FRED AFLAKIAN, PG, CEG
CONSULTING ENGINEERING GEOLOGIST

September 26, 2019 Project No.19-805 Fault

Mr. John Rowland
23811 Washington Avenue
Murrieta, California 92562
John@s2amodular.com

Subject: Fault Rupture Hazard Investigation, Proposed S2A Showroom and Factory Compound, APNs 439-030-009, 439-030-010 and 439-400-023, West of State Street and Crow's Nest Place, City of Hemet, Riverside County, California

.

Dear Mr. Rowland,

Presented herewith is our Fault Rupture Hazard Investigation for the subject site. The work was conducted in accordance with our proposal dated August 9, 2019 and your subsequent authorization to proceed. The purpose of this fault investigation was to meet the criteria outlined in Appendix A of the California Geological Survey Special Publication 42 (CGS, 2007) for human occupancy. The location of the project site is shown on the Site Location Map, Figure 1.

SCOPE OF WORK

The following services were performed for the subject site:

- Review of available geologic reports for the general site area and stereo pair aerial photos for the site and surrounding areas.

- Logging of two fault trenches (FT-1 and FT-2), which encompassed approximately 850 linear feet of excavation exposing topsoil, undocumented fill, colluvium and alluvium to depths of up to approximately 12 feet. The trench locations and excavation depths were determined based on our review of available geologic and geotechnical data and conditions exposed during the fault trench excavation.

- Preparation of this report presenting our findings.

GEOLOGIC FAULT STUDY

Site Description and Proposed Project Development

The site is currently a vacant dirt covered parcel of land which is covered with scattered trees, brush and grasses. A northwest to southeast trending 15 to 20 ft. high scarp (2:1 horizontal: vertical) transects the central portion of the site. The area to the southeast of the scarp the site is flat with elevations ranging from approximately 1525 to 1535 feet above mean sea level (msl). To the southwest of the scarp, the site is relatively flat with elevations ranging from 1550 to 1555 feet above msl. Scattered dirt roads cross the site. The site is bounded on the north by scattered residential, open fields, commercial and light industrial use; to the south by residential development and a self-storage facility; to the east by State Street; and to the west by residential development. Base on a review of the plot plan prepared by Sake Engineers, Inc. the proposed improvements will a modular building and showroom facility consisting of multiple building for modular home construction; offices and showrooms; a modular home pre-shipping parking area; vehicle parking; and a water quality basin.

Field Investigation

The logging of the fault trenches (FT-1 and FT-2), which took place periodically on August 23 through September 7, 2019, and was directed by a certified engineering geologists who examined and logged the exposed soil materials. The City of Hemet Planning Engineer (Robert Vestal) was made aware of our trenching activities. Based on phone communication with Mr. Vestal, we communicated the findings of our fault trenching and he indicated that we could submit our report to the city. The approximate locations of the fault trenches are shown on the enclosed Fault Trench Location Map (Plate 1). The logs of the exploratory fault trenches are included on Plates 2 through 6.

Site Geologic Setting

The site is located on an alluvial plain within the San Jacinto Valley, which slopes downward to the east. A modified, prominent northeast facing fault scarp exists within the central portion of the site and can be clearly seen trending in a southeast to northwest direction. The same scarp can be clearly seen to the northwest of the site as well as to the southeast of the site crossing State Street. The site is entirely underlain by recent alluvium. The geology of the general site area is shown on the Site Regional Geology Map, Figure 2.

The active, northwest trending fault passing through the western portion of the site is the Casa Loma fault, a branch of the San Jacinto fault zone (See Figure 3, Site Alquist-Priolo Map). The block of land between the on-site Casa Loma fault and the Claremont fault, approximately 3 miles to the northeast, is a large graben (down-thrown block of land between faults) that has historically undergone subsidence of up to 4 feet in some places. Both the Casa Loma and Claremont faults are part of the San Jacinto fault zone (Sharp, 1975). The graben between these faults is underlain by several thousand feet of alluvial sediments, whereas the alluvial sediments southwest of the Casa Loma fault only continue to depths of approximately 500 feet (Fett, 1968). Igneous, bedrock hills are located southwest of the Casa Loma fault. Metamorphic and igneous rocks, regionally capped by Pleistocene sediments, are located along the northeast side of the Claremont fault.

The San Jacinto fault zone in recent years has demonstrated its active nature and potential for large magnitude earthquakes. Earthquakes attributed to this fault zone were reported in 1899 and 1918, resulting in some destruction to the communities of San Jacinto and Hemet.

Recent studies have indicated that the San Jacinto Valley is also actively subsiding. Three factors acting collectively have probably been responsible for valley subsidence. These include: 1) down-faulting along the bordering fault zones (Lofgren and Rubin, 1975); 2) groundwater withdrawal, and 3) hydrocompaction of low density alluvial deposits (Lofgren, 1976). The subsidence is primarily occurring along the western side of the valley.

Seismic Setting

A northwest trending branch of the San Jacinto fault zone, the Casa Loma fault, passes through the central portion of the site and can be clearly seen trending in a southeast to northwest direction. The same scarp can be clearly seen to the northwest of the site as well as to the southeast of the site crossing State Street. Additional surficial evidence of this fault can be observed in alluvium approximately 3 miles to the southeast (Rasmussen, 1976).

Evidence of fault rupture was observed up to the surface in both fault trenches. Therefore, the fault is considered to be an active fault, having undergone very recent and possibly historic surface rupture.

Numerous other active faults are located within the general region, such as the Elsinore and San Andreas fault zone, but because of their much greater distance from the site, they are not considered significant when compared to the on-site branch of the San Jacinto fault zone.

Casa Loma Fault

Vertical movement along the Casa Loma fault has resulted in a prominent northeast facing fault scarp in the central portion of the site. The scarp has been modified by cultivation/farming and erosion, leaving a broader and less steep scarp than originally existed.

Major movement along the fault occurs along a narrow well defined zone. The strike of the fault measured in the bottom of the trench was approximately the same as the surface trace of the scarp. The attitude of the fault was N38W, dipping 65 degrees to the northeast in Fault Trench 1 and N63W, dipping 60 degrees to the northeast in Fault Trench 2.

The existence of a very prominent fault scarp at one confined location together with the narrow zone of sediment rupture near the surface observed in both on-site trenches indicate fault rupture has occurred in the past over a very narrow zone. Recurring faulting usually occurs along the same plane that underwent previous fault rupture.

The surface locations of the major fault break were mapped. The mapped trend of the fault, as shown on Plate 1 (Fault Trench Location Map) was based on both the trend of the fault in the fault trenches as well as the trend of the fault scarp based on our review of aerial photographs. Human occupancy structures are not recommended across or within the designated fault setback zone as shown on Plate 1, Fault Trench Location Map.

The full length and depth of both trenches was carefully examined for evidence of recent faulting. No other disruptions or suspicious zones were observed, and the remainder of the site is considered to be relatively free of a fault rupture hazard.

Review of Stereo Pair Aerial Photos

In order to identify possible unmapped faults, a photo-lineament analysis was performed in the area of the site. Stereo pair aerial photos were reviewed for the subject site and general surrounding area. The aerial photos were obtained from County of Riverside Flood Control and Water Conservation District and included the following years: 1962, 1974, 1980, 1990, 2000 and 2010. A detailed list of the aerial photos (date, photo id and approximate scale) are presented in Appendix A.

Lineaments were classified according to their development as strong, moderate or weak. A strong lineament is a well-defined feature that can be continuously traced several hundred feet to a few thousand feet. A moderate lineament is less well defined, somewhat discontinuous, and can be traced for only a few hundred feet. A weak lineament is discontinuous, poorly defined, and can be traced for a few hundred feet or less. Each lineament within the A-P and County of Riverside Zones were field checked during our reconnaissance mapping to evaluate possible origin. All of the lineaments, with the exception of the prominent scarp in the central portion of the site, were classified as weak. The lineaments were located to the southwest of the prominent scarp in the central portion of the site. These lineaments trended northwest-southeast. Review and exploratory trenching for fault related features revealed no evidence for faulting associated with these weak lineaments. The lineaments are likely related to the previous farming and cultivation activities including concrete pipes and leach lines.

GEOLOGICAL AND SOIL UNITS

General

Geologic and soil units identified within the site and fault trench excavated on subject property consisted of topsoil, undocumented fill, colluvium, and quaternary-age alluvium. The generalized descriptions of these site materials provided below are based upon conditions exposed in the fault trenches excavated for this study.

Topsoil (map symbol, Qs)

The site is covered with a thin layer of topsoil. The topsoil consists of dark grayish brown silty sand which is highly disturbed with organics.

Undocumented Fill

Undocumented fill consisting of silty sand was encountered at various locations within the fault trenches. The undocumented fill was located within the upper 1 to 3 feet and was generally associated with existing irrigation lines and dirt roads.

Colluvium (map symbol, Qc)

Colluvium was encountered on the east side of the fault to the total depth of the trenches. The colluvium consisted of brown silty sand which was very porous.

Alluvium (map symbol, Qal)

Alluvium was encountered on the west side of the fault to the total depth of the trenches. The alluvium consisted of layers of fine to coarse grained white sand; dark gray silty clay; light brown poorly cemented sand; and brown silty clay.

CONCLUSIONS

The northwest trending, active Casa Loma fault passes through the central portion of the site and future ground rupture from faulting should be expected along this fault zone. Fault rupture is not expected through any of the remaining portion of the site as no evidence of faulting was noted during the aerial photo analysis or fault trenching.

RECOMMENDATIONS

Structures for human occupancy should not be placed in or across the designated fault setback zone shown on the enclosed fault trench location map (Plate 1).

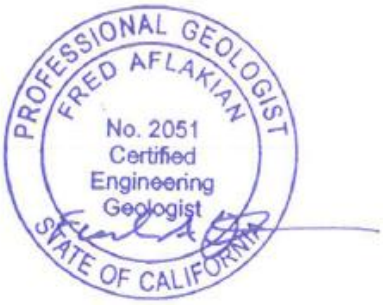
Shut-off valves are recommended for any wet utilities (sewer and water) crossing the designated fault setback zone. The shut-off valves should be placed on either side of the zone.

CLOSURE

Our findings were obtained in accordance with generally accepted current professional principles and local practice in geotechnical engineering. We make no other warranty, either express or implied

This report is subject to review by the controlling authorities for the project. We thank you for the opportunity of providing our services to you on this project.

Edward L. Burrows, MS, PG, CEG 1750
Engineering Geologist



Fred Aflakian, PG, CEG 2051
Engineering Geologist

Attachments:

Figure 1 – Site Location Map
Figure 2 – Regional Geology Map
Figure 3 – Site Alquist-Priolo Map
Plate 1 – Fault Trench Location Map
Plates 2 through 6 – Fault Trench Logs
Appendix A – References and List of Stereo Pair Aerial Photos

APPENDIX A
REFERENCES

CGS, State of California Earthquake Fault Zones of Required Investigation, Devore Quadrangle, dated June 1, 1995

Fett, J. D., 1968, Geophysical Investigation of the San Jacinto Valley, Riverside County, California, Univ. Of California Masters Thesis

Gary S. Rasmussen & Associates, 1976, Subsurface Engineering Geology Investigation of a 6+ Parcel east of the southeast corner of Stanford & Acacia, Hemet, California, Project No. 1128, dated February 25, 1976

Hart, E.W., Bryant, W.A., 2007 (Revised), Fault Rupture Hazard Zone in California: California Division of Mines and Geology., Spec. Pub. 42

Sake Engineering Inc., 2019, City of Hemet Plot Plan, Lot 5 and a Portion of Lot 4 of Mesa Terrace Tract, in the City of Hemet, County of Riverside, State of California, dated August 2019

STEREO PAIR AERIAL PHOTOS

Date	Frame No.	Scale (Approximate)
3/28/2010	10-38 & 10-39	1 in. = 1,600 ft.
3/18/2000	10-37 & 10-38	1 in. = 1,600 ft.
01/9/1990	10-42 & 10-43	1 in. = 2,000 ft.
04/10/1980	487 & 488	1 in. = 2,000 ft.
06/20/1974	527 & 528	1 in. = 2,000 ft.
01/29/1962	2-235 & 2-236	1 in. = 2,000 ft.

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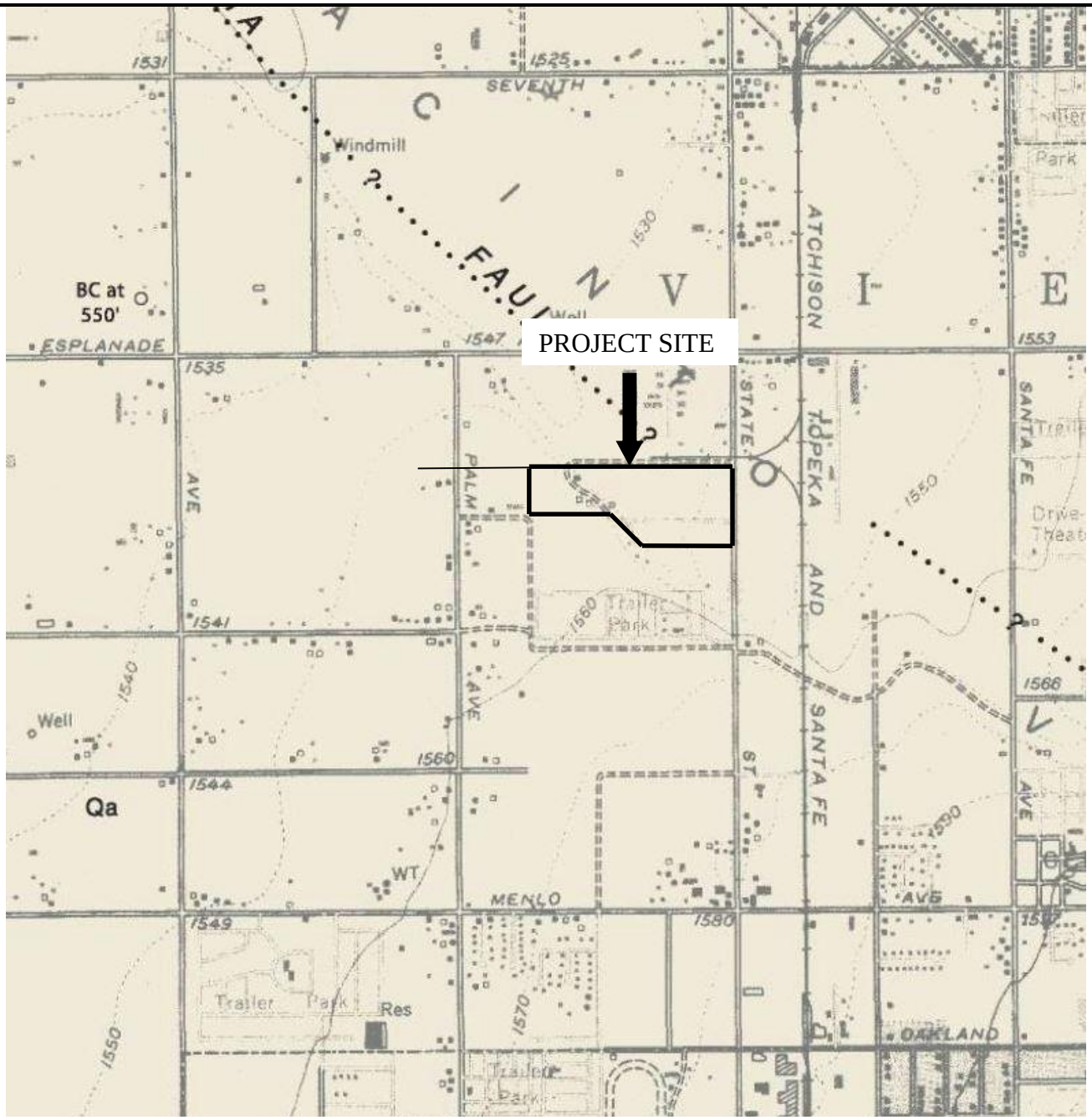
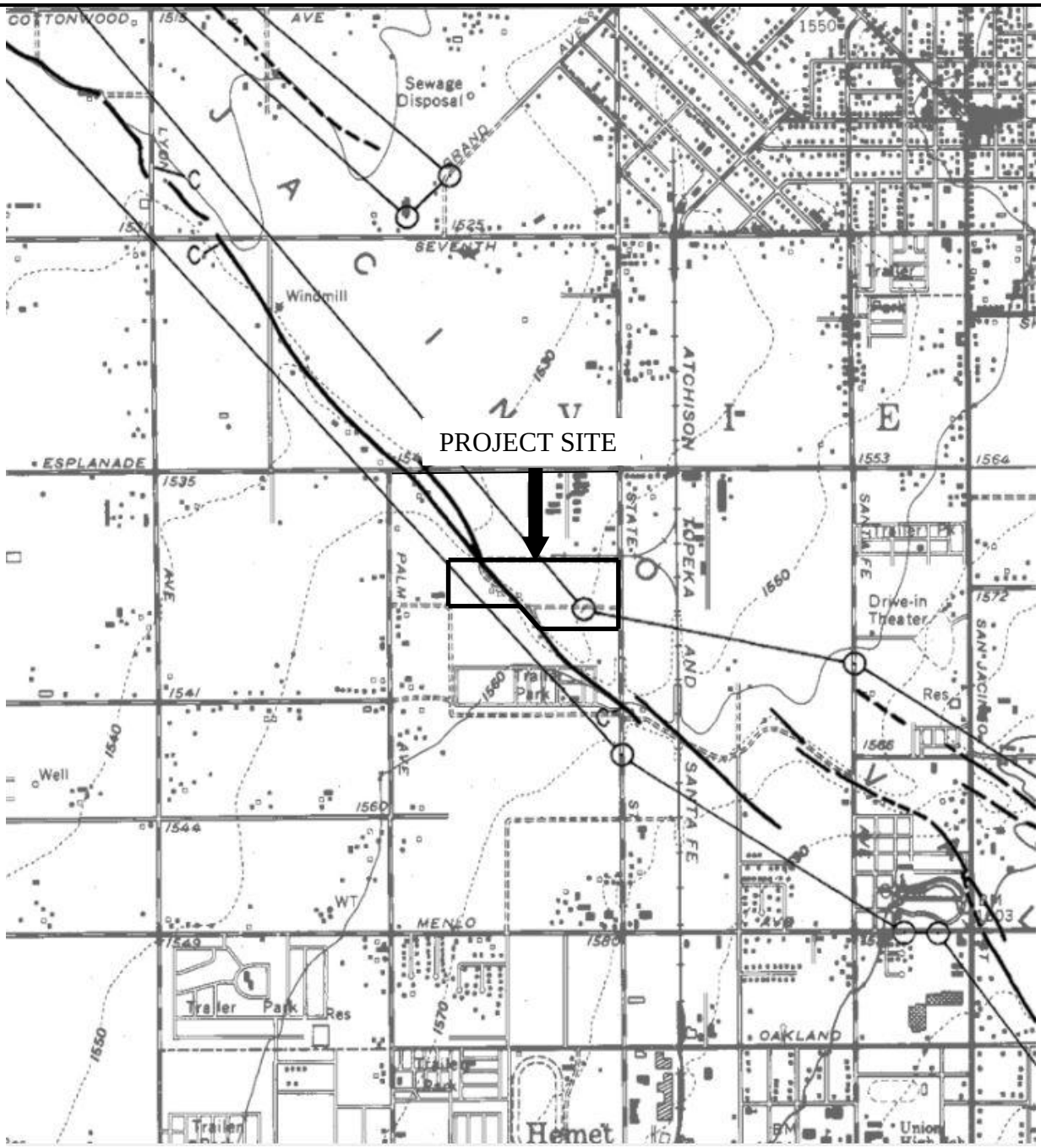
SITE LOCATION MAP	**Project No: 19-805 Fault**
S2A Modular Factory and Showroom, City of Hemet, California	
FRED AFLAKIAN, PG, CEG	**FIGURE** **1**



Base Map Modified From: Dibblee, T.W., and Minch, J.A., 2003, Geologic map of the San Jacinto quadrangle, Riverside County, California: Dibblee Geological Foundation, Dibblee Foundation Map DF-116, scale 1:24,000.

SITE REGIONAL GEOLOGY MAP	**Project No: 19-805 Fault**
S2A Modular Factory and Showroom, City of Hemet, California	
FRED AFLAKIAN, PG, CEG	**FIGURE** **2**



Base Map Modified From: California Division of Mines and Geology, State of California Special Studies Zone, San Jacinto Quadrangle, January 1, 1980

SITE ALQUIST-PRIOLO MAP	**Project No: 19-805 Fault**
S2A Modular Factory and Showroom, City of Hemet, California	
FRED AFLAKIAN, PG, CEG	**FIGURE** **3**

LOT 5 AND PORTION OF LOT 4 OF MESA TERRACE TRACT, IN THE CITY OF HEMET, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, AS PER MAP RECORDED IN BOOK 8 PAGE 46 OF MAPS, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY.

SAKE ENGINEERS, INC. AUGUST 2019

ASSESSORS PARCEL NO.:

TOTAL ACREAGE:

EASEMENT NOTES:

ZONING AND LAND USE:

BASIS OF ELEVATION:

BASIS OF BEARING:

FLOOD ZONE:

EMERGENCY PHONE NUMBERS:

UTILITIES:

LEGAL DESCRIPTION:

EARTHWORK:

NOTE:

OWNER/DEVELOPER:

ENGINEER:

SOIL ENGINEER:

TOPOGRAPHY:

VICINITY MAP

THOMAS BROTHERS MAP PAGE/GRID:

SEC 3, T.5S, R.1W

ZONE C-M
APN 439-030-007

ZONE M-1
APN 439-030-022

ZONE M-1
439-022-001

ZONE C-M
439-022-002

APN 439-040-015

APN 439-040-016

APN 439-040-001

ZONE R-R

150.00'

WATER QUALITY BASIN

RECOMMENDED FAULT SETBACK ZONE

150.00'

50.00'

FAULT TRENCH

1553.00
FF
BUILDING "G"

ROOFING BUILDING

SIDING BUILDING

1553.00
FF
BUILDING "F"

FAULT TRENCH

CASA LOMA FAULT

50.00'

50.00'

PHASE 2

BUILDING "E"

1554.50 FF

1537.35 FF1

BUILDING "A"
1543.00 FF

STATE STREET

1540.00 FF

BUILDING "C"

1542.65 FF

BUILDING "B" OFFICE & WAREHOUSE
1544.00 FF

CROWS NEST PLACE

ZONE R-1-6
APN 439-040-025

PM 3911 PMB 23/61-62

50.00'

APN 439-040-023
FUTURE BUILDING ON STATE STREET / PARKING AREA PRE SHIPPING

PARCEL 3
PM 3911 PMB 23/61-62

ZONE C-M

SECTION "A-A"

SECTION "B-B"

SECTION "C-C"

SECTION "D-D"

SECTION "E-E"

LEGEND:

CROWS NEST PLACE
TYP. STREET SECTION :

STATE STREET

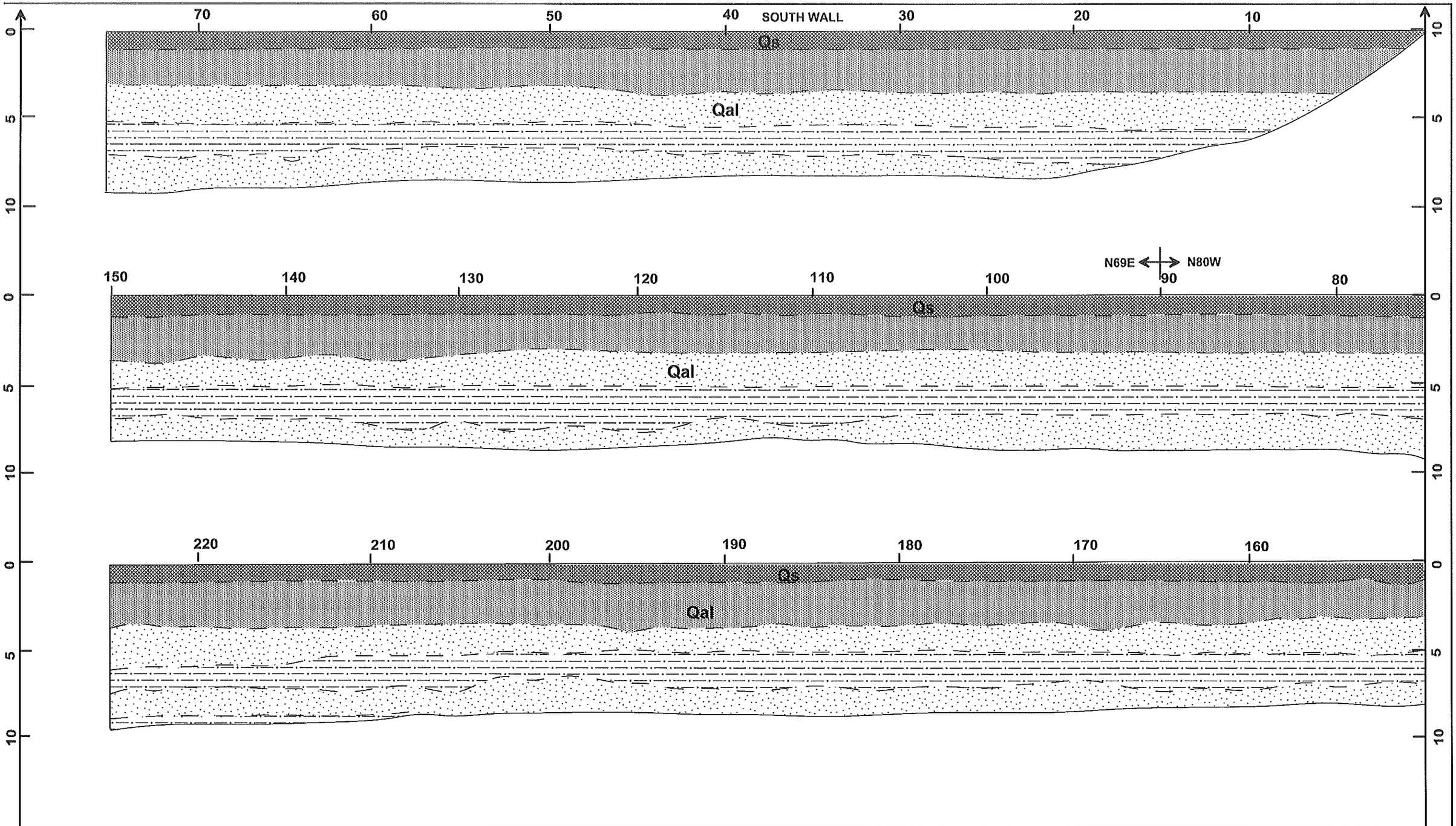
SCALE: 1" = 150'

PREPARED UNDER THE DIRECTION OF:

PLATE 1
FAULT TRENCH LOCATION MAP

PLOT PLAN
CITY OF HEMET

SAKE



Project No.: 19-805FAULT
Project Name: S2A Modular Factory and Showroom

FAULT TRENCH - 1
APNs 439-030-009, 010 AND 439-040-023, HEMET, CALIFORNIA

PLATE 2
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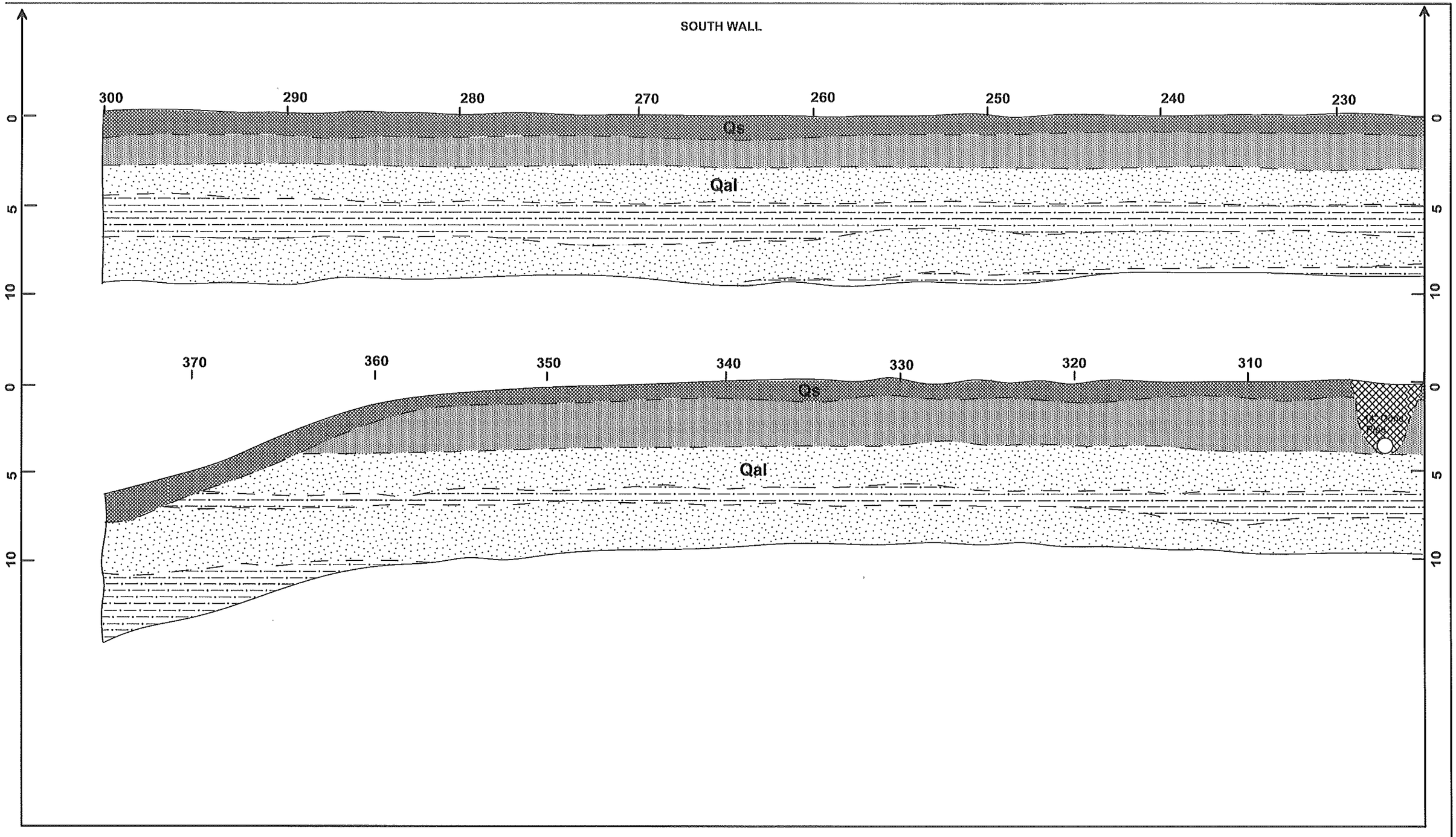
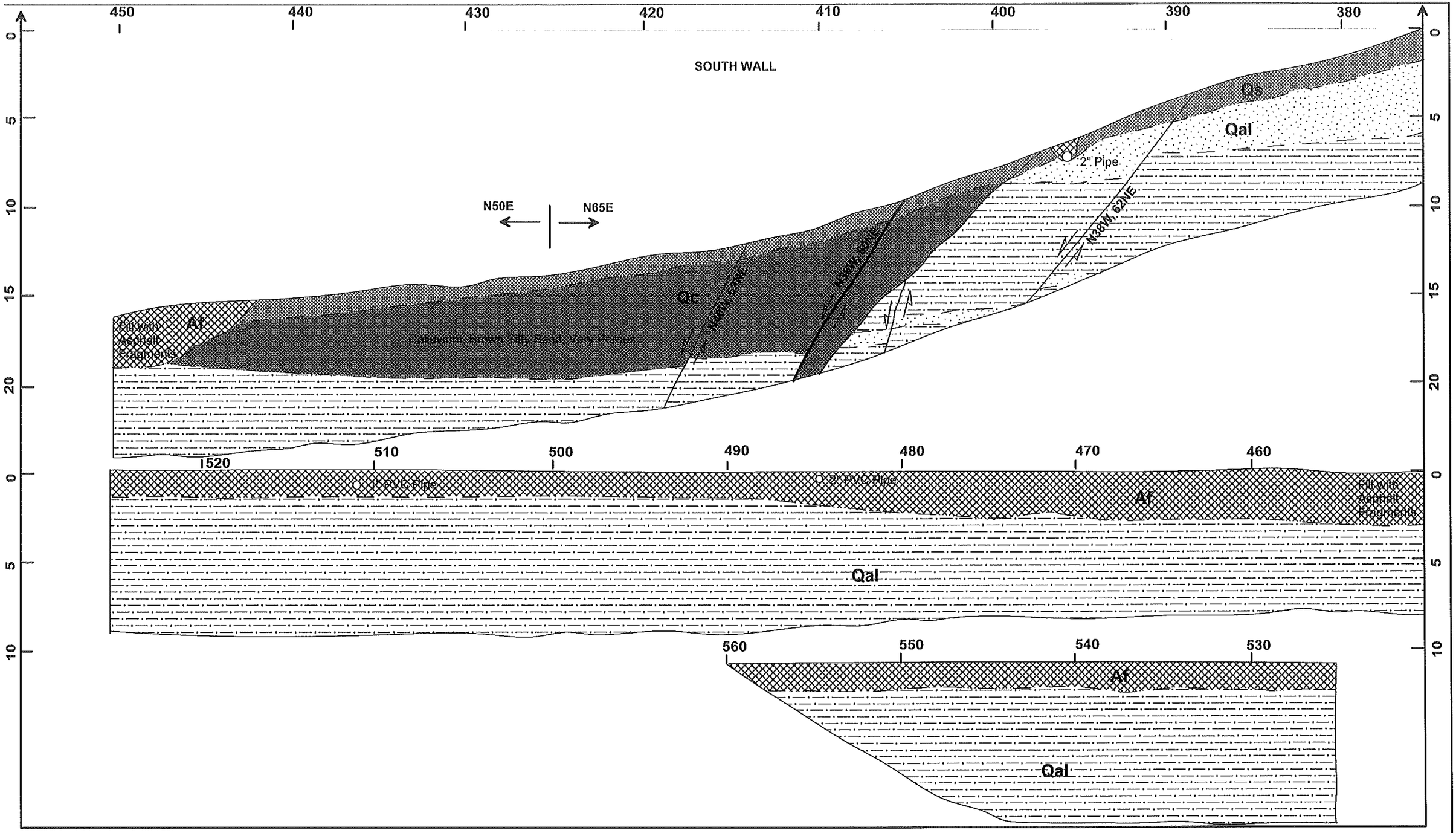
SOUTH WALL



Project No.: 19-805FAULT
Project Name: S2A Modular Factory and Showroom

FAULT TRENCH - 1
APNs 439-030-009, 010 AND 439-040-023, HEMET, CALIFORNIA

PLATE 3
FRED AFLAKIAN, PG, CEG



Project No.: 19-805FAULT
Project Name: S2A Modular Factory and Showroom

FAULT TRENCH - 1

APNs 439-030-009, 010 AND 439-040-023, HEMET, CALIFORNIA

PLATE 4

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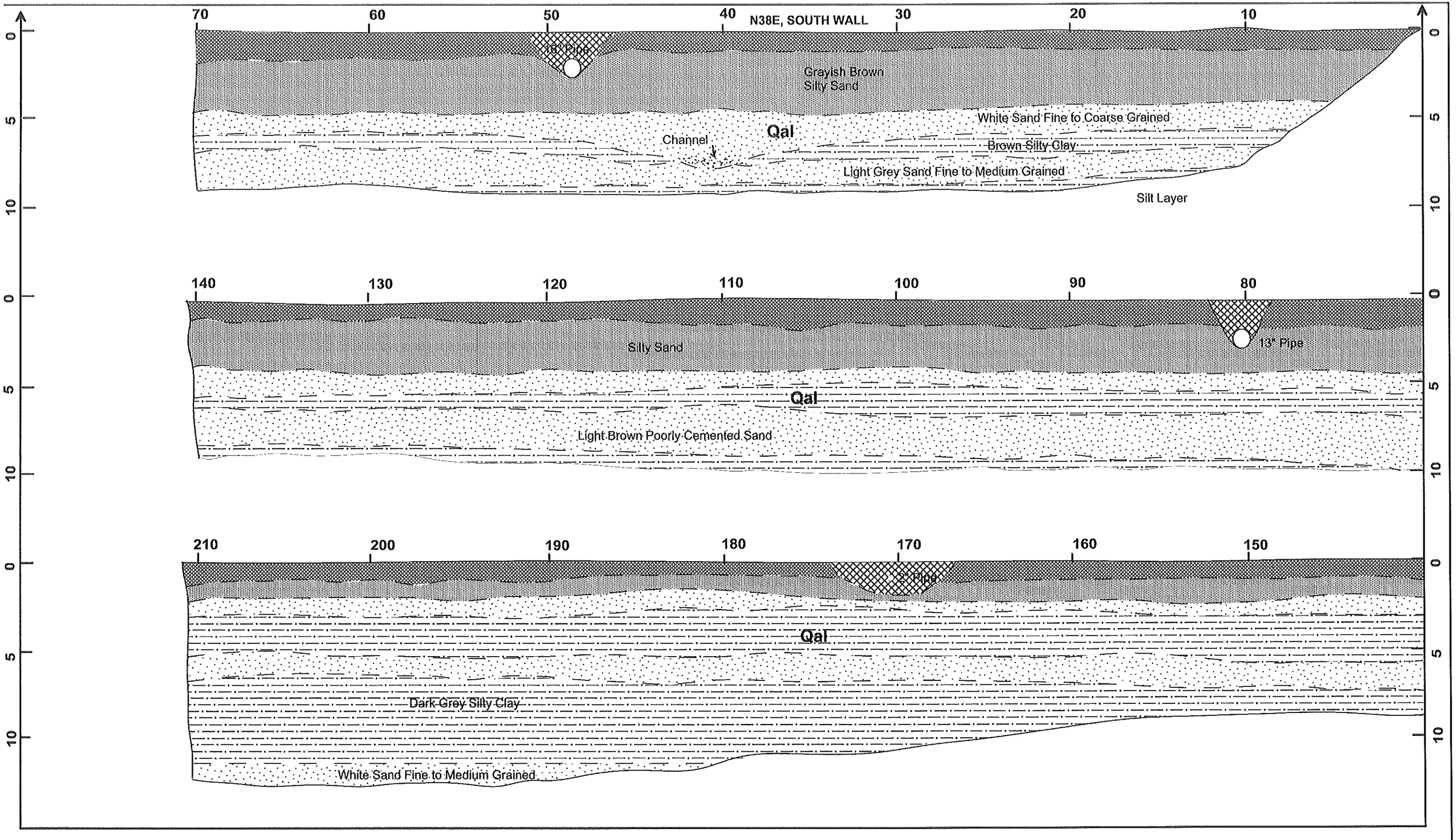
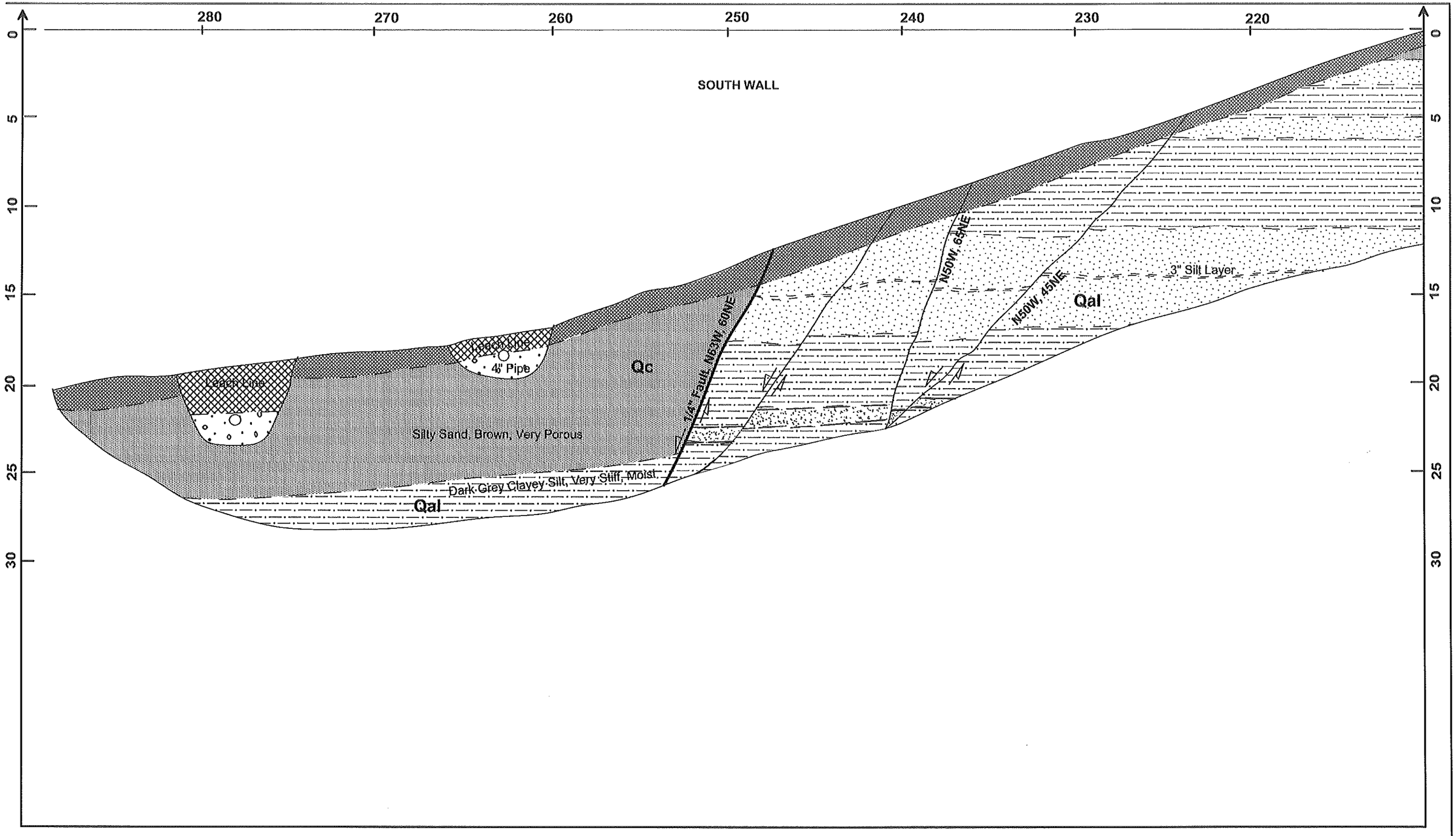


Project No.: 19-805FAULT
Project Name: S2A Modular Factory and Showroom

FAULT TRENCH - 2
APNs 439-030-009, 010 AND 439-040-023, HEMET, CALIFORNIA

PLATE 5
FRED AFLAKIAN, PG, CEG



Project No.: 19-805FAULT
Project Name: S2A Modular Factory and Showroom

FAULT TRENCH - 2
APNs 439-030-009, 010 AND 439-040-023, HEMET, CALIFORNIA

PLATE 6
FRED AFLAKIAN, PG, CEG

GEO 00080

TECHNICAL REPORTS

OF PAGES: 13

FAULT HAZARD REPORT

for

A PORTION OF LOTS 104 and 105, OF THE ESTUDILLO LAND AND WATER COMPANY ADDITION AS SHOWN IN M.B. 9/410 RECORDS OF SAN DIEGO COUNTY, LYING WITHIN THE RANCHO SAN JACINTO VIEJO.

May 17, 1977

Job. No. 27-77-5

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714 787-2267

Return to

ANTHONY B BROWN
ENGINEERING GEOLOGIST

COUNTY OF RIVERSIDE

PLANNING DEPARTMENT
4080 LEMON STREET 9TH FLOOR
RIVERSIDE CALIF 92501

Lewis S. Lohr
40811 Le Grande Dr.
Hemet, Calif. 92343
714-658-1048

FOR: Mr. Monard N. Miller
P. O. Box 68
Hemet, California
92343

Job. No. 27-77-5

FAULT HAZARD REPORT

for

A PORTION OF LOTS 104 AND 105, OF THE ESTUDILLO LAND AND WATER COMPANY ADDITION AS SHOWN IN M.B. 9/410 RECORDS OF SAN DIEGO COUNTY, LYING WITHIN THE RANCHO SAN JACINTO VIEJO.

INTRODUCTION

The Alquist-Priolo Geologic Hazard Zones Act of December 1972 authorized the State Geologist to delineate "Special Studies Zones" along all recently and potentially active traces of the major fault systems within the State of California.

A Fault Hazard Report is presently required to be submitted to the Riverside County Planning Department and/or the Building and Safety Department, for any land lying within a "Special Studies Zone" in Riverside County, if such land is proposed for land division or structures for human habitation. An exception to these requirements is the construction of a single-family, wood-frame residence on an already subdivided lot lying within a "Special Studies Zone." Such construction has been exempted by the passage of Senate Bill 5 (May 1975) which also changes the name of the act to the "Alquist-Priolo Special Studies Zone Act." "Light Industrial structures have been proposed for construction on the property for which this report and investigation were made. This property is situated in the "Special Studies Zone" which contains the Casa Loma Fault.

A review of pertinent geologic literature was made to aid in the field location of any faults which might cross the property in question. Aerial photographs were carefully examined to aid in the investigation of the Casa Loma Fault and it's geomorphic expression across the subject property. Applicable seismic literature was received with respect to previous seismic activity, which has occurred in the San Jacinto Valley and the surrounding vicinity. (reviewed ?)

A field geology investigation was made of the subject property which included both a surface investigation and trench excavation and examination.

LOCATION OF PROPERTY

The property studied for this report is located on the southerly side of Esplanade Avenue between Lyon Avenue on the west and State Street on the east, northerly of the City of Hemet, in Riverside County, California. It is a portion of Lots 104 and 105 of the Estudillo Land and Water Company Addition as shown in M.B. 9/410, Records of San Diego County (see figures 1 and 2). The subject property is further described as lying within the Rancho San Jacinto Viejo. The total property is approximately 12 acres net.

GEOLOGIC SETTING

The property studied in this report is crossed by the Casa Loma Fault which has as its geomorphic expression an apparent scarp with a height that varies from 16 to 20 feet (4.9 to 6.1 M.). At the foot of, and along the face of this scarp are numerous fault related features such as sumps, small scarps, collapsed fissures, partially filled "blow holes", and cracks and disturbed ground. All of these features were in an area which was later shown by the subsurface investigation to be under the displacement influence of the Casa Loma Fault.

The property has been bisected by fault displacement on the Casa Loma Fault into essentially two areas. One, the upper or "plateau" area which comprises approximately 1.30 acres and a lower area which contains approximately 7.5 acres. Both of these areas do not appear to be affected by displacement on a fault for the last several thousand years and drain generally in a northwesterly direction.

The entire subject property is situated upon Quaternary Alluvium which is typically sandy silts, silty sands, unconsolidated fine to coarse sands, silts, clay-silts, and various mixtures of these soil types. For the most part, the thickness of the various soil horizons varies from a fraction of an inch to several feet. Trenching exposed these alluvial sediments which have an unknown age but are estimated to be several thousand years old.

The depth to the ground water table in the vicinity of the subject property is unknown, however, it is probably greater than 200 feet (61. M.).

FAULTS

The property studied in this report is entirely within a "Special Studies Zone" which contains the Casa Loma Fault and related adjacent faults. This "Zone" is shown on the State of California's Division of Mines and Geology "Special Studies Zones" map, (San Jacinto Quadrangle, Scale 1:24,000). The Casa Loma Fault is shown as both inferred in part and as acurately located and crosses the subject property in a northwesterly-southeasterly direction (See Figure 2 and Plate II). The trench investigation showed the "Special Studies Zone" map location for these faults to be correct. → The 2 faults appear to be located approximately 100 feet southerly of the map location.

The subject property lies within the San Jacinto Fault Zone, which contains the San Jacinto Fault, the Casa Loma Fault, the Park Hill Fault (?), the Bautista Creek Fault and several other related unnamed faults. The Casa Loma Fault, in various locations within the San Jacinto Valley, is geomorphically expressed by swales and depressions, low to moderate height scarps and apparent scarps, and linear gullies (Miscellaneous Geologic Investigations, Map I-675-1972). In the vicinity of the subject property the trace of the Casa Loma Fault is geomorphically expressed by an apparent scarp, sumps, filled and unfilled cracks, small recent scarps, and filled "blow" holes.

Some of the faults, within the San Jacinto Fault Zone, exhibit predominantly strike slip movement, with right lateral displacement being the relative direction of movement. However there has been over 14,000 feet of vertical movement along the San Jacinto Fault proper, and the Casa Loma Fault with evidence that the northeasterly block has been relatively upthrown with respect to the southwesterly block. It is to be noted, that between the San Jacinto and the Casa Loma Faults, a grabin exists with reported sediment thicknesses of up to 10,000 feet. The relative movement on the Casa Loma Fault is thought to be normal with the northeasterly block down-dropped, however, there also is an excellant possibility that this fault exhibits right-lateral, strike slip movement.

TRENCH EXAMINATION

Three trenches were excavated on the subject property (See Plate II for trench locations). These trenches in conjunction with trenches excavated and investigated for County Geologic Reports No.'s 36 and 53 were located so as to determine whether displacement on a fault had or had not occurred across the property studied. The primary trench was excavated from the southwest corner of the property northeasterly on an approximate bearing of N. 31° E. .. length of approximately 570 feet (173.7 M.). This trench (See Plate I) shows that the "plateau" area is stable with no evidence of displacement on a fault. From station 2+74 to station 3+30, occur a series of faults with displacement varying between 0.5 and 7.0 feet (0.15 to 2.1 M.). The total displacement on this series of faults is on the order of 23.5 feet (7.2 M.). A small reverse fault was seen at station 3+66 (displacement approximately 6" (15.2 M.).

From station 4+07 to station 4+30 several faults were observed. The most prominent of which occurred at station 4+15. The amount of displacement on this fault is unknown. From station 4+30 to 5+70 (the end of the trench) no displacement on a fault was observed).

Two other short trenches were excavated to properly locate the most northeasterly limits of active faulting. These trenches designated TRENCH "A" and TRENCH "B" (See Plate II for location) both crossed the most northeasterly fault area as exposed in the primary trench of station 4+30. Trench "A" exhibited numerous stepped normal faults (total displacement unknown) from station 0+00 to approximately station 0+40 with a stable area, uneffected by fault displacement from station 0+40 to 0+82. Trench "B" exposed numerous small, stepped normal faults, and even more numerous fractures and also a prominant fault (with gouge) from station 0+34 to approximately 0+40. Evidence of drag on adjacent sediments by displacement on this normal fault, (Stations 0+18 to 0+34) was observed. The total displacement on faults exposed by this trench is unknown. The sediments examined from station 0+40 to 1+05 showed no evidence of having been displaced by faulting.

All of these trenches were logged and their northerly or northwesterly wall is shown on Plate I or II.

The alluvial materials exposed in the trench in the "plateau" area generally included silty sand, sandy silts and silt and clay-silt layers in the upper 6 feet (1.8 M.) and fine to coarse sands in the lower 4 feet (1.2 M.). In the lower, stable outwash area the alluvial materials logged in the trenches generally included silty sand and top soil over dark brown to black-brown carbonaceous silt or clay silt. Beneath this dark soil are various layers of silty sand, silt and clay-silt.

SEISMIC HISTORY

During the last 85 years, several earthquakes have been recorded which have had magnitudes greater than 6.0 on the Richter Scale. These earthquakes have had epicenters within a 55 mile (88.5 Km.) radius around the subject property. The following is a list of these earthquakes giving their date of occurrence, location and magnitude if known. (Crustal Strain and Fault Movement Investigation, Bulletin, No. 116-2 California Department of Water Resources, 1964 and Seismicity of Southern California Region, 1 January 1932 to 31 December 1972, Seismological Laboratory, California Institute of Technology (1973).

DATE	LOCATION	MAGNITUDE*
July 22, 1899	Near Cajon Pass	6.0+
December 25, 1899	Near San Jacinto	6.5
		Perhaps 7.0?
April 21, 1918	In San Jacinto Valley	6.8
July 22, 1923	South of Loma Linda	6.3
March 25, 1937	Southeasterly of Anza	6.0
December 4, 1948	Easterly of Desert Hot Springs	6.5 (On San Andreas Fault)
March 19, 1954	Easterly of the Borrego Valley	6.2

*Richter Scale

Two of the above listed earthquakes, with magnitudes of 6.5 (perhaps 7.0) and 6.8 occurred within a 10 mile (16 Km.) radius of the property studied and were located within the San Jacinto Valley. "The earthquake of December 25, 1899 near the town of San Jacinto did a great deal of damage to structures and killed several people. The earthquake of April 21, 1918 (magnitude 6.8) which occurred in the San Jacinto Valley did extensive damage to structures situated in the towns of San Jacinto and Hemet, and also to farm and ranch structures throughout the San Jacinto Valley.

The high seismicity of the San Jacinto Valley is evidenced by the past record of earthquakes along the San Jacinto Fault Zone. There is a district probability that earthquakes with a magnitude of 6.0 or greater will occur within the San Jacinto Valley in the future. The maximum probable earthquake which may occur within the San Jacinto Valley or the surrounding vicinity during the next 100 years may have a magnitude as high as 7.0 on the Richter Scale. It is also quite likely that numerous structures within the valley will be extensively damaged should such an earthquake occur. The design of structures for human habitation or commerical purposes, which are to be constructed within the San Jacinto Valley, should take into consideration both the probability of such a seismic event occuring, and also the seismic risk entailed if such an event should occur.

The maximum credible earthquake which might occur within the San Jacinto Valley or the surrounding vicinity (up to 100 kilometer radius from the subject property) would probably be of a magnitude of 7.5 on the Richter Scale (Roger W. Greensfelder, M.D. 23, California Division of Mines and Geology, Revised 1974). The maximum credible earthquake is by present definition, the maximum earthquake that appears to be reasonably capable of occuring under the conditions of the presently known "geological framework".

SEISMIC RISK

The primary effects of earthquakes are surface displacement ground rupture, changes of elevation of land due to subsidence and/or uplift, and strong ground vibrations. The secondary effects are ground fissuring, lurching, landsliding, and soil liquefaction and flooding due to dam break.

The property studied in this report lies entirely within the "Special Studies Zone", which contains the Casa Loma Fault and adjacent, associated faults. Evidence of fault displacement was found within the trenches excavated, (See Plates I and II), so it is considered likely that the primary earthquake effect of surface displacement on a fault or ground rupture could occur across the subject property. All structures for human habitation should be set back a minimum of 50 feet from either side of the fault zone as exposed in the trenches. (See setback lines in Plate II)

Proper consideration of the primary seismic risk of strong ground vibration should be made during the design of all structures proposed for construction on the property studied.

It is unlikely that earthquakes which may occur along the San Jacinto Fault Zone in the future will have a magnitude greater than 7.0 on the Richter Scale. This figure is based on both the recorded magnitude of previous seismic events along this fault zone, and on a theory that the maximum earthquake magnitude possible is limited by the product of the maximum possible fault rupture length and the maximum strain possible without rupture. The maximum ground acceleration to be expected from the maximum probable earthquake along the San Jacinto Fault Zone, in the vicinity of the subject property, would be approximately 0.46 g. Industrial structures for this property should be planned in terms of design, for at least a 7.0 Richter magnitude quake, a duration of 20 seconds, and a Mercalli Scale of IX.

It is possible that the secondary earthquake affects such as ground fissuring and cracking could occur on the subject property in conjunction with a seismic event. It is my opinion, that the recommended 50 foot set back from the fault lines will be sufficient to also protect structures from the effects of ground fissuring and cracking.

Lurching is related to the displacement of the tops of cliffs, gullies, and other steep embankments outward and downward by a combination of gravity and strong earthquake induced ground vibrations. It is my opinion that the northeasterly facing apparent scarp slope may be susceptible to the seismic risk of lurching. Since this scarp slope lies entirely within the suggested setback area where construction is not recommended due to other seismic risk factors the risk caused by lurching would be minimized. Over the remainder of the property, lurching is not a seismic risk factor to be considered.

Data with regard to the precise depth to the water table beneath the subject property is not available, but this author is of the opinion that the depth is such (200 feet 61M.), that soils liquefaction is unlikely to cccur within or adjacent to the property in question. Earthquake induced landslides are unlikely to have an effect on the property, and are not considered to be a significant hazard to it.

If the Little Lake Dam should fail due to a seismic event, a portion of the property would be in the inundation pathway. Since this dam only impounds approximately a maximum of 90 acre feet of water, damages associated with such inundation should be minor.

SUMMARY

The fault hazard investigation made by me indicates that the Casa Loma Fault and associated faults diagonally cross the southwesterly corner of the property studied. The remainder of the property south westerly and northeasterly of the located fault zone apparently has not been displaced by faulting for the last several thousand years as shown by both geomorphic and trench evidence.

There is a good possibility that the primary earthquake effects of surface displacement on a fault or ground rupture could occur across the property as shown on the location map on Plate II along with the secondary effects of ground fissuring and cracking.

The secondary earthquake effect of lurching could also possibly occur along the northeasterly facing apparent scarp of the Casa Loma Fault. The potential seismic hazard is mitigated by the fact that the area which could be subject to lurching lies entirely within the boundaries of the area suggested for the exclusion of structures for human habitation.

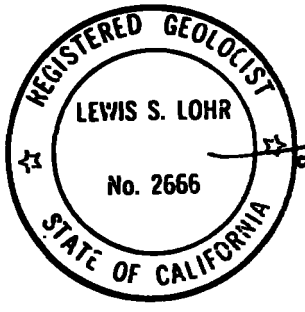
The secondary earthquake effects of landsliding, liquefaction and the possibility of failure of the Little Lake Dam are not considered to be a significant hazard to the property.

The past record of earthquakes along the San Jacinto Fault Zone, indicates the high seismicity of the San Jacinto Valley. There is a distinct probability that earthquakes with a magnitude of 6.0 or greater will occur within the San Jacinto Valley in the future (Maximum probable earthquake 7.0 magnitude). There is a possibility that an earthquake with a magnitude of 7.5 on the Richter Scale (Maximum credible) could occur along the San Jacinto Fault Zone.

RECOMMENDATIONS

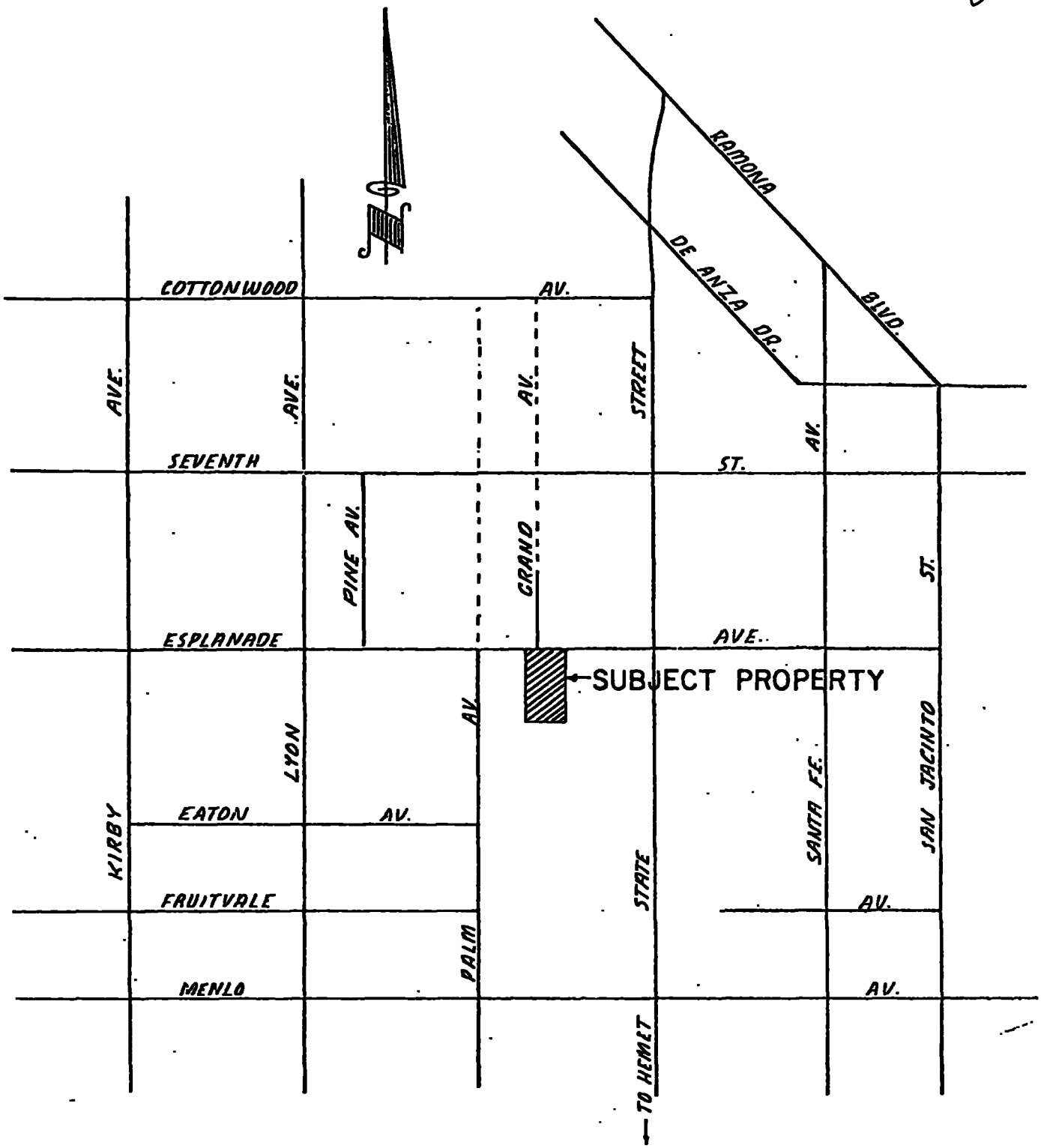
No structures for human habitation should be built between the building setback lines as shown on the location map (Plate II).

The design of all industrial structures to be constructed on the subject property should take into consideration both seismic loading and all the possible effects of earthquakes with a potential magnitude of up to 7.0 on the Ricter Scale and with ground accelerations based upon a distance to the epicenter of the causative fault of approximately 100 feet (30.5 M.). These structures should be designed to withstand this 7.0 magnitude quake for a duration of 20 seconds, with ground acceleration of up to 0.46 g. The probable maximum intensity of the seismic event to affect the subject property would be approximately IX, as measured on the Modified Mercalli Scale (1931).



Respectfully submitted,

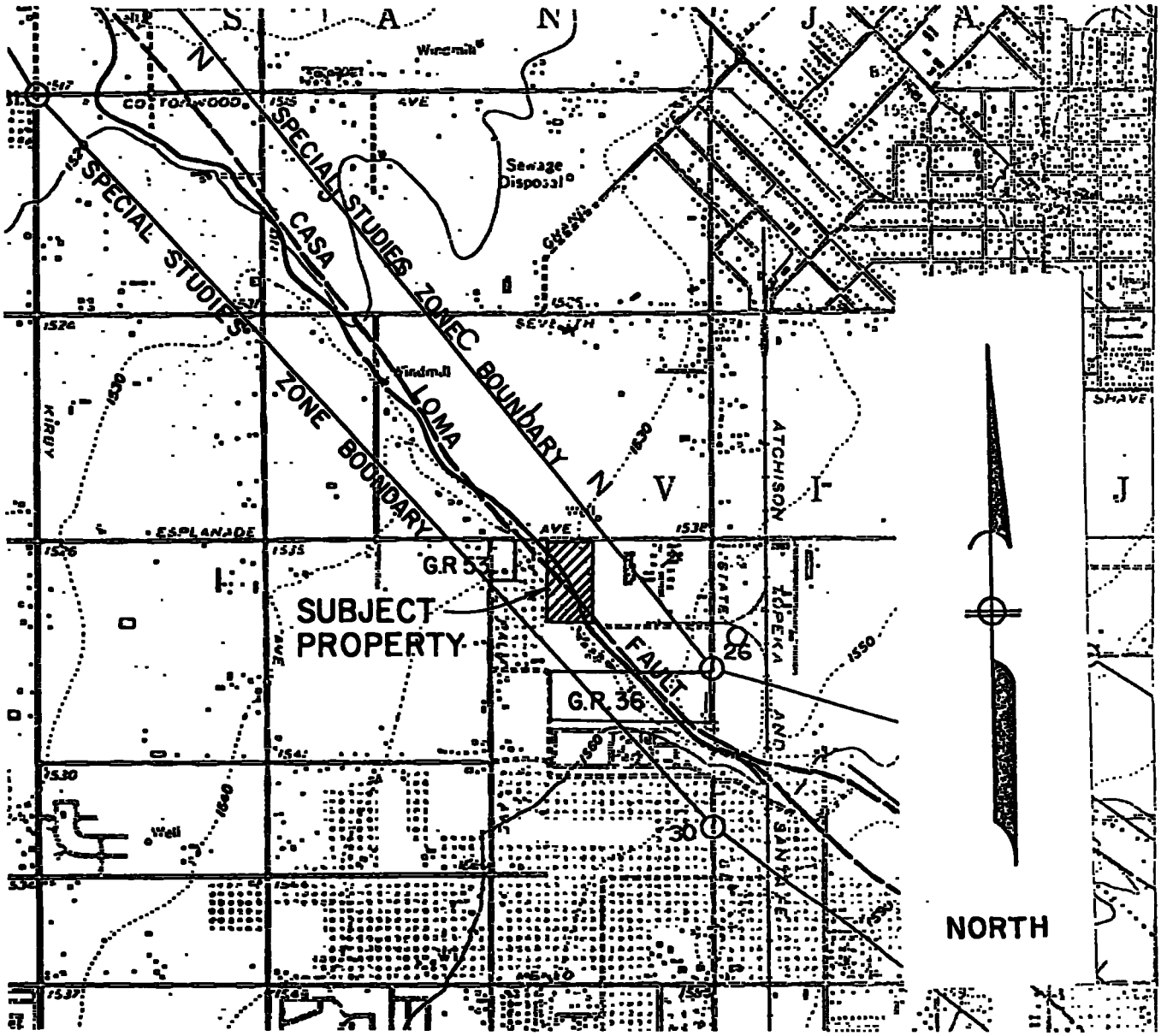
Lewis S. Lohr
Registered Geologist



VICINITY MAP

NO SCALE

FIGURE 1



PORTION OF
SPECIAL STUDIES ZONES MAP

SAN JACINTO QUADRANGLE

SCALE: 1" = 2,000'

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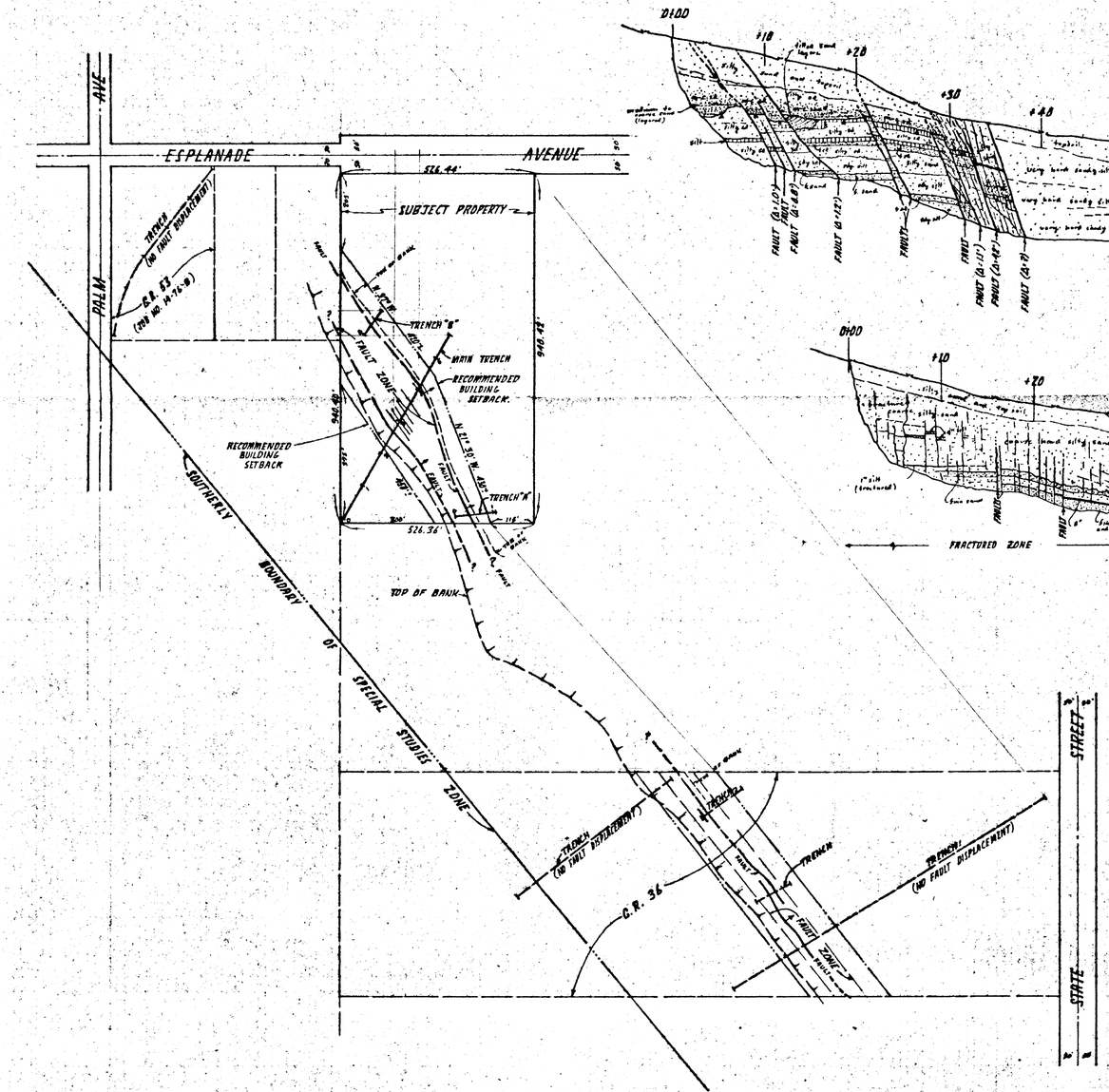
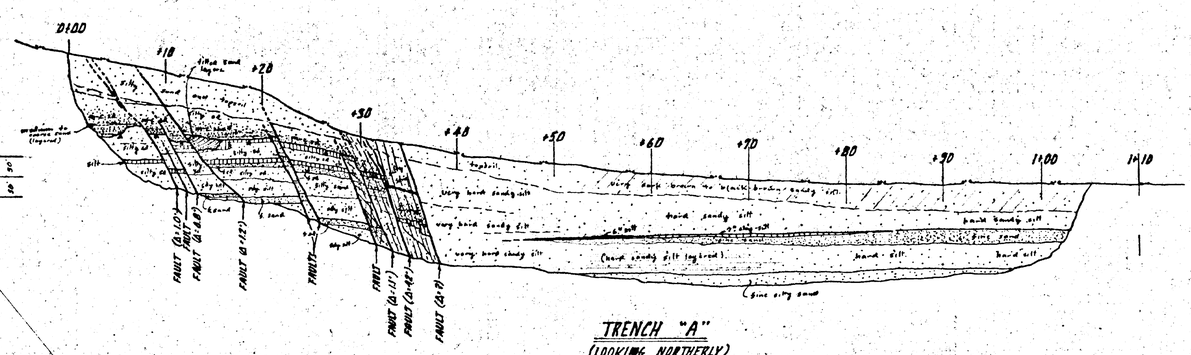
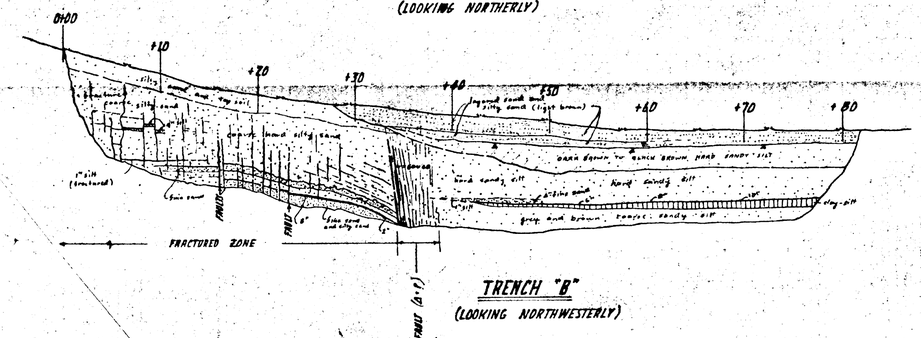




TRENCH "A"
(LOOKING NORTHERLY)



TRENCH "B"
(LOOKING NORTHWESTERLY)

PLATE II

LEWIS S. LOHR, REGISTERED GEOLOGIST NO. 2666
40811 LE GRANDE DR., HEMET, CALIFORNIA, 714-658-1048

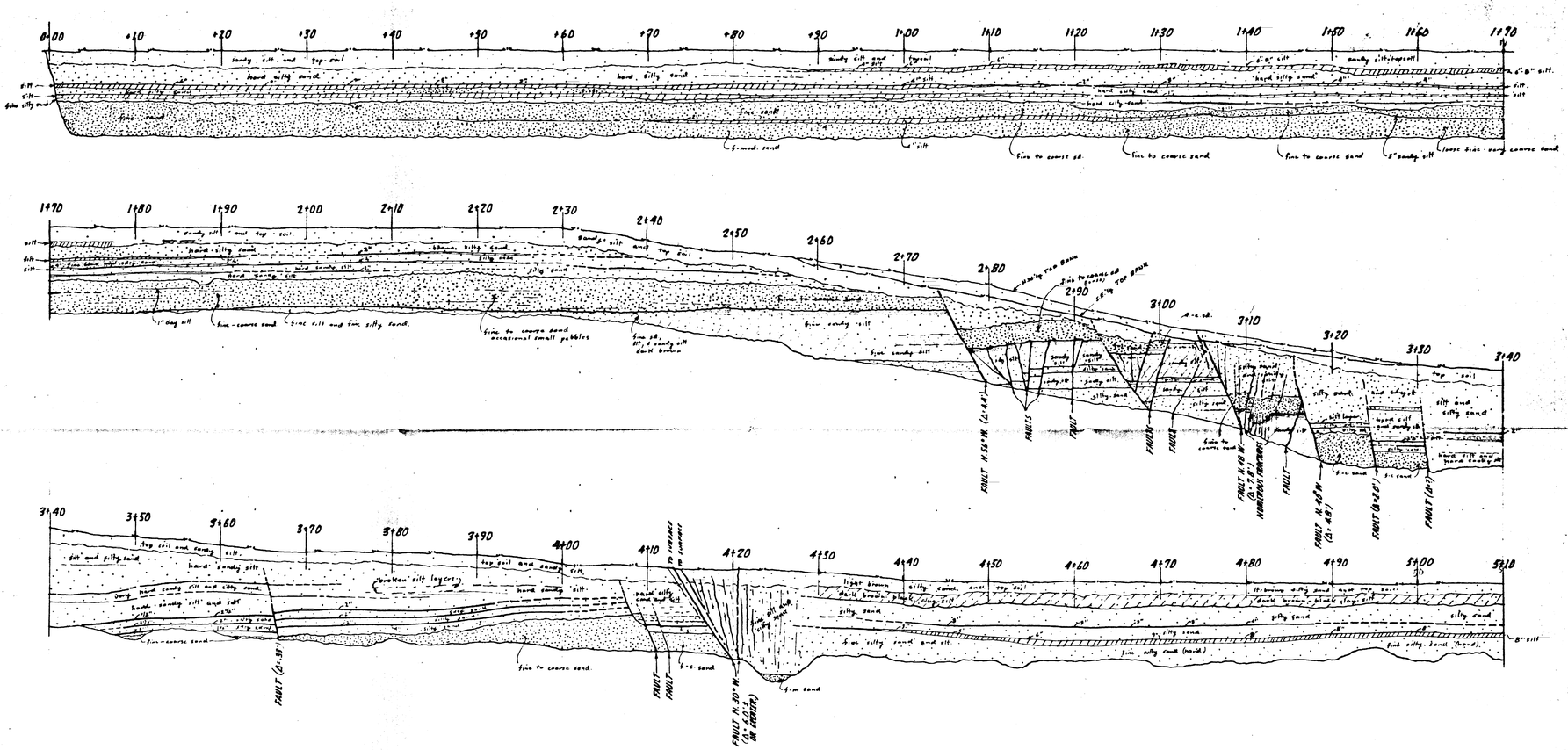
TRENCH CROSS SECTIONS

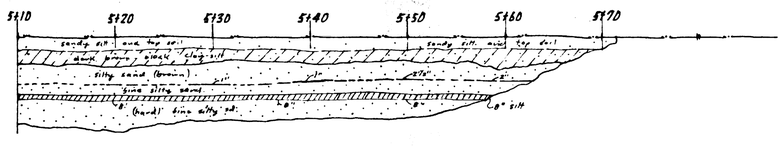
FOR

PROPERTY LYING SOUTHERLY OF ESPLANADE AVENUE
BETWEEN PALM AVENUE AND STATE STREET

JOB NO. 27-77-5

GR-80





MAIN TRENCH (LOOKING NORTHWESTERLY)

SCALE: 1" = 8' HORIZONTALLY AND VERTICALLY

LEGEND

- SAND
- SILTY SAND OR SANDY SILT
- SANDY SILT ~ OR SILT (MOSTLY SILT)
- SILT OR CLAY SILT LAYER
- EROSION SURFACE
- FAULT
- NATURAL GROUND
- Δ APPROXIMATE DISPLACEMENT

PLATE I

LEWIS S. LOHR, REGISTERED GEOLOGIST NO. 2666
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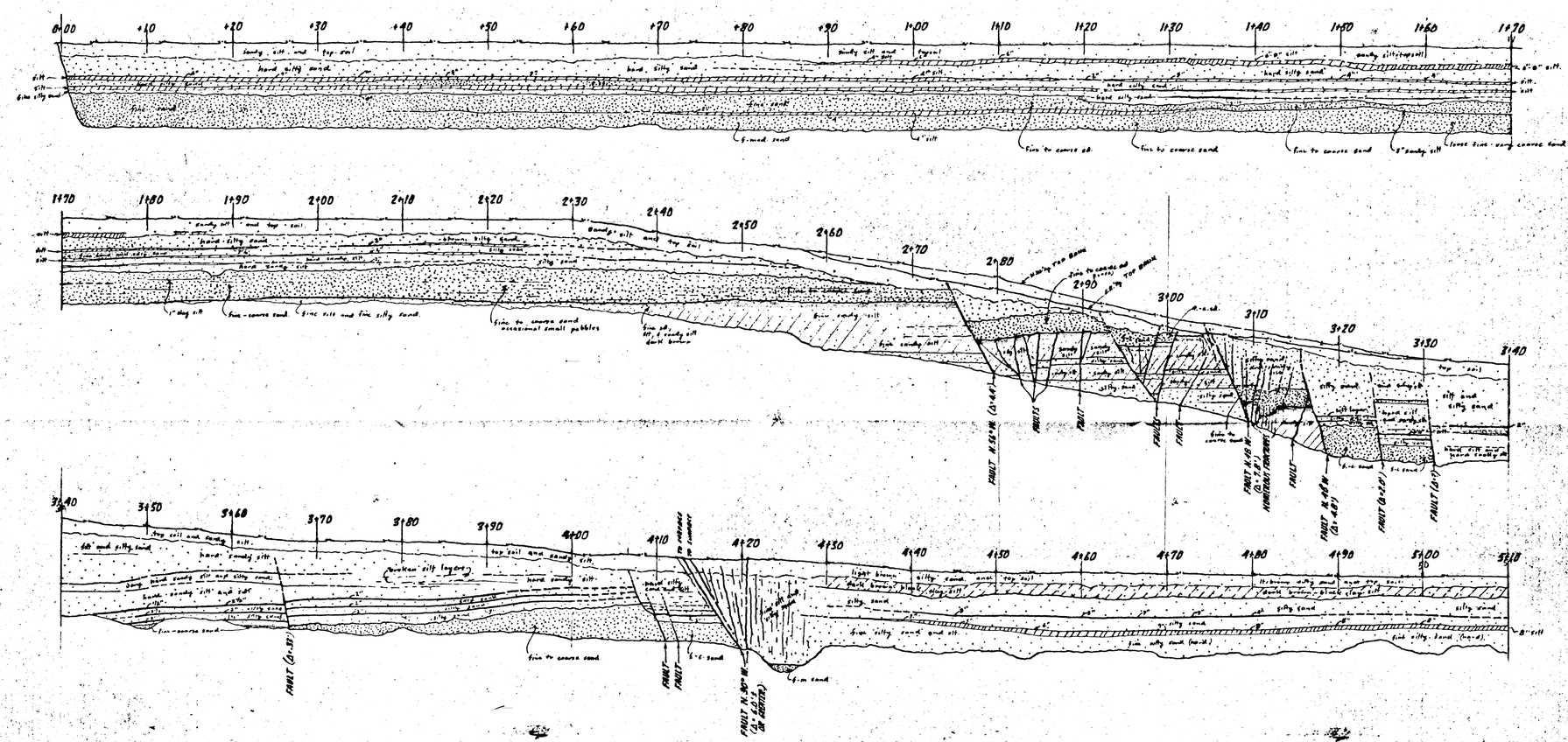
TRENCH CROSS SECTIONS

FOR

PROPERTY LYING SOUTHERLY OF ESPLANADE AVENUE BETWEEN PALM AVENUE AND STATE STREET

JOB NO. 27-77-5

GR-80



LEGEND

- SAND
- SILTY SAND OR SANDY SILT
- SANDY SILT ~ OR SILT (MOSTLY SILT)
- SILT OR CLAY SILT LAYER
- EROSION SURFACE
- FAULT
- NATURAL GROUND

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TRENCH CROSS SECTIONS

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