Appendix 7.0

Fault Rupture Hazard Study

FAULT RUPTURE HAZARD STUDY

WON MEDITATION CENTER
19993 GRAND AVENUE
LAKE ELSINORE, CALIFORNIA
APN # 382-140-002

GEOCON
WEST, INC.

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

PREPARED FOR

ANDMORE PARTNERS, INC.
LOS ANGELES, CALIFORNIA

PROJECT NO. T2877-22-01

AUGUST 21, 2019

GEOCON
W E S T, I N C.
G E O T E C H N I C A L ■ E N V I R O N M E N T A L ■ M A T E R I A L S

Project No. T2877-22-01
August 21, 2019

Mr. Sean Mo
Andmore Partners Inc.
3530 Wilshire Boulevard, Suite 1830
Los Angeles, California 90010

Subject: FAULT RUPTURE HAZARD STUDY
WON MEDITATION CENTER
19993 GRAND AVENUE
LAKE ELSINORE, CALIFORNIA
APN # 382-140-002

Dear Mr. Mo:

We are pleased to submit this report presenting the results of our site-specific fault rupture hazard study for the property located at 19993 Grand Avenue in the City of Lake Elsinore, California. The site is not located within the boundaries of an Alquist-Priolo Earthquake Fault Zone (APEFZ) established for the Elsinore fault zone (California Geological Survey, 1990). However, it is located within a Riverside County Fault Study Zone (RCFSZ). The County requires site-specific fault rupture hazard investigation be performed for all new developments within a RCFSZ.

This report presents the findings of our investigation and our conclusions and recommendations pertaining to the potential for surface fault rupture within the vicinity of proposed building locations at the site. Based on the results of our investigation, it is with a high degree of confidence we conclude that the potential for surface fault rupture within 50 feet of proposed buildings, during the design life of the proposed development, is considered low. Details regarding this conclusion are presented herein.

We appreciate the opportunity to be of service to you. Please contact us if you have questions regarding this report, or if we may be of further service.

Very truly yours,

GEOCON WEST, INC.

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FAULT RUPTURE HAZARD STUDY

1. PURPOSE AND SCOPE

This report presents the results of our fault rupture hazard study for the proposed development located at 19993 Grand Avenue in the City of Lake Elsinore, California (Figure 1, *Vicinity Map*). As shown on Figure 2, the site is not located within a State of California Alquist-Priolo Earthquake Fault Zone [APEFZ]. However, as depicted on Figure 3, it is located within a Riverside County Fault Study Zone (RCFSZ) for the Willard fault zone, a strand of the Elsinore fault zone. This requires a site-specific fault rupture hazard evaluation to be performed for proposed developments to determine the possibility of faulting on or near the site. If evidence suggests faulting is present on the site or within 50 feet of proposed human occupancy structures, a fault hazard investigation would be required to determine the location and age of the faulting

The criteria used in our investigation to evaluate fault activity at the site follows that of CGS based on criteria developed by the CGS (2018) for the Alquist-Priolo Earthquake Fault Zoning Program. An active fault has had surface displacement within Holocene time (about the last 11,700 years). Faults that have not moved in the last 11,700 years are not considered active. A potentially active fault has demonstrated surface displacement during Quaternary time (approximately the last 1.6 million years) but has had no known Holocene movement. Faults that have not moved in the last 1.6 million years are considered inactive.

In general, the activity of a fault is determined by establishing the age of the youngest materials displaced by the fault. If datable material is present, an absolute age can sometimes be established; if no datable material exists, then only a relative age can be estimated.

The purpose of our investigation was to collect site-specific geologic information in order to evaluate the location and activity of faults that may impact the future development of the site. The scope of our investigation included the following tasks:

- Perform a literature review, including published geologic maps and reports, historic topographic maps, aerial photographs, available local groundwater level data, and nearby fault investigations performed by others.
- Perform a site reconnaissance and geologic mapping by a Certified Engineering Geologist (CEG) of an existing road cut extending across the site
- Preparation of this report that includes the results of our investigation as well as our recommendations based on our findings.

This study was performed in general accordance with the current geologic standard-of-practice for fault rupture hazard investigations and California Geological Survey (CGS) Special Publication 42 (CGS, 2018) and Note 49, "Guidelines for Evaluating the Hazard of Surface Rupture" (CGS, 2002).

2. SITE CONDITIONS & PROJECT DESCRIPTION

The subject property is a 16.4-acre irregular shaped parcel. A single-family residence is located in the southeast portion of the site. Access to the site is through a gated driveway southwest of the intersection of Grand Avenue and Corydon Road, along the eastern boundary.

The site is bounded by unincorporated Riverside County on the west and south, the City of Wildomar on the east and south, and rural residences on the north. Located in the foothills of the Santa Ana Mountains, the site has moderately high relief with granitic slopes descending to the east. In the area of proposed improvements, the site drains to the east. Vegetation on the site consists of shrubs, grasses, and sparse trees throughout the majority of the site at the time of our site visit. Elevations in the vicinity of habitable structures range from approximately 1,376 feet above mean sea level (MSL) in the northwest to approximately 1,355 feet above MSL in the southeast. The existing elevations at the proposed parking lot in the southeast corner of the site range from 1,334 feet above MSL to 1,325 feet above MSL.

The proposed development is currently planned to include a meditation center with a two-story main building, two multi-room guest houses, and associated improvements. The proposed construction will be limited to approximately three-acres, including a parking lot and access roads on the southwest flank of a northwest trending ridge. Plans for the proposed development were provided by Andmore Partners. The proposed structures and pertinent site details are depicted on the *Site Plan and Geologic Map* (see Figure 4).

3. GEOLOGIC SETTING

3.1 Regional Geology

The site is located in the northern part of the Peninsular Ranges Geomorphic Province, consisting of northwest-trending, predominately Cretaceous-age granitic mountain ranges bisected by alluvial, fault-controlled valleys. Quaternary- to Tertiary-age sediments flank the ranges, and lie at depth beneath the Holocene-age alluvium-filled valleys. The Province is further characterized by relatively stable structural blocks bound by active faulting.

Two distinct, relatively stable structural blocks within the Province, the Santa Ana Block to the west and Perris Block to the east, are bisected by the Elsinore fault zone (Woodford et al., 1971). The Santa Ana block is dominated by the Mesozoic-age undifferentiated low-grade metamorphic rocks and Cretaceous-age crystalline rocks that make up the Santa Ana Mountains in the vicinity of the site. The bedrock is unconformably overlain by Miocene-age basalt flows. Flanking the relatively steep, east facing slopes that define the western edge of the Elsinore fault zone, are Pleistocene-age fanglomerate and sandstone. The eastern edge of the zone is less pronounced, with scarps in the lowlying sandstone hills and buried by young alluvial deposits. The Perris block, bound by the Elsinore fault zone on the West and San Jacinto fault zone on the east, is dominated by Mesozoic-age metasedimentary rocks, Cretaceous-age crystalline ranges, and Pleistocene-age sedimentary rocks (Woodford et al. 1971).

Locally, several Holocene-age alluvium-filled valleys bisect the older units. One of these valleys, the Elsinore Valley is depicted on Figure 5, *Regional Geologic Map*. The complexity of the Elsinore fault zone in the area of the site is shown on Figure 6, *Local Geologic Map*. Based on a review of published geologic maps of the area, the site is underlain by Cretaceous-age granitic rocks (Kennedy, 1977; Mann, 1955) and Holocene-age alluvial deposits (Kennedy, 1977; CDMG, 1977). The granular deposits were derived primarily from the uplifted Elsinore Mountains just west of the site (CDMG, 1977).

Faulting in the region is dominated by the San Andreas fault system, from east to west consists of the San Andreas, San Jacinto, Elsinore, Newport-Inglewood, and several offshore faults. The faulting predominately of northwest-striking, right lateral faults with local steeply dipping normal components (See Figure 7, *Regional Fault Map*). The Elsinore fault zone includes the Wildomar branch approximately 2,000 feet northeast of site and the Willard branch approximately 680 feet northeast of the site. Geologic mapping indicates that faulting associated with the Willard branch may be present on site.

3.2 Local Geology

The site is situated within the Willard fault zone, a strand of the larger Elsinore fault zone. As mapped by Kennedy (1977), the active portions of the Wildomar strand are mapped approximately 2,000 feet northeast of the site; an active portion of the Willard strand is mapped parallel to and approximately 300 feet southwest of Grand Avenue. The geologic conditions at the site and in the surrounding area are shown on Figures 4, 5, and 6.

3.3 Elsinore Fault Zone

3.3.1 General

The Elsinore fault zone (EFZ) is a part of the larger San Andreas fault zone system, consisting predominately of right-lateral, strike-slip faults with a normal component resulting in the down dropped Elsinore Valley graben between the Wildomar and Willard faults. The EFZ is a major northwest-striking group of faults that extend for more than 200 kilometers from the City of Corona on the north to the international boundary with Mexico and beyond (Kennedy, 1977). The EFZ consists of several segments in the vicinity of the site including: Glen Ivy North; Glen Ivy South; Willard; and Wildomar. They are identified on Figure 7 as fault numbers 461, 462, 467, and 460, respectively.

The Southern California Earthquake Center indicates the EFZ could produce a Mw 7.5 earthquake with an estimated average recurrence interval of between major events of approximately 250 years.

The site is shown with respect to Wildomar strand of the Elsinore fault on Figure 2, *Alquist-Priolo Earthquake Fault Zone Map*. The location of the EFZ is well defined based on geomorphic evidence and several previous fault rupture hazard investigations. Recent studies near the site have constrained the location of the Wildomar segment of the EFZ fault based on trenches, borings, cone penetrometer soundings, and geomorphic studies. Radiocarbon age dating, performed as part of these previous investigations, has confirmed that Holocene-age sediments have been offset by faulting along the Wildomar, Glen Ivy South, and Glen Ivy North branches.

The Willard fault zone is the boundary between the Elsinore Trough and the Elsinore and Santa Ana Mountains to the west. It consists of a series of east-dipping, high-angle, northwest-striking normal faults. The discontinuous series of faults form a complex relationship to one another, and only as a group form a through-going zone (Kennedy, 1977). The Willard fault is geologically mapped 680 feet northeast of the site and 3 lineaments have been mapped on the site.

3.3.2 Previous Published Work

The CGS (formerly California Division of Mines and Geology [CDMG]) (1978) published the Fault Evaluation Report (FER-76) for the EFZ within the Wildomar, Murrieta, Bachelor Mountain, Temecula, Pechanga, Elsinore and Wildomar 7.5-minute Quadrangles. The FER is the background document which summarizes all of the data utilized by CGS to assess the location and activity of the fault strands associated with the EFZ. As part of this study, CGS performed a detailed review of previously published literature, historic aerial photographs and topographic maps, and fault hazard reports prepared by consulting geologists. Those faults, or portions of faults, that are characterized as sufficiently active (Holocene) with locations being well defined are included in APEFZ maps as directed by the Alquist-Priolo (AP) Act of 1972. Figure 2 depicts the site location with respect to APEFZ zoned faults. Pertinent details from the fault evaluation are discussed below.

FER 76 identifies several localities where field observations were performed and several lineaments in the vicinity of the site were identified. The FER concludes the faulting identified as Holocene by Kennedy (1977) located 300 feet southwest of Grand Avenue is interpreted to be Late Quaternary. Lineaments identified trending towards the site were not considered faults. Furthermore, the FER indicates that Holocene faulting is not present within the boundary of the site (see Figure 8, *Excerpt of FER Figure 2A*).

3.3.3 Local Fault Studies

The Willard strand of the EFZ has been mapped along the western edge of the Elsinore Trough near and within the Cretaceous-age granitic rocks of the Santa Ana Mountains by Mann (1955), Engle *et al*. (1959), Kennedy (1977), and others. There have been relatively few fault surface rupture hazard investigations performed by consulting geologists on the Willard fault zone in the vicinity of the site.

Nebblett and Associates (N&A) in 2004 performed a fault hazard investigation of a site approximately 2 miles southeast of the subject property, as depicted on Figure 6. Faulting was originally mapped as active (Kennedy, 1977), and designated Late Quaternary by FER 76 in 1978. N&A identified a fault consistent with that mapped by Kennedy (1977) and performed a soil stratigraphic age assessment of an unfaulted soil profile overlying the Willard fault yielding a relative age of approximately 80-125 thousand years ago (ka). N&A further determined the last observable displacement of the Willard fault occurred prior to 100 ka and likely more than 150 ka.

Petra (2001), performed a surface fault investigation for a single-family residential development located approximately 0.5 mile southeast of the site, along trend of the Willard fault, as depicted on Figure 6. Petra's investigation included 5 trenches which exposed older alluvium as verified by Dr. Roy Schlemon. Due to the lack of faulting within of the older alluvium in the trench exposures, Petra concluded no active faulting was present on the site.

4. HISTORICAL TOPOGRAPHIC MAP & AERIAL PHOTOGRAPH REVIEW

Several historic topographic maps (U. S. Geological Survey, 1901, 1953, U. S. Army Corps of Engineers, 1942, 1943) were reviewed to identify possible fault-related features at the site and in the vicinity. The historic topographic maps did not provide adequate topographic relief to observe fault-related features at or near the site.

A series of stereoscopic aerial photographs were reviewed as part of this investigation. The dates, negative numbers, scale, and review comments are provided in Table 4.1 below.

TABLE 4.1
AERIAL PHOTOGRAPHIC STERIO PAIRS

DATE	NEGATIVE NO.	SCALE	COMMENTS
5-6-1949	5F-15, -16	1"=2,400'	Moderate Lineaments, coincident with Kennedy (1977)
5-15-1967	3HH-162, 163	1"=2,400'	Moderate Lineaments, coincident with Kennedy (1977)
11-23-1977	192B1-1, -2	1"=2,400'	Moderate Lineaments, coincident with Kennedy (1977)
2-15-1977	RIV-5, -6	1"=2,400'	Moderate Lineaments, coincident with Kennedy (1977)
2-20-1991	90133-16, -17	1"=2,400'	Moderate Lineaments, coincident with Kennedy (1977)
1-30-1995	C101-40-95, -96	1"=2,000'	Moderate Lineaments, coincident with Kennedy (1977)
9-11-97	C116-40-194, -195	1"=2,000'	Moderate Lineaments, coincident with Kennedy (1977)
3-2-1999	C135-40-181, -182	1"=2,000'	Moderate Lineaments, coincident with Kennedy (1977)

The stereoscopic review of aerial photographs indicates the lineaments (see *Figure 4*) are coincident with those mapped by Kennedy (1977) shown on Figures 3, 4, 6, 7, and 8.

5. SITE RECONAISANCE AND GEOLOGIC MAPPING

5.1 General

Site reconnaissance was performed on July 2 and included geologically mapping an existing road cut which transected the proposed development. The road cut exposed a veneer of soil overlying granitic bedrock. Geologic units encountered during the field mapping included alluvium and granitic bedrock consisting of Quartz Monzonite. Numerous joints were observed within the granitic bedrock, with the majority trending northwest and steeply dipping. The jointing was coincident with the lineaments previously mapped by Kennedy, 1977. Evidence of faulting was not observed within the granitic bedrock during our geologic mapping. Results of the field mapping are provided on Figure 4, *Site Plan and Geologic Map*. The geologic units are described below.

5.2 Alluvium

Holocene-age alluvium was observed southern and eastern portion of the site overlying the granitic bedrock. As observed during our field exploration, alluvium consisted predominately of silty to gravelly sand, that was gray to light brown, and dry. Varying amounts of granitic cobbles and boulders were observed within the alluvium.

5.3 Quartz Monzonite

Cretaceous-age Quartz Monzonite was observed in western and northern portion of the site and underlies the alluvium at depth. The roadcut exposed bedrock that is highly to moderately weathered. The rock is medium grained, gray, black, and white, and slightly jointed. Where weathered this granitic bedrock unit was hard and slightly friable. Joints were generally slightly open with some oxidation and more advanced weathering along the joint surface. Careful examination of the joints at location of mapped lineaments did not indicate evidence of faulting or fault related features (such as gauge, shear fabric, crushed bedrock), as shown on Figures 9 and 10, *Site Photographs*.

6. CONCLUSIONS AND RECOMMENDATIONS

Based on the results of our literature research, and aerial photograph review, and geologic field mapping, we conclude active faulting is not present on or trending toward site, in the vicinity of or within 50 feet of the proposed structures, based on the following lines of evidence:

1. A surface fault rupture hazard investigation approximately 2 miles southeast of the site along trend of the Willard fault zone determined the last observable displacement of the Willard fault occurred prior to 100 ka.
2. A surface fault rupture hazard investigation approximately 0.5 mile southeast of the site along trend of the Willard fault zone found no faulting.
3. A Fault Evaluation Report (FER-76) concluded that, in the vicinity of the site, there are no faults that display Holocene activity. Further, prior mapping of the fault near the site that was originally identified as Holocene in age (Kennedy, 1977) was reassigned an age of Late Pleistocene by CDMG (1977).
4. Lineaments observed in aerial photographs and regionally mapped by others are not the result of Holocene fault displacement.
5. Lineament identified during this investigation were identified in the field as jointing, not faulting. No faults or fault-related features were observed along the length of the mapped transect.

Therefore, the potential for surface fault rupture at the site and within 50 feet of proposed structures depicted on *Figure 4* is considered low and no building setbacks are recommended at this time. If future development of habitable structures is planned in other locations at the site, further evaluation may be needed.

The main trace of the Willard strand of the Elsinore fault zone has been well documented approximately 680 feet northeast of the site. Based on the results of our field mapping, there is no evidence for Holocene faulting on or trending towards the site. An active strand of the Wildomar strand of the Elsinore fault zone has been mapped approximately 2,000 feet northeast of the site. The Glen Ivy South and North strands of the Elsinore fault zone are located approximately 1.2 miles northwest and 1.9 miles northeast, respectively. A future earthquake originating on these faults could produce very strong near-field ground motions at the site that should be taken into consideration during project design. Also, there is a potential for ground cracking or ground shatter associated with strong ground shaking during an earthquake event on nearby faults. The findings of our study are limited to detection of existing seismogenic faults (deep-seated structures) that propagate to the surface. We cannot predict the location of ground shatter associated with strong ground shaking.

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SOURCE: Google Earth Pro, 2019

VICINITY MAP

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PDT		

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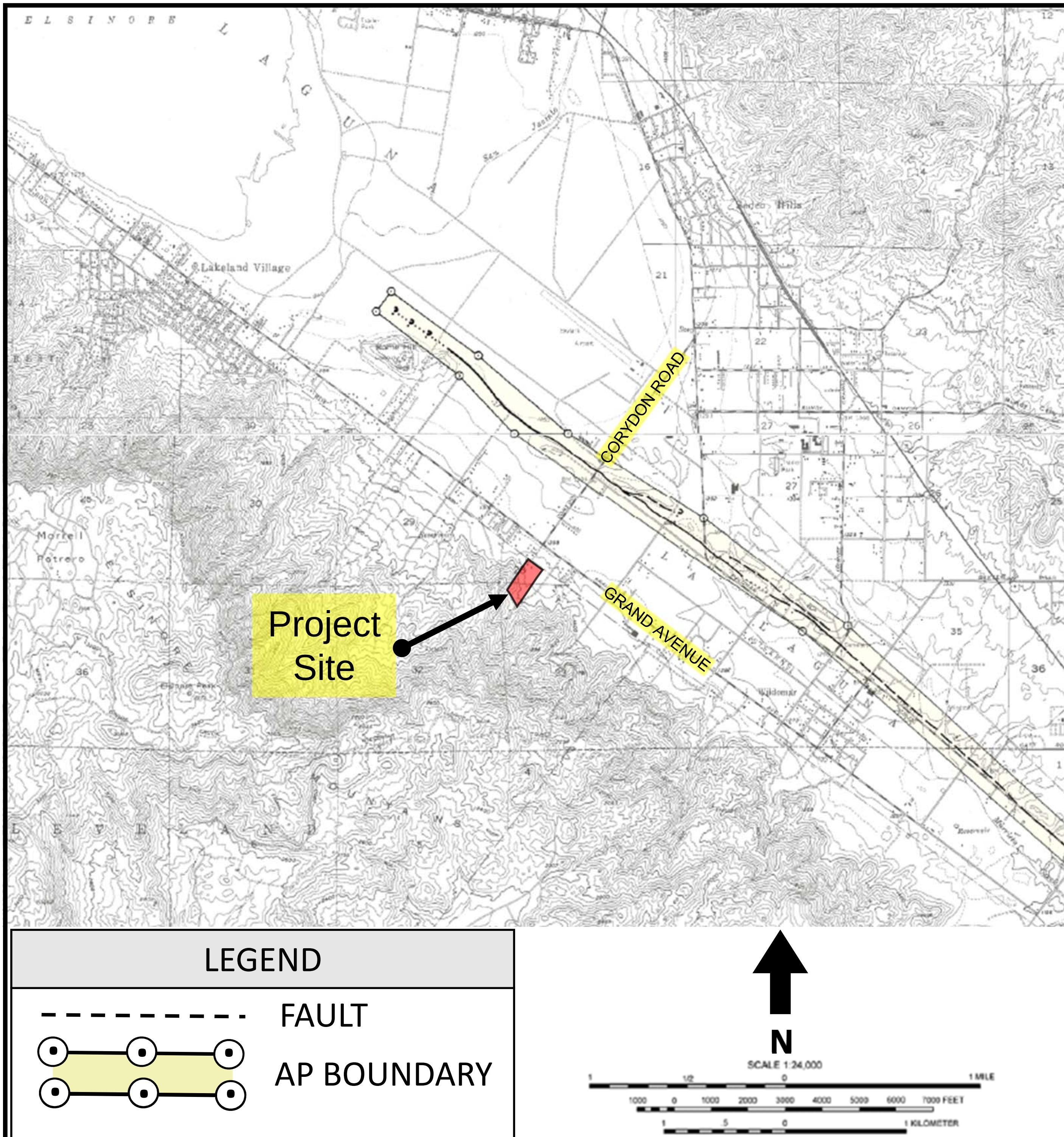
AUGUST 2019	PROJECT NO. T2877-22-01	FIG. 1



California Division of Mines and Geology, 1980, State of California Special Studies Zones, Elsinore and Wildomar Quadrangles, Official Map

ALQUIST-PRIOLO EARTHQUAKE FAULT ZONE MAP

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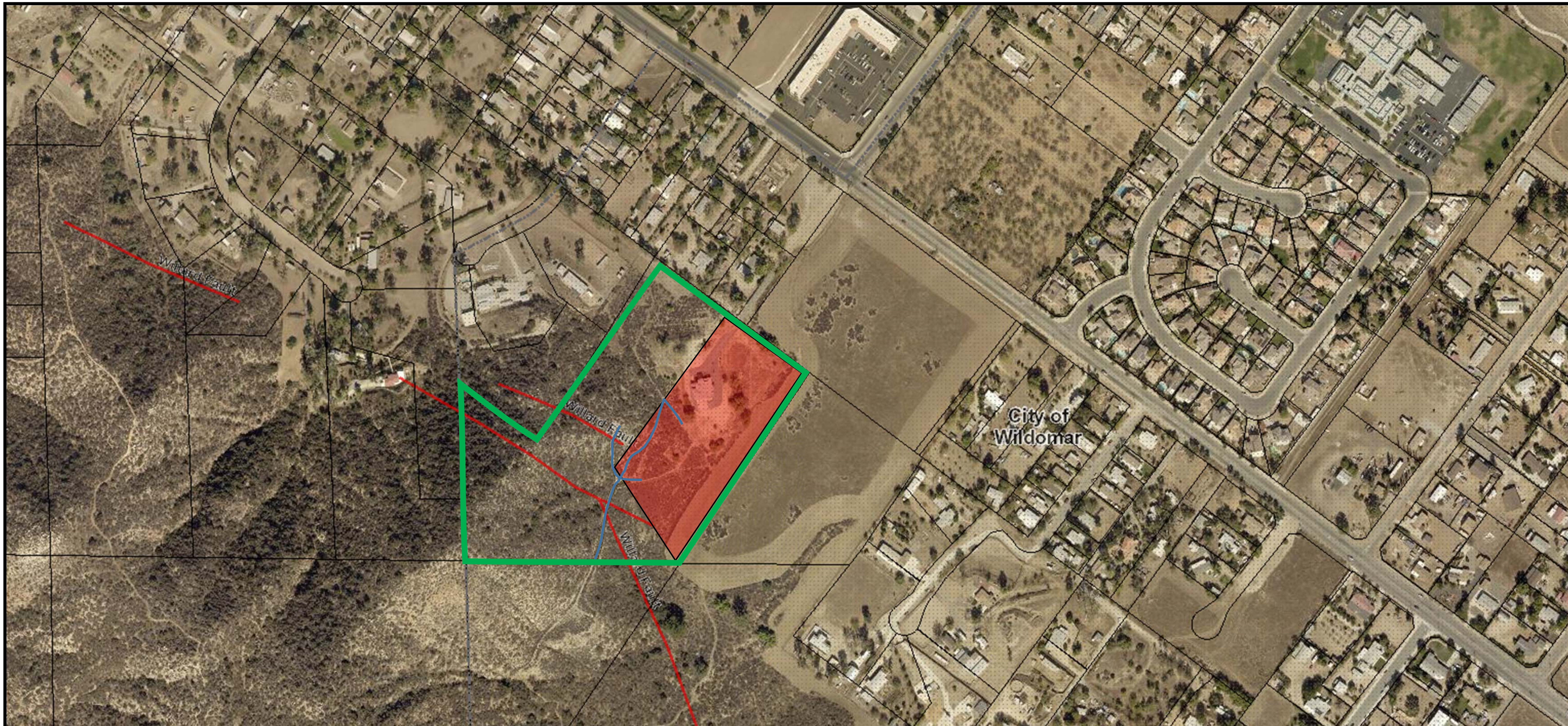

0 300 600

1"=300'

N

GEOCON LEGEND

Locations are approximate

……. APN BOUNDARY

……. COUNTY FAULT

……. AREA OF PROPOSED DEVELOPMENT

……. FIELD MAPPED ROAD CUTS

Source: *Riverside County RCIT, Map My County, Accessed July 30, 2019.*

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COUNTY FAULT MAP

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19993 GRAND AVENUE
LAKE ELSINORE, CALIFORINA
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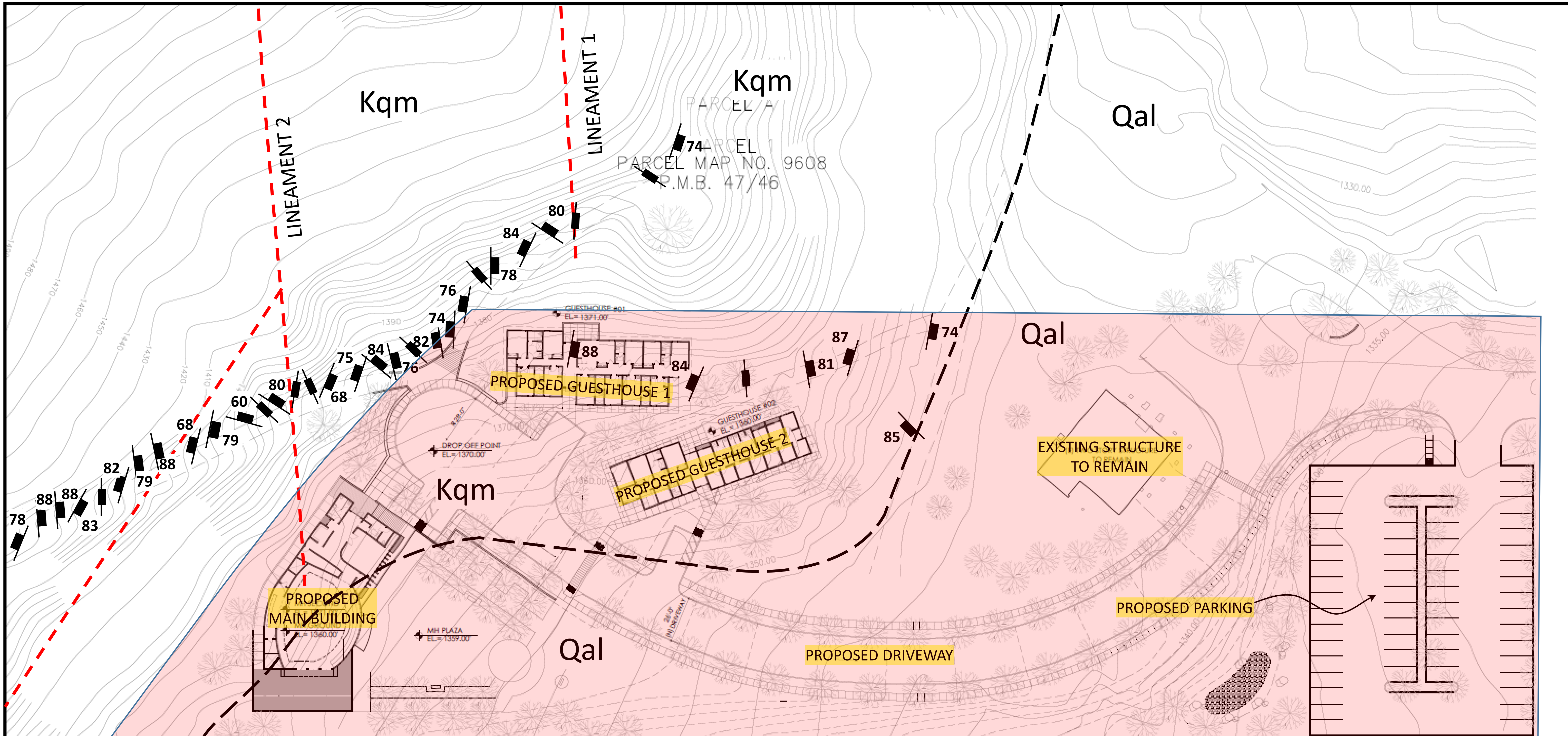
PDT			AUGUST 2019	PROJECT NO. T2877-22-01	FIG. 3



GEOCON LEGEND

Locations are approximate

.....LINEAMINTS-COINCIDENT WITH COUNTY, KENNEDY (1977), AND PHOTO ANALYSIS

..... GEOLOGIC CONTACT

80 ..... STRIKE AND DIP OF JOINT

Qal ..... ALLUVIUM

..... STRIKE OF VERTICAL JOINT

Kqm ..... QUARTZ MONZONITE

..... AREA OF PROPOSED DEVELOPMENT

Source: *Enlarged Site Plan*, Andmore Partners, dated July 22, 2019.

N

0 60 120

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SITE PLAN AND GEOLOGIC MAP

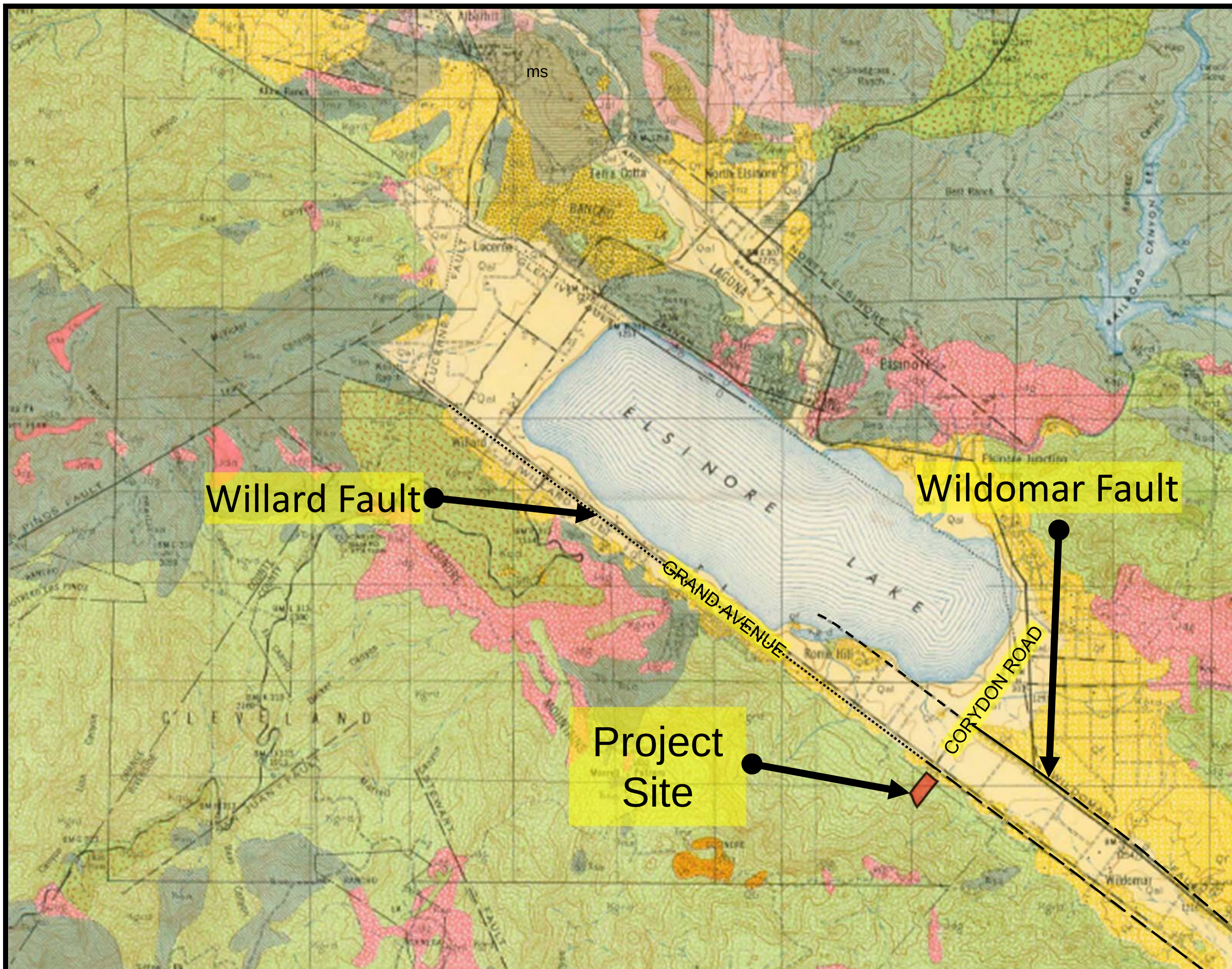
WON MEDITATION CENTER

19993 GRAND AVENUE

LAKE ELSINORE, CALIFORINA

APN # 382-140-002

PDT			AUGUST 2019	PROJECT NO. T2877-22-01	FIG. 4



Legend
(Pertinent Geologic Units)

Qal Alluvium
Qf Fanglomerate and Terrace Deposits
Qb Basalt
Kgrd Granodiorite
Jdg Diorite and Gabbro
Trsa Santa Ana Formation

Fault, Known Position
Fault, Approximate Position
Fault, Concealed by Alluvium

0 5300 10600

SCALE 1" = 5300'

N

SOURCE: Engel, René, 1959, Geology of the Lake Elsinore Quadrangle, California, Dept. of Natural Resources, Division of Mines, Bulletin 146.

REGIONAL GEOLOGIC MAP

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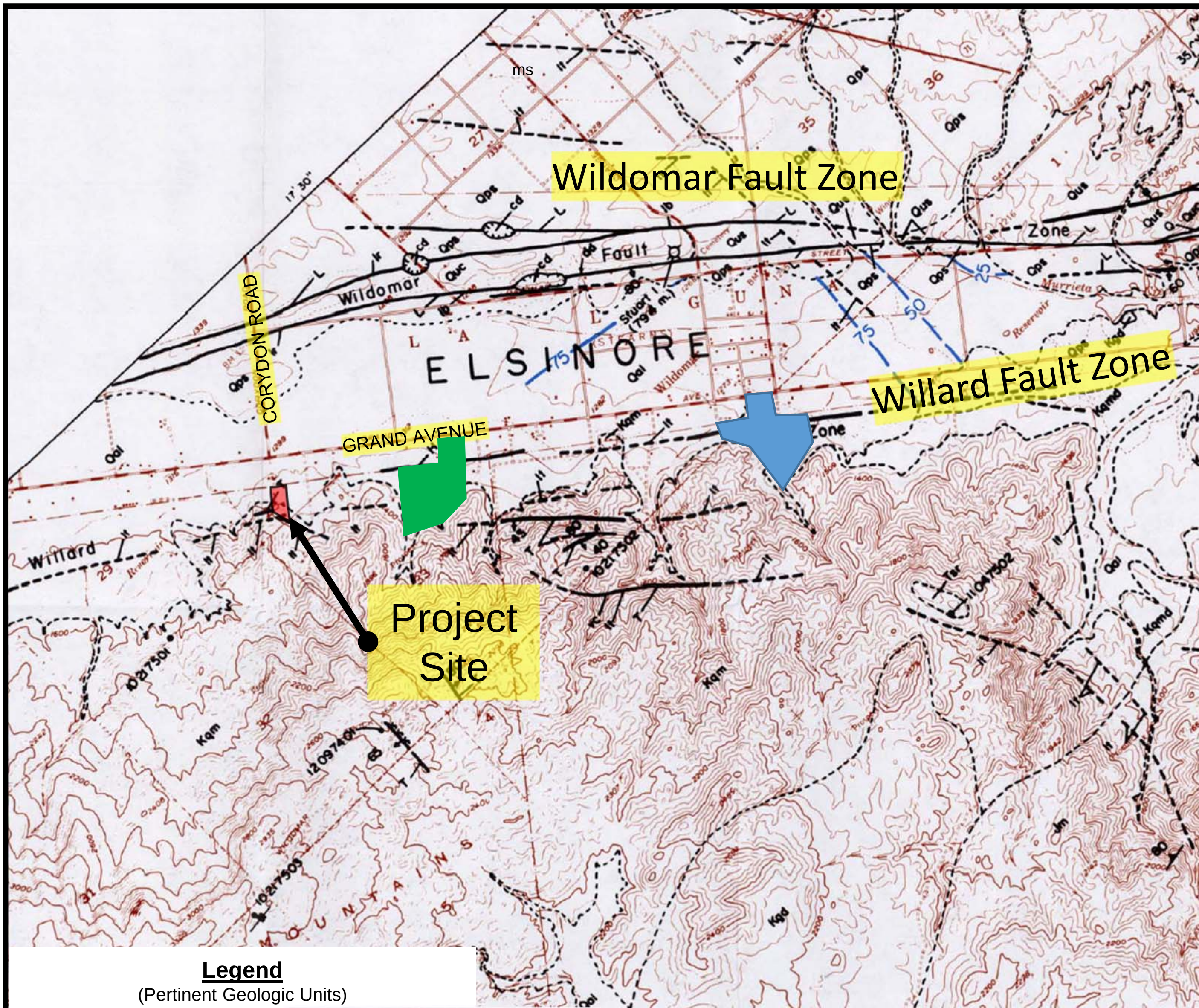
PHONE 951-304-2300 FAX 951-304-2392

WON MEDITATION CENTER
19993 GRAND AVENUE
LAKE ELSINORE, CALIFORINA
APN # 382-140-002

PDT			AUGUST 2019	PROJECT NO. T2877-22-01	FIG. 5



Legend
(Pertinent Geologic Units)

Qal Alluvium
Qps Pauba Formation
Qb Basalt
Kqm Quartz Monzonite
Kgd Granodiorite

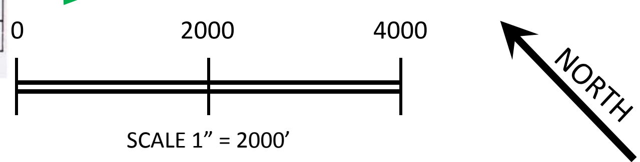
KEY TO AGE OF FAULTS			
FORMATION	AGE	SYMBOL IF FAULTED	SYMBOL IF NOT FAULTED
Alluvium, colluvium and slope wash	Holocene	H	h
Pauba Formation	late Pleistocene	L	l
Unnamed sandstone formation	Pleistocene	Q	—
Temecula Arkose	late Pliocene	P	—
All other	pre-Pliocene	T	—

Example: P/h assigned to a fault indicates that the Pleistocene age Temecula Formation is faulted but that Holocene age sediments overlap the same fault.

Fault, Confirmed
Fault, Inferred
Fault, Concealed by Unfaulted Rock


.....NEBLETT & ASSOC., INC., 2004


.....PETRA, 2001



SOURCE: Kennedy, M.P., 1977, *Recency and Character of Faulting Along the Elsinore Fault Zone in Southern Riverside County, California; CDMG Special Report 131*.

LOCAL GEOLOGIC MAP

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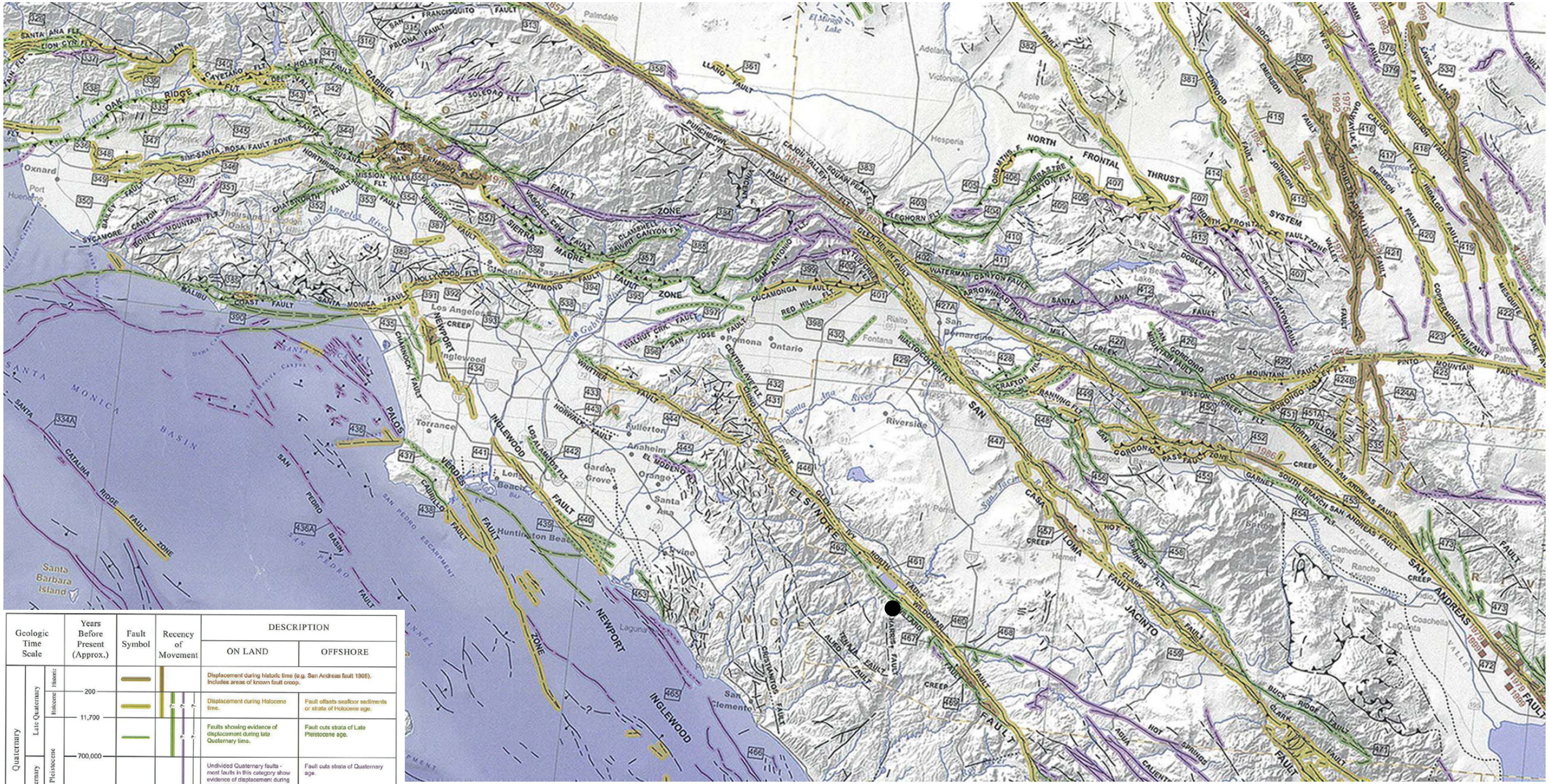
PDT			AUGUST 2019	PROJECT NO. T2877-22-01	FIG. 6

Reference: Jennings, C.W. and Bryant, W. A., 2010, Fault Activity Map of California, California Geological Survey Geologic Data Map No. 6.



Geologic Time Scale			Years Before Present (Approx.)	Fault Symbol	Recency of Movement	DESCRIPTION: ON LAND	DESCRIPTION: OFFSHORE
Quaternary	Late Quaternary	Historic				Displacement during historic time (e.g. San Andreas fault 1906). Includes areas of known fault creep.	
		Holocene	200		? ? ?	Displacement during Holocene time.	Fault offsets seafloor sediments or strata of Holocene age.
		Pleistocene	11,700		? ?	Faults showing evidence of displacement during late Quaternary time.	Fault cuts strata of Late Pleistocene age.
	Early Quaternary		700,000		?	Undivided Quaternary faults - most faults in this category show evidence of displacement during the last 1,600,000 years; possible exceptions are faults which displace rocks of undifferentiated Plio-Pleistocene age.	Fault cuts strata of Quaternary age.
Pre-Quaternary			1,600,000* – 4.5 billion (Age of Earth)			Faults without recognized Quaternary displacement or showing evidence of no displacement during Quaternary time. Not necessarily inactive.	Fault cuts strata of Pliocene or older age.

* Quaternary now recognized as extending to 2.6 Ma (Walker and Geissman, 2009). Quaternary faults in this map were established using the previous 1.6 Ma criterion.

N

0 12 24 Miles

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DRAFTED BY: PDT | CHECKED BY:

REGIONAL FAULT MAP

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ELSINORE, CALIFORNIA
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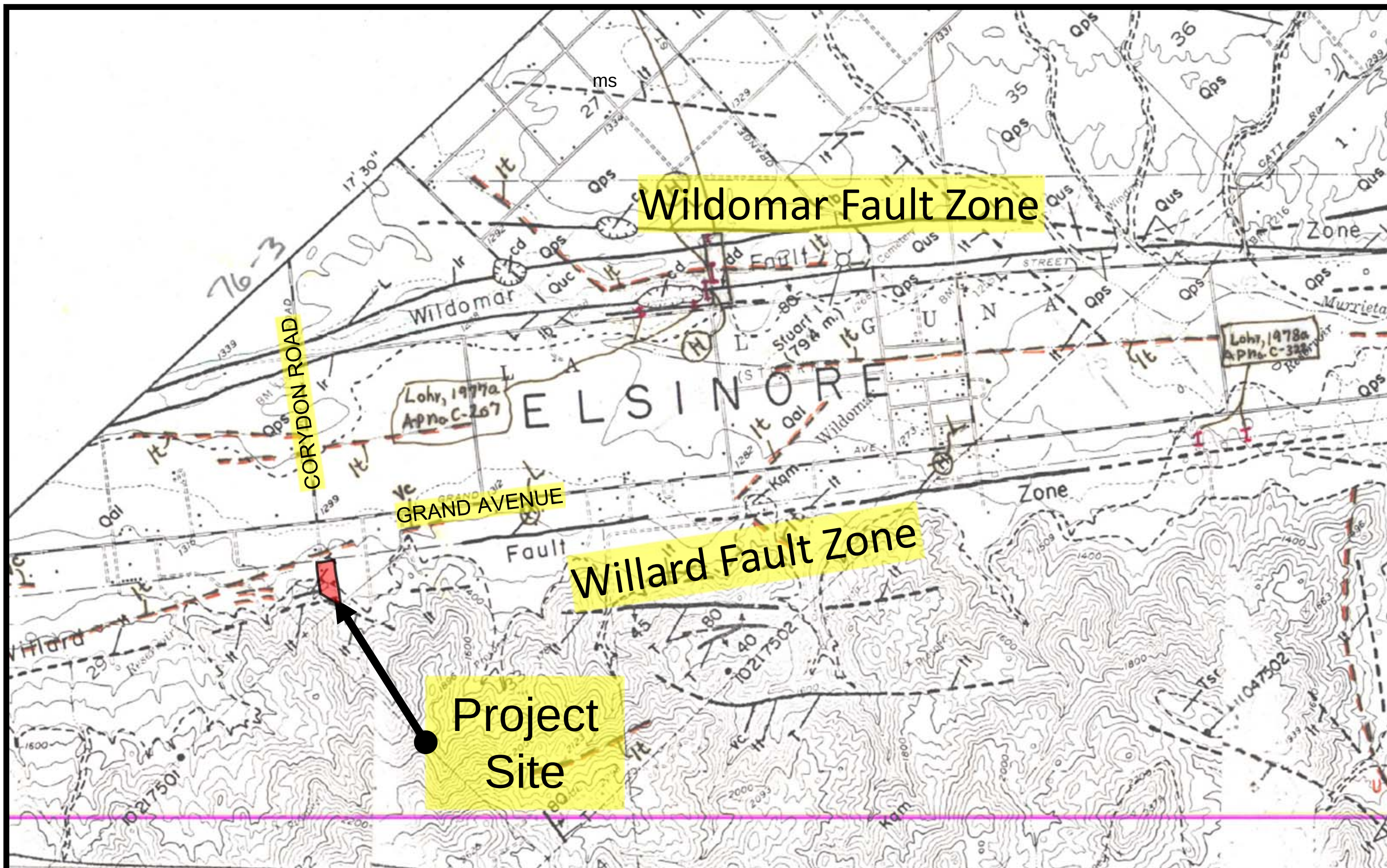
AUGUST 2019 | PROJECT NO. T2877-22-01 | FIG. 7



Legend
(Pertinent Geologic Units)

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Unnamed sandstone formation	Pleistocene	Q	—
Temecula Arkose	late Pliocene	P	—
All other	pre-Pliocene	T	—

Example: P/h assigned to a fault indicates that the Pleistocene age Temecula Formation is faulted but that Holocene age sediments overlap the same fault.

NORTH

0 2000 4000

SCALE 1" = 2000'

SOURCE: CDMG, 1977, *FER 76, Excerpt Figure 2A*.

EXCERPT FER 76, FIGURE 2A

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Figure 9. Jointing in granitic bedrock. Joint parallel to handle is coincident with mapped lineament 1 as shown on Figure 4.

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SITE PHOTOGRAHS

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Figure 10. Jointing in granitic bedrock. Joint pick is pointing towards is coincident with mapped lineament 2 as shown on Figure 4.