A Report Prepared for:

Lawrence Berkeley National Laboratory
One Cyclotron Road
Berkeley, California 94720

Attention: Mr. Steve Blair
Building 90F

**FAULT INVESTIGATION
COMPUTATION RESEARCH AND
THEORY BUILDING
LAWRENCE BERKELEY
NATIONAL LABORATORY
BERKELEY, CALIFORNIA**

Kleinfelder Job No.: 67929

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September 27, 2006

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DRAFT FAULT INVESTIGATION
COMPUTATION RESEARCH AND THEORY BUILDING
LAWRENCE BERKELEY NATIONAL LABORATORY
BERKELEY, CALIFORNIA

1.0 INTRODUCTION

This report presents the results of Kleinfelder's fault investigation for the proposed Computation Research and Theory Building (CRT) located on the Lawrence Berkeley National Laboratory (LBNL) campus in Berkeley, California (Plate 1). The objective of this report is to provide LBNL with geologic information regarding the possible presence of active trace(s) of the Hayward fault on this site.

1.1 LOCATION AND SITE DESCRIPTION

The CRT site is located on the west-facing slope, west of (below) Building 70A and east of (above) the Blackberry Gate entrance on the LBNL campus in Berkeley, California (see Site Location, Plate 1). No improvements or structures currently exist on the site. Current inclinations on the slope range from 1.5H:1V (horizontal: vertical) to 3H:1V.

The site is located within a state-mandated Earthquake Fault Zone, as defined by the California Geological Survey (CGS, 1982, formerly the California Division of Mines and Geology, CDMG) in accordance with the Alquist-Priolo Earthquake Fault Zone Act of 1972. It is our understanding that the property of LBNL does not fall under that jurisdiction of the State of California requiring a fault investigation; however, a fault study is standard practice for LBNL when the site is located in an Earthquake Fault Zone. The mapped trace of the Hayward fault, as per the CGS (1982, Richmond, Oakland East and Oakland West), is located approximately 300 feet west of the site.

1.2 PROJECT DESCRIPTION

It is our understanding that the proposed 50,000-square-foot (footprint) new CRT building will be eight stories (stair-stepped up the slope) with the lowest level at approximately elevation 637 feet and the upper entrance deck at elevation 760 feet. The building will be cut into the hillside and retaining walls will be required along the east side of the building. Additional details of the planned development are not known at this time. If actual project considerations differ significantly from those indicated herein, we should be contacted to review and, if necessary, revise our recommendations.

1.3 PURPOSE AND SCOPE OF SERVICES

The purpose of this investigation is to evaluate the site for the possible presence of active faulting. The scope of services included the following:

- Excavation and logging of two fault trenches.
- Review of published geologic maps, aerial photographs, and literature from our files.
- Review of consultant's geologic and fault report from our files and on file with the CGS.
- Analysis of the collected data.
- Preparation of this report.

1.4 AUTHORIZATION

This investigation was authorized by LBNL in the Subcontractor Agreement number 6805923 signed by Laura Crosby of LBNL and Michael Burns of Kleinfelder, Inc.

2.0 GEOLOGIC SETTING

2.1 REGIONAL GEOLOGY

The site is located in the Berkeley Hills area within the Coast Range Geomorphic Province of Northern California. This province is generally characterized by northwest trending mountain ranges and intervening valleys, which are a reflection of the dominant northwest structural trend of the bedrock in the region. The basement rock in the northern portion of this province is presumed to consist of the Franciscan Complex, a diverse group of igneous, sedimentary, and metamorphic rocks of Upper Jurassic to Cretaceous age (140 to 65 million years old). The Franciscan Complex is part of a northwest trending belt of material immediately adjacent to the eastern edge of the San Andreas fault system, which is located approximately 30 kilometers west of the site. In the site vicinity, the Franciscan Complex rocks have been unconformably overlain by Tertiary age continental and marine sedimentary and volcanic rocks. These Tertiary age rocks have been locally overlain by younger Quaternary alluvial and colluvial deposits.

2.2 LOCAL GEOLOGY

The site and vicinity have been mapped by Graymer (2000) and Harding Lawson Associates (1982). The geologic maps prepared by these authors generally agree that the site is underlain by Late Cretaceous sedimentary rocks. Graymer described the site area as being underlain by "unnamed sedimentary rocks of the Great Valley Complex" that are characterized as "massive to distinctly bedded, biotite-bearing, brown-weathering, coarse- to fine-grained greywacke and lithic wacke, siltstone, and mudstone."

Landslide mapping performed by Nilsen (1975) indicates that there are no mapped landslides in the site or immediate vicinity. Documents supplied by LBNL (plans by LBNL entitled "North Gate Slide Repair, Hillside Stabilization, As-built Plan and Section," dated March 12, 1975) indicate that there was a landslide along Cyclotron Road at the north end of the project site. The

landslide was approximately 60-feet long, 100-feet wide and 12-feet deep. A slide repair was constructed in 1975 and consisted of removal of the slide debris and replacement with compacted engineered fill. The fill was keyed, benched into the underlying bedrock, and a subdrain was installed in the keyway. During this investigation, we found evidence of a dormant landslide within the building envelope that will be discussed below.

2.3 FAULTS AND SEISMICITY

The site, as well as the entire Northern California Coastal Region, is located within a seismically active portion of the state dominated by the presence of the San Andreas fault system, which forms the boundary between two tectonic plates of the earth's crust. At this boundary, the Pacific Plate (west of the fault) is moving north relative to the North American Plate (east of the fault). In the San Francisco Bay Area, this movement is distributed across a complex system of strike-slip, right-lateral, parallel, and sub-parallel faults that include the San Andreas, Healdsburg-Rodgers Creek, and Hayward among others.

The site is located within an Earthquake Fault Zone as defined by the California Geologic Survey (formerly California Division of Mines and Geology) in accordance with the Alquist–Priolo Earthquake Fault Zone Act of 1972. The Richmond (CGS, 1982), Oakland East (CGS, 1982) and Oakland West (CGS, 1982) quadrangles indicate the Hayward fault is located less than 1 kilometer to the west of the planned CRT site. Moderate to major earthquakes generated on the Hayward fault can be expected to cause strong ground shaking at the site. In addition, strong ground shaking can be expected from moderate to major earthquakes generated on other faults in the region such as the Concord-Green Valley fault (located 22 kilometers east of the site), the Calaveras fault (located 24 kilometers east of the site), the San Andreas fault (located 30 kilometers west of the site), and the Healdsburg-Rodgers Creek fault (located 36 kilometers north of the site). A number of large earthquakes have occurred within this region in the historic past. Some of the significant nearby events include the 1989 Loma Prieta earthquake (M6.9), the 1906 San Francisco earthquake (M8+), the 1868 Hayward fault earthquake (M7), the 1838 San Francisco earthquake (M7+), and the 1836 Oakland earthquake (M6+). Future seismic events in this region can be expected to produce strong seismic ground shaking at this site. The intensity

of future shaking will depend on the distance from the site to the earthquake focus, magnitude of the earthquake, and the response of the underlying soil and bedrock.

3.0 PREVIOUS STUDIES AND AERIAL PHOTO REVIEW

Several fault investigations have been conducted by consultants in the general site vicinity within the Earthquake Fault Zone along the Hayward fault. The CGS (2003) has compiled those investigations in Northern California that were performed between 1974 and 2000 onto a six CD reference set, which was reviewed for this study. We reviewed the complete reports on 13 sites in the immediate vicinity from the CD sets, as well as recent work by Fugro West Inc. (2002) for the Building 50X site which is located directly north of the planned CRT site. The locations of study sites and the reports reviewed are presented on Plate 6, Previous Fault Investigations. Of the 13 CGS (2003) reports reviewed, 5 of the reports identified fault traces by subsurface exploration. For the purposes of discussion in this report, we will refer to the study sites by the site number presented on the CGS (2003) discs. Full reference for these studies can be found in the References Section (7.0) of this report.

CGS Site 2602: The Preliminary Study utilized published information including maps and aerial photos to conclude that there is no active trace of the Hayward fault crossing the site.

CGS Site 2815: The Preliminary Study incorporated review of published and unpublished geologic information as well as a site visit to conclude that active traces of the Hayward fault do not cross the site.

CGS Site 2601: An active trace of the Hayward fault (presumed to be the west trace) was located in four trenches excavated at the site. The risk associated with ground rupture and strong seismic shaking at the site was described in the report as moderate to high.

CGS Site 2529: Eight reports were located for this site (UC Berkeley campus) for various projects. Extensive subsurface information was collected in the form of test borings, trenches, and seismic refraction surveys. The general findings indicated that the main trace of the Hayward fault is approximately located as shown on the published maps and previous studies.

Additional reports explored the Lauderback fault trace and concluded through exposures observed during trenching and radiometric dating that this fault is not active.

CGS Site 2646: Subsurface exploration consisted of 22 borings and 7 seismic refraction profiles to address fault hazard for the existing UC Berkeley campus buildings. The active main trace was located near Memorial Stadium and Bowles Hall. No evidence of faulting noted east of the active trace.

CGS Site 2211: Subsurface exploration (trenching and/or drilling) revealed no evidence of faulting on the site.

CGS Site 2530: Reports prepared for this site located the main trace of the Hayward fault along the northeast side of the project area at the approximate location shown on the CGS fault maps. The studies indicated that the fault trace crosses a sports field and that the nearest building is located approximately 60 feet to the southwest of the fault trace.

CGS site 0507: Subsurface exploration (trenching and/or drilling) revealed no evidence of faulting on the site.

CGS Site 0166: Subsurface exploration (trenching and/or drilling) revealed no evidence of faulting on the site.

CGS Site 1992: Subsurface exploration consisted of 6 borings and 2 trenches in which the main trace of the Hayward fault was located. The recorded trend of the fault at this location was N34°W dipping 80°W. A 40-foot-wide setback zone was recommended for the building addition.

CGS Site 0816: Surface mapping and review of published information indicated no evidence of faulting on the site.

CGS Site 2974: This site is part of a large re-construction area associated with the East Bay Hills fire of 1991. Subsurface exploration consisted of 29 borings and seismic refraction surveys. A zone approximately 40-feet wide was interpreted from seismic refraction data and field mapping to represent the main trace of the Hayward fault. Setbacks 50-feet wide were established on either side of the 40-foot fault trace zone creating a 140-foot-wide zone for non-occupied construction area.

CGS Site 0013: Surface mapping and review of published information indicated no evidence of faulting on the site.

Fugro 2002: Subsurface exploration consisted of excavating three trenches and revealed no evidence of faulting on the site.

We reviewed stereoscopic aerial photographs of the project area to observe tonal lineaments related to faulting. The photographs reviewed for this project were flown in 1947, 1957 1968, 1975, and 1988. Development in the site vicinity and vegetation growth inhibits visibility of surface features associated with faulting in the immediate site vicinity. Lineaments interpreted to be related to active faults are visible west of the site in some of the earlier photographs.

The photographs indicate that there is a well-defined topographic lineament at the base of the slope below the project area. This feature coincides with the documented fault traces of the Hayward fault.

4.0 SUBSURFACE EXPLORATION

4.1 FIELD EXPLORATION

Our field exploration was performed on April 17-19, 2006, and consisted of excavating and logging of two fault trenches, T-1 and T-2, at the approximate locations shown on Plate 2. The trenches were excavated using a track-mounted excavator equipped with a 30-inch-wide bucket. The trench was excavated to depths up to 12 feet below existing ground surface and was shored for safety. Due to localized, loose, wet upper soils, the upper portion of the trench was benched laterally on each side approximately 2 to 3 feet and to depths of 2 to 3 feet to prevent these soils from falling into the trench. The resultant excavation and upper bench were approximately 9-feet-wide. A 30-inch-wide trench approximately 7- to 10-feet-deep below the bench elevation was then excavated down the center of the excavation to reach the appropriate depths.

Trench T-1 extended from the southeast corner of the proposed building site, west for 163 feet, along a trend of approximately N50-63°E. Trench T-2 was excavated from the west edge of the planned building area toward Cyclotron Road along a trend of approximately N85-90°E. The trenches were oriented roughly perpendicular to the general mapped trend of the Hayward fault in the vicinity of the investigation for the possible existence of the main trace and any secondary traces or splays extending from this main trace. The excavations were logged by our Professional Geologists and Staff Geologist on a full-time basis under the supervision of our Certified Engineering Geologist.

Materials encountered in the trench were visually classified in the field and a log was recorded. The log of trench T-1, describing the characteristics of the materials encountered, is presented on Plates 3a and 3b, and trench T-2 is presented on Plate 4. Visual classifications were made in accordance with the Unified Soils Classification System (USCS) presented on the Trench Log Legend, Plate 5.

Upon completion of the field logging, the trenches were compacted and tested to 90 percent relative compaction in compliance with ASTM D-1557. Test results will be retained in our project files and can be reviewed upon request.

4.2 SUBSURFACE CONDITIONS

Evidence of faulting was not observed in Trench T-1 or T-2. Exposures within the trenches consisted of colluvial deposits overlying completely weathered bedrock (residual soil) over less weathered bedrock. No shears or offsets of the layers/geologic contacts were observed in the trench. Geologic data collected in the form of strike and dip of bedding was consistent throughout the trenches. Evidence of landsliding, however, was observed in both trenches.

The east end of trench T-1 is fill (Unit 1) that extends along the upper portion of the trench approximately 47 feet along the trench line. The fill is described as gravelly, sandy clay that is wet and medium stiff. The fill is 2- to 3- feet thick. Underlying the fill is colluvium (Unit 2 and 3) consisting of sandy silt with gravel and gravelly silt with sand that is moist to wet and stiff to very stiff. This layer is approximately 2- to 6-feet thick with a localized area that is approximately 8 feet thick. Unit 4 and 5, located beneath Unit 3, varied in thickness from 0.5 to 5 feet. Units 4 and 5 are siltstone and sandstone, respectively, that is moderately weathered, weak, and intensely fractured and locally closely fractured and crushed. The siltstone laterally grades into sandstone in several locations throughout the trenches (Unit 5). The bedrock unit displays zones of sheared material associated with tectonic activity. These shear zones and clay shear seams are not consistent with the trend of the Hayward fault. Unit 6 is landslide debris that has been classified as gravelly silt with sand that is wet and stiff to very stiff.

At approximately Station 130 of trench T-1, a gray clay dormant landslide plane was encountered. The slide plane continues to the end of the trench and was also observed in trench T-2. The feature is further recognized by the presence of deep soil infill of what appears to be a landslide headscarp and the absence of residual soil upslope.

The static groundwater table was not encountered in trench T-1 or T-2. Minor seepage was observed in the landslide plane area and water pooled in the lower elevations of the trenches.

5.0 CONCLUSIONS

Based on the results of our field work, we conclude that there are no active faults that cross the planned CRT site. The nearest known active trace of the Hayward fault is located approximately 300 feet west of the site. As such, no building setbacks are required for this site.

The presence of landslide deposits should be addressed in the site-specific geotechnical investigation for the project.

6.0 LIMITATIONS

The conclusions and recommendations contained in this report are subject to the limitations presented herein. In addition, a brochure prepared by ASFE (Association of Firms Practicing in the Geosciences) has been included in this report. We recommend that all individuals reading this report also read this attached brochure.

Recommendations contained in this report are based on our field observations, data from two (2) new trenches by Kleinfelder, review of previous fault studies in the area, and our experience in the region. It is possible that subsurface conditions could vary between or beyond the points explored. If geologic conditions are encountered during construction that differ from those described herein, our firm should be notified immediately in order that a review may be made and supplemental recommendations provided, if warranted.

Our firm has prepared this report for the exclusive use of Lawrence Berkeley National Laboratory and their representatives in substantial accordance with the generally accepted geologic practice as it exists in the site area at the time of our investigation. No warranty is expressed or implied.

This report may be used only by the client and only for the purposes stated, within a reasonable time from its issuance, but in no event later than 3 years from the date of the report. Land or facility use, on and off-site conditions, regulations, or other factors may change over time, and additional work may be required with the passage of time. Based on the intended use of the report, Kleinfelder may require that additional work be performed and that an updated report be issued. Non-compliance with any of these requirements by the client or anyone else will release Kleinfelder from any liability resulting from the use of this report by any unauthorized party and client agrees to defend, indemnify, and hold harmless Kleinfelder from any claim or liability associated with such unauthorized use or non-compliance.

7.0 REFERENCES

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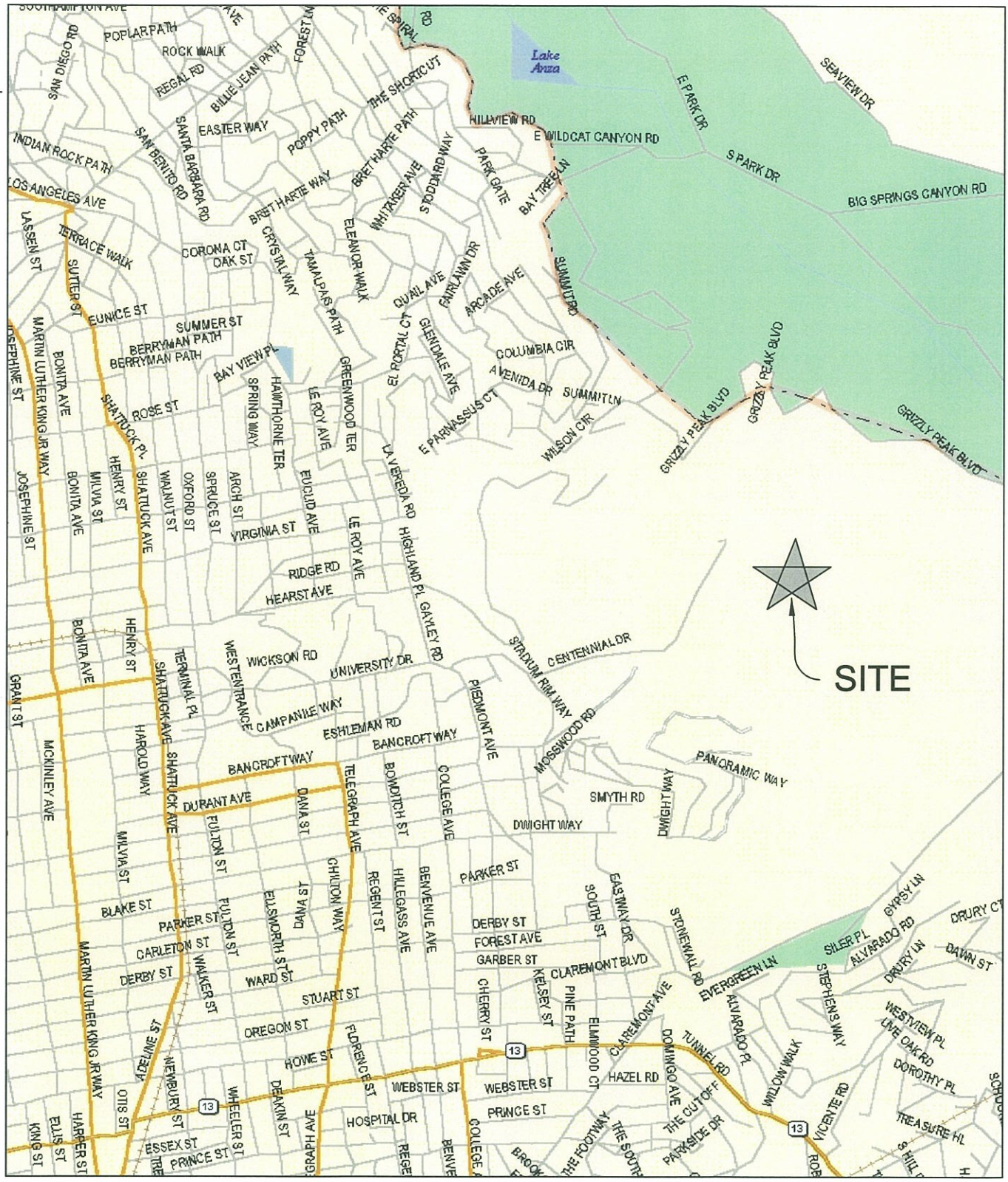
Aerial Photographs

Date	Flight Line	Scale
3-24-47	AV11-03-11, 12	1:24,000
5-3-57	AV 253-09-22, 23	1:12,000
7-2-68	AV-858-01-20, 21	1:12,000
5-6-75	AV-1193-08-15, 16	1:12,000
8-3-88	AV 3368-9-21, 22	1:12,000

PLATES



Base: DeLorme

KLEINFELDER

PROJECT NO. 67929-1 DATE SEPT 2006

SITE LOCATION

Fault Investigation
CRT Building
Lawrence Berkeley National Laboratory
Berkeley, California

PLATE 1

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APPROXIMATE PROPOSED
BUILDING FOOTPRINT

N 22° W

KT-1

KT-2

T-1

T-2

T-3

50A

50B

50C

50D

50E

50F

CYCLOTRON ROAD

EXPLANATION

Approximate Trench Location
(Kleinfelder 2006)

Approximate Trench Location
(Fugro 2002)

Eastern Boundary of the Alquist Priolo
Earthquake Fault Zone

50 25 0 50

scale feet

KLEINFELDER

PROJECT NO. 74911-1 DATE SEPT 2006

SITE PLAN
Fault Investigation
CRT Building
Lawrence Berkeley National Laboratory
Berkeley, California

PLATE
2

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EXPLANATION

⊙ Point of S/D

① GRAVELLY SANDY CLAY (CL) - mottled olive-brown dark olive-brown (5Y $\frac{3}{2}$) 2.5Y $\frac{3}{2}$) very dark grayish-brown, dark yellow-brown, medium gray, wet, angular gravels to 2" diameter, medium stiff. P.P.=1 tsf, abundant roots.

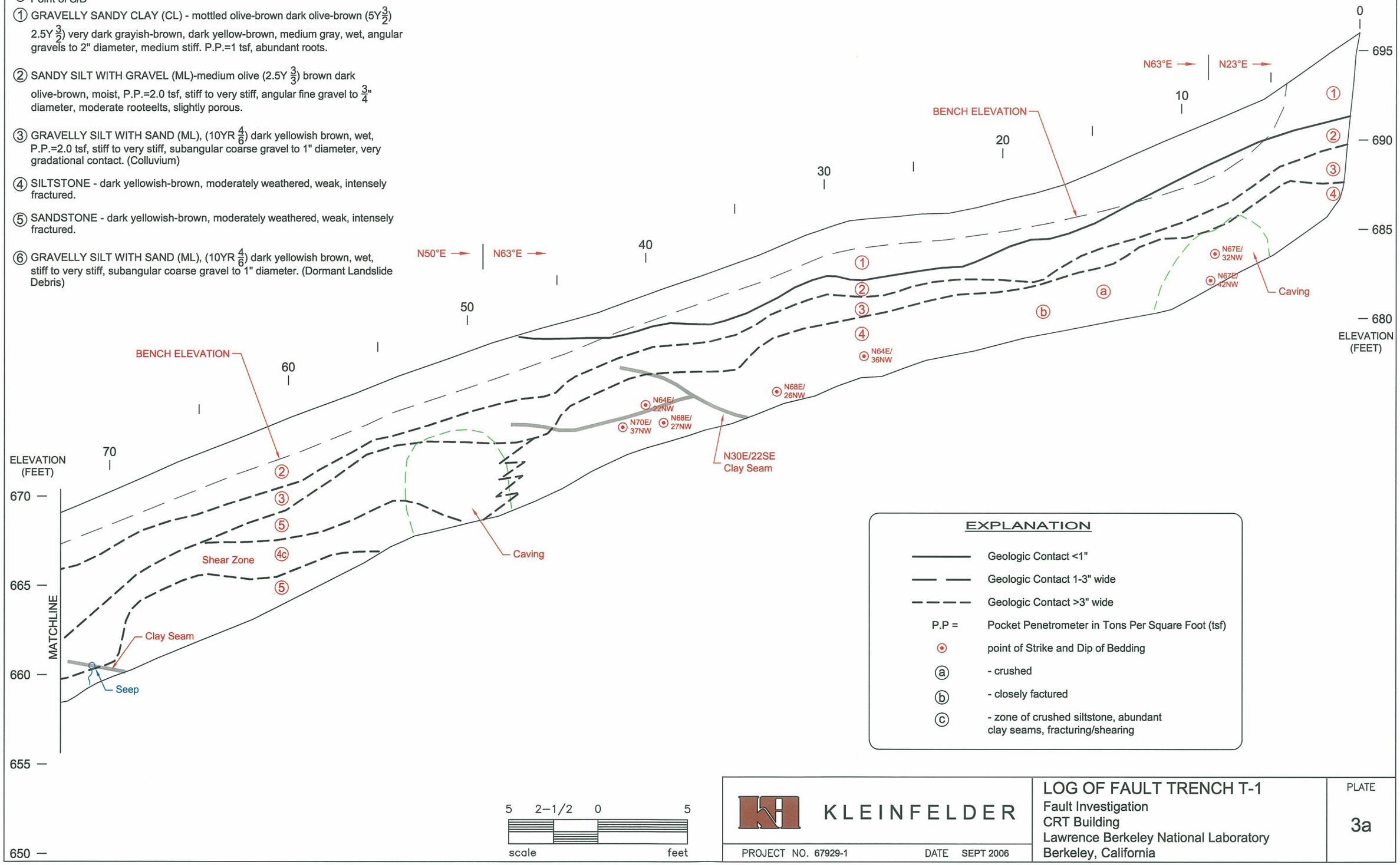
② SANDY SILT WITH GRAVEL (ML)-medium olive (2.5Y $\frac{3}{3}$) brown dark olive-brown, moist, P.P.=2.0 tsf, stiff to very stiff, angular fine gravel to $\frac{3}{4}$" diameter, moderate rooteelts, slightly porous.

③ GRAVELLY SILT WITH SAND (ML), (10YR $\frac{4}{6}$) dark yellowish brown, wet, P.P.=2.0 tsf, stiff to very stiff, subangular coarse gravel to 1" diameter, very gradational contact. (Colluvium)

④ SILTSTONE - dark yellowish-brown, moderately weathered, weak, intensely fractured.

⑤ SANDSTONE - dark yellowish-brown, moderately weathered, weak, intensely fractured.

⑥ GRAVELLY SILT WITH SAND (ML), (10YR $\frac{4}{6}$) dark yellowish brown, wet, stiff to very stiff, subangular coarse gravel to 1" diameter. (Dormant Landslide Debris)



EXPLANATION

———	Geologic Contact <1"
— —	Geologic Contact 1-3" wide
- - -	Geologic Contact >3" wide
P.P =	Pocket Penetrometer in Tons Per Square Foot (tsf)
⊙	point of Strike and Dip of Bedding
ⓐ	- crushed
ⓑ	- closely factured
ⓒ	- zone of crushed siltstone, abundant clay seams, fracturing/shearing

5 2-1/2 0 5

scale feet

KLEINFELDER

PROJECT NO. 67929-1 DATE SEPT 2006

LOG OF FAULT TRENCH T-1

Fault Investigation
CRT Building
Lawrence Berkeley National Laboratory
Berkeley, California

PLATE 3a

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EXPLANATION

⊙ Point of S/D

① GRAVELLY SANDY CLAY (CL) - mottled olive-brown dark olive-brown (5Y $\frac{3}{2}$) 2.5Y $\frac{3}{2}$) very dark grayish-brown, dark yellow-brown, medium gray, wet, angular gravels to 2" diameter, medium stiff. P.P.=1 tsf, abundant roots.

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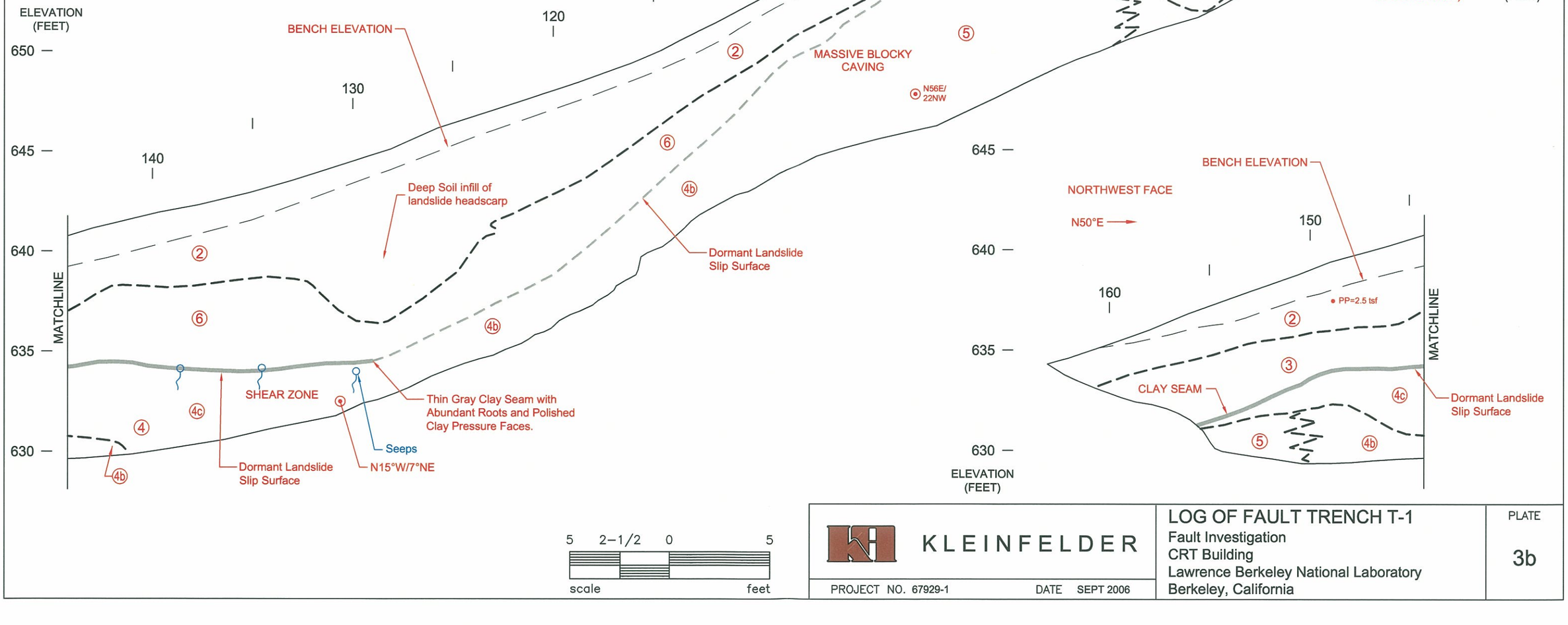
EXPLANATION

- Geologic Contact <1"
- Geologic Contact 1-3" wide
- Geologic Contact >3" wide
- P.P = Pocket Penetrometer in Tons Per Square Foot (tsf)
- ⊙ point of Strike and Dip of Bedding
- ⓐ - crushed
- ⓑ - closely factured
- ⓒ - zone of crushed siltstone, abundant clay seams, fracturing/shearing



5 2-1/2 0 5
scale feet

KLEINFELDER

PROJECT NO. 67929-1 DATE SEPT 2006

LOG OF FAULT TRENCH T-1

Fault Investigation
CRT Building
Lawrence Berkeley National Laboratory
Berkeley, California

PLATE 3b

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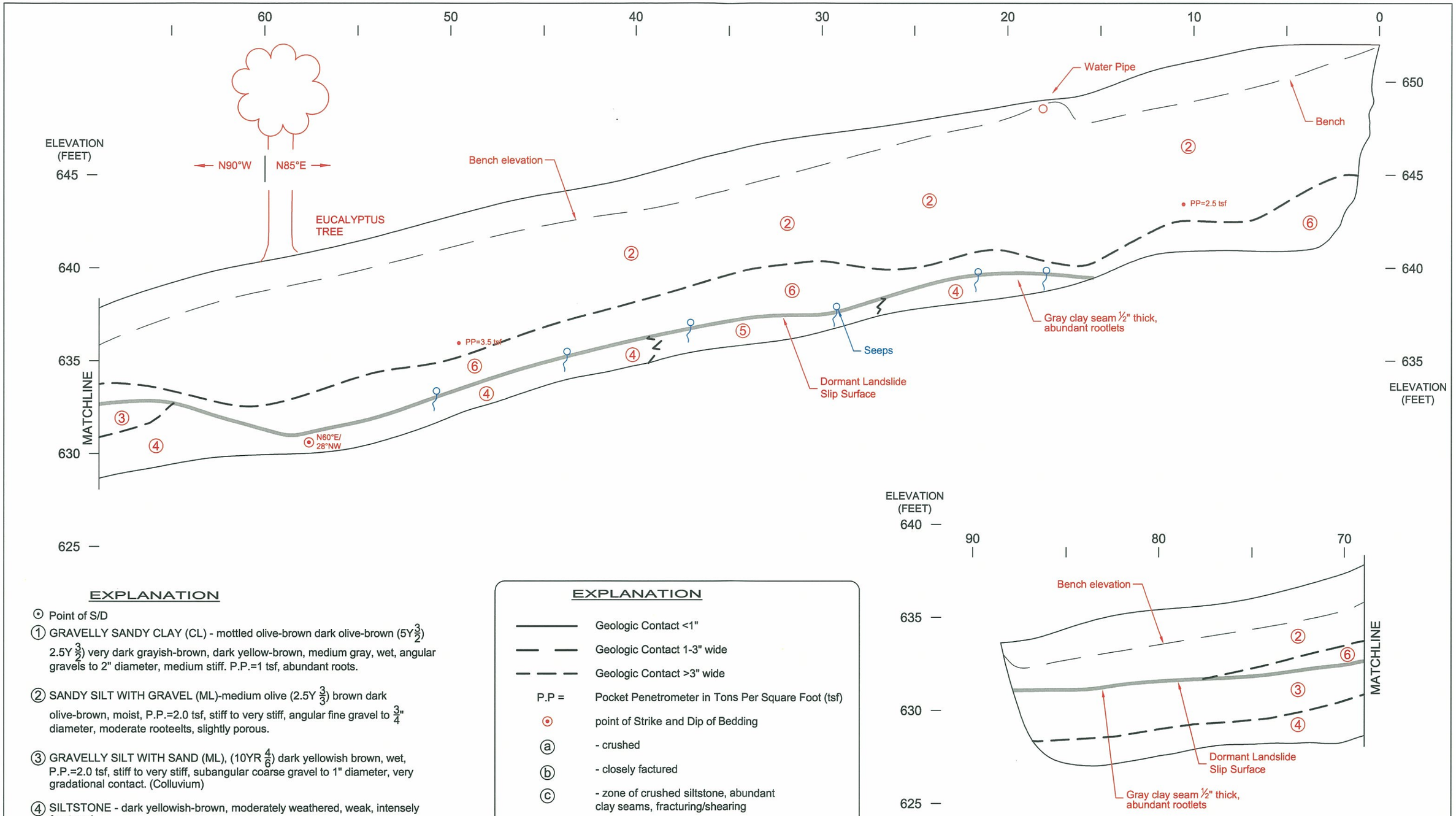

EXPLANATION

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- ② SANDY SILT WITH GRAVEL (ML)-medium olive (2.5Y 3/3) brown dark olive-brown, moist, P.P.=2.0 tsf, stiff to very stiff, angular fine gravel to 3/4" diameter, moderate rooteelts, slightly porous.
- ③ GRAVELLY SILT WITH SAND (ML), (10YR 4/6) dark yellowish brown, wet, P.P.=2.0 tsf, stiff to very stiff, subangular coarse gravel to 1" diameter, very gradational contact. (Colluvium)
- ④ SILTSTONE - dark yellowish-brown, moderately weathered, weak, intensely fractured.
- ⑤ SANDSTONE - dark yellowish-brown, moderately weathered, weak, intensely fractured.
- ⑥ GRAVELLY SILT WITH SAND (ML), (10YR 4/6) dark yellowish brown, wet, stiff to very stiff, subangular coarse gravel to 1" diameter. (Dormant Landslide Debris)

EXPLANATION

———	Geologic Contact <1"
— —	Geologic Contact 1-3" wide
– – –	Geologic Contact >3" wide
P.P =	Pocket Penetrometer in Tons Per Square Foot (tsf)
⊙	point of Strike and Dip of Bedding
ⓐ	- crushed
ⓑ	- closely factured
ⓒ	- zone of crushed siltstone, abundant clay seams, fracturing/shearing

5 2–1/2 0 5
scale feet

KLEINFELDER

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LOG OF FAULT TRENCH T-2
Fault Investigation
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PLATE 4

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UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS				DESCRIPTIVE NAMES
COARSE GRAINED SOILS More than Half > #200 sieve	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES
			GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES
		GRAVELS WITH OVER 12% FINES	GM	SILTY GRAVELS, POORLY GRADED GRAVEL-SAND-SILT MIXTURES
			GC	CLAYEY GRAVELS, POORLY GRADED GRAVEL-SAND-CLAY MIXTURES
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS WITH LITTLE OR NO FINES	SW	WELL GRADED SANDS, GRAVELLY SANDS
			SP	POORLY GRADED SANDS, GRAVELLY SANDS
		SANDS WITH OVER 12% FINES	SM	SILTY SANDS, POORLY GRADED SAND-SILT MIXTURES
			SC	CLAYEY SANDS, POORLY GRADED SAND-CLAY MIXTURES
FINE GRAINED SOILS More than Half < #200 sieve	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS, OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC CLAYS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS

FIELD SAMPLING

- MODIFIED CALIFORNIA SAMPLE
- DISTURBED, BAG OR BULK SAMPLE
- STANDARD PENETRATION TEST
- SHELBY TUBE SAMPLE
- 3-1/2" I.D. CONTINUOUS CORE SAMPLE
- UNRETAINED PORTION OF SAMPLE
- WATER LEVEL OBSERVED IN BORING (at given post-drilling time)
- WATER LEVEL OBSERVED IN BORING (at time of drilling)

LABORATORY TESTS

LL	LIQUID LIMIT
PI	PLASTICITY INDEX
SA	SIEVE ANALYSIS
#200	PERCENT PASSING #200 SIEVE
RV	RESISTANCE VALUE
EI	EXPANSION INDEX
DS	DIRECT SHEAR
Tx/UU	TRIAXIAL SHEAR-UNCONSOLIDATED UNDRAINED
UC	UNCONFINED COMPRESSION
SG	SPECIFIC GRAVITY
PP	POCKET PENETROMETER SHEAR STRENGTH (tsf)

NOTES: The lines separating strata on the logs represent approximate boundaries only. The actual transition may be gradual. No warranty is provided as to the continuity of soil strata between borings. Logs represent the soil strata and groundwater observed at the boring location on the date of drilling only.

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TRENCH LOG LEGEND

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PLATE **5**

EXPLANATION

2929 — PREVIOUS FAULT INVESTIGATIONS (on file with California Geological Survey, CGS CD 2003-01, number indicates CGS file number)

FAULT TRACES MAPPED BY CGS

BOUNDARIES OF ALQUIST-PRIOLO EARTHQUAKE FAULT ZONE

CGS (2003) SITES	FAULT	
	FOUND	NOT FOUND
2602		X
2815		X
2601	X	
2529	X	
2646	X	
2211		X
2530	X	
0507		X
0166		X
1992	X	
0816		X
2974	X	
0013		X

3000 1500 0 3000
scale feet

Base: CGS (1983, 1993)

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PREVIOUS FAULT INVESTIGATIONS

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PLATE 6

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