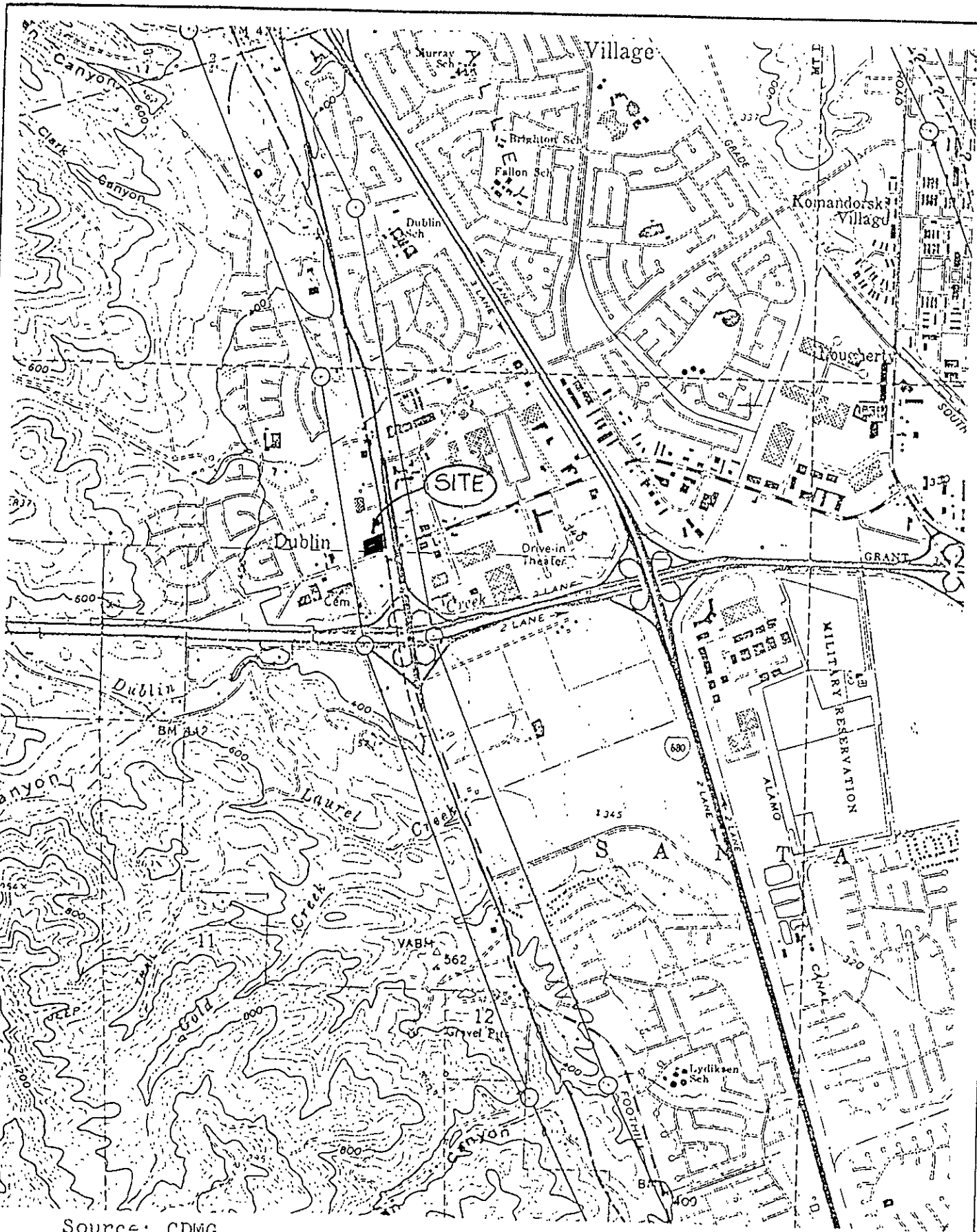
APPENDIX

Geologic Map

Site Plan

Trench Logs

References




Source: CDMG

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FIGURE NO. 1: Geologic Map

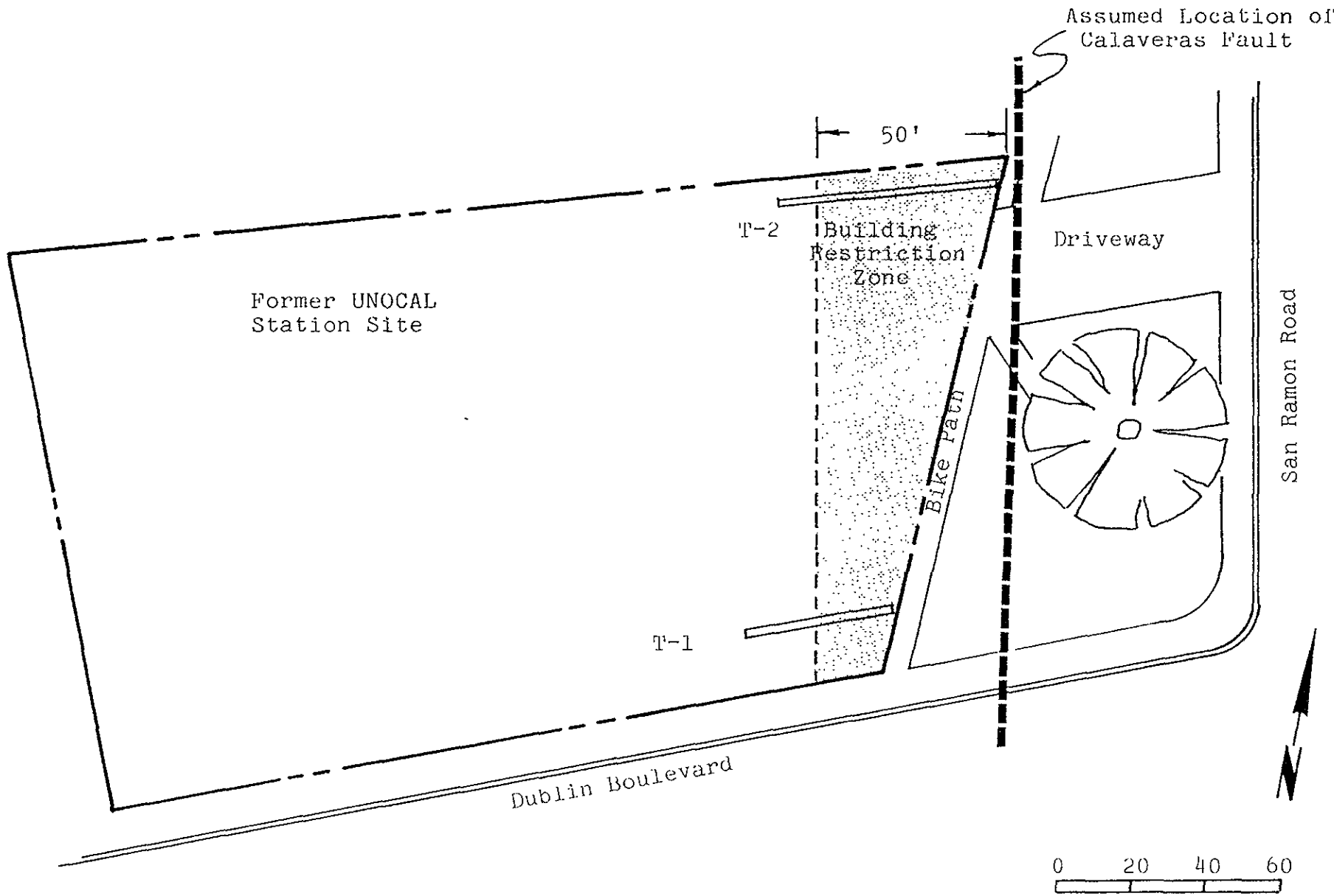


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**FIGURE NO. 2:** Site Plan

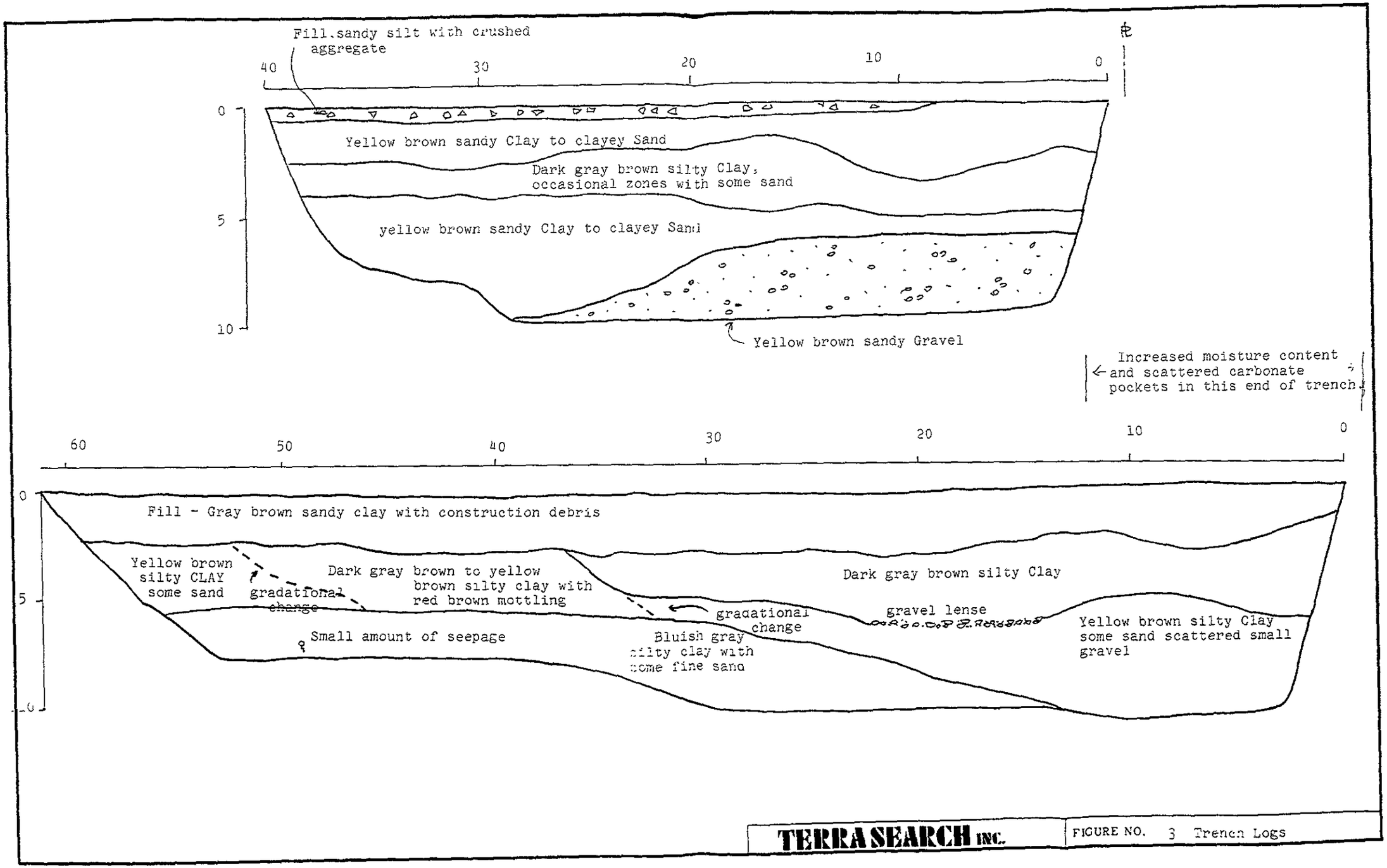


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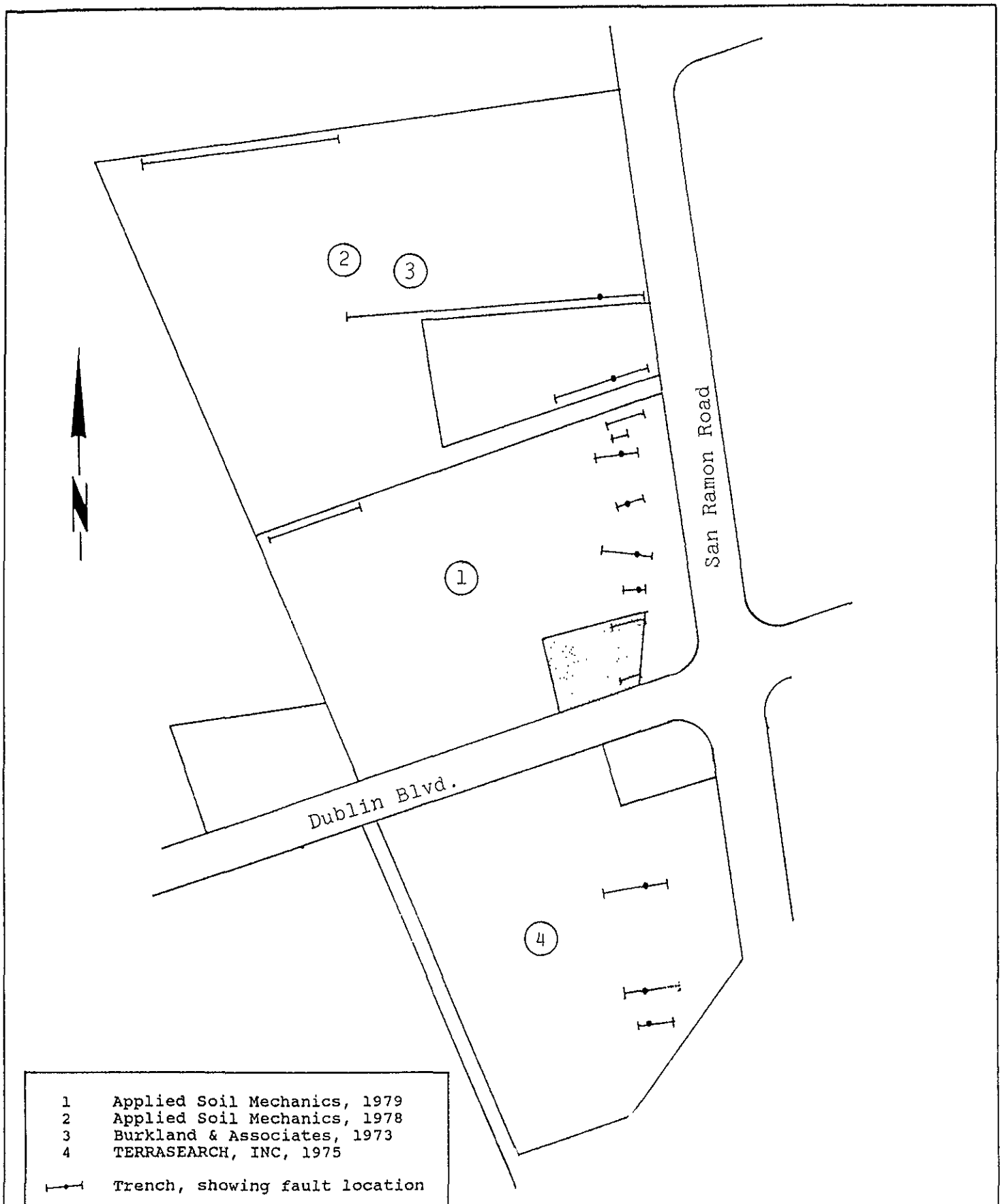
FIGURE NO. 3 Trench Logs

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|---|---|
| 1 | Applied Soil Mechanics, 1979 |
| 2 | Applied Soil Mechanics, 1978 |
| 3 | Burkland & Associates, 1973 |
| 4 | TERRASEARCH, INC, 1975 |
| ⊢•⊣ | Trench, showing fault location |

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**FIGURE NO. 4:** NEARBY STUDIES

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