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June 21, 2022
File No. 21644

Walter N. Marks, Inc.
8758 Venice Boulevard, Suite 100
Culver City, California 90034

Attention: Walter Marks

Subject: Addendum III – Fault Distances
Proposed Mixed-Use Development
5401 – 5425 Wilshire Boulevard, Los Angeles, California

References: *Reports by Geotechnologies, Inc.:*
Geotechnical Engineering Investigation, dated April 3, 2019;
Addendum II – Additional Comments on Shoring Design, dated May 29, 2020.

City of Los Angeles, Department of Building and Safety:
Soils Report Approval Letter (Log # 109141), dated July 31, 2019;
Soils Report Approval Letter (Log # 113402), dated June 11, 2020.

Dear Mr. Marks:

This letter has been prepared to provide additional geotechnical information for the Project Site. Based on correspondences with CAJA Environmental Services, LLC, it is the understanding of this firm that the City of Los Angeles Planning Division is requesting additional information regarding the closest faults and distance of these faults from the Project Site.

Regional Faulting

Based on criteria established by the California Division of Mines and Geology (CDMG) now called California Geologic Survey (CGS), Faults may be categorized as Holocene-active, Pre-Holocene faults, and Age-undetermined faults. Holocene-active faults are those which show evidence of surface displacement within the last 11,700 years. Pre-Holocene faults are those that have not moved in the past 11,700 years. Age-undetermined faults are faults where the recency of fault movement has not been determined.

Buried thrust faults are faults without a surface expression but are a significant source of seismic activity. They are typically broadly defined based on the analysis of seismic wave recordings of hundreds of small and large earthquakes in the southern California area. Due to the buried nature of these thrust faults, their existence is usually not known until they produce an earthquake. The risk for surface rupture potential of these buried thrust faults is inferred to be low (Leighton, 1990). However, the seismic risk of these buried structures in terms of recurrence and maximum potential magnitude is not well established. Therefore, the potential for surface rupture on these surface-verging splays at magnitudes higher than 6.0 cannot be precluded.

A list of faults located within 100 miles from the project sites has been provided in the enclosed table titled: Table I – Faults in the Vicinity of the Project Site. These fault distances were obtained using the website program by United States Geological Survey (USGS) 2008 National Seismic Hazard Maps - Source Parameters. The following sections describe some of the regional active faults, potentially active faults, and blind thrust faults.

A) Holocene Active Faults

Hollywood Fault

The Hollywood Fault is part of the Transverse Ranges Southern Boundary fault system. The Hollywood Fault is located approximately 2.8 miles north of the site. This fault trends east-west along the base of the Santa Monica Mountains from the West Beverly Hills Lineament in the West Hollywood–Beverly Hills area to the Los Feliz area of Los Angeles. The Hollywood Fault is the eastern segment of the reverse oblique Santa Monica–Hollywood fault. Based on geomorphic evidence, stratigraphic correlation between exploratory borings, and fault trenching studies, this fault is classified as active.

Until recently, the approximately 9.3-mile-long Hollywood Fault was considered to be expressed as a series of linear ground-surface geomorphic expressions and south-facing ridges along the south margin of the eastern Santa Monica Mountains and the Hollywood Hills. Multiple recent fault rupture hazard investigations have shown that the Hollywood Fault is located south of the ridges and bedrock outcroppings along portions of Sunset Boulevard. The Hollywood Fault has not produced any damaging earthquakes during the historical period and has had relatively minor micro-seismic activity. It is estimated that the Hollywood Fault is capable of producing a maximum 6.7 magnitude earthquake. In 2014, the California Geological Survey established an Earthquake Fault Zone for the Hollywood Fault.

Newport-Inglewood Fault System

The Newport-Inglewood Fault System is located 2.84 miles to the west of the site. The Newport-Inglewood Fault Zone is a broad zone of discontinuous north to northwestern echelon faults and northwest to west trending folds. The fault zone extends southeastward from West Los Angeles, across the Los Angeles Basin, to Newport Beach and possibly offshore beyond San Diego (Barrows, 1974; Weber, 1982; Ziony, 1985).

The onshore segment of the Newport-Inglewood Fault Zone extends for about 37 miles from the Santa Ana River to the Santa Monica Mountains. Here it is overridden by, or merges with, the east-west trending Santa Monica zone of reverse faults.

The surface expression of the Newport-Inglewood Fault Zone is made up of a strikingly linear alignment of domal hills and mesas that rise on the order of 400 feet above the surrounding plains. From the northern end to its southernmost onshore expression, the Newport-Inglewood fault zone is made up of: Cheviot Hills, Baldwin Hills, Rosecrans Hills, Dominguez Hills, Signal Hill-Reservoir Hill, Alamitos Heights, Landing Hill, Bolsa Chica Mesa, Huntington Beach Mesa, and Newport Mesa. Several single and multiple fault strands, arranged in a roughly left stepping en echelon arrangement, make up the fault zone and account for the uplifted mesas.

The most significant earthquake associated with the Newport-Inglewood Fault System was the Long Beach earthquake of 1933 with a magnitude of 6.3 on the Richter scale. It is believed that the Newport-Inglewood Fault Zone is capable of producing a 7.5 magnitude earthquake.

Santa Monica Fault

The Santa Monica Fault, located approximately 3.81 miles to the northwest of the site, is a part of the Transverse Ranges Southern Boundary fault system. The Santa Monica Fault extends east from the coastline in Pacific Palisades through Santa Monica and West Los Angeles and merges with the Hollywood fault at the West Beverly Hills Lineament in Beverly Hills where its strike is northeast. It is believed that at least six surface ruptures have occurred in the past 50 thousand years. In addition, a well-documented surface rupture occurred between 10 and 17 thousand years ago, although a more recent earthquake probably occurred 1 to 3 thousand years ago. This leads to an average earthquake recurrence interval of 7 to 8 thousand years. It is thought that the Santa Monica Fault System may produce earthquakes with a maximum magnitude of 7.4.

The California Geological Survey has recently established an Earthquake Fault Zone for the Santa Monica Fault, as shown in the Earthquake Zones of Required Investigation for the Beverly Hills Quadrangle, dated January 11, 2018.

Raymond Fault

The Raymond Fault is located approximately 8.13 miles to the northeast of the site. The Raymond fault is an effective groundwater barrier which divides the San Gabriel Valley into groundwater sub-basins. Much of the geomorphic evidence for the Raymond Fault has been obliterated by urbanization of the San Gabriel Valley. However, a discontinuous escarpment can be traced from Monrovia to the Arroyo Seco in South Pasadena. The very bold, “knife edge” escarpment in Monrovia parallel to Scenic Drive is believed to be a fault scarp of the Raymond Fault. Trenching of the Raymond Fault is reported to have revealed Holocene movement (Weaver and Dolan, 1997).

The recurrence interval for the Raymond Fault is probably slightly less than 3,000 years, with the most recent documented event occurring approximately 1,600 years ago (Crook, et al, 1978). However, historical accounts of an earthquake that occurred in July 1855 as reported by Toppozada and others, 1981, place the epicenter of a Richter Magnitude 6 earthquake within the Raymond Fault. It is believed that the Raymond Fault is capable of producing a 6.8 magnitude earthquake. The Raymond Fault is considered active by the California Geological Survey.

Verdugo Fault

The Verdugo Fault is located approximately 9.18 miles to the north of the site. The Verdugo Fault runs along the southwest edge of the Verdugo Mountains. The fault displays a reverse motion. According to Weber, et. al., (1980) 2 to 3 meter high scarps were identified in alluvial fan deposits in the Burbank and Glendale areas. Further to the northeast, in Sun Valley, a fault was reportedly identified at a depth of 40 feet in a sand and gravel pit. Although considered active by the County of Los Angeles, Department of Public Works (Leighton, 1990), and the United States Geological Survey, the fault is not designated with an Earthquake Fault Zone by the California Geological Survey. It is estimated that the Verdugo Fault is capable of producing a maximum 6.9 magnitude earthquake.

Malibu Coast Fault

The Malibu Coast Fault is located approximately 10.55 miles from the Project Site and is a part of the Transverse Ranges Southern Boundary fault system, a west-trending system of reverse, oblique-slip, and strike-slip faults that extends for more than approximately 124 miles along the southern edge of the Transverse Ranges and includes the Hollywood, Raymond, Anacapa–Dume, Malibu Coast, Santa Cruz Island, and Santa Rosa Island Faults.

The Malibu Coast Fault Zone runs in an east-west orientation onshore subparallel to and along the shoreline for a linear distance of about 17 miles through the Malibu City limits, but also extends offshore to the east and west for a total length of approximately 37.5 miles. The onshore Malibu Coast Fault Zone involves a broad, wide zone of faulting and shearing as much as 1 mile in width. While the Malibu Coast Fault Zone has not been officially designated as an active fault zone by the State of California and no Special Studies Zones have been delineated along any part of the fault zone under the Alquist-Priolo Act of 1972, evidence for Holocene activity (movement in the last 11,000 years) has been established in several locations along individual fault splays within the fault zone. Due to such evidence, several fault splays within the onshore portion of the fault zone are identified as active.

Large historic earthquakes along the Malibu Coast Fault include the 1979, 5.2 magnitude earthquake and the 1989, 5.0 magnitude earthquake. The Malibu Coast Fault Zone is approximately 13.39 miles northwest of the site and is believed to be capable of producing a maximum 7.0 magnitude earthquake.

Palos Verdes Fault

Studies indicate that there are several active on-shore extensions of the strike-slip Palos Verdes Fault, which is located approximately 13.53 miles southwest of the site. Geophysical data also indicate the off-shore extensions of the fault are active, offsetting Holocene age deposits. No historic large magnitude earthquakes are associated with this fault. However, the fault is considered active by the California Geological Survey. It is estimated that the Palos Verdes Fault is capable of producing a maximum 7.7 magnitude earthquake.

Sierra Madre Fault System

The Sierra Madre Fault alone forms the southern tectonic boundary of the San Gabriel Mountains in the northern San Fernando Valley. It consists of a system of faults approximately 75 miles in length. The individual segments of the Sierra Madre Fault System range up to 16 miles in length and display a reverse sense of displacement and dip to the north. The most recently active portions of the zone include the Mission Hills, Sylmar and Lakeview segments, which produced an earthquake in 1971 of magnitude 6.4. Tectonic rupture along the Lakeview Segment during the San Fernando Earthquake of 1971 produced displacements of approximately 2½ to 4 feet upward and southwestward. It is believed that the Sierra Madre Fault Zone is capable of producing an earthquake of magnitude 7.3. The closest trace of the fault is located approximately 13.6 miles north of the site.

Whittier-Elsinore Fault System

The Whittier Fault is located approximately 17.72 miles to the southeast of the site. The Whittier Fault together with the Chino Fault comprises the northernmost extension of the northwest trending Elsinore Fault System. The mapped surface of the Whittier Fault extends in a west-northwest direction for a distance of 20 miles from the Santa Ana River to the terminus of the Puente Hills. The Whittier Fault is essentially a strike-slip, northeast dipping fault zone which also exhibits evidence of reverse movement along with en echelon fault segments, en echelon folds and anatomizing (braided) fault segments. Right lateral offsets of stream drainages of up to 8800 feet (Durham and Yerkes, 1964) and vertical separation of the basement complex of 6,000 to 12,000 feet (Yerkes, 1972), have been documented. It is believed that the Whittier Fault is capable of producing a 7.8 magnitude earthquake.

The Whittier Narrows earthquakes of October 1, 1987, and October 4, 1987, occurred in the area between the westernmost terminus of the mapped trace of the Whittier Fault and the frontal fault system. The main 5.9 magnitude shock of October 1, 1987 was not caused by slip on the Whittier Fault. The quake ruptured a gently dipping thrust fault with an east-west strike (Haukson, Jones, Davis and others, 1988). In contrast, the earthquake of October 4, 1987, is assumed to have occurred on the Whittier Fault as focal mechanisms show mostly strike-slip movement with a small reverse component on a steeply dipping northwest striking plane (Haukson, Jones, Davis and others, 1988).

San Gabriel Fault System

The San Gabriel Fault System is located approximately 17.99 miles north of the site. The San Gabriel Fault System comprises a series of subparallel, steeply north-dipping faults trending approximately north 40 degrees west with a right-lateral sense of displacement. There is also a small component of vertical dip-slip separation. The fault system exhibits a strong topographic expression and extends approximately 90 miles from San Antonio Canyon on the southeast to Frazier Mountain on the northwest. The estimated right lateral displacement on the fault varies from 34 miles (Crowell, 1982) to 40 miles (Ehlig, 1986), to 10 miles (Weber, 1982). Most scholars accept the larger displacement values and place the majority of activity between the Late Miocene and Late Pliocene Epochs of the Tertiary Era (65 to 1.8 million years before present).

Portions of the San Gabriel Fault System are considered active by California Geological Survey. Recent seismic exploration in the Valencia area (Cotton and others, 1983; Cotton, 1985) has established Holocene offset. Radiocarbon data acquired by Cotton (1985) indicate that faulting in the Valencia area occurred between 3,500 and 1,500 years before present.

It is hypothesized by Ehlig (1986) and Stitt (1986) that the Holocene offset on the San Gabriel Fault System is due to sympathetic (passive) movement as a result of north-south compression of the upper Santa Susana thrust sheet. Seismic evidence indicates that the San Gabriel Fault System is truncated at depth by the younger, north-dipping Santa Susana-Sierra Madre Faults (Oakeshott, 1975; Namson and Davis, 1988).

Santa Susana Fault

The Santa Susana Fault extends approximately 19.57 miles west-northwest from the northwest edge of the San Fernando Valley into Ventura County and is at the surface high on the south flank of the Santa Susana Mountains. The fault ends near the point where it overrides the south-side-up South strand of the Oak Ridge Fault. The Santa Susana Fault strikes northeast at the Fernando lateral ramp and turns east at the northern margin of the Sylmar Basin to become the Sierra Madre Fault. This fault is exposed near the base of the San Gabriel Mountains for approximately 46 miles from the San Fernando Pass at the Fernando lateral ramp east to its intersection with the San Antonio Canyon fault in the eastern San Gabriel Mountains, east of which the range front is formed by the Cucamonga fault. The Santa Susana Fault has not experienced any recent major ruptures except for a slight rupture during the 6.5 magnitude 1971 Sylmar earthquake. The Santa Susana Fault is considered to be active by the County of Los Angeles. It is believed that the Santa Susana Fault has the potential to produce a 6.9 magnitude earthquake. The closest trace of the fault is located approximately 23.44 miles north of the site.

San Andreas Fault System

The San Andreas Fault System forms a major plate tectonic boundary along the western portion of North America. The system is predominantly a series of northwest trending faults characterized by a predominant right lateral sense of movement. At its closest point, the San Andreas Fault System is located approximately 36.11 miles to the northeast of the site.

The San Andreas and associated faults have had a long history of inferred and historic earthquakes. Cumulative displacement along the system exceeds 150 miles in the past 25 million years (Jahns, 1973). Large historic earthquakes have occurred at Fort Tejon in 1857, at Point Reyes in 1906, and at Loma Prieta in 1989. Based on single-event rupture length, the maximum Richter magnitude earthquake is expected to be approximately 8.25 (Allen, 1968). The recurrence interval for large earthquakes on the southern portion of the fault system is on the order of 100 to 200 years.

B) Pre- Holocene Faults

Anacapa-Dume Fault

The Anacapa–Dume Fault, located approximately 12.19 miles to the northwest of the site, is a near-vertical offshore escarpment exceeding 600 meters locally, with a total length exceeding 62 miles. This fault is also part of the Transverse Ranges Southern Boundary Fault System. It occurs as close as 3.6 miles offshore south of Malibu at its western end, but trends northeast where it merges with the offshore segments of the Santa Monica Fault Zone. It is believed that the Anacapa–Dume fault is responsible for generating the historic 1930 magnitude 5.2 Santa Monica earthquake, the 1973 magnitude 5.3 Point Mugu earthquake, and the 1979 and 1989 Malibu earthquakes, each of which possessed a magnitude of 5.0. The Anacapa–Dume Fault is thought to be capable of producing a maximum magnitude 7.2 earthquake.

C) Blind Thrusts Faults

Blind or buried thrust faults are faults without a surface expression but are a significant source of seismic activity. By definition, these faults have no surface trace, therefore the potential for ground surface rupture is considered remote. They are typically broadly defined based on the analysis of seismic wave recordings of hundreds of small and large earthquakes in the Southern California area. Due to the buried nature of these thrust faults, their existence is sometimes not known until they produce an earthquake. Two blind thrust faults in the Los Angeles metropolitan area are the Puente Hills Blind Thrust and the Elysian Park Blind Thrust. Another blind thrust fault of note is the Northridge Fault located in the northwestern portion of the San Fernando Valley.

The Puente Hills Blind Thrust Fault extends eastward from Downtown Los Angeles to the City of Brea in northern Orange County. The Puente Hills Blind Thrust Fault includes three north-dipping segments, named from east to west as the Coyote Hills segment, the Santa Fe Springs segment, and the Los Angeles segment. These segments are overlain by folds expressed at the surface as the Coyote Hills, Santa Fe Springs Anticline, and the Montebello Hills. The Los Angeles segment of the Puente Hills Blind Thrust is located approximately 2.16 miles to the east of the site.

The Santa Fe Springs segment of the Puente Hills Blind Thrust Fault is believed to be the cause of the October 1, 1987, Whittier Narrows Earthquake. Based on deformation of late Quaternary age sediments above this fault system and the occurrence of the Whittier Narrows earthquake, the Puente Hills Blind Thrust Fault is considered an active fault capable of generating future earthquakes beneath the Los Angeles Basin. A maximum moment magnitude of 7.0 is estimated by researchers for the Puente Hills Blind Thrust Fault.

The Elysian Park Anticline is thought to overlie the Elysian Park Blind Thrust Fault. This fault has been estimated to cause an earthquake every 500 to 1,300 years in the magnitude range 6.2 to 6.7. The Elysian Park Anticline is approximately 4.45 miles to the north of the site.

The Mw 6.7 Northridge earthquake was caused by the sudden rupture of a previously unknown, blind thrust fault. This fault has since been named the Northridge Thrust, however it is also known in some of the literature as the Pico Thrust. It has been assigned a maximum magnitude of 6.9 and a 1,500 to 1,800 year recurrence interval. The Northridge Thrust is located 17.72 miles to the northwest of the site.

Should you have any questions please contact this office.

Respectfully submitted,
GEOTECHNOLOGIES, INC.

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SST:km

Enclosures: Table I – Faults in the Vicinity of the Project Site

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Geotechnologies, Inc.
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Project: Walter N. Marks, Inc.

TABLE I - FAULTS IN THE VICINITY OF THE PROJECT SITE

Distance in Miles	Name	State	Pref Slip Rate (mm/yr)	Dip (degrees)	Dip Dir	Slip Sense	Rupture Top (km)	Rupture Bottom (km)	Length (km)
2.16	Puente Hills (LA)	CA	0.7	27	N	thrust	2.1	15	22
2.8	Hollywood	CA	1	70	N	strike slip	0	17	17
2.84	Newport Inglewood	CA	1.3	89		strike slip	0	11	208
3.81	Santa Monica	CA	2.6	51		strike slip	0	16	79
4.45	Elysian Park (Upper)	CA	1.3	50	NE	reverse	3	15	20
8.13	Raymond	CA	1.5	79	N	strike slip	0	16	22
9.18	Verdugo	CA	0.5	55	NE	reverse	0	15	29
10.55	Malibu Coast	CA	0.3	75	N	strike slip	0	8	38
12.19	Anacapa-Dume	CA	3	41	N	thrust	1.2	12	65
13.53	Palos Verdes	CA	3	90	V	strike slip	0	14	99
13.6	Sierra Madre	CA	2	53	N	reverse	0	14	57
17.12	Northridge	CA	1.5	35	S	thrust	7.4	17	33
17.72	Elsinore	CA	n/a	81	NE	strike slip	0	14	83
17.99	San Gabriel	CA	1	61	N	strike slip	0	15	71
19.57	Santa Susana	CA	5	55	N	reverse	0	16	27
21.4	Clamshell-Sawpit	CA	0.5	50	NW	reverse	0	14	16
26.05	Simi-Santa Rosa	CA	1	60		strike slip	1	12	39
26.83	San Jose	CA	0.5	74	NW	strike slip	0	15	20
27.05	Holser	CA	0.4	58	S	reverse	0	19	20
31.61	Oak Ridge (Onshore)	CA	4	65	S	reverse	1	19	49
34.5	Chino	CA	1	65	SW	strike slip	0	14	29
34.71	San Joaquin Hills	CA	0.5	23	SW	thrust	2	13	27
35.07	San Cayetano	CA	6	42	N	thrust	0	16	42
35.64	Cucamonga	CA	5	45	N	thrust	0	8	28
36.11	S. San Andreas	CA	n/a	90	V	strike slip	0.1	13	421
40.89	Newport-Inglewood (Offshore)	CA	1.5	90	V	strike slip	0	10	66
46.31	Elsinore	CA	n/a	86	NE	strike slip	0	16	195
48.06	Santa Ynez	CA	2	70		strike slip	0	11	132
49.48	Ventura-Pitas Point	CA	1	64	N	reverse	1	15	44
49.48	Pitas Point Connected	CA	1	55		reverse	1.2	13	78
52.69	Channel Islands Thrust	CA	1.5	20	N	thrust	5	12	59
52.76	Santa Cruz Island	CA	1	90	V	strike slip	0	13	69
53.31	Cleghorn	CA	3	90	V	strike slip	0	16	25
54.68	Mission Ridge-Arroyo Parida-Santa Ana	CA	0.4	70	S	reverse	0	8	69
54.7	Oak Ridge (Offshore)	CA	3	32	S	thrust	0	8	38
58.08	Red Mountain	CA	2	56	N	reverse	0	14	101
59.34	Coronado Bank	CA	3	90	V	strike slip	0	9	186
60.67	Garlock	CA	n/a	90	V	strike slip	0.4	12	210
64.12	North Frontal (West)	CA	1	49	S	reverse	0	16	50
64.29	North Channel	CA	1	26	N	thrust	1.1	5	51
65.31	Pitas Point (Lower)-Montalvo	CA	2.5	16	N	thrust	0.4	13	30
67.39	Pleito	CA	2	46	S	reverse	0	14	44
72.98	Pitas Point (Upper)	CA	1	42	N	thrust	1.4	10	35
76.46	White Wolf	CA	2	75	S	reverse	0	14	63
76.62	Helendale-So Lockhart	CA	0.6	90	V	strike slip	0	13	114
79.69	Santa Ynez (West)	CA	2	70	S	strike slip	0	9	63
83.83	Rose Canyon	CA	1.5	90	V	strike slip	0	8	70
84.3	Lenwood-Lockhart-Old Woman Springs	CA	0.9	90	V	strike slip	0	13	145
86.86	So Sierra Nevada	CA	0.1	50	E	normal	0	14	112
89.6	Santa Rosa Island	CA	1	90	V	strike slip	0	9	58
90.54	North Frontal (East)	CA	0.5	41	S	thrust	0	16	27
93.25	Pinto Mtn	CA	2.5	90	V	strike slip	0	16	74
95.63	Gravel Hills-Harper Lk	CA	0.7	90	V	strike slip	0	11	65
98.47	Landers	CA	0.6	90	V	strike slip	0	15	95
99.37	Blackwater	CA	0.5	90	V	strike slip	0	12	60