APPENDIX IV.F

Geology and Soils

F.1

Geohazards Report

Converse Consultants
Geotechnical Engineering, Environmental & Groundwater Science, Inspection & Testing Services

June 17, 2020

Mr. Tony Locacciato, AICP, Partner
Meridian Consultants
920 Hampshire Road, Suite A-5
Westlake Village, California 91361

Subject: **GEOHAZARDS REPORT**
Proposed River Park Residential Development
712 Baker Street
Long Beach, Los Angeles County, California 90806
Converse Project No. 19-41-290-01

Dear Mr. Locacciato:

Converse Consultants (Converse) appreciates the opportunity to provide this Geohazards Report for the proposed River Park Residential Development located at 712 Baker Street in Long Beach, California. The proposed 20.12 acre single-family residential development site is to be located on the Oil Operators Inc. (OOI) properties. Environmental site characterizations and remediation activities on the site properties are currently being performed by others. It is proposed to coordinate the future geotechnical grading work (over-excavation and re-compaction of building pads, streets and improvements) during implementation of the remaining environmental remediation measures for the residential site development. This report was prepared in accordance with our proposal dated November 7, 2019.

Based on our geologic hazards assessment of the subject property, we conclude that the site is suitable for the proposed residential development from a geotechnical standpoint provided a site-specific geotechnical soils investigation is performed on the property and the recommendations presented in that report are incorporated during the design, permitting, grading, site remediation, and construction of the project site.

We appreciate the opportunity to be of service to Meridian Consultants. Should you have any questions, please do not hesitate to contact us at 626-930-1200.

Sincerely,

CONVERSE CONSULTANTS

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1.0 PROJECT SITE DESCRIPTION

The 20.12-acre property is located south of the San Diego Freeway (Interstate 405), north of Wardlow Road, east of the Los Angeles River Channel and Long Beach Freeway (Interstate 710) and west of Golden Avenue in the City of Long Beach, California as shown on Figure No. 1, *Site Location Map*. A new single-family residential development is proposed for the property that will include townhome style residences with associated access driveways, parking and recreational improvements. Residential development is planned on the 13.3 acre southern parcel at 712 West Baker Street (APN 7203-002-005) and the 4.8 acre northern parcel at 701 West Baker Street (APN 7203-002-001) is planned to remain as an open-space or be developed as a park. A four (4) foot deep retention swale for stormwater runoff is planned along the western length of the property. The proposed site grading is planned to be a balanced cut/fill operation with the exception of possible export of environmentally impacted earth materials that do not met the site remediation criteria and requirements.

Extensive environmental studies for soil gas, soil and ground water, site monitoring and site remediation activities have been performed on the Oil Operators, Inc. (OOI) property parcels from 1984 to present. Wastewater treatment activities have occurred on the property parcels since the 1920s. OOI operated an oil field wastewater treatment facility that treated oil field brines and wastewater that were direct by-products of crude oil drilling and oil production. Environmental monitoring and remediation activities on the property are still on going to further clean-up the site. Environmental remediation activities on the property parcels are currently being monitored and reviewed by the lead environmental enforcement agencies including the City of Long Beach and the State of California Los Angeles Regional Water Quality Control Board.

In 1959, a wastewater treatment plant was constructed on the property that consisted of five (5) circular concrete-walled skimming basins and associated pumps, aboveground storage tanks, pipelines and related small buildings and support facilities. The treatment plant was located north of two (2) rectangular-shaped, clay-lined, settling basins in the southern portion of the project site. The settling basins were referred to as Basin 1 and Basin 2. Basin 1 received oily residual solids that settled out of the produced water. Basin 2 received relatively clean processed water that was discharged off-site. The approximate location of the wastewater treatment plant on the central portion of the property is shown on Figure No. 1, *Site Location Map*.

In 1998 the water treatment facility ceased operations. In October 2000, the City of Long Beach Fire Department directed that liquid hydrocarbon products, wastewater and sludge be removed from the site and that hydrocarbon impacted soils and groundwater be remediated. The existing buildings, facilities, above ground storage tanks, structures, and pipelines were cleaned, demolished and disposed off-site in 2000 and 2001.

The existing site conditions are shown on Figure No. 2, *Project Site Aerial Photo*. Existing ground surface elevations range from approximately 25 feet to 40 feet above

mean sea level (msl). The proposed building pads for the residential development are planned to range between approximate elevations 34 feet to 41 feet above mean sea level (msl).

2.0 SUBSURFACE CONDITIONS

The project site is situated on a broad alluvial basin on the southern edge of the Los Angeles coastal plain. This coastal basin has been gradually filled with marine and non-marine sediments. The Los Angeles and San Gabriel rivers have deposited stream and flood sediments across the coastal plain during Holocene time (0-11,000 years) to form a relatively flat and broad river flood plain. Most of the river and stream channels flows are now controlled by an extensive network of flood control channels and storm drains which ultimately drain to the Pacific Ocean.

A general description of the subsurface conditions and various earth materials encountered during previous subsurface environmental field exploration performed by others at the project site are presented in this section.

2.1 Subsurface Profile

The project site is located on the Los Angeles coastal plain approximately 3.1 miles north of the Long Beach Harbor and Pacific Ocean. The project site is located in the southeast portion of the Los Angeles Basin near the western end of Signal Hill. Previous grading and earthwork has been performed along the edges of the project site to create the fill embankments for the Los Angeles River Flood Control Channel to the west of the site and for support of the San Diego Freeway (Interstate 405) raised freeway level and embankments to the north. The property is reported to be underlain by up to 26 feet of undocumented fill place during previous site grading and earthwork activities. The depth of undocumented fill varies across the project site and within the basins. The fill soils consist of fine-grained silty sand, sandy silts, silts, clayey silts and silty clays.

The fill soils are underlain by non-marine and marine alluvial sediments that have gradually filled the coastal basin over time to form a broad coastal plain as shown on Figure No. 3, *Long Beach Geologic Map*. Based on the exploratory soil borings and Cone Penetration Tests (CPTs), the native alluvial site soils consist of fine-grained, interbedded layers of sands, silty sands, sandy silts, silts, clayey silts and clays to the maximum explored depth of approximately 60 feet below ground surface (bgs).

2.2 Groundwater

Groundwater was encountered in the exploratory borings and monitoring wells installed across the project site at depths ranging from 30 feet to 51 feet below ground surface. Historically highest groundwater contours compiled by the CDMG (1998) for the Long Beach 7.5 minute indicate the historic high groundwater level is approximately 20 feet

below ground surface. Groundwater is not expected to be encountered during grading and construction of the project.

In general, groundwater levels fluctuate with the seasons and local zones of perched groundwater may be present within the near-surface deposits due to local conditions or during rainy seasons. Groundwater conditions below the site may vary depending on numerous factors including seasonal rainfall, local irrigation, stormwater recharge, pumping activities for sea water intrusion barriers, groundwater recharge and pumping, among other factors. The regional groundwater table is not expected to be encountered during the planned construction.

2.3 Subsurface Variations

Based on the results of the subsurface exploration by others and our experience, some variations in the continuity and nature of subsurface conditions within the project site should be anticipated. Because of the uncertainties involved in the nature and depositional characteristics of the earth material at the site, care should be exercised in interpolating or extrapolating subsurface conditions between or beyond the boring and CPT locations.

3.0 FAULTING AND GEOHAZARDS

3.1 Active Faults

The project site lies along the southern portion of the Los Angeles coastal plain in the Peninsular Ranges Geomorphic Province of California. The Peninsular Ranges province is characterized by northwest trending valleys and mountain ranges which have formed in response to regional tectonic forces along the boundary between the Pacific and North American tectonic plates. The Peninsular Ranges geomorphic province extends southward from the Transverse Ranges province at the north end of the Los Angeles basin to the southern tip of the Baja California Peninsula. The geologic structure is dominated by northwest trending, right-lateral faults, most notably the Newport-Inglewood fault, Whitter-Elsinore fault, San Jacinto fault and San Andreas fault. The approximate location of these local and regional faults with respect to the project site are shown on Figure No. 4, *Southern California Regional Fault Map*.

The project site is situated in a seismically active region. As is the case for most areas of Southern California, ground shaking resulting from earthquakes associated with nearby and more distant faults may occur at the project site. During the life of the project, seismic activity associated with active faults can be expected to generate moderate to strong ground shaking at the site. Review of recent seismological and geophysical publications indicates that the seismic hazard for the project site is high. Review of the California Geologic Survey Map Sheet 49, Epicenters and Areas Damaged by M>5 California Earthquakes, 1800-1999, (CGS, Toppozada et al., 2000), shows the mapped epicenters of earthquakes with magnitude 5.0 or greater in Southern

California during the past 200 years and is presented on Figure No. 5, *Epicenters Map of Southern California Earthquakes (1800-1999).*

Newport Inglewood Fault. The Newport-Inglewood fault zone boundary is located approximately 600 feet east of the project site. The Newport-Inglewood fault system is approximately 66 km long on shore and extends northwest from Huntington Beach through Long Beach to Culver City and the Cheviot Hills. The Newport-Inglewood fault continues offshore to the southeast of Huntington Beach and makes landfall in La Jolla as the Rose Canyon fault.

The Newport-Inglewood fault is characterized by a series of uplifts and anticlines including Newport Mesa, Huntington Beach Mesa, Bolsa Chica Mesa, Alamitos Heights and Landing Hill, Signal Hill and Reservoir Hill, Dominguez Hills and Baldwin Hills.

Several earthquakes have occurred along the fault zone including the March 10, 1933 “Long Beach” earthquake of M6.4, with its epicenter off Newport Beach, and smaller earthquakes at Inglewood on June 20, 1920 (M4.9) and May 17, 2009 (4.7), Torrance on October 21, 1941 (M4.8), Gardena on November 14, 1941 (M4.8), and Newport Beach on April 7, 1989 (M 4.7). These earthquakes show evidence of right-lateral strike slip focal mechanisms.

The Newport-Inglewood fault is considered to be active and considered capable of producing a maximum moment magnitude (Mw) 7.1 earthquake. The slip rate is considered to be about 1.0 mm/year but may range up to 2 to 3 mm/year along isolated segments.

The active Newport-Inglewood fault zone dominates the geologic structure in the Long Beach area. The mapped fault traces of the active Newport-Inglewood fault zone (Cherry Hill fault segment) are located approximately 0.18 mile to 0.37 mile east of the project site. The northwest-trending Newport-Inglewood fault zone exhibits surface geomorphic features including low eroded scarps along side-stepping fault segments and a series of northwest trending elongated low hills and mesas that extend from Newport Bay in Orange County northwestward to Beverly Hills. Signal Hill is one of these fault uplifted hillsides along the Newport-Inglewood fault zone and is located approximately 1/2 mile southeast of the project site. The major fault segments of the Newport-Inglewood fault zone in the Long Beach area include the Cherry Hill fault, Pickler fault, Northeast Flank fault, Reservoir Hill fault and Seal Beach fault. The orientation of these fault segments is generally attributed to right-lateral, strike-slip faulting at depth.

Whittier Fault. The mapped trace of the Whittier Fault is located approximately 16 miles northeast of the project site in the Puente Hills. The revised official map for the La Habra Quadrangle effective November 1, 1991, shows the Whitter Fault traces located northeast of the site in the Puente Hills to be zoned as an active fault trace with potential for surface fault rupture.

The Whitter Fault is considered part of the Elsinore Fault system, which is one of the major right-lateral strike slip faults on the Peninsular Ranges geomorphic province. The Elsinore faults splits northwestward into the Chino fault and westward into the Whittier fault near the City of Corona.

The Whitter Fault dips north with reverse separation along most of its length. However, the late Quaternary evidence is for nearly pure strike slip movement (Gath, 1977). Part of the uplift of the Puente Hills may accompany reverse faulting related to the restraining bend and more westerly strike of the Whitter fault. The Whitter fault turns more northwesterly at the San Gabriel River and Whittier Narrows to become the East Montebello fault. The Whitter Fault is considered capable of producing a magnitude Mw 6.8 earthquake.

Puente Hills Blind Thrust Fault. Potential for damage from earthquakes along a zone of north-dipping blind thrust faults in the northern Los Angles basin was illustrated by the M 5.9 Whittier earthquake event on October 1, 1987 and the M 6.7 Northridge earthquake event on January 17, 1994. Blind thrust faults are low angle reverse faults which generally have no surface trace and express tectonic deformation as folding and uplift of ridges. Examples of blind thrust fault landforms include the Elysian, Repetto and Montebello Hills and the Puente Hills.

Details concerning the Puente Hills Blind Thrust are limited by the fact that the thrust fault is buried below ground surface - thus, the term “blind” thrust fault. Conventional fault finding trenches, boreholes and paleoseismic dating methods used at the surface have limited use for study of these deeply buried thrust fault structures. The geometry and location of the blind thrust fault structures and thrust ramps are based on interpretation of oil well data, seismic and strong motion data solutions, high resolution geophysical data, paleoseismic studies and structural model analyses (Yeats, R.S., 2004, Dolan, J.F. et al., 2003). Recent revisions to fault parameter models have replaced the lower Elysian Park Thrust Fault with the Puente Hills Blind Thrust and Upper Elysian Park Blind Thrust (Cao, T. et al.,2003). Seismic hazard fault models for the Los Angeles basin and vicinity will continue to be refined as new information and technology develops and becomes available through time.

The Puente Hills Blind Thrust has been interpreted to be approximately 42 km long and 19 km wide with a depth range of 3 km to 13 km below ground surface (Dolan, J.F., et al., 2003). The thrust fault dips northward from the Montebello Hills and Puente Hills beneath the San Gabriel basin.

Paleoseismic studies of the Puente Hills Blind Thrust have indicated the occurrence of at least four large Mw 7.2 to 7.5 earthquakes on this fault during the past 11,000 years.

As is the case for most areas of Southern California, strong ground shaking resulting from earthquakes associated with nearby and more distant faults may occur at the

project site. During the life of the project, seismic activity associated with active faults can be expected to generate moderate to strong ground shaking at the site.

3.2 Geohazards

Geologic hazards are defined as geologically related conditions that may present a potential danger to life and property. Geologic hazards in Southern California include fault surface rupture, landslides, soil liquefaction, lateral spreading, seismically induced slope instability, earthquake-induced flooding and tsunami and seiches due to seismic shaking. The site-specific potential for each of these seismic hazards is discussed in the following sections.

Fault Surface Rupture. The project site is not located within a currently designated State of California Earthquake Fault Zone (formerly Alquist-Priolo Special Studies Zones) for surface fault rupture. The Alquist Priolo Earthquake Fault Zoning Act requires the California Geologic Survey to zone “active faults” within the State of California. An “active fault” has exhibited surface displacement within Holocene time (within the last 11,700 years) hence constituting a potential hazard to structures that may be located across it. Essential service structures are required to be set-back at least 50 feet from an active fault. The active fault set-back distance is measured perpendicular from the dip of the fault plane. Based on review of existing geologic information, no know active faults project through or toward the site. The nearest mapped active fault trace is the Newport-Inglewood fault zone located approximately 0.18 mile to 0.37 mile east of the project site as shown on Figure No. 6, *Seismic Hazard Zones Map*. The potential for surface rupture resulting from the movement of nearby major faults, or currently unknown faults, is not known with certainty but is considered low.

Landslides. The project site is relatively flat. Fill slope embankments for the Los Angeles River channel embankment are located along the west side of the project site and along the north side of the property along the San Diego Freeway (Interstate 405). These engineered fill slope embankments range from 20 to 25 feet in vertical height. No earthquake-induced landslide areas are shown on the Earthquake Zones of Required Investigation – Long Beach Quadrangle by the California Geologic Survey for the project site. In the absence of significant ground slopes, the potential for seismically induced landslides to affect the proposed site is considered to be very low.

Liquefaction. Liquefaction is the sudden decrease in the strength of cohesionless soils due to dynamic or cyclic shaking. Saturated soils behave temporarily as a viscous fluid (liquefaction) and, consequently, lose their capacity to support the structures founded on them. The potential for liquefaction decreases with increasing clay and gravel content but increases as the ground acceleration and duration of shaking increase. Liquefaction potential has been found to be the greatest where the groundwater level and loose sands occur within 50 feet of the ground surface. Soil liquefaction generally occurs in submerged sandy soils and non-plastic silts during or after strong ground

shaking. There are several general requirements for liquefaction to occur. They are as follows.

- Soils must be submerged
- Soils must be primarily sandy
- Soils must be loose to medium-dense
- Ground motion must be intense
- Duration of shaking must be sufficient for the soils to lose shear resistance

The project site is underlain by alluvial sediments that are identified within a mapped potential liquefaction zone as shown on the Earthquake Zones of Required Investigation-Long Beach Quadrangle (1999) and on Figure No. 6, *Seismic Hazard Zones Map*. The potential for liquefaction and seismic settlement ground failures at the site shall require a site specific geotechnical investigation to evaluate liquefaction potential and mitigation measures.

Lateral Spreading. Seismically induced lateral spreading involves primarily lateral movement of earth materials due to ground shaking. It differs from the slope failure in that complete ground failure involving large movement does not occur due to the relatively smaller gradient of the initial ground surface. Lateral spreading is demonstrated by near-vertical cracks with predominantly horizontal movement of the soil mass involved. The project site is underlain by alluvial sediments that are identified within a mapped potential liquefaction zone. The topography at the project site is relatively flat. Fill slope embankments for the Los Angeles River channel are located along the west side of the project site and for the San Diego Freeway along the north side of the site. These fill slopes were engineered to provide support for their respective structures. Under these circumstances, the potential for lateral spreading on these fill slope embankments are considered low. The potential for lateral spreading ground failure at the site shall require a site specific geotechnical investigation to evaluate lateral spreading potential and mitigation measures if needed.

Seismically Induced Slope Instability. Seismically induced landslides and other slope failures are common occurrences during or soon after earthquakes. The project site is not shown with any earthquake-induced landslide areas due the relatively flat ground conditions of the site topography. In the absence of significant ground slopes, the potential for seismically induced landslides to affect the proposed site is considered to be very low.

Earthquake-Induced Flooding. Review of the Flood Insurance Rate Map (FIRM), Map Number 06037C1955F, dated September 26, 2008, from the FEMA Map Service Center Viewer, indicates that the site is in an area designated as Zone X, “area of minimal flood hazard”. The area along the west side of the project site at the base of the Los Angeles River channel embankment is mapped as an “area with reduced flood risk due to levee”. The Los Angeles River flood channel located west of the project site was built with a low flow central channel and lined with concrete on the bottom and embankment sidewalls

to control erosion. The area within the Los Angeles River channel concrete lined embankments are shown as Zone A, “special flood hazard areas”. Due to the absence of groundwater at shallow depths, proximity of the Los Angeles River channel that serves as a regional flood control structure, and freeway embankments located along *the north side of the project site, the potential for earthquake induced flooding at the* project site is considered low.

Tsunami and Seiches. Tsunamis are seismic sea waves generated by fault displacement or major ground movement. *Based on the location of the site from the* Pacific Ocean (approximately 3.1 miles) and review of the *Tsunami Inundation Map for Emergency Planning – Long Beach Quadrangle, dated March 1, 2009, tsunamis do not* pose a hazard. The mapped tsunami inundation run up area extends northward up the Los Angeles River flood channel to approximately 1.4 miles south of the project site to an area south Willow Street. Seiches are large waves generated in enclosed bodies of water in response to ground shaking. Based on site locations away from lakes and reservoirs, seiches do not pose a hazard.

Volcanic Eruption Hazard. There are no know volcanoes near the site. According to Jennings (1994), the nearest potential hazards from volcanic eruptions is the Amboy Crater-Lava Lake area located in the Mojave Desert more than 120 miles northeast of the project site. Volcanic eruption hazards are not present.

4.0 GEOTECHNICAL INVESTIGATIONS AND MONITORING

A site specific geotechnical investigation with subsurface exploration, soil sampling, laboratory testing and engineering analyses should be performed to further evaluate the subsurface soil condition and potential geologic hazards for residential development. It is proposed to coordinate the site grading work with implementation of environmental mitigation measures. Geotechnical recommendations and mitigation measures for site development shall then be provided for site clearing, grading, over-excavation and re-compaction, environmental mitigation, vapor membranes, foundation designs, corrosion and pavement designs. The geotechnical consultant should then review the plans and specifications as the project design progresses. Such review is necessary to identify design elements, assumptions, or new conditions which require revisions or additions to the geotechnical recommendations.

The project geotechnical consultant should then be present to observe conditions during grading and construction. Geotechnical observation and testing should be performed as needed to verify compliance with project specifications and building codes. Additional geotechnical recommendations may be required based on subsurface conditions encountered during construction.

5.0 CLOSURE

The findings and opinions of this geohazard report were prepared in accordance with generally accepted engineering geologic principals and practice. The report was prepared without the benefit of subsurface investigation and testing. We make no warranty, either express or implied. Our opinions and conclusions are based on the review of available published maps, documents and information. Our services are for the sole benefit and exclusive use of Meridian Consultants as it pertains to the subject property in accordance with the General Conditions under which these services are provided.

The Scope of Services for this report were designed solely in accordance with the objectives, schedule, budget and risk-management preferences of Meridian Consultants. This report should not be regarded as a guarantee that no further geohazard, beyond which could be detected within the scope of this study, is present at the property. Converse makes no warranties or guarantees as the accuracy or completeness of information provided or compiled by others. It is possible that information exists beyond the scope of this study. It is not possible absolutely confirm that no geohazards exist at the property. If none are identified as part of a limited scope of work, such a conclusion should not be construed as a guaranteed absence, but merely the results of the evaluation of the property at the time of the study. Additional information, which was not found or available to Converse at the time of report preparation, may result in a modification of the conclusions and recommendations presented. Any reliance on this report by Third Parties shall be at the Third Party' sole risk.

Thank you for the opportunity to be of assistance. If you should have any questions regarding this report, please do not hesitate to contact Mark Schluter at (626) 930-1223 or Norman Eke at (626) 930-1260.

6.0 REFERENCES

CALIFORNIA DEPARTMENT OF CONSERVATION, 1988, Seismic Hazard Zone Report for the Long Beach 7.5-Minute Quadrangle, Los Angeles County, California.

CALIFORNIA GEOLOGIC SURVEY, 1999, Earthquake Zones of Required Investigation, Long Beach Quadrangle, Earthquake Fault Zones Revised Official Map Released July 1, 1986, Seismic Hazard Zones Official Map Released March 25, 1999.

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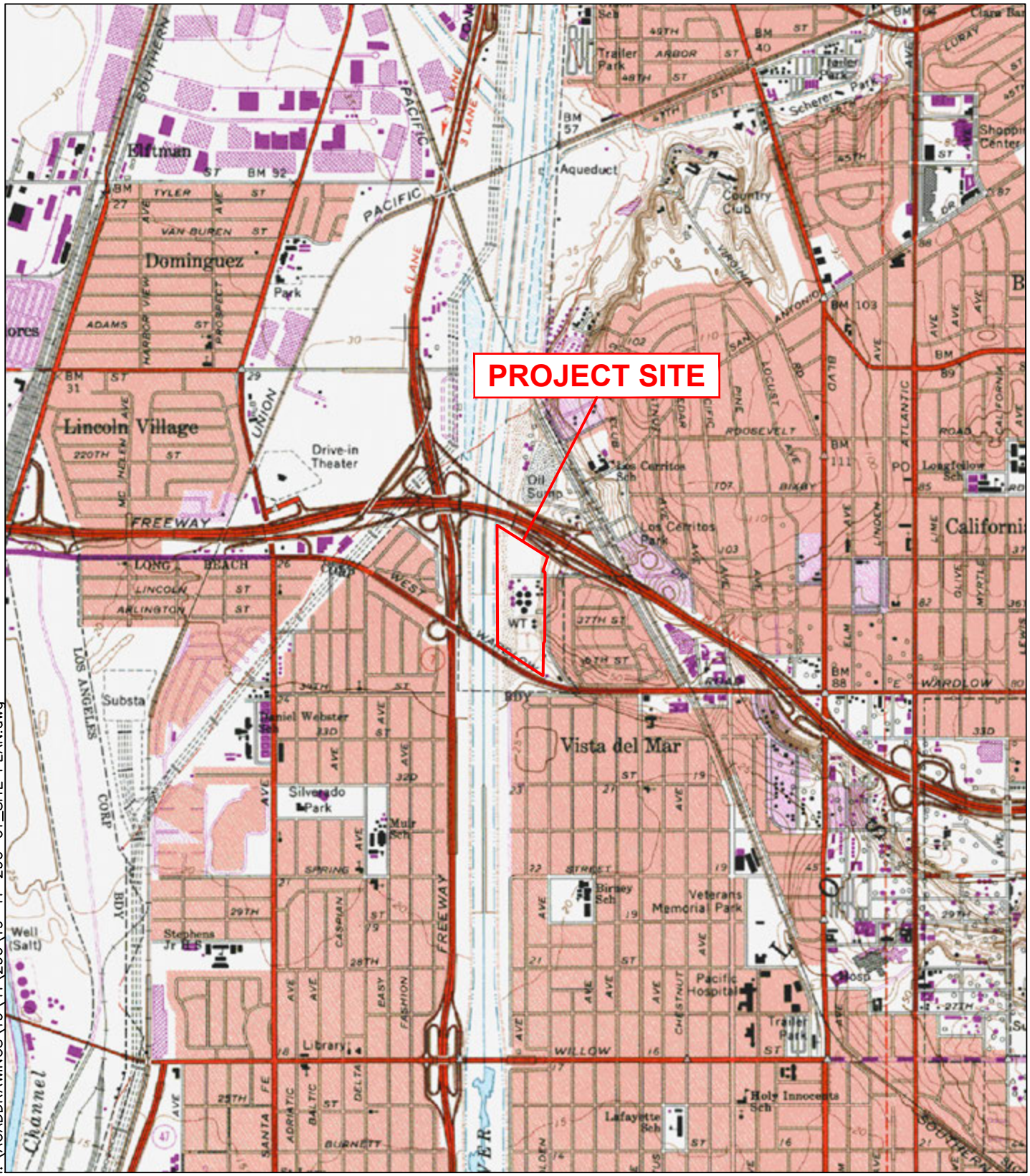
Figures

Figure 1, Site Location Map
Figure 2, Project Site Aerial Photo
Figure 3, Long Beach Geologic Map
Figure 4, Southern California Regional Fault Map
Figure 5, Epicenters Map of Southern California Earthquakes (1800-1999)
Figure 6, Seismic Hazard Zones Map



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SITE LOCATION MAP

0 1,000' 2,000'

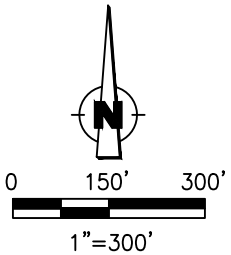
SCALE: 1"=2,000'
SCALE IN FEET

Converse Consultants

PROPOSED 20-ACRE RESIDENTIAL DEVELOPMENT
712 BAKER STREET
LONG BEACH, CALIFORNIA

Figure No.
19-41-290-01

Figure No.
1



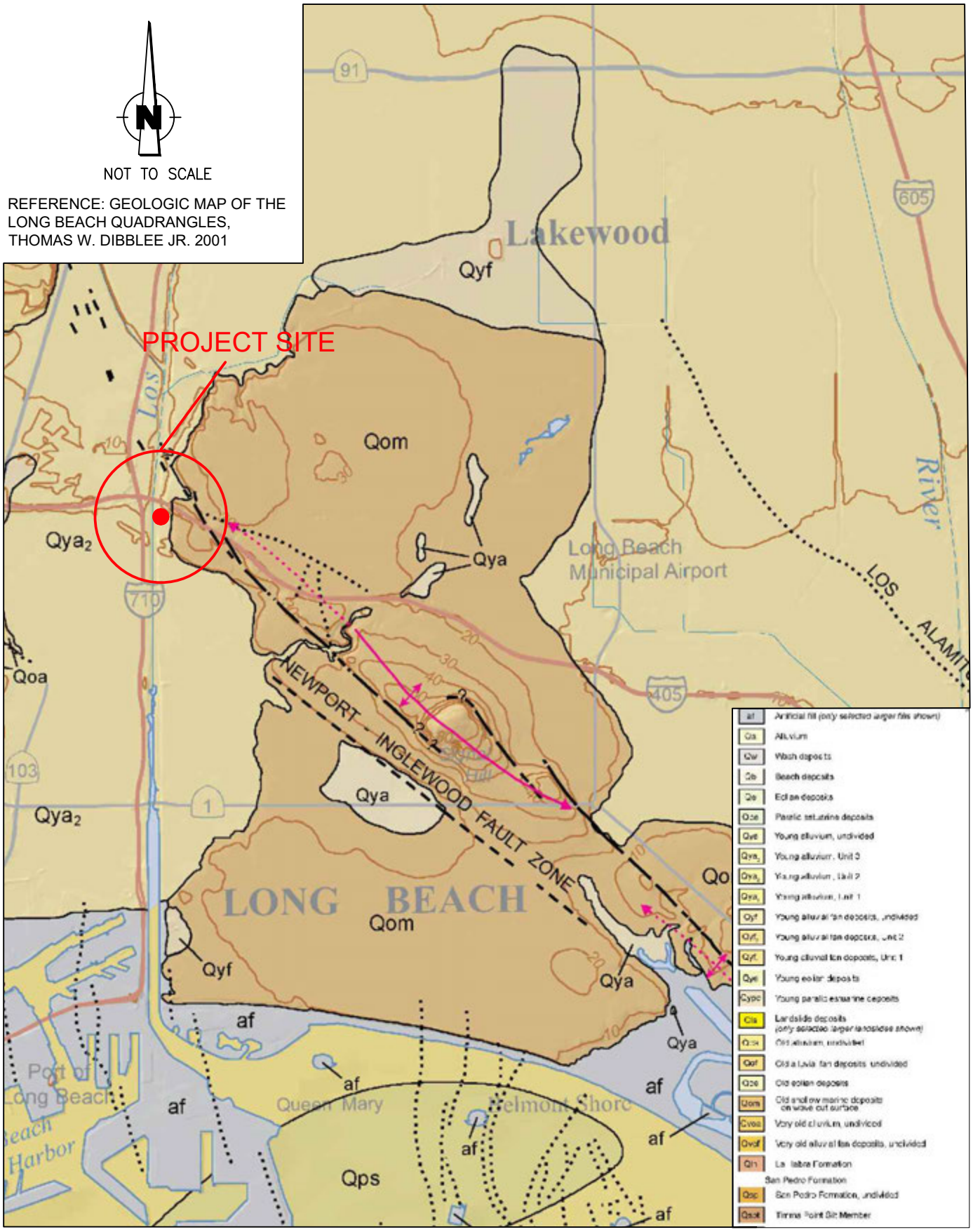
PROJECT SITE AERIAL PHOTO

Converse Consultants

PROPOSED 20-ACRE RESIDENTIAL DEVELOPMENT
712 BAKER STREET
LONG BEACH, CALIFORNIA

Project No.
19-41-290-01

Figure No.
2



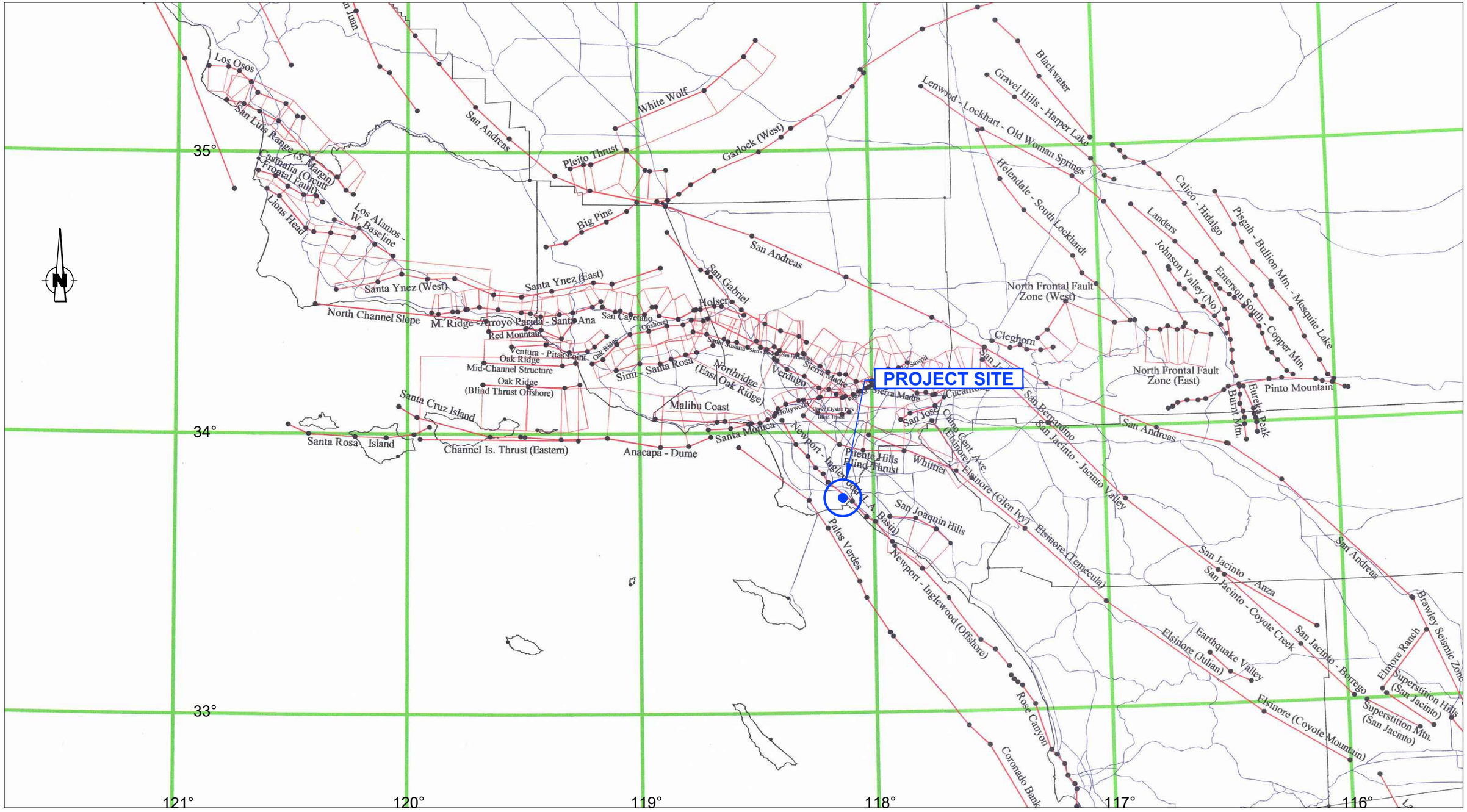
LONGBEACH GEOLOGIC MAP

Converse Consultants

PROPOSED 20-ACRE RESIDENTIAL DEVELOPMENT
712 BAKER STREET
LONG BEACH, CALIFORNIA

Project No. 19-41-290-01

Figure No. 3



REFERENCE: PORTION OF CGS 2002 CALIFORNIA FAULT MODEL MODIFIED FOR USE WITH FRISKSP AND EQFAULT BY THOMAS F. BLAKE, AUGUST 2004

FAULT SOURCES

BLIND THRUST FAULT, POLYGONS INDICATE RUPTURE PLANES AND DIP DIRECTION

SOUTHERN CALIFORNIA REGIONAL FAULT MAP

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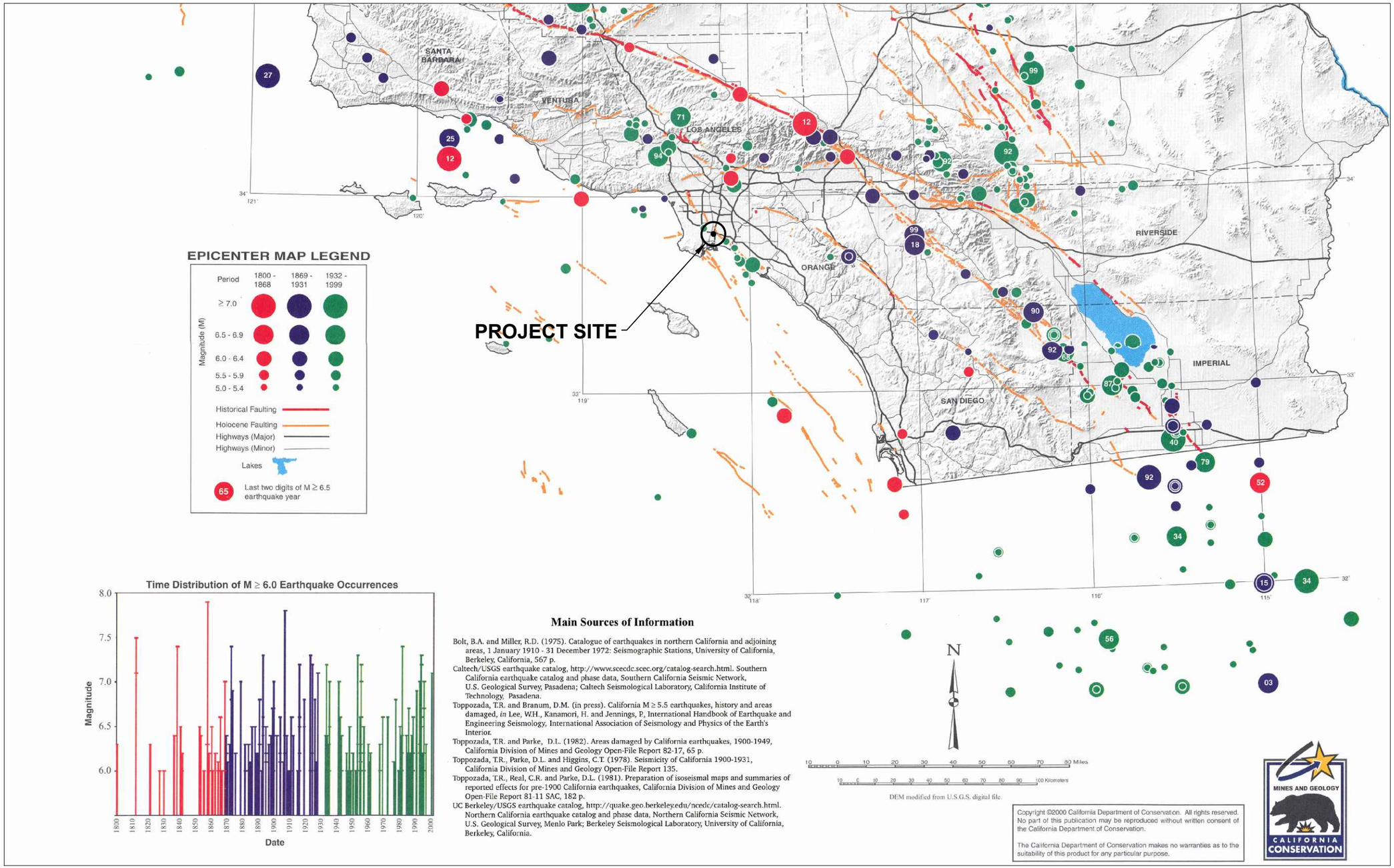
PROPOSED 20-ACRE
RESIDENTIAL DEVELOPMENT
712 BAKER STREET
LONG BEACH, CALIFORNIA

Project No. 19-41-290-01

Figure No. 4



Main Sources of Information

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REFERENCE: PORTION OF EPICENTERS AND AREAS DAMAGED BY M≥5 CALIFORNIA EARTHQUAKES, 1800-1999 CALIFORNIA DEPARTMENT OF CONSERVATION, MAP SHEET 49 DATED 2000.

EPICENTER MAP OF SOUTHERN CALIFORNIA EARTHQUAKES (1800-1999)

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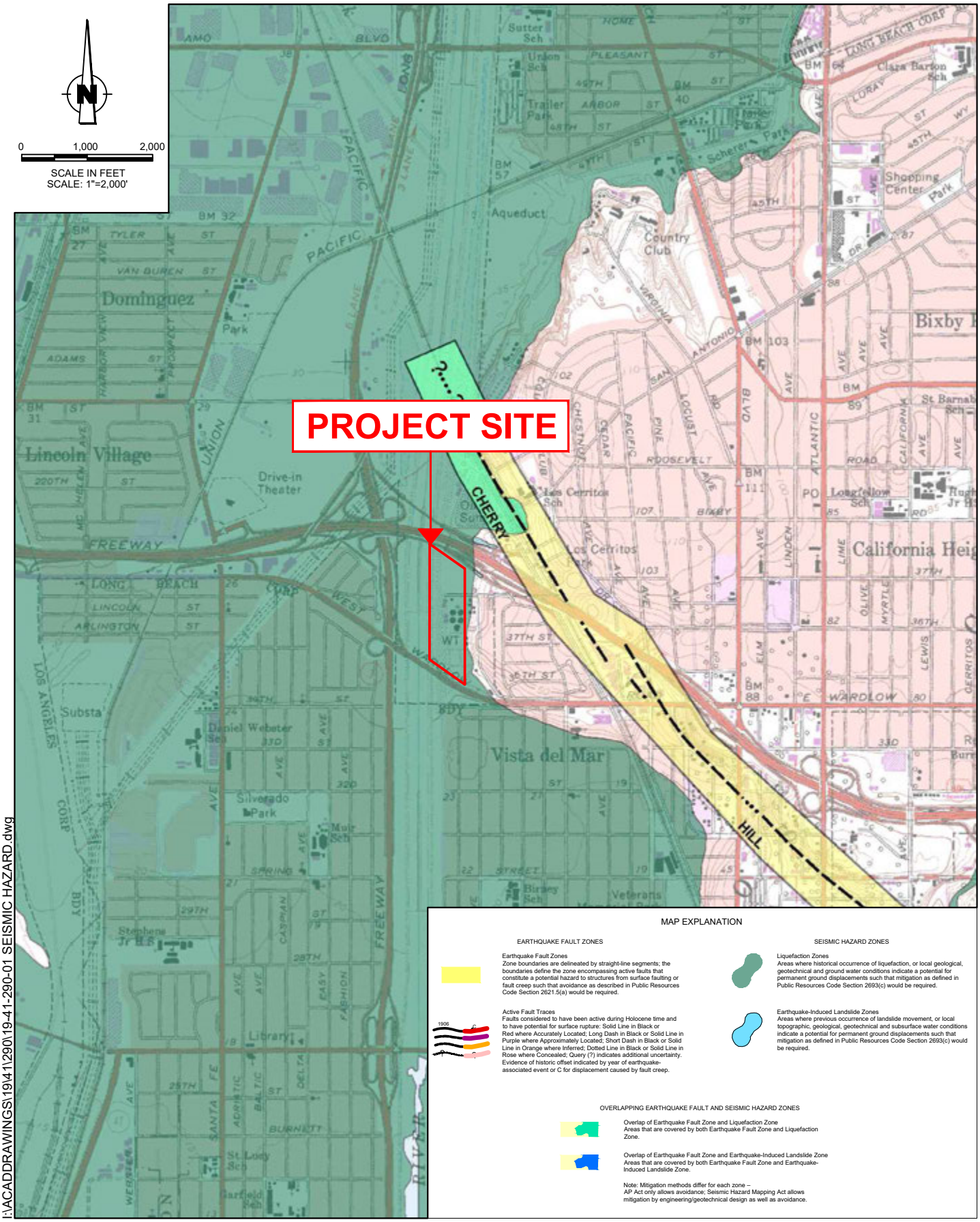
PROPOSED 20-ACRE
RESIDENTIAL DEVELOPMENT
712 BAKER STREET
LONG BEACH, CALIFORNIA

Project No. 19-41-290-01

Figure No. 5



I:\ACADDRAWINGS\19\41\290\19-41-290-01 SEISMIC HAZARD.dwg

REFERENCE: LONG BEACH QUADRANGLE 1999

SEISMIC HAZARD ZONES MAP

Converse Consultants

PROPOSED 20-ACRE RESIDENTIAL DEVELOPMENT
712 BAKER STREET,
LONG BEACH, CALIFORNIA

Project No. 19-41-290-01

Figure No. 6

F.2

Paleontological Resources Analysis

Converse Consultants
Geotechnical Engineering, Environmental & Groundwater Science, Inspection & Testing Services

June 17, 2020

Mr. Tony Locacciato, AICP, Partner
Meridian Consultants
920 Hampshire Road, Suite A-5
Westlake Village, California 91361

Subject: **GEOHAZARDS REPORT**
Proposed River Park Residential Development
712 Baker Street
Long Beach, Los Angeles County, California 90806
Converse Project No. 19-41-290-01

Dear Mr. Locacciato:

Converse Consultants (Converse) appreciates the opportunity to provide this Geohazards Report for the proposed River Park Residential Development located at 712 Baker Street in Long Beach, California. The proposed 20.12 acre single-family residential development site is to be located on the Oil Operators Inc. (OOI) properties. Environmental site characterizations and remediation activities on the site properties are currently being performed by others. It is proposed to coordinate the future geotechnical grading work (over-excavation and re-compaction of building pads, streets and improvements) during implementation of the remaining environmental remediation measures for the residential site development. This report was prepared in accordance with our proposal dated November 7, 2019.

Based on our geologic hazards assessment of the subject property, we conclude that the site is suitable for the proposed residential development from a geotechnical standpoint provided a site-specific geotechnical soils investigation is performed on the property and the recommendations presented in that report are incorporated during the design, permitting, grading, site remediation, and construction of the project site.

We appreciate the opportunity to be of service to Meridian Consultants. Should you have any questions, please do not hesitate to contact us at 626-930-1200.

Sincerely,

CONVERSE CONSULTANTS

PROFESSIONAL GEOLOGIST
MARK B. SCHLUTER
No. 1415
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

Mark B. Schluter, PG, CEG, CHG
Senior Engineering Geologist

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1.0 PROJECT SITE DESCRIPTION

The 20.12-acre property is located south of the San Diego Freeway (Interstate 405), north of Wardlow Road, east of the Los Angeles River Channel and Long Beach Freeway (Interstate 710) and west of Golden Avenue in the City of Long Beach, California as shown on Figure No. 1, *Site Location Map*. A new single-family residential development is proposed for the property that will include townhome style residences with associated access driveways, parking and recreational improvements. Residential development is planned on the 13.3 acre southern parcel at 712 West Baker Street (APN 7203-002-005) and the 4.8 acre northern parcel at 701 West Baker Street (APN 7203-002-001) is planned to remain as an open-space or be developed as a park. A four (4) foot deep retention swale for stormwater runoff is planned along the western length of the property. The proposed site grading is planned to be a balanced cut/fill operation with the exception of possible export of environmentally impacted earth materials that do not met the site remediation criteria and requirements.

Extensive environmental studies for soil gas, soil and ground water, site monitoring and site remediation activities have been performed on the Oil Operators, Inc. (OOI) property parcels from 1984 to present. Wastewater treatment activities have occurred on the property parcels since the 1920s. OOI operated an oil field wastewater treatment facility that treated oil field brines and wastewater that were direct by-products of crude oil drilling and oil production. Environmental monitoring and remediation activities on the property are still on going to further clean-up the site. Environmental remediation activities on the property parcels are currently being monitored and reviewed by the lead environmental enforcement agencies including the City of Long Beach and the State of California Los Angeles Regional Water Quality Control Board.

In 1959, a wastewater treatment plant was constructed on the property that consisted of five (5) circular concrete-walled skimming basins and associated pumps, aboveground storage tanks, pipelines and related small buildings and support facilities. The treatment plant was located north of two (2) rectangular-shaped, clay-lined, settling basins in the southern portion of the project site. The settling basins were referred to as Basin 1 and Basin 2. Basin 1 received oily residual solids that settled out of the produced water. Basin 2 received relatively clean processed water that was discharged off-site. The approximate location of the wastewater treatment plant on the central portion of the property is shown on Figure No. 1, *Site Location Map*.

In 1998 the water treatment facility ceased operations. In October 2000, the City of Long Beach Fire Department directed that liquid hydrocarbon products, wastewater and sludge be removed from the site and that hydrocarbon impacted soils and groundwater be remediated. The existing buildings, facilities, above ground storage tanks, structures, and pipelines were cleaned, demolished and disposed off-site in 2000 and 2001.

The existing site conditions are shown on Figure No. 2, *Project Site Aerial Photo*. Existing ground surface elevations range from approximately 25 feet to 40 feet above

mean sea level (msl). The proposed building pads for the residential development are planned to range between approximate elevations 34 feet to 41 feet above mean sea level (msl).

2.0 SUBSURFACE CONDITIONS

The project site is situated on a broad alluvial basin on the southern edge of the Los Angeles coastal plain. This coastal basin has been gradually filled with marine and non-marine sediments. The Los Angeles and San Gabriel rivers have deposited stream and flood sediments across the coastal plain during Holocene time (0-11,000 years) to form a relatively flat and broad river flood plain. Most of the river and stream channels flows are now controlled by an extensive network of flood control channels and storm drains which ultimately drain to the Pacific Ocean.

A general description of the subsurface conditions and various earth materials encountered during previous subsurface environmental field exploration performed by others at the project site are presented in this section.

2.1 Subsurface Profile

The project site is located on the Los Angeles coastal plain approximately 3.1 miles north of the Long Beach Harbor and Pacific Ocean. The project site is located in the southeast portion of the Los Angeles Basin near the western end of Signal Hill. Previous grading and earthwork has been performed along the edges of the project site to create the fill embankments for the Los Angeles River Flood Control Channel to the west of the site and for support of the San Diego Freeway (Interstate 405) raised freeway level and embankments to the north. The property is reported to be underlain by up to 26 feet of undocumented fill place during previous site grading and earthwork activities. The depth of undocumented fill varies across the project site and within the basins. The fill soils consist of fine-grained silty sand, sandy silts, silts, clayey silts and silty clays.

The fill soils are underlain by non-marine and marine alluvial sediments that have gradually filled the coastal basin over time to form a broad coastal plain as shown on Figure No. 3, *Long Beach Geologic Map*. Based on the exploratory soil borings and Cone Penetration Tests (CPTs), the native alluvial site soils consist of fine-grained, interbedded layers of sands, silty sands, sandy silts, silts, clayey silts and clays to the maximum explored depth of approximately 60 feet below ground surface (bgs).

2.2 Groundwater

Groundwater was encountered in the exploratory borings and monitoring wells installed across the project site at depths ranging from 30 feet to 51 feet below ground surface. Historically highest groundwater contours compiled by the CDMG (1998) for the Long Beach 7.5 minute indicate the historic high groundwater level is approximately 20 feet

below ground surface. Groundwater is not expected to be encountered during grading and construction of the project.

In general, groundwater levels fluctuate with the seasons and local zones of perched groundwater may be present within the near-surface deposits due to local conditions or during rainy seasons. Groundwater conditions below the site may vary depending on numerous factors including seasonal rainfall, local irrigation, stormwater recharge, pumping activities for sea water intrusion barriers, groundwater recharge and pumping, among other factors. The regional groundwater table is not expected to be encountered during the planned construction.

2.3 Subsurface Variations

Based on the results of the subsurface exploration by others and our experience, some variations in the continuity and nature of subsurface conditions within the project site should be anticipated. Because of the uncertainties involved in the nature and depositional characteristics of the earth material at the site, care should be exercised in interpolating or extrapolating subsurface conditions between or beyond the boring and CPT locations.

3.0 FAULTING AND GEOHAZARDS

3.1 Active Faults

The project site lies along the southern portion of the Los Angeles coastal plain in the Peninsular Ranges Geomorphic Province of California. The Peninsular Ranges province is characterized by northwest trending valleys and mountain ranges which have formed in response to regional tectonic forces along the boundary between the Pacific and North American tectonic plates. The Peninsular Ranges geomorphic province extends southward from the Transverse Ranges province at the north end of the Los Angeles basin to the southern tip of the Baja California Peninsula. The geologic structure is dominated by northwest trending, right-lateral faults, most notably the Newport-Inglewood fault, Whitter-Elsinore fault, San Jacinto fault and San Andreas fault. The approximate location of these local and regional faults with respect to the project site are shown on Figure No. 4, *Southern California Regional Fault Map*.

The project site is situated in a seismically active region. As is the case for most areas of Southern California, ground shaking resulting from earthquakes associated with nearby and more distant faults may occur at the project site. During the life of the project, seismic activity associated with active faults can be expected to generate moderate to strong ground shaking at the site. Review of recent seismological and geophysical publications indicates that the seismic hazard for the project site is high. Review of the California Geologic Survey Map Sheet 49, Epicenters and Areas Damaged by M>5 California Earthquakes, 1800-1999, (CGS, Toppozada et al., 2000), shows the mapped epicenters of earthquakes with magnitude 5.0 or greater in Southern

California during the past 200 years and is presented on Figure No. 5, *Epicenters Map of Southern California Earthquakes (1800-1999).*

Newport Inglewood Fault. The Newport-Inglewood fault zone boundary is located approximately 600 feet east of the project site. The Newport-Inglewood fault system is approximately 66 km long on shore and extends northwest from Huntington Beach through Long Beach to Culver City and the Cheviot Hills. The Newport-Inglewood fault continues offshore to the southeast of Huntington Beach and makes landfall in La Jolla as the Rose Canyon fault.

The Newport-Inglewood fault is characterized by a series of uplifts and anticlines including Newport Mesa, Huntington Beach Mesa, Bolsa Chica Mesa, Alamitos Heights and Landing Hill, Signal Hill and Reservoir Hill, Dominguez Hills and Baldwin Hills.

Several earthquakes have occurred along the fault zone including the March 10, 1933 “Long Beach” earthquake of M6.4, with its epicenter off Newport Beach, and smaller earthquakes at Inglewood on June 20, 1920 (M4.9) and May 17, 2009 (4.7), Torrance on October 21, 1941 (M4.8), Gardena on November 14, 1941 (M4.8), and Newport Beach on April 7, 1989 (M 4.7). These earthquakes show evidence of right-lateral strike slip focal mechanisms.

The Newport-Inglewood fault is considered to be active and considered capable of producing a maximum moment magnitude (Mw) 7.1 earthquake. The slip rate is considered to be about 1.0 mm/year but may range up to 2 to 3 mm/year along isolated segments.

The active Newport-Inglewood fault zone dominates the geologic structure in the Long Beach area. The mapped fault traces of the active Newport-Inglewood fault zone (Cherry Hill fault segment) are located approximately 0.18 mile to 0.37 mile east of the project site. The northwest-trending Newport-Inglewood fault zone exhibits surface geomorphic features including low eroded scarps along side-stepping fault segments and a series of northwest trending elongated low hills and mesas that extend from Newport Bay in Orange County northwestward to Beverly Hills. Signal Hill is one of these fault uplifted hillsides along the Newport-Inglewood fault zone and is located approximately 1/2 mile southeast of the project site. The major fault segments of the Newport-Inglewood fault zone in the Long Beach area include the Cherry Hill fault, Pickler fault, Northeast Flank fault, Reservoir Hill fault and Seal Beach fault. The orientation of these fault segments is generally attributed to right-lateral, strike-slip faulting at depth.

Whittier Fault. The mapped trace of the Whittier Fault is located approximately 16 miles northeast of the project site in the Puente Hills. The revised official map for the La Habra Quadrangle effective November 1, 1991, shows the Whitter Fault traces located northeast of the site in the Puente Hills to be zoned as an active fault trace with potential for surface fault rupture.

The Whitter Fault is considered part of the Elsinore Fault system, which is one of the major right-lateral strike slip faults on the Peninsular Ranges geomorphic province. The Elsinore faults splits northwestward into the Chino fault and westward into the Whittier fault near the City of Corona.

The Whitter Fault dips north with reverse separation along most of its length. However, the late Quaternary evidence is for nearly pure strike slip movement (Gath, 1977). Part of the uplift of the Puente Hills may accompany reverse faulting related to the restraining bend and more westerly strike of the Whitter fault. The Whitter fault turns more northwesterly at the San Gabriel River and Whittier Narrows to become the East Montebello fault. The Whitter Fault is considered capable of producing a magnitude Mw 6.8 earthquake.

Puente Hills Blind Thrust Fault. Potential for damage from earthquakes along a zone of north-dipping blind thrust faults in the northern Los Angles basin was illustrated by the M 5.9 Whittier earthquake event on October 1, 1987 and the M 6.7 Northridge earthquake event on January 17, 1994. Blind thrust faults are low angle reverse faults which generally have no surface trace and express tectonic deformation as folding and uplift of ridges. Examples of blind thrust fault landforms include the Elysian, Repetto and Montebello Hills and the Puente Hills.

Details concerning the Puente Hills Blind Thrust are limited by the fact that the thrust fault is buried below ground surface - thus, the term “blind” thrust fault. Conventional fault finding trenches, boreholes and paleoseismic dating methods used at the surface have limited use for study of these deeply buried thrust fault structures. The geometry and location of the blind thrust fault structures and thrust ramps are based on interpretation of oil well data, seismic and strong motion data solutions, high resolution geophysical data, paleoseismic studies and structural model analyses (Yeats, R.S., 2004, Dolan, J.F. et al., 2003). Recent revisions to fault parameter models have replaced the lower Elysian Park Thrust Fault with the Puente Hills Blind Thrust and Upper Elysian Park Blind Thrust (Cao, T. et al.,2003). Seismic hazard fault models for the Los Angeles basin and vicinity will continue to be refined as new information and technology develops and becomes available through time.

The Puente Hills Blind Thrust has been interpreted to be approximately 42 km long and 19 km wide with a depth range of 3 km to 13 km below ground surface (Dolan, J.F., et al., 2003). The thrust fault dips northward from the Montebello Hills and Puente Hills beneath the San Gabriel basin.

Paleoseismic studies of the Puente Hills Blind Thrust have indicated the occurrence of at least four large Mw 7.2 to 7.5 earthquakes on this fault during the past 11,000 years.

As is the case for most areas of Southern California, strong ground shaking resulting from earthquakes associated with nearby and more distant faults may occur at the

project site. During the life of the project, seismic activity associated with active faults can be expected to generate moderate to strong ground shaking at the site.

3.2 Geohazards

Geologic hazards are defined as geologically related conditions that may present a potential danger to life and property. Geologic hazards in Southern California include fault surface rupture, landslides, soil liquefaction, lateral spreading, seismically induced slope instability, earthquake-induced flooding and tsunami and seiches due to seismic shaking. The site-specific potential for each of these seismic hazards is discussed in the following sections.

Fault Surface Rupture. The project site is not located within a currently designated State of California Earthquake Fault Zone (formerly Alquist-Priolo Special Studies Zones) for surface fault rupture. The Alquist Priolo Earthquake Fault Zoning Act requires the California Geologic Survey to zone “active faults” within the State of California. An “active fault” has exhibited surface displacement within Holocene time (within the last 11,700 years) hence constituting a potential hazard to structures that may be located across it. Essential service structures are required to be set-back at least 50 feet from an active fault. The active fault set-back distance is measured perpendicular from the dip of the fault plane. Based on review of existing geologic information, no know active faults project through or toward the site. The nearest mapped active fault trace is the Newport-Inglewood fault zone located approximately 0.18 mile to 0.37 mile east of the project site as shown on Figure No. 6, *Seismic Hazard Zones Map*. The potential for surface rupture resulting from the movement of nearby major faults, or currently unknown faults, is not known with certainty but is considered low.

Landslides. The project site is relatively flat. Fill slope embankments for the Los Angeles River channel embankment are located along the west side of the project site and along the north side of the property along the San Diego Freeway (Interstate 405). These engineered fill slope embankments range from 20 to 25 feet in vertical height. No earthquake-induced landslide areas are shown on the Earthquake Zones of Required Investigation – Long Beach Quadrangle by the California Geologic Survey for the project site. In the absence of significant ground slopes, the potential for seismically induced landslides to affect the proposed site is considered to be very low.

Liquefaction. Liquefaction is the sudden decrease in the strength of cohesionless soils due to dynamic or cyclic shaking. Saturated soils behave temporarily as a viscous fluid (liquefaction) and, consequently, lose their capacity to support the structures founded on them. The potential for liquefaction decreases with increasing clay and gravel content but increases as the ground acceleration and duration of shaking increase. Liquefaction potential has been found to be the greatest where the groundwater level and loose sands occur within 50 feet of the ground surface. Soil liquefaction generally occurs in submerged sandy soils and non-plastic silts during or after strong ground

shaking. There are several general requirements for liquefaction to occur. They are as follows.

- Soils must be submerged
- Soils must be primarily sandy
- Soils must be loose to medium-dense
- Ground motion must be intense
- Duration of shaking must be sufficient for the soils to lose shear resistance

The project site is underlain by alluvial sediments that are identified within a mapped potential liquefaction zone as shown on the Earthquake Zones of Required Investigation-Long Beach Quadrangle (1999) and on Figure No. 6, *Seismic Hazard Zones Map*. The potential for liquefaction and seismic settlement ground failures at the site shall require a site specific geotechnical investigation to evaluate liquefaction potential and mitigation measures.

Lateral Spreading. Seismically induced lateral spreading involves primarily lateral movement of earth materials due to ground shaking. It differs from the slope failure in that complete ground failure involving large movement does not occur due to the relatively smaller gradient of the initial ground surface. Lateral spreading is demonstrated by near-vertical cracks with predominantly horizontal movement of the soil mass involved. The project site is underlain by alluvial sediments that are identified within a mapped potential liquefaction zone. The topography at the project site is relatively flat. Fill slope embankments for the Los Angeles River channel are located along the west side of the project site and for the San Diego Freeway along the north side of the site. These fill slopes were engineered to provide support for their respective structures. Under these circumstances, the potential for lateral spreading on these fill slope embankments are considered low. The potential for lateral spreading ground failure at the site shall require a site specific geotechnical investigation to evaluate lateral spreading potential and mitigation measures if needed.

Seismically Induced Slope Instability. Seismically induced landslides and other slope failures are common occurrences during or soon after earthquakes. The project site is not shown with any earthquake-induced landslide areas due the relatively flat ground conditions of the site topography. In the absence of significant ground slopes, the potential for seismically induced landslides to affect the proposed site is considered to be very low.

Earthquake-Induced Flooding. Review of the Flood Insurance Rate Map (FIRM), Map Number 06037C1955F, dated September 26, 2008, from the FEMA Map Service Center Viewer, indicates that the site is in an area designated as Zone X, “area of minimal flood hazard”. The area along the west side of the project site at the base of the Los Angeles River channel embankment is mapped as an “area with reduced flood risk due to levee”. The Los Angeles River flood channel located west of the project site was built with a low flow central channel and lined with concrete on the bottom and embankment sidewalls

to control erosion. The area within the Los Angeles River channel concrete lined embankments are shown as Zone A, “special flood hazard areas”. Due to the absence of groundwater at shallow depths, proximity of the Los Angeles River channel that serves as a regional flood control structure, and freeway embankments located along *the north side of the project site, the potential for earthquake induced flooding at the* project site is considered low.

Tsunami and Seiches. Tsunamis are seismic sea waves generated by fault displacement or major ground movement. *Based on the location of the site from the* Pacific Ocean (approximately 3.1 miles) and review of the *Tsunami Inundation Map for Emergency Planning – Long Beach Quadrangle, dated March 1, 2009, tsunamis do not* pose a hazard. The mapped tsunami inundation run up area extends northward up the Los Angeles River flood channel to approximately 1.4 miles south of the project site to an area south Willow Street. Seiches are large waves generated in enclosed bodies of water in response to ground shaking. Based on site locations away from lakes and reservoirs, seiches do not pose a hazard.

Volcanic Eruption Hazard. There are no know volcanoes near the site. According to Jennings (1994), the nearest potential hazards from volcanic eruptions is the Amboy Crater-Lava Lake area located in the Mojave Desert more than 120 miles northeast of the project site. Volcanic eruption hazards are not present.

4.0 GEOTECHNICAL INVESTIGATIONS AND MONITORING

A site specific geotechnical investigation with subsurface exploration, soil sampling, laboratory testing and engineering analyses should be performed to further evaluate the subsurface soil condition and potential geologic hazards for residential development. It is proposed to coordinate the site grading work with implementation of environmental mitigation measures. Geotechnical recommendations and mitigation measures for site development shall then be provided for site clearing, grading, over-excavation and re-compaction, environmental mitigation, vapor membranes, foundation designs, corrosion and pavement designs. The geotechnical consultant should then review the plans and specifications as the project design progresses. Such review is necessary to identify design elements, assumptions, or new conditions which require revisions or additions to the geotechnical recommendations.

The project geotechnical consultant should then be present to observe conditions during grading and construction. Geotechnical observation and testing should be performed as needed to verify compliance with project specifications and building codes. Additional geotechnical recommendations may be required based on subsurface conditions encountered during construction.

5.0 CLOSURE

The findings and opinions of this geohazard report were prepared in accordance with generally accepted engineering geologic principals and practice. The report was prepared without the benefit of subsurface investigation and testing. We make no warranty, either express or implied. Our opinions and conclusions are based on the review of available published maps, documents and information. Our services are for the sole benefit and exclusive use of Meridian Consultants as it pertains to the subject property in accordance with the General Conditions under which these services are provided.

The Scope of Services for this report were designed solely in accordance with the objectives, schedule, budget and risk-management preferences of Meridian Consultants. This report should not be regarded as a guarantee that no further geohazard, beyond which could be detected within the scope of this study, is present at the property. Converse makes no warranties or guarantees as the accuracy or completeness of information provided or compiled by others. It is possible that information exists beyond the scope of this study. It is not possible absolutely confirm that no geohazards exist at the property. If none are identified as part of a limited scope of work, such a conclusion should not be construed as a guaranteed absence, but merely the results of the evaluation of the property at the time of the study. Additional information, which was not found or available to Converse at the time of report preparation, may result in a modification of the conclusions and recommendations presented. Any reliance on this report by Third Parties shall be at the Third Party' sole risk.

Thank you for the opportunity to be of assistance. If you should have any questions regarding this report, please do not hesitate to contact Mark Schluter at (626) 930-1223 or Norman Eke at (626) 930-1260.

6.0 REFERENCES

CALIFORNIA DEPARTMENT OF CONSERVATION, 1988, Seismic Hazard Zone Report for the Long Beach 7.5-Minute Quadrangle, Los Angeles County, California.

CALIFORNIA GEOLOGIC SURVEY, 1999, Earthquake Zones of Required Investigation, Long Beach Quadrangle, Earthquake Fault Zones Revised Official Map Released July 1, 1986, Seismic Hazard Zones Official Map Released March 25, 1999.

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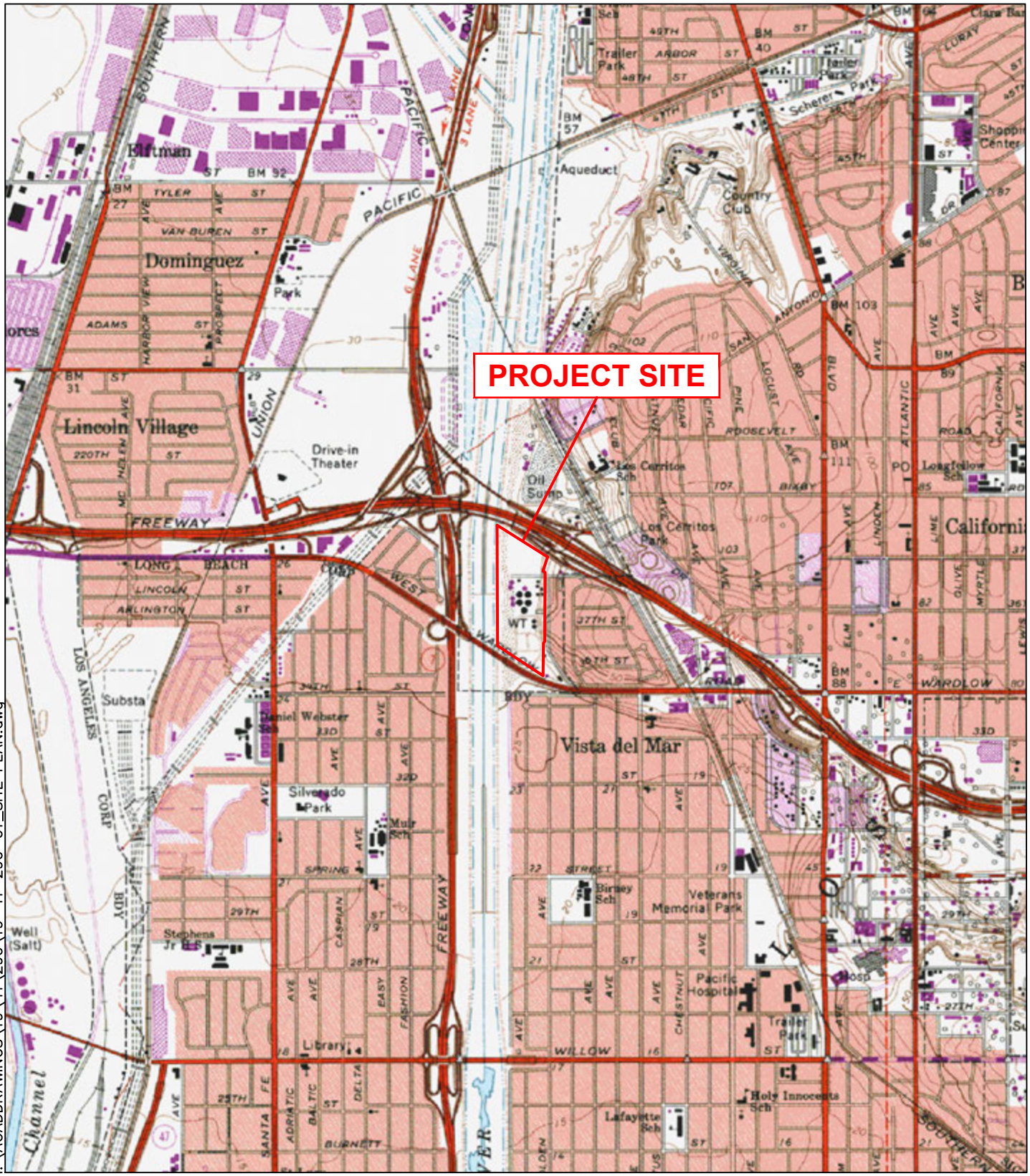
Figures

Figure 1, Site Location Map
Figure 2, Project Site Aerial Photo
Figure 3, Long Beach Geologic Map
Figure 4, Southern California Regional Fault Map
Figure 5, Epicenters Map of Southern California Earthquakes (1800-1999)
Figure 6, Seismic Hazard Zones Map



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SITE LOCATION MAP

0 1,000' 2,000'

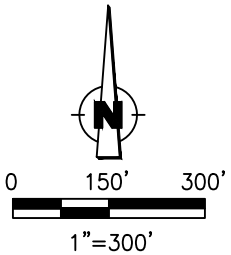
SCALE: 1"=2,000'
SCALE IN FEET

Converse Consultants

PROPOSED 20-ACRE RESIDENTIAL DEVELOPMENT
712 BAKER STREET
LONG BEACH, CALIFORNIA

Figure No.
19-41-290-01

Figure No.
1



PROJECT SITE AERIAL PHOTO

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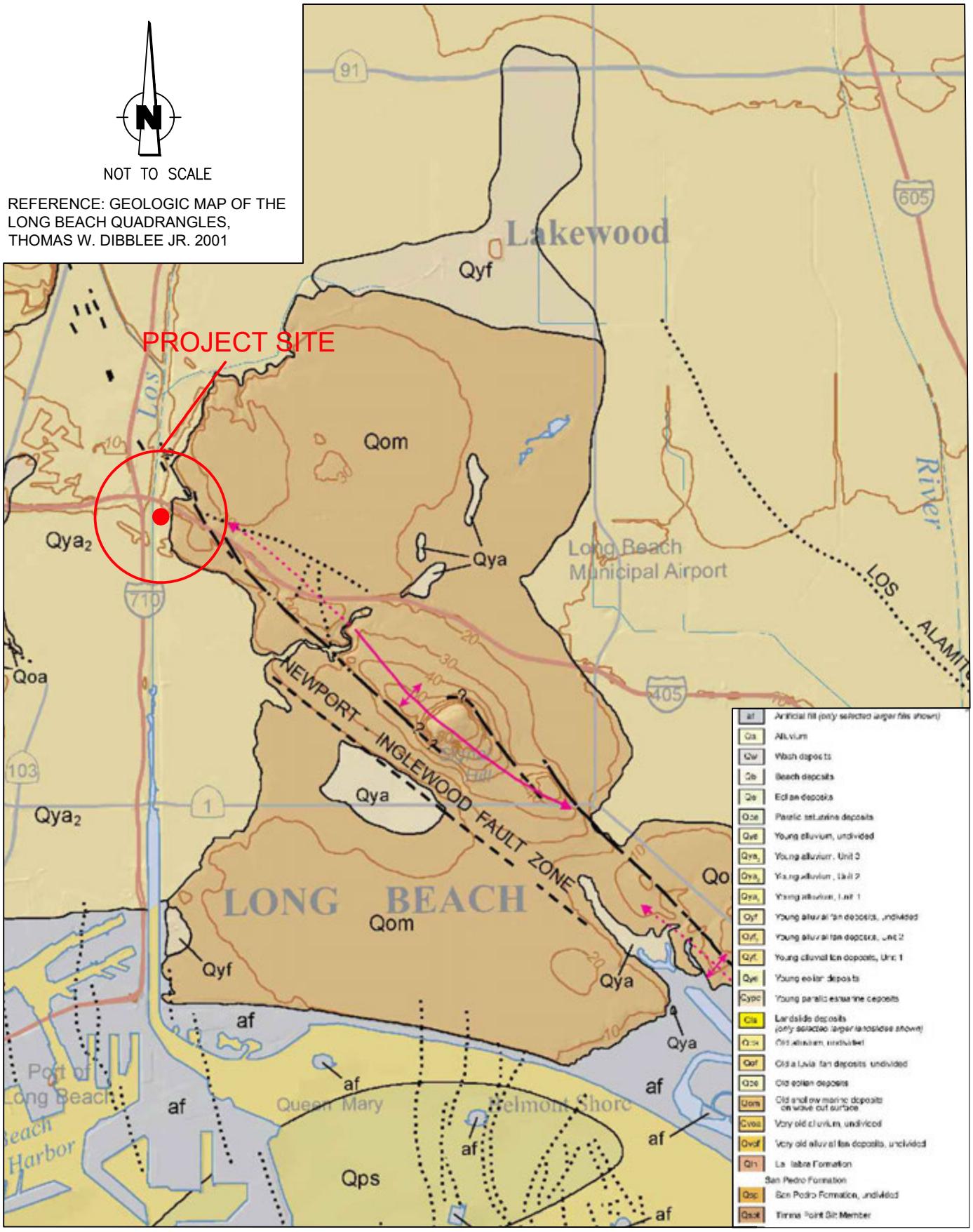
PROPOSED 20-ACRE RESIDENTIAL DEVELOPMENT
712 BAKER STREET
LONG BEACH, CALIFORNIA

Project No.
19-41-290-01

Figure No.
2



LONGBEACH GEOLOGIC MAP

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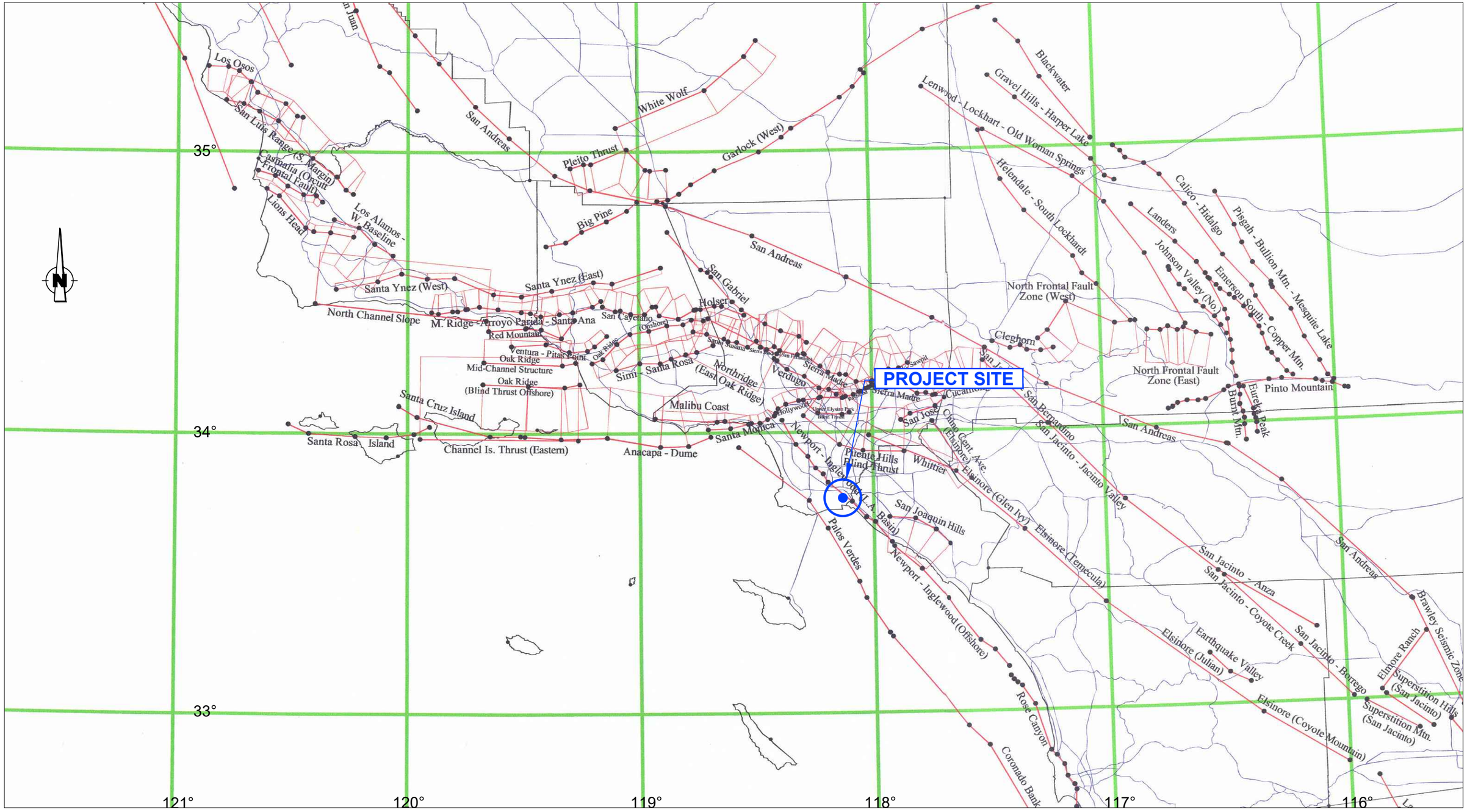
PROPOSED 20-ACRE RESIDENTIAL DEVELOPMENT
712 BAKER STREET
LONG BEACH, CALIFORNIA

Project No. 19-41-290-01

Figure No. 3



REFERENCE: PORTION OF CGS 2002 CALIFORNIA FAULT MODEL MODIFIED FOR USE WITH FRISKSP AND EQFAULT BY THOMAS F. BLAKE, AUGUST 2004

FAULT SOURCES

BLIND THRUST FAULT, POLYGONS INDICATE RUPTURE PLANES AND DIP DIRECTION

SOUTHERN CALIFORNIA REGIONAL FAULT MAP

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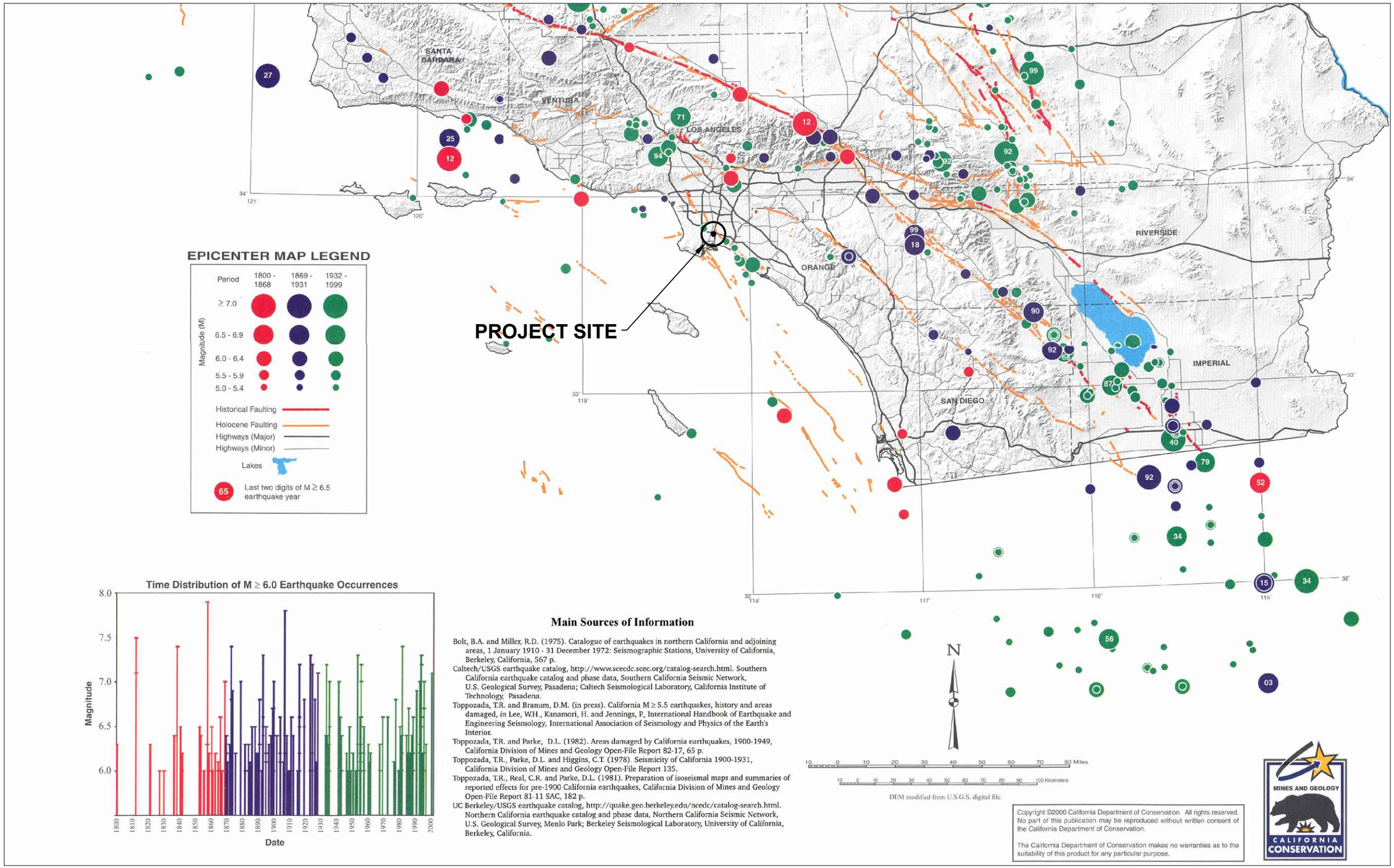
PROPOSED 20-ACRE
RESIDENTIAL DEVELOPMENT
712 BAKER STREET
LONG BEACH, CALIFORNIA

Project No. 19-41-290-01

Figure No. 4



Main Sources of Information

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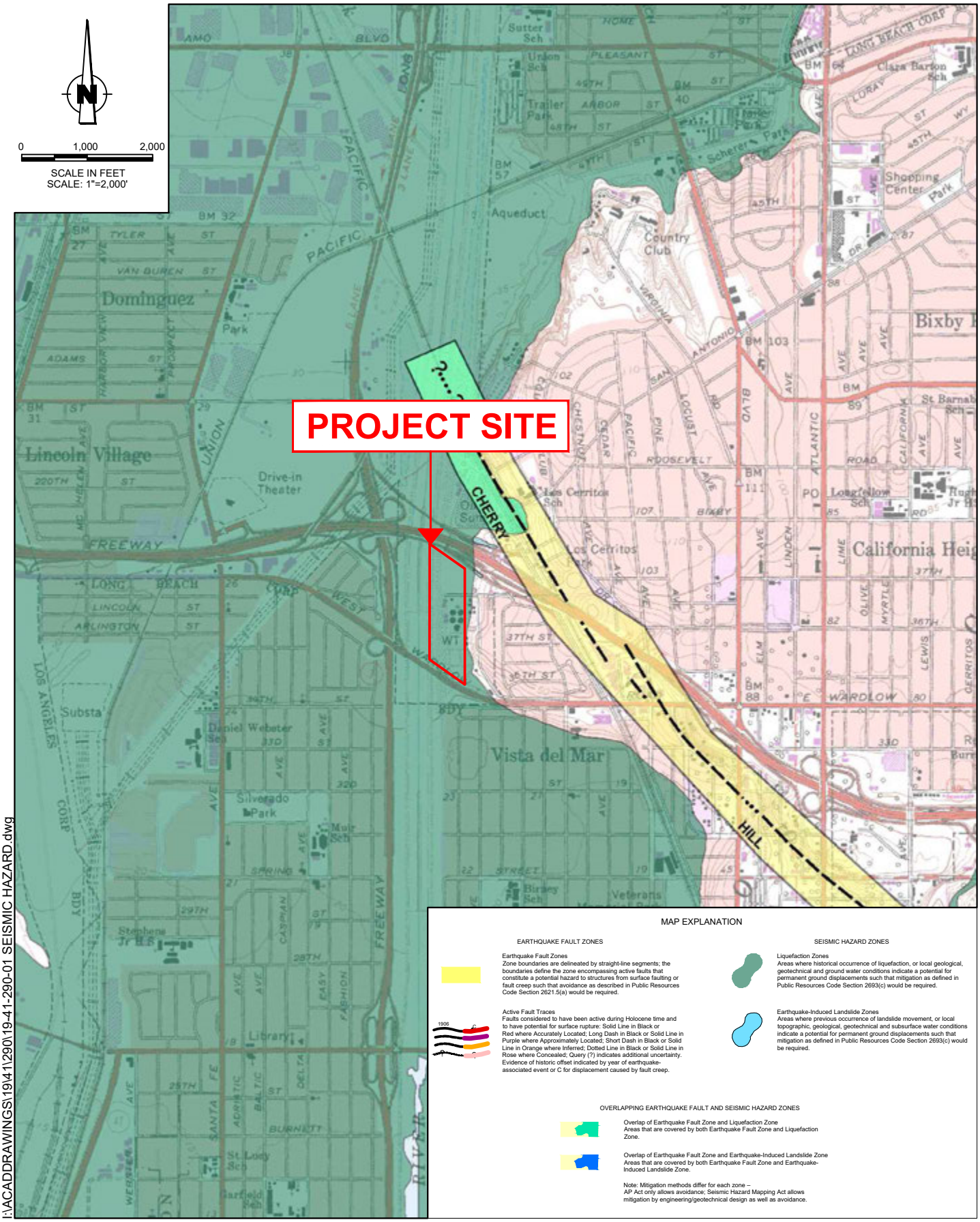
EPICENTER MAP OF SOUTHERN CALIFORNIA EARTHQUAKES (1800-1999)

Converse Consultants

PROPOSED 20-ACRE
RESIDENTIAL DEVELOPMENT
712 BAKER STREET
LONG BEACH, CALIFORNIA

Project No. 19-41-290-01

Figure No. 5



I:\ACADDRAWINGS\19\41\290\19-41-290-01 SEISMIC HAZARD.dwg

REFERENCE: LONG BEACH QUADRANGLE 1999

SEISMIC HAZARD ZONES MAP

Converse Consultants

PROPOSED 20-ACRE RESIDENTIAL DEVELOPMENT
712 BAKER STREET,
LONG BEACH, CALIFORNIA

Project No. 19-41-290-01

Figure No. 6

F.3

Paleontological Resources Assessment

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April 14, 2021

Christine Lan
Senior Project Manager
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706 S. Hill Street, 11th Floor
Los Angeles, CA 90014
Transmitted via email to CLan@meridianconsultantsllc.com

RE: Paleontological Resource Assessment for the Long Beach River Park Development Project, City of Long Beach, Los Angeles County, California

Dear Ms. Lan,

At the request of Meridian Consultants, LLC, PaleoWest LLC. (PaleoWest) conducted a paleontological resource assessment for the Long Beach River Park Development Project (Project) in the city of Long Beach, Los Angeles County, California.The goal of the assessment is to identify the geologic units that may be impacted by development of the Project, determine the paleontological sensitivity of geologic unit(s) within the Project area, assess potential for impacts to paleontological resources from development of the Project, and recommend mitigation measures to avoid or mitigate impacts to scientifically significant paleontological resources, as necessary.

This paleontological resource assessment included a fossil locality records search conducted by the Natural History Museum of Los Angeles County (NHMLAC). The records search was supplemented by a review of existing geologic maps and primary literature regarding fossiliferous geologic units within the proposed Project vicinity and region. This technical memorandum, which was written in accordance with the guidelines set forth by the Society of Vertebrate Paleontology (SVP) (2010), has been prepared to support environmental review under the California Environmental Quality Act (CEQA).

PROJECT DESCRIPTION

The proposed Project lies along the east side of the Los Angeles River, immediately south of the 405 in the city of Long Beach in Los Angeles County (Figures 1 and 2). The Project site is situated within Township 4 South, Range 13 West on the Long Beach CA USGS 7.5-minute quadrangle. The lot is 20.3 acres on Assessor's Parcel Numbers (APNs) 7203-002-001, 005, 007, 008, 009, and 0010.

The proposed Project involves the construction of condominium and townhouse residential units as well as an open space recreation area.

Figure 1. Project Vicinity Map

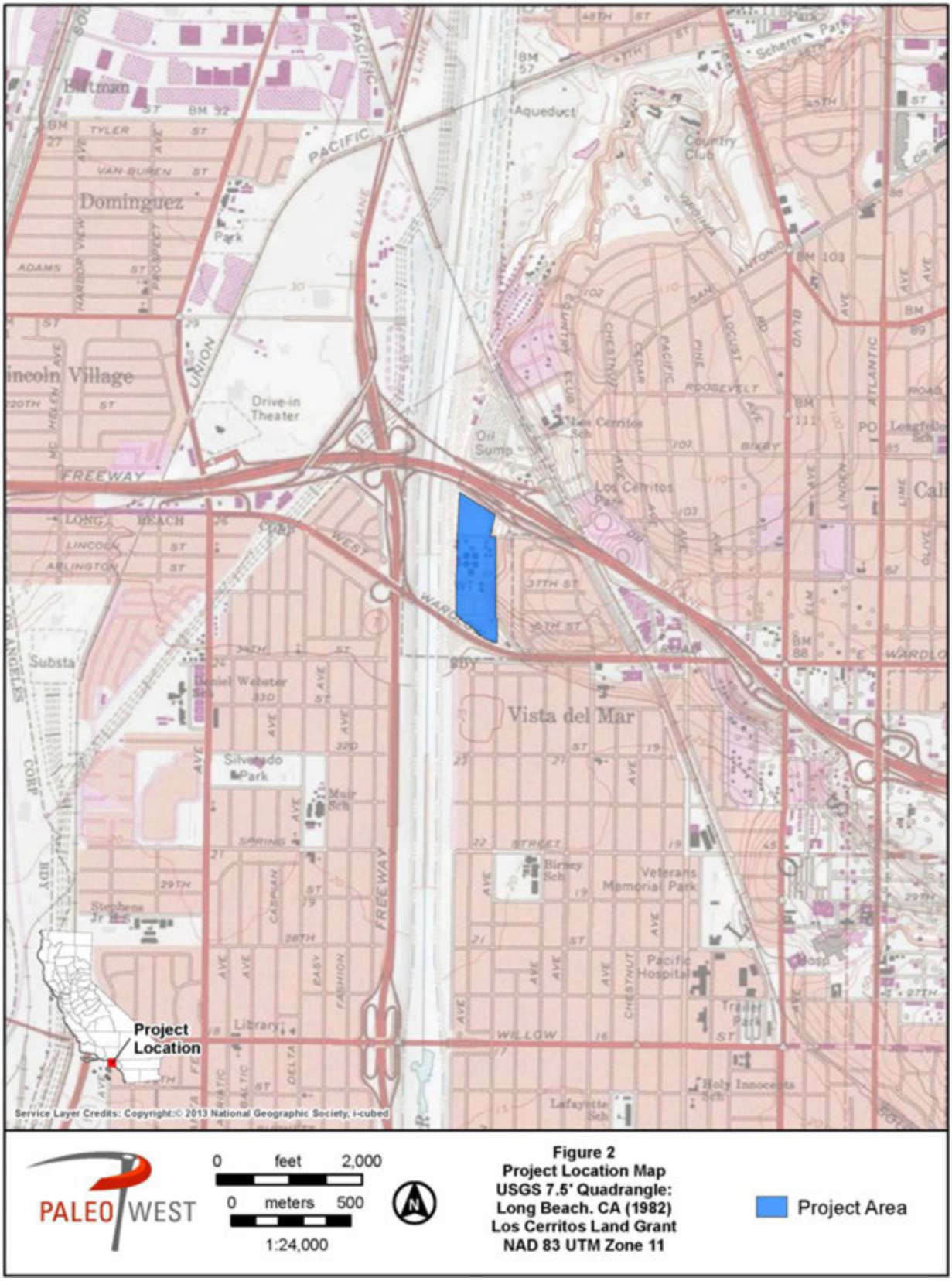

Figure 2. Project Location Map

REGULATORY CONTEXT

Paleontological resources (i.e., fossils) are considered nonrenewable scientific resources because once destroyed, they cannot be replaced. As such, paleontological resources are afforded protection under various federal, state, and local laws and regulations. Laws pertinent to this Project are discussed below.

STATE LAWS AND REGULATIONS

California Environmental Quality Act

CEQA requires that public agencies and private interests identify the potential environmental consequences of their Projects on any object or site of significance to the scientific annals of California (Division I, California Public Resources Code [PRC] Section 5020.1 [b]). Appendix G in Section 15023 provides an Environmental Checklist of questions (PRC 15023, Appendix G, Section VII, Part f) that includes the following: "Would the project directly or indirectly destroy a unique paleontological resource or site or unique geological feature?"

CEQA does not define "a unique paleontological resource or site." However, the Society of Vertebrate Paleontology (SVP) has provided guidance specifically designed to support state and Federal environmental review. The SVP broadly defines significant paleontological resources as follows (SVP 2010, page 11):

> "Fossils and fossiliferous deposits consisting of identifiable vertebrate fossils, large or small, uncommon invertebrate, plant, and trace fossils, and other data that provide taphonomic, taxonomic, phylogenetic, paleoecologic, stratigraphic, and/or biochronologic information. Paleontological resources are considered to be older than recorded human history and/or older than middle Holocene (i.e., older than about 5,000 radiocarbon years)."

Significant paleontological resources are determined to be fossils or assemblages of fossils that are unique, unusual, rare, diagnostically important, or are common but have the potential to provide valuable scientific information for evaluating evolutionary patterns and processes, or which could improve our understanding of paleochronology, paleoecology, paleophylogeography, or depositional histories. New or unique specimens can provide new insights into evolutionary history; however, additional specimens of even well represented lineages can be equally important for studying evolutionary pattern and process, evolutionary rates, and paleophylogeography. Even unidentifiable material can provide useful data for dating geologic units if radiometric dating is possible. As such, common fossils (especially vertebrates) may be scientifically important, and therefore considered significant.

California Public Resources Code

Section 5097.5 of the Public Resources Code (PRC) states:

> "No person shall knowingly and willfully excavate upon, or remove, destroy, injure or deface any historic or prehistoric ruins, burial grounds, archaeological or vertebrate paleontological site, including fossilized footprints, inscriptions made by human agency, or any other archaeological, paleontological or historical

feature, situated on public lands, except with the express permission of the public agency having jurisdiction over such lands. Violation of this section is a misdemeanor."

As used in this PRC section, "public lands" means lands owned by, or under the jurisdiction of, the state or any city, county, district, authority, or public corporation, or any agency thereof. Consequently, public agencies are required to comply with PRC 5097.5 for their own activities, including construction and maintenance, as well as for permit actions (e.g., encroachment permits) undertaken by others.

PALEONTOLOGICAL RESOURCE POTENTIAL

Absent specific agency guidelines, most professional paleontologists in California adhere to the guidelines set forth by SVP (2010) to determine the course of paleontological mitigation for a given project. These guidelines establish protocols for the assessment of the paleontological resource potential of underlying geologic units and outline measures to mitigate adverse impacts that could result from project development. Using baseline information gathered during a paleontological resource assessment, the paleontological resource potential of the geologic unit(s) (or members thereof) underlying a Project area can be assigned to one of four categories defined by SVP (2010). These categories include high, undetermined, low and no paleontological resource potential (see Table 1 below):

Table 1. Paleontological Sensitivity Categories

Resource Potential*	Criteria	Mitigation Recommendations
High Potential (sensitivity)	Rock units from which significant vertebrate or significant invertebrate fossils or significant suites of plant fossils have been recovered are considered to have a high potential for containing significant non-renewable fossiliferous resources. These units include but are not limited to, sedimentary formations and some volcanic formations which contain significant nonrenewable paleontological resources anywhere within their geographical extent, and sedimentary rock units temporally or lithologically suitable for the preservation of fossils. Sensitivity comprises both (a) the potential for yielding abundant or significant vertebrate fossils or for yielding a few significant fossils, large or small, vertebrate, invertebrate, or botanical and (b) the importance of recovered evidence for new and significant taxonomic, phylogenetic, ecologic, or stratigraphic data. Areas which contain potentially datable organic remains older than Recent, including deposits associated with nests or middens, and areas which may contain new vertebrate deposits, traces, or trackways are also classified as significant.	Typically, a field survey (dependent on field conditions) as well as onsite construction monitoring will be required. Any significant specimens discovered will need to be prepared, identified, and curated into a museum. A final report documenting the significance of the finds will also be required.
Low Potential (sensitivity)	Sedimentary rock units that are potentially fossiliferous, but have not yielded fossils in the past or contain common and/or widespread invertebrate fossils of well documented and understood taphonomic, phylogenetic species and habitat	Mitigation is not typically required.

Resource Potential*	Criteria	Mitigation Recommendations
	ecology. Reports in the paleontological literature or field surveys by a qualified vertebrate paleontologist may allow determination that some areas or units have low potentials for yielding significant fossils prior to the start of construction. Generally, these units will be poorly represented by specimens in institutional collections and will not require protection or salvage operations. However, as excavation for construction gets underway it is possible that significant and unanticipated paleontological resources might be encountered and require a change of classification from Low to High Potential and, thus, require monitoring and mitigation if the resources are found to be significant.	
Undetermined Potential (sensitivity)	Specific areas underlain by sedimentary rock units for which little information is available are considered to have undetermined fossiliferous potentials. Field surveys by a qualified vertebrate paleontologist to specifically determine the potentials of the rock units are required before programs of impact mitigation for such areas may be developed.	A field survey is required to further assess the unit's paleontological potential.
No Potential	Rock units of metamorphic or igneous origin are commonly classified as having no potential for containing significant paleontological resources.	No mitigation required.

*Adapted from SVP (2010)

METHODOLOGY

In order to assess whether or not a particular area has the potential to contain significant fossil resources at the subsurface, it is necessary to review published geologic mapping to determine the geology and stratigraphy of the area. Geologic units are considered to be "sensitive" for paleontological resources if they are known to contain significant fossils anywhere in their extent. Therefore, a search of pertinent local and regional museum repositories for paleontological localities within and nearby the project area is necessary to determine whether or not fossil localities have been previously discovered within a particular rock unit. For this Project, a formal museum records search was conducted at the NHMLAC.

RESOURCE CONTEXT

GEOLOGIC SETTING

The Project area is located in the Penninsular Ranges geomorphic province of southern California, a region bordered to the north by the Transverse Ranges and to the east by the Colorado Desert, and extending south into Baja California (Saucedo et al. 2016). Stratigraphically the region sits in the Los Angeles sedimentary basin. This basin formed as a result of transrotation of the Transverse Range block and subsequent accommodation by the formation of a sphenochasm in the geographic location of the modern Los Angeles Basin. Basin fill begins in the Miocene. Sediment fill was predominantly Miocene to Pliocene marine sediments with

deposition of such units as prolific petroliferous Monterey and Pico Formations. Today the basin is an emergent alluviated coastal plain (Yerkes et al. 1965). Through the Pleistocene with up lift of the region, a number of coastal terraces have formed as well (Woodring et al. 1946).

SITE SPECIFIC GEOLOGY AND PALEONTOLOGY

According to published geologic maps, the Project area is immediately underlain by Holocene and Pleistocene age surficial sediments (Qya_2) that locally consist of unconsolidated, permeable, flood plain clay, silt, sands and silty sands (Saucedo et al. 2016) (Figure 3). Holocene-age alluvial deposits, particularly those younger than 5,000 years old, are generally too young to contain fossilized material and are considered to have a low paleontological resource potential in accordance with SVP guidelines (2010). Early Holocene and Pleistocene alluvium (Qya_2) is mapped extensively within the Project boundary and vicinity. The very eastern edge of the Project area is underlain by Pleistocene, uplifted, shallow marine sediments (Qom). This unit is poorly sorted, unconsolidated, beach and near shore sediments. Due to the abrasive nature of such depositional environments, fossil preservation is typically poor. Pleistocene age alluvial sediments in the vicinity have preserved Ice Age vertebrate fauna of large land mammals, including mammoth and camel (Miller 1971, Bell 2020) (Table 2). Due to the intense historical usage of the site for the petroleum industry, in places in the Project area there is fill up to 25 feet deep (California Environmental 2019). Fill is considered low sensitivity for fossil resources.

RECORDS SEARCH RESULTS

The NHMLAC records five fossil localities from the vicinity of the Project, two invertebrate locations and three vertebrate locations. All of these come from similar geologic units as those that underlay the Project area, but none are found from within the Project boundary. All vertebrate bearing locations in the area were found over 19 feet below ground surface (Table 2).

Table 2. Fossil localities in vicinity of the Project from records of the NHMLAC

Locality #	Formation	Taxa	Depth
LACM VP 4129	Undetermined (Pleistocene)	Proboscidea; Camelidae	24 feet below ground surface (bgs)
LACM VP 3319	Undetermined (Pleistocene)	Mammoth (*Mammuthus*)	30 feet bgs
LACM IP 424	Undetermined (Pleistocene)	Invertebrates	Unknown
LACM IP 5059	Undetermined (Pleistocene)	Oyster shell bed (*Ostrea lurida*)	Unknown
LACM VP 3660	Undetermined (Pleistocene)	Mammoth (*Mammuthus*)	19 feet bgs

Data from Bell 2020

Figure 3. Geologic Map

FINDINGS

Shallow excavations in the Project area are unlikely to yield any significant paleontological resources because younger Quaternary deposits are void of fossils and near-surface alluvium is usually too young to contain fossils, and therefore possesses low sensitivity. In addition, the Project area has undergone significant surficial disturbance. As a result, no effects to paleontological resources would occur from earth-moving activities at shallow depths at the Project site. However, deeper excavations approaching 19 feet below ground surface in undisturbed sediment, that may extend down into older Quaternary (Pleistocene) alluvial deposits are more likely to unearth fossil vertebrate remains (Bell 2020). Older Quaternary deposits underlying the Project area are considered to have a high paleontological sensitivity because they have proven to yield significant paleontological resources (i.e., identifiable vertebrate fossils). Generally, ground-disturbing activities exceeding depths beyond Holocene soils and younger Quaternary alluvium would encounter older Quaternary alluvium and, consequently, should be monitored by a qualified paleontological monitor to identify and effectively salvage any recovered resources while minimizing discovery-related delays. Monitoring, even in deep excavations, of sedimentary fill is not necessary due to the low chance of fossil resources preserved in such materials. Areas of the Project underlain by fill and to specific depth can be found in the site Remedial Action Plan (California Environmental 2019).

RECOMMENDATIONS

In general, the potential for a given project to result in negative impacts to paleontological resources is directly proportional to the amount of ground disturbance associated with the project; thus, the higher the amount of ground disturbances within geological deposits with a known paleontological sensitivity, the greater the potential for negative impacts to paleontological resources. Since this Project entails excavations for a housing development, new ground disturbances are anticipated. Sediments in the Project area have a low-to-high paleontological sensitivity, being too young and disturbed at the surface to preserve fossil resources but increasing in age and sensitivity with depth. Ground disturbing activities in previously undisturbed portions of the Project deeper than 19 feet may result in significant impacts under CEQA to paleontological resources, such as destruction, damage, or loss of scientifically important paleontological resources. A qualified paleontologist should be retained to develop and implement the measures recommended below. These measures have been developed in accordance with SVP guidelines; if implemented, these measures will satisfy the requirements of CEQA.

WORKER'S ENVIRONMENTAL AWARENESS PROGRAM (WEAP)

Prior to the start of the proposed Project activities, all field personnel will receive a worker's environmental awareness training on paleontological resources. The training will provide a description of the laws and ordinances protecting fossil resources, the types of fossil resources that may be encountered in the Project area, the role of the paleontological monitor, outline steps to follow in the event that a fossil discovery is made, and provide contact information for

the Project Paleontologist. The training will be developed by the Project Paleontologist and can be delivered concurrent with other training including cultural, biological, safety, etc.

PALEONTOLOGICAL MITIGATION MONITORING

Prior to the commencement of ground-disturbing activities, a professional paleontologist will be retained to prepare and implement a PRMMP for the proposed Project. The PRMMP will describe the monitoring required during excavations that extend into older Quaternary (Pleistocene) age sediments, and the location of areas deemed to have a high paleontological resource potential. Monitoring will entail the visual inspection of excavated or graded areas and trench sidewalls. If the Project Paleontologist determines full-time monitoring is no longer warranted, based on the geologic conditions at depth, he or she may recommend that monitoring be reduced or cease entirely.

FOSSIL DISCOVERIES

In the event that a paleontological resource is discovered, the monitor will have the authority to temporarily divert the construction equipment around the find until it is assessed for scientific significance and, if appropriate, collected. If the resource is determined to be of scientific significance, the Project Paleontologist shall complete the following:

1. Salvage of Fossils. If fossils are discovered, all work in the immediate vicinity should be halted to allow the paleontological monitor, and/or Project Paleontologist to evaluate the discovery and determine if the fossil may be considered significant. If the fossils are determined to be potentially significant, the Project Paleontologist (or paleontological monitor) should recover them following standard field procedures for collecting paleontological as outlined in the PRMMP prepared for the project. Typically, fossils can be safely salvaged quickly by a single paleontologist and not disrupt construction activity. In some cases, larger fossils (such as complete skeletons or large mammal fossils) require more extensive excavation and longer salvage periods. In this case the paleontologist should have the authority to temporarily direct, divert or halt construction activity to ensure that the fossil(s) can be removed in a safe and timely manner.
2. Fossil Preparation and Curation. The PRMMP will identify the museum that has agreed to accept fossils that may be discovered during project-related excavations. Upon completion of fieldwork, all significant fossils collected will be prepared in a properly equipped laboratory to a point ready for curation. Preparation may include the removal of excess matrix from fossil materials and stabilizing or repairing specimens. During preparation and inventory, the fossils specimens will be identified to the lowest taxonomic level practical prior to curation at an accredited museum. The fossil specimens must be delivered to the accredited museum or repository no later than 90 days after all fieldwork is completed. The cost of curation will be assessed by the repository and will be the responsibility of the client.

FINAL PALEONTOLOGICAL MITIGATION REPORT

Upon completion of ground disturbing activity (and curation of fossils if necessary) the Project Paleontologist should prepare a final mitigation and monitoring report outlining the results of

the mitigation and monitoring program. The report should include discussion of the location, duration and methods of the monitoring, stratigraphic sections, any recovered fossils, and the scientific significance of those fossils, and where fossils were curated.

It has been a pleasure working with you on this Project. If you have any questions, please do not hesitate to contact us.

Sincerely,

Joshua Bonde Ph.D. | Senior Paleontologist

PALEOWEST

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