FEFFER
GEOLOGICAL CONSULTING

Montecito Fault Investigation
Presentation by
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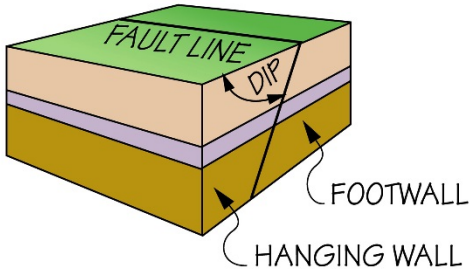
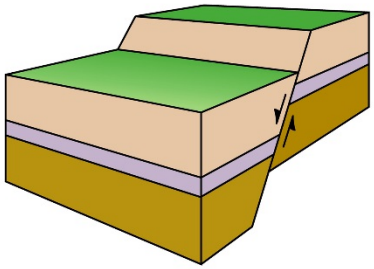
Types of Fault Movement

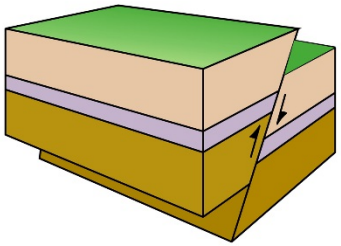
A- NAMES OF FAULT COMPONENTS

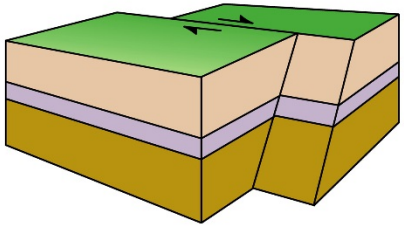




B- NORMAL FAULT

C- REVERSE FAULT
(OR THRUST FAULT)





D- STRIKE-SLIP FAULT
(RIGHT LATERAL MOVEMENT)

Figure 62.

Problems Associated With Earthquakes

- Ground shaking (occurs frequently)
- Ground rupture and lurching (occurs less frequently)
- Liquefaction (occurs only in select soil types with a shallow groundwater table)
- Lateral spreading (liquefaction induced or in slopes)
- Earthquake induced landsliding

What is an Active Fault?

- 1971 Sylmar/San Fernando Earthquake
  - Caused Ground Cracking and Movement
- Alquist-Priolo Fault Special Studies Zone Act of 1972
  - Designed to Mitigate Damage from Surface Fault Rupture
- Definition of Active Fault
  - Readily Identifiable
  - Active in Holocene Time, ~11,000 years

Investigation

- Initial Research
  - Maps
    - Geology and Topographic maps
  - Historical Photographs
  - Publications, both published and unpublished
- Site Review
  - Borings
    - Bucket Auger
    - Continuous Sampling
  - Trenches
  - CPT
  - Age Dating of Soil Encountered

Geologic Map

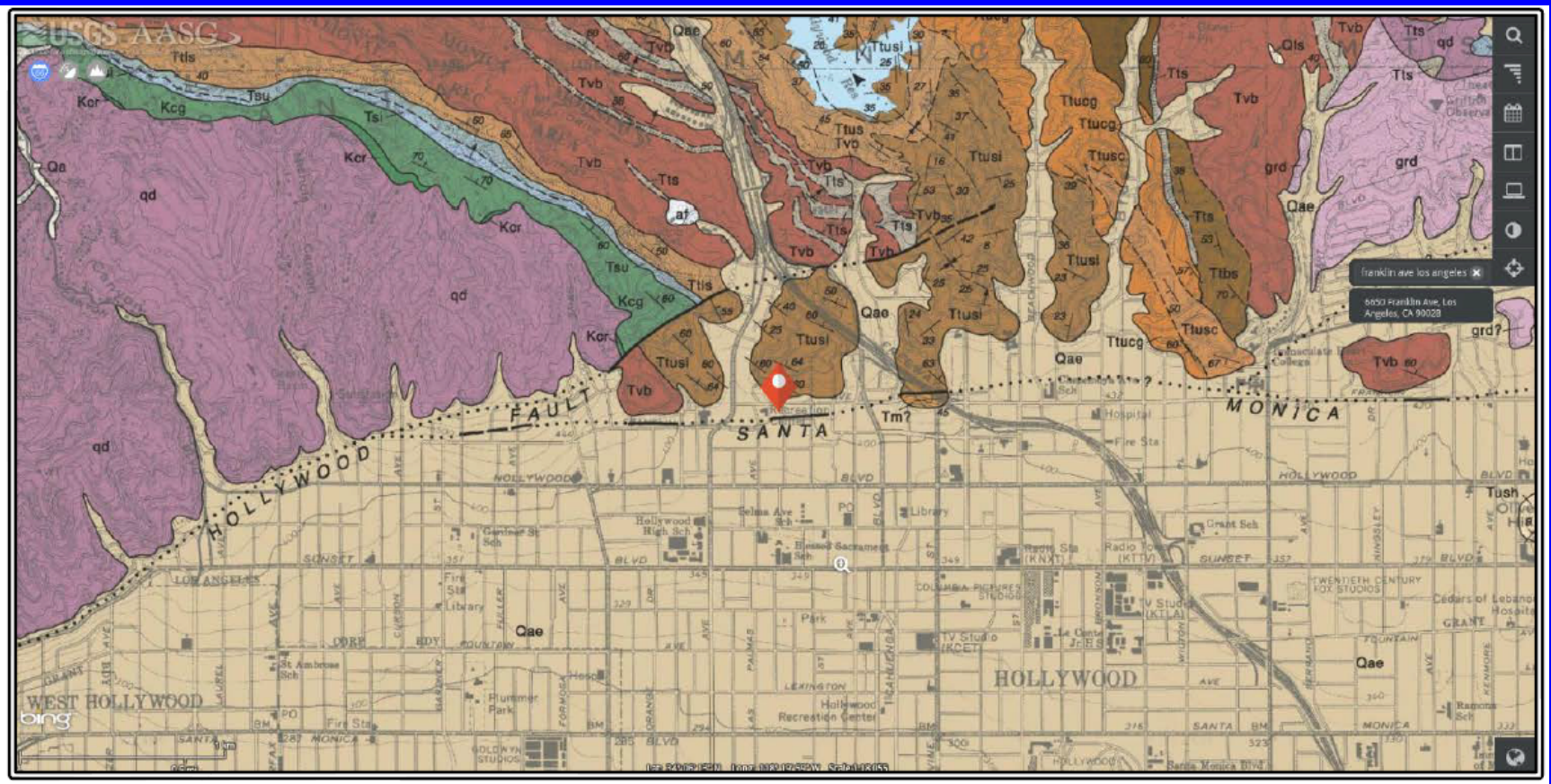


Figure 5. Portion of Dibblee Geologic Map of the Hollywood Quadrangle. The subject site location is at the base of the red diamond.

Publications

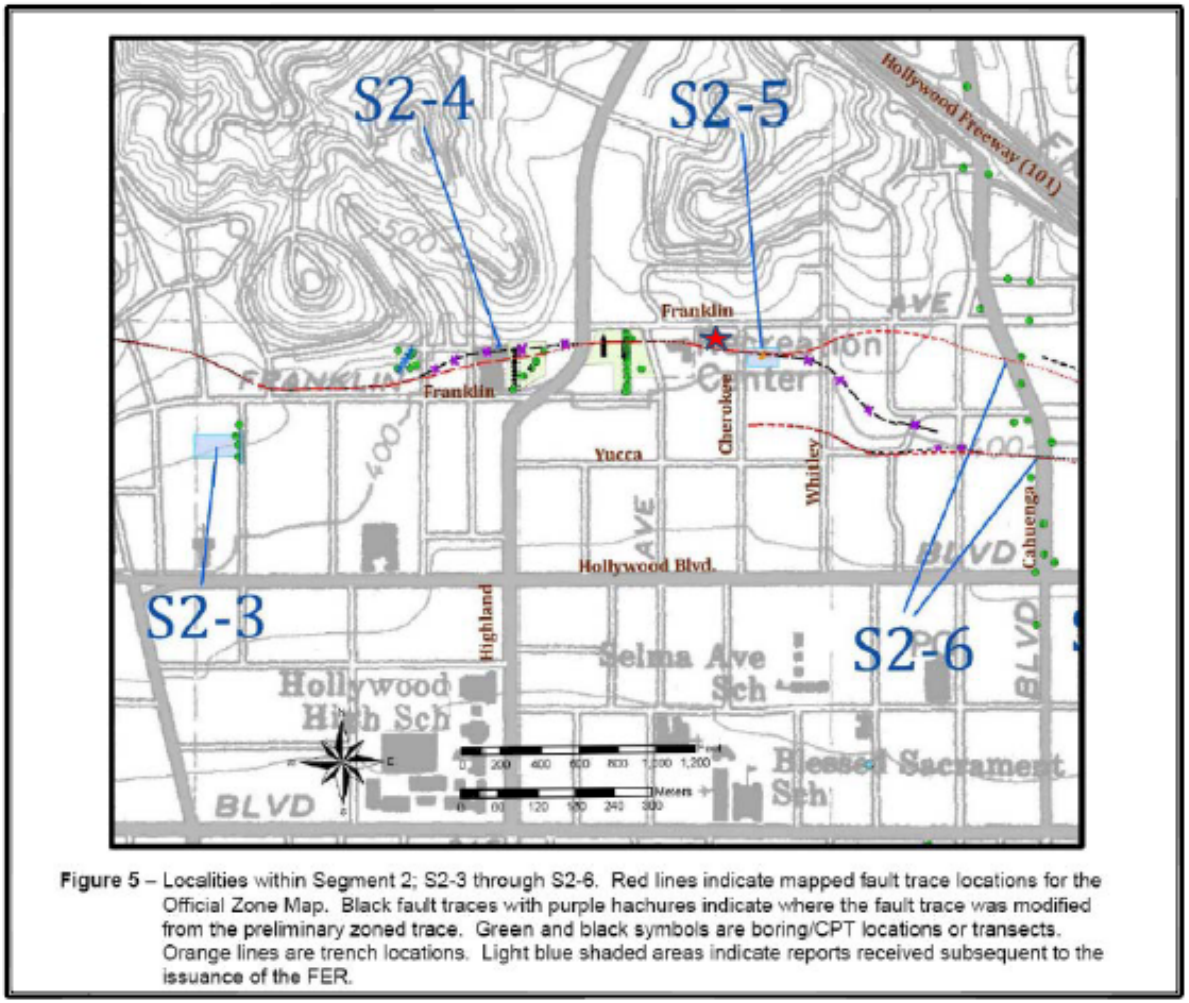
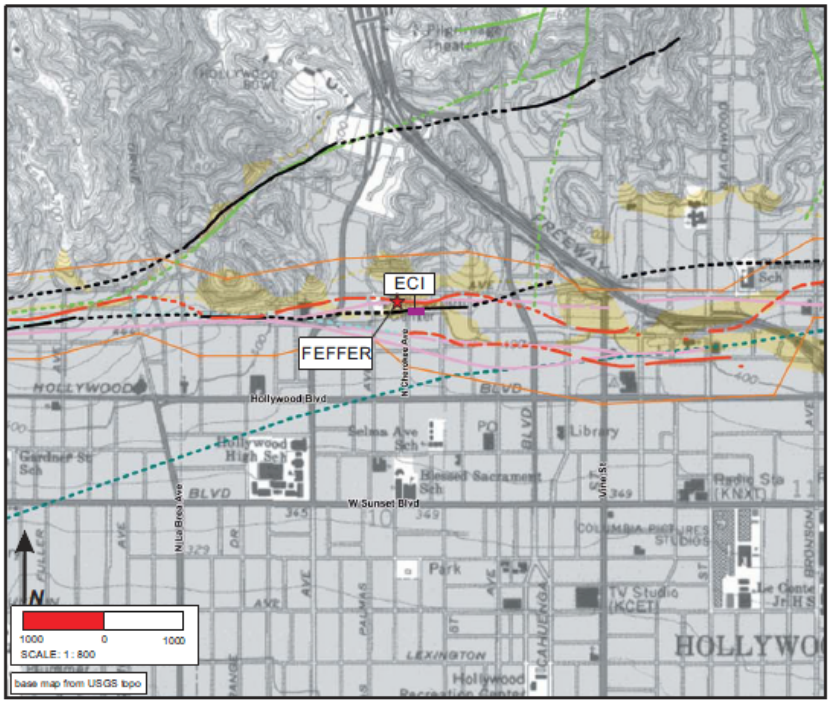


Figure 5 – Localities within Segment 2; S2-3 through S2-6. Red lines indicate mapped fault trace locations for the Official Zone Map. Black fault traces with purple hachures indicate where the fault trace was modified from the preliminary zoned trace. Green and black symbols are boring/CPT locations or transects. Orange lines are trench locations. Light blue shaded areas indicate reports received subsequent to the issuance of the FER.

Figure 7. Figure 5 from FER-253 supplement. The approximately location of the subject site is designated with a red star.

Publications



FAULT INVESTIGATION STUDIES

FEFFER GEO, 2015, 2016
(this study)

ECI, 2016

FAULTS

Hoots (1930)
Solid line where accurately located, dashed where approximately located, dotted where concealed.

Hill et al. (1978, 1979)
Dotted where buried, queried where speculated.

Dibblee (1991a, 1991b)
Dashed where indefinite or inferred, dotted where concealed, queried where existence is doubtful.

Crook and Proctor (1992)
Active and potentially active fault.

Lang and Dressen (1975)
Trace of Santa Monica fault at depth, ~2700 m (~8850 ft) below sea level.

MAPPED SCARPS & FOLDS

Dolan and Sieh (1992, 1997)
Geomorphic scarps interpeted as fault- or fold-controlled. In areas of young alluvium where there are no scarps, dots are used to infer where faults extend below alluvium.

PRELIMINARY ALQUIST-PRIOLO EARTHQUAKE FAULT ZONE

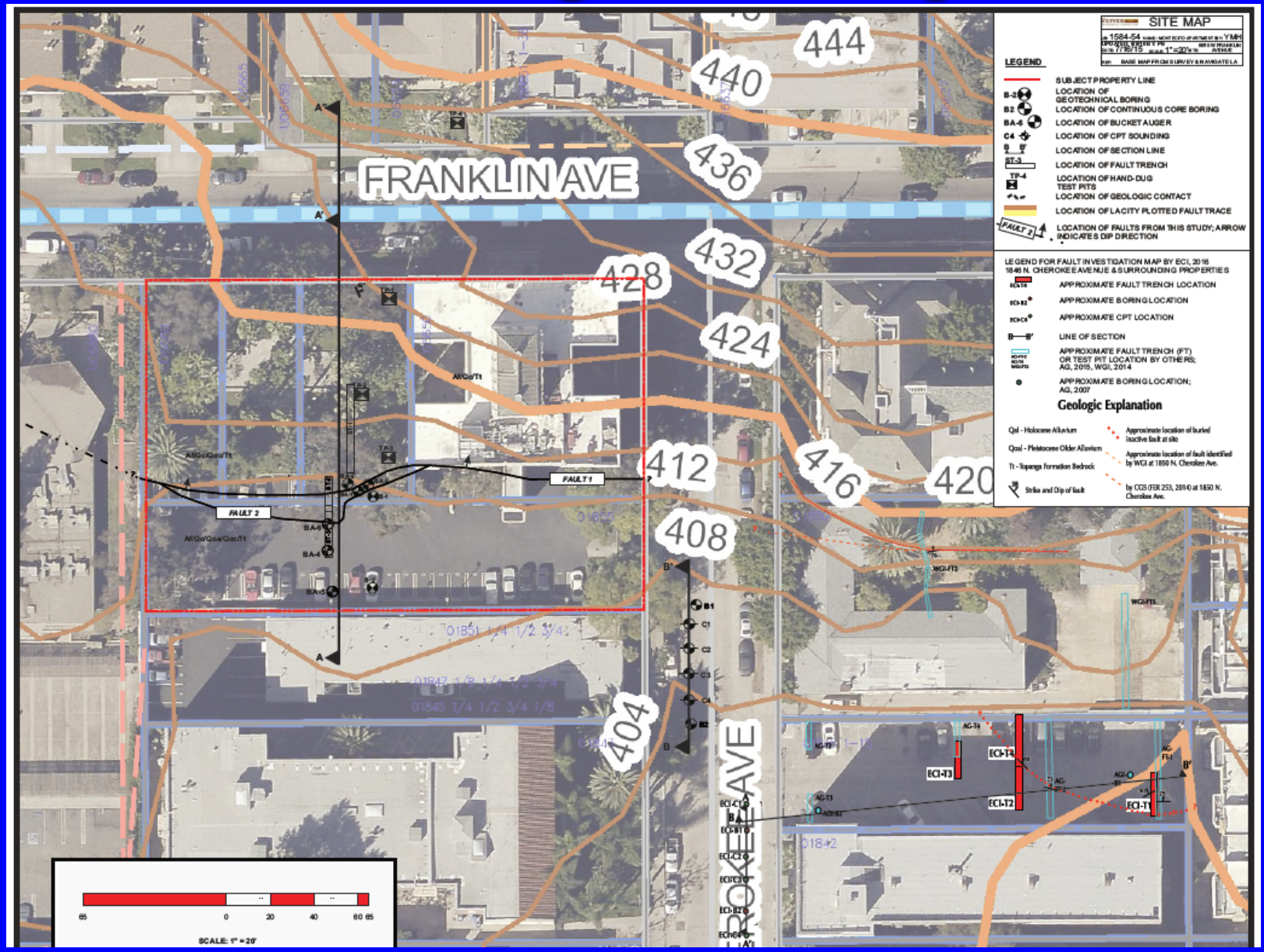
Proposed Earthquake Fault Zone Boundaries delineated as straight line segments that connect encirdled turning points so as to define speical studies zone segments (CGS, 2014)

Faults considered to have been active during Holocene time, solid where accurately located, long dash where approximately located, short dash where inferred, dotted where concealed (CGS, 2014)

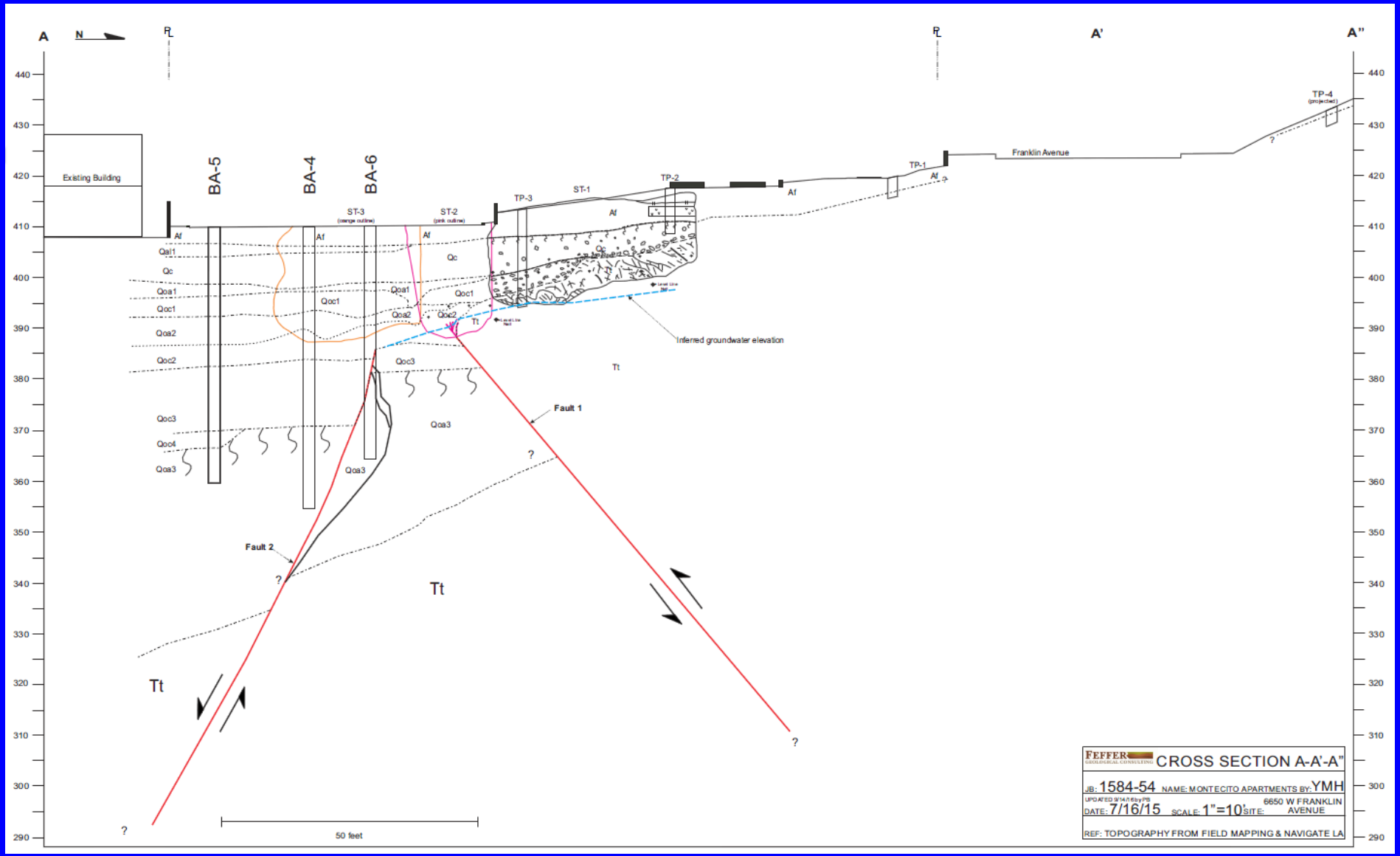
Investigation

- Iterative Approach
  - Consulted with Geologists from State of California Geological Survey and City of Los Angeles
- Initial Subsurface Investigation-Phase I
  - 4 test pits, 2 Auger Holes, Trench 1
- Phase II Subsurface Investigation
  - 6 Bucket Augers
- Phase III Subsurface Investigation
  - Trenches 2 and 3
- Phase IV Subsurface Investigation
  - Continuous Borings and CPT's

Investigation Map



Cross Section



Age Dating

- Reproducible and Verifiable

TABLE 1.2 - Soil Development Index Calculation Sheet
Soil Profile - 1, Trench Exposure

Unit	Thickness (Feet)	Color				Texture		Structure		Consistence				Clay Films		Horizon Values	Mean Hor. Values
		Dry		Moist						Dry		Wet					
Raw Alluvium	*3*	*2.5Y 7/2*	*X/10*	*10YR 6/3*	*X/10*	*s*	*X/6*	*sg*	*X/6*	*lo*	*X/5*	*so, po*	*X/6*	*0*	*X/15*		
Profile 1																	
ABt1	1.8	10YR 5/4	0.3	10YR 4/3	0	l-cl	0.58	1 sbk	0.33	sh	0.33	s, p-vp	0.75	1-2fpf, v1mkpf, 2fcl	0.47	0.39	0.71
Bt2	1.7	7.5YR 4/4	0.4	7.5YR 3/3	0.1	cl	0.67	2 abk	0.67	h	0.6	s-vs, vp	0.92	1mkpf, 2fpf, 1dpo, 1dcl	0.63	0.57	0.97
Bt3	2	7.5YR 4/3	0.3	7.5YR 3/3	0.1	sl-l	0.42	1 sbk	0.33	sh	0.33	ss-s, ps	0.42	1fpf, 1fcl	0.32	0.32	0.63
2Bt1b / 2BC1b	1.5	7.5YR 4/4	0.4	7.5YR 3/3	0.1	l-cl	0.58	1-2 abk	0.58	h	0.6	s-vs, vp	0.92	2fpf, 2dcl	0.43	0.52	0.77
2Bt2b / 2BC2b	1.1	7.5YR 5/4	0.4	7.5YR 4/3	0.1	sl-l	0.42	1 sbk	0.33	so-sh	0.25	ss, ps	0.33	v1-1fpf	0.18	0.29	0.32
3Bt1b	2.9	7.5YR 5/6	0.6	7.5YR 4/4	0.2	cl	0.67	2 abk	0.67	h	0.6	vs, vp	1.00	2fpf, 1dpf, 2dcl	0.63	0.62	1.81
3Bt2b/ 3BCb	1.3	7.5YR 5/4	0.4	7.5YR 4/3	0.1	l	0.5	1 sbk	0.33	h	0.6	s-ss, ps	0.42	2fpf, v1dpf, 2dcl	0.48	0.40	0.53
4Crb	2	10YR 5/2	0.3	10YR 3/1	0	ls	0.17	m	0.00	h	0.6	ss, po	0.17		0	0.18	0.35

INDEX VALUES AND ESTIMATED AGES (ka)

Soil Member	MHI	Mean Soil Index	SDI @ 7 feet	Color Index	Clay Film Index	Soil Age Estimate ka	Section Age Estimate ka	Stratigraphic Unit
Surface Soil	0.57	2.31	2.94	1.2	1.42	8 - 13	8 - 13	Qc
Buried Soil 1	0.52	1.09	2.94	1	0.61	8 - 13	16 - 26	Qoa1
Buried Soil 2	0.62	2.34	3.89	1.3	1.11	13 - 30	29 - 56	Qoc1
Buried Soil 3	0.18	0.35	1.24	0.3	0.00	4 - 8	33 - 64	Tt

Conclusions

- No Evidence of Active Faulting at Montecito
  - Unbroken soil overlying inactive faults is older than 11,000 years
- State of California and City of Los Angeles review and approval
- Geotechnical Investigation still to be completed