GEOTECHNICAL RECONNAISSANCE
TORREY PINES ROAD REALIGNMENT
SAN DIEGO, CALIFORNIA

PREPARED FOR:
Tran Consulting Engineers
4444 El Cajon Boulevard, Suite 15
San Diego, California 92115

PREPARED BY:
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June 4, 2010
Project No. 106843001

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Mr. John Austin
Tran Consulting Engineers
4444 El Cajon Boulevard, Suite 15
San Diego, California 92115

Subject: Geotechnical Reconnaissance
Torrey Pines Road Realignment
San Diego, California

Dear Mr. Austin:

Transmitted herein are the results of Ninyo & Moore's geotechnical reconnaissance study for the City's proposed realignment of Torrey Pines Road. This study was conducted in accordance with your request and included review and analysis of available geologic and geotechnical background data, and a geologic reconnaissance of the project site area.

We appreciate the opportunity to be of service.

Respectfully submitted,
NINYO & MOORE

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FOM/RI/GTF/gg

Distribution: (5) Addressee

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1. INTRODUCTION

In accordance with your request, Ninyo & Moore has performed a geotechnical reconnaissance study of the project site. This report presents our preliminary findings and conclusions pertaining to the City's proposed realignment of Torrey Pines Road. The purpose of this study was to evaluate geologic and geotechnical conditions using available geologic and geotechnical data and to provide a geotechnical reconnaissance report, which we understand will be utilized as part of a study for the subject project. Subsurface exploration and laboratory testing of materials were not included in the scope of this reconnaissance study.

2. SCOPE OF SERVICES

Ninyo & Moore's scope of services has included review of background materials and geologic reconnaissance of the site area. Specifically, we have performed the following tasks:

- Review of pertinent, available geotechnical literature including topographic maps, geologic maps, stereoscopic aerial photographs, and geotechnical and geologic reports. Documents reviewed for our site study are listed in the References section of this report.
- Geologic reconnaissance of the project study area by a California-certified engineering geologist from our firm.
- Compilation and analysis of the data obtained.
- Preparation of this report presenting our preliminary findings, conclusions, and recommendations.

3. PROJECT AND SITE DESCRIPTION

The site is located in the residential community of La Jolla in northwestern San Diego (Figure 1). The project extends along Torrey Pines Road from Prospect Place on the southwest to Calle Juela (near La Jolla Shores Drive) on the northeast. Elevations across the alignment range from a high of approximately 155 feet above mean sea level (MSL) at Prospect Place to a low of approximately 55 feet above MSL at the Calle Juela.

The purpose of the project is to provide continuous sidewalks on both sides of Torrey Pines Road. Retaining walls, soil nail walls, durawalls or other measures are planned along portions of the alignment west of Amalfi Street, and between Hillside Drive and East Roseland Drive. Relatively minor vertical and lateral changes in the roadbed (less than 3 feet) will be made to Torrey Pines Road.

4. GEOLOGY

The following sections present our findings relative to regional geology, site geology, groundwater, faulting, and seismicity.

4.1. Regional Geologic Setting

The project study area is situated in the western portion of the Peninsular Ranges geomorphic province of southern California. This geomorphic province encompasses an area that extends roughly 125 miles from the Transverse Ranges and the Los Angeles Basin, south to the Mexican border, and beyond another 795 miles to the tip of Baja California (Norris and Webb, 1990; Harden, 1998). The geomorphic province varies in width from 30 to 100 miles, most of which is characterized by northwest trending mountain ranges separated by subparallel fault zones. In general, the Peninsular Ranges are underlain by Jurassic- and Cretaceous-age metavolcanic and metasedimentary rocks and by Cretaceous-age igneous rocks of the southern California batholith. The westernmost portion of the province in San Diego County generally consists of Upper Cretaceous-, Tertiary-, and Quaternary-age sedimentary rocks.

The Peninsular Ranges are traversed by several major active faults (Figure 3). The Whittier-Elsinore, San Jacinto, and the San Andreas faults are major active fault systems located northeast of the site and the Agua Blanca-Coronado Bank and San Clemente faults are active faults located to the west-southwest. The nearby Rose Canyon fault zone, which crosses the eastern portion of the site, has also been recognized as active by the State of California. Major tectonic activity associated with these and other faults within this regional tectonic framework is right-lateral strike-slip movement. These faults, as well as other faults in the region, have the potential for generating strong ground motions at the project site. Further discussion of faulting relative to the site is provided in the Faulting and Seismicity section of this report.

4.2. Site Geology

Based on our literature review of published geologic maps and available geologic reports and our site reconnaissance, the project vicinity is underlain by surficial soils consisting of artificial fill underlain by young alluvium, old paralic deposits (formerly designated Bay Point Formation), the Cabrillo Formation, and the Point Loma Formation. A geologic map is provided as Figure 4. A brief description of these units, as described in the cited literature or as observed on the site, is presented below.

4.2.1. Artificial Fill

Artificial fill soils are present beneath the roadway and within utility trenches. The fill soils may have been derived from nearby alluvial and formational materials or imported soils and are expected to range in composition from loose to medium dense, silty sand to sandy silt with scattered gravel and cobbles.

4.2.2. Alluvium

Alluvial soils are expected to underlie the eastern end of the project alignment. These soils are generally expected to be composed of soft to firm silt and clay to loose to medium dense silty sand and clayey sand, possibly with scattered gravel and cobbles.

4.2.3. Old Paralic Deposits (Bay Point Formation)

Pleistocene-age old paralic deposits are mapped on the west side of Torrey Pines Road. The old paralic deposits in the vicinity of the site generally consist of a brown to reddish brown, weakly cemented, silty fine to coarse grained sandstone.

4.2.4. Cabrillo Formation

The Cretaceous-age Cabrillo Formation is mapped at the western end of the project alignment. The Cabrillo Formation in the vicinity of the site generally consists of massive medium-grained sandstone and cobble conglomerate.

4.2.5. Point Loma Formation

The Cretaceous-age Point Loma Formation is mapped on the east side of Torrey Pines Road in the central portion of the alignment. The Point Loma Formation in the vicinity of the site generally consists of interbedded fine-grained dusky yellow sandstone and olive-gray clay shale. Relative weak clay-rich strata such as sheared bedding surfaces (bedding plane faults) and fractures are common in the Point Loma Formation in this region.

4.2.6. Groundwater

The depth to groundwater in the vicinity of the project is expected to be located roughly at or near sea level. Groundwater levels are expected to fluctuate due to seasonal variations, tidal changes, and other factors.

4.3. Faulting and Seismicity

The project site, like the rest of southern California, is considered to be located in a seismically active area. The western portion of the alignment is located within a State of California Earthquake Fault (Alquist-Priolo Special Studies) Zone. In addition, multiple known, inferred, and concealed inactive or potentially active faults are located in the site vicinity. The approximate locations are shown on Figure 5.

The Rose Canyon fault zone is a part of a more extensive fault zone that includes the Offshore Zone of Deformation and the Newport-Inglewood fault to the north, and several possible extensions southward, both onshore and offshore (Treiman, 1993). The Rose Canyon fault zone consists predominantly of right-lateral strike-slip faults that extend south-southeast through the San Diego metropolitan area. Various fault strands display strike-slip, normal, oblique, or reverse components of displacement (Treiman, 1993). South of downtown San Diego, the Rose Canyon fault breaks into several subparallel splays that underlie much of central and southern San Diego Bay. Portions of the Rose Canyon fault zone in the Mount Soledad, La Jolla, Rose Canyon, Mission Bay, and downtown areas of San Diego have been recognized by the State of California as Earthquake Fault Special Studies Zones

(California Geological Survey [CGS], 2001). The Coronado Bank fault zone, located approximately 13 miles southwest of the project and the Elsinore fault zone, located approximately 40 miles northeast of the site, are also considered to be active.

4.3.1. Strong Ground Motion

The 2007 California Building Code (CBC) recommends that the design of structures be based on the horizontal peak ground acceleration (PGA) having a 2 percent probability of exceedance in 50 years, which is defined as the Maximum Considered Earthquake (MCE). The statistical return period for PGA_{MCE} is approximately 2,475 years. Based on our review of subsurface data, the project site corresponds to a Site Class D. The site modified PGA_{MCE} was estimated to be 0.68g using the United States Geological Survey (USGS) (USGS, 2010) ground motion calculator (web-based). The site modified design PGA was estimated to be 0.45g. These estimates of ground motion do not include near-source factors that may be applicable to the design of structures on site.

4.3.2. Ground Surface Rupture

Based on our review of the referenced literature and our site reconnaissance, the active Rose Canyon fault is known to cross the project site. Therefore, the potential for ground rupture due to faulting at the site is high. Lurching or cracking of the ground surface as a result of nearby seismic events is also possible.

4.3.3. Liquefaction and Seismically Induced Settlement

Liquefaction of cohesionless soils can be caused by strong vibratory motion due to earthquakes. Research and historical data indicate that loose granular soils and non-plastic silts that are saturated by a relatively shallow groundwater table are susceptible to liquefaction. The eastern end of the alignment is mapped as being underlain by alluvium. If groundwater is present within the alluvium, this portion of the alignment may be subject to liquefaction and seismically induced settlement during a nearby seismic event. Based on the competent nature of the underlying formational materials and lack of shallow groundwater beneath remaining portions of the alignment, it is our opinion that the potential for liquefaction and seismically induced settlement to occur is not a design consideration.

4.3.4. Tsunamis

Tsunamis are long seismic sea waves (long compared to ocean depth) generated by sudden movements of the sea floor caused by submarine earthquakes, landslides, or volcanic activity. Due to the orientation of California's coastline with regard to Pacific Ocean tsunami generating areas and our relatively wide continental shelf, wave heights from historic tsunamis in the San Diego Region have generally been within the normal tidal range. Based on these factors, there is little potential for catastrophic tsunamis in San Diego, however some coastal flooding and damage may occur. Based on its elevation, the potential for damage due to tsunamis at the site is not a design consideration.

4.4. Landsliding

Based on our review of published geologic maps and stereoscopic aerial photographs, as well as our site reconnaissance, no landslides or indications of deep-seated slope instability were observed underlying the project site. However, numerous large landslides have been mapped approximately 1,000 feet south of the alignment.

4.5. Geologic Hazards Map

We have included as Figure 5 a portion of Sheet 29 of the City of San Diego Seismic Safety Study that includes the site. The hazard map indicates the mapped location of known or suspected faults and landslides and areas of potentially unfavorable geologic structure relative to slope stability. The hazard map indicates that the Alquist-Priolo earthquake fault zone for the Active Rose Canyon fault crosses the eastern portion of the alignment. The active strand of the Rose Canyon fault crosses the alignment at approximately Roseland Drive. Multiple strands of the Rose Canyon fault which are classified as potentially active or inactive cross the western portion of the alignment.

5. CONCLUSIONS

The following sections discuss site-specific geologic and geotechnical issues.

- The active Rose Canyon fault crosses the eastern portion of the alignment. There is therefore, a high potential for ground rupture at the alignment in the event of a nearby seismic event.
- Based on our seismic hazard analysis, there is a potential for high ground accelerations at the site as a result of nearby earthquakes.
- Landslides or indications of deep-seated slope instability were not observed underlying the project site but are mapped in areas to the south of the project site.
- Potentially compressible fill soils may be encountered in some areas under the existing roadways. In addition, unknown thicknesses of potentially compressible alluvium may exist at the eastern end of the alignment. The presence of compressible soils could potentially impact the design of improvements or other related structures. The nature and extent of potentially compressible subsurface soils should be further evaluated by a subsurface geotechnical evaluation.
- Potentially liquefiable alluvial soils are present beneath the eastern end of the alignment.
- It is our understanding that a soil nail retaining wall with a dura-block facing is under consideration for the project. This retaining wall type would be feasible at the site.
- In general, the soils in the area should be excavatable with standard heavy-duty excavation equipment. The engineering properties of the subsurface soils should be further evaluated by a subsurface geotechnical evaluation.

6. PRELIMINARY RECOMMENDATIONS

We recommend that a comprehensive geotechnical evaluation, including subsurface exploration and laboratory testing, be conducted prior to design and construction. The purpose of the subsurface evaluation would be to further evaluate the subsurface conditions and to provide information pertaining to the engineering characteristics of earth materials at the project site. From these data, a geotechnical design report would be prepared presenting recommendations pertaining to geotechnical aspects of the design and construction of the project.

7. LIMITATIONS

The field evaluation and geotechnical analyses presented in this report have been conducted in accordance with current engineering practice and the standard of care exercised by reputable geotechnical consultants performing similar tasks in this area. No warranty, implied or expressed, is made regarding the conclusions, recommendations, and professional opinions expressed in this report. Variations may exist and conditions not observed or described in this report may be encountered. Our preliminary conclusions and recommendations are based on an analysis of the observed conditions and the referenced background information.

The purpose of this study was to evaluate geologic and geotechnical conditions within the project site and to provide a geotechnical reconnaissance report to assist in the preliminary design of the project. A comprehensive geotechnical evaluation, including subsurface exploration and laboratory testing, should be performed prior to design and construction of structural improvements.

8. REFERENCES

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AERIAL PHOTOGRAPHS				
Source	**Date**	**Flight**	**Numbers**	**Scale**
United States Department of Agriculture	5/2/53 & 4/11/53	AXN-7M/8M	189 & 190	1:20,000

REFERENCE: 2005 THOMAS GUIDE FOR SAN DIEGO COUNTY, STREET GUIDE AND DIRECTORY,

APPROXIMATE SCALE

0 2400 4800 FEET

N

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Ninyo & Moore

SITE LOCATION MAP

PROJECT NO.	DATE	TORREY PINES ROAD REALIGNMENT SAN DIEGO, CALIFORNIA	FIGURE
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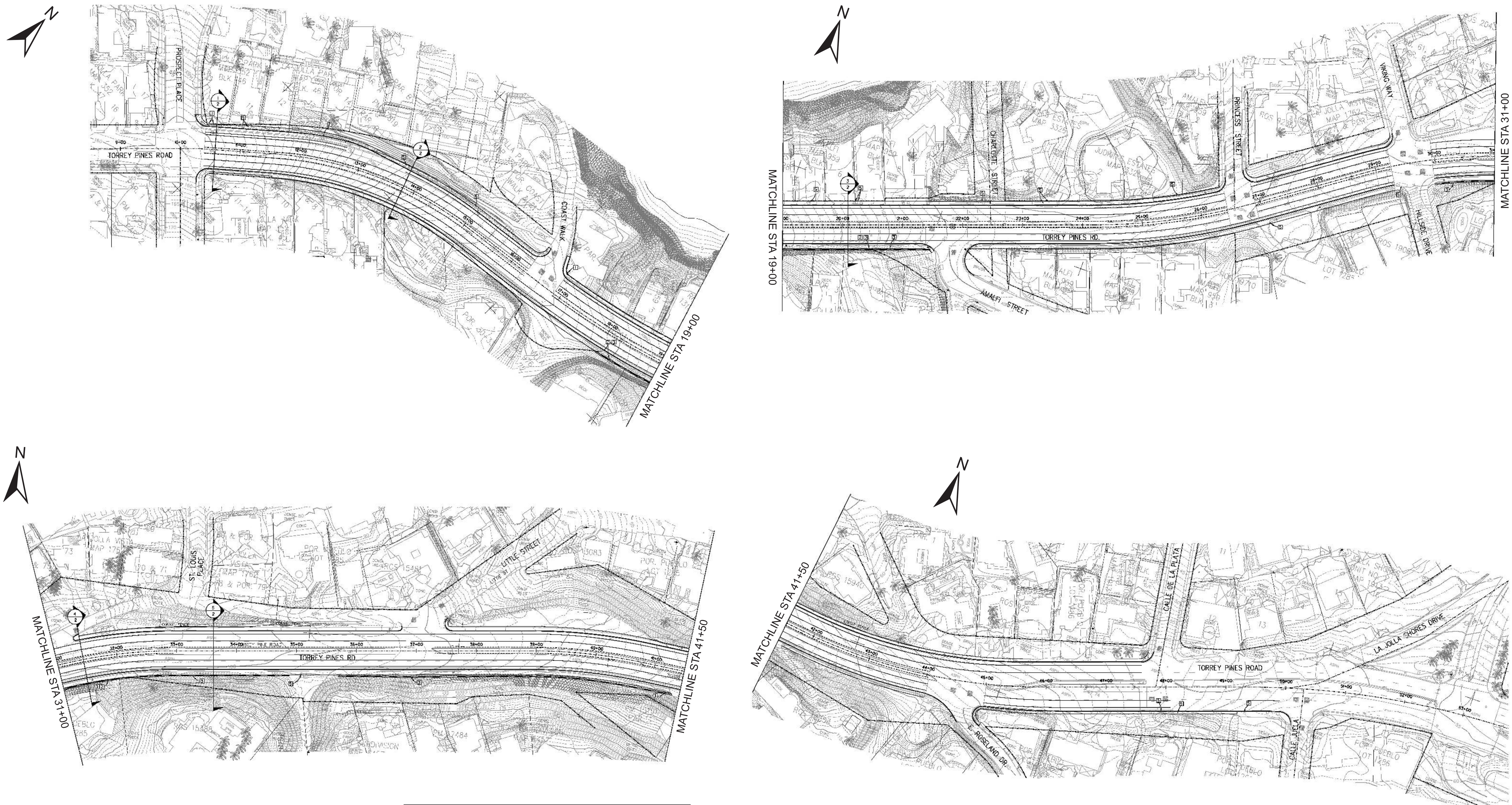

SOURCE: TRAN CONSULTING ENGINEERS, 2010

APPROXIMATE SCALE

0 100 200 FEET

LEGEND

- PROPERTY ENCROACHMENT
- RETAINING WALL ENCROACHMENT
- RETAINING WALL
- POTENTIAL RETAINING WALL
- ABOVE-GROUND UTILITY SIDEWALK CONFLICT

NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

106843001 site plan.cdr

Ninyo & Moore		SITE PLAN	FIGURE
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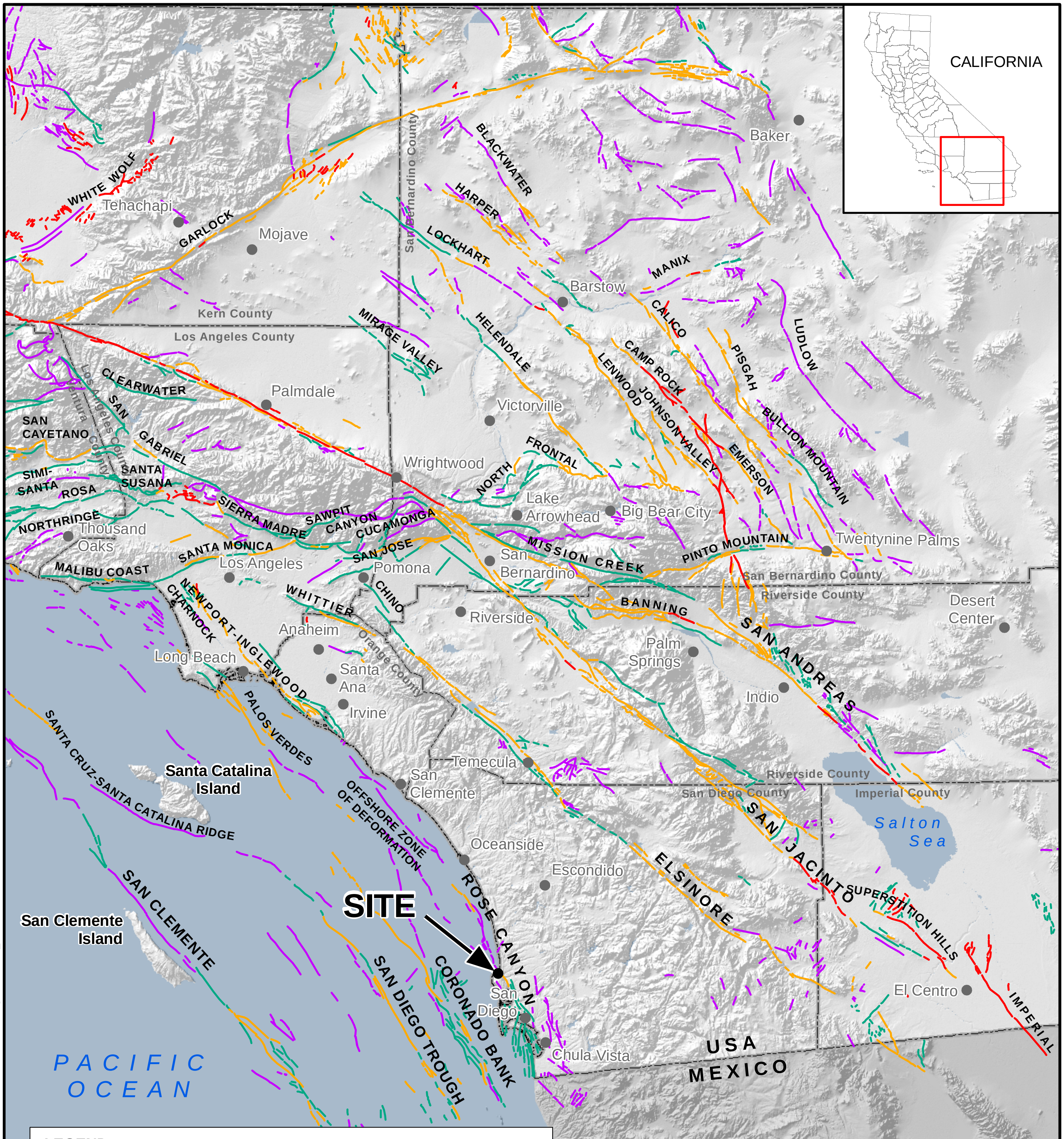

LEGEND

CALIFORNIA FAULT ACTIVITY

- HISTORICALLY ACTIVE
- HOLOCENE ACTIVE
- LATE QUATERNARY (POTENTIALLY ACTIVE)
- QUATERNARY (POTENTIALLY ACTIVE)
- STATE/COUNTY BOUNDARY

SOURCE: FAULTS - CA DEPT OF CONSERVATION, 2000; BASE - ESRI, 2008

N

APPROXIMATE SCALE

0 25 50 MILES

NOTES: ALL DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE

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Ninyo & Moore	FAULT LOCATION MAP	FIGURE
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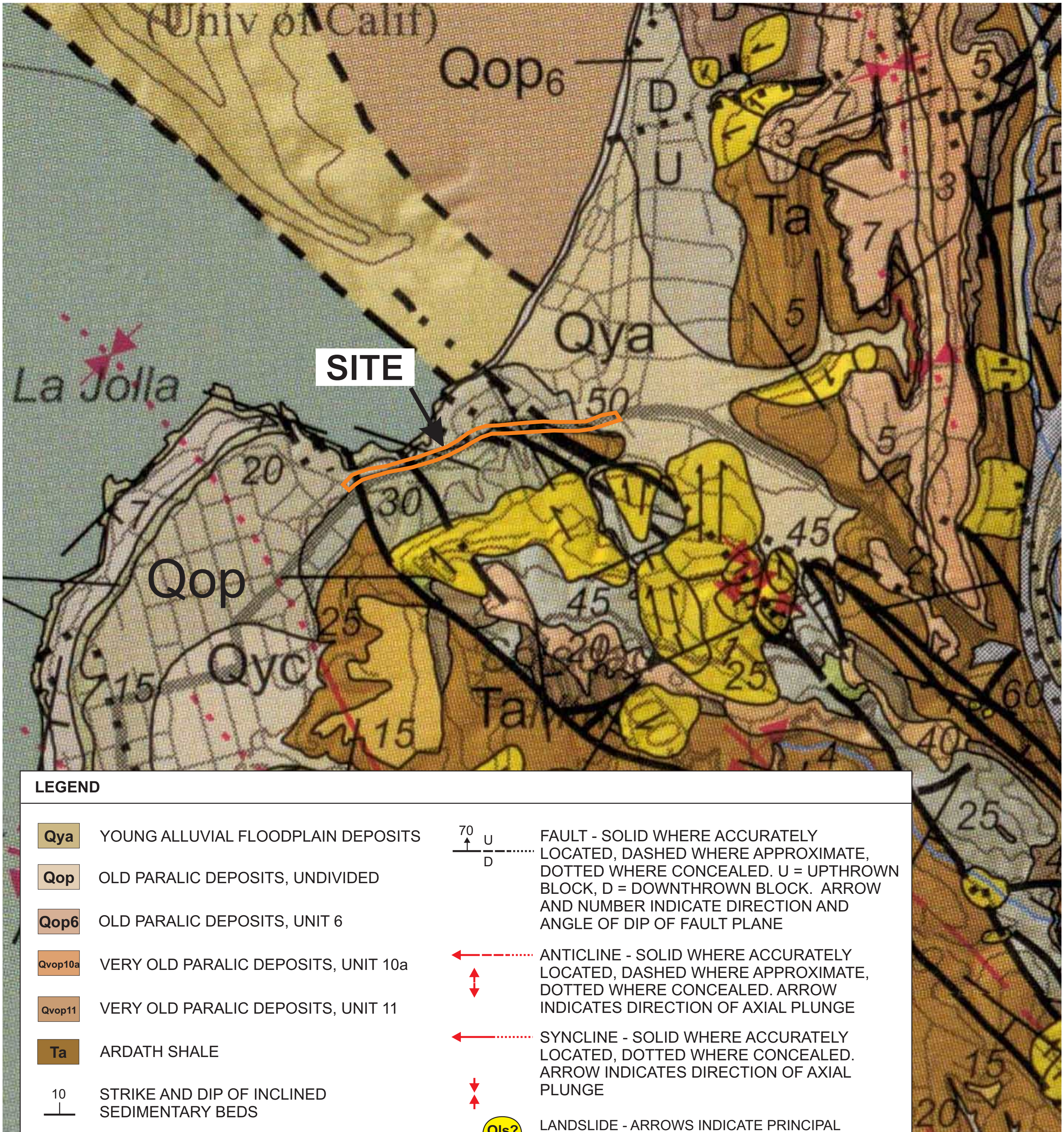

LEGEND

Qya	YOUNG ALLUVIAL FLOODPLAIN DEPOSITS
Qop	OLD PARALIC DEPOSITS, UNDIVIDED
Qop6	OLD PARALIC DEPOSITS, UNIT 6
Qvop10a	VERY OLD PARALIC DEPOSITS, UNIT 10a
Qvop11	VERY OLD PARALIC DEPOSITS, UNIT 11
Ta	ARDATH SHALE
10	STRIKE AND DIP OF INCLINED SEDIMENTARY BEDS
70 U D	FAULT - SOLID WHERE ACCURATELY LOCATED, DASHED WHERE APPROXIMATE, DOTTED WHERE CONCEALED. U = UPTHROWN BLOCK, D = DOWNTHROWN BLOCK. ARROW AND NUMBER INDICATE DIRECTION AND ANGLE OF DIP OF FAULT PLANE
	ANTICLINE - SOLID WHERE ACCURATELY LOCATED, DASHED WHERE APPROXIMATE, DOTTED WHERE CONCEALED. ARROW INDICATES DIRECTION OF AXIAL PLUNGE
	SYNCLINE - SOLID WHERE ACCURATELY LOCATED, DOTTED WHERE CONCEALED. ARROW INDICATES DIRECTION OF AXIAL PLUNGE
Qls?	LANDSLIDE - ARROWS INDICATE PRINCIPAL DIRECTION OF MOVEMENT, QUERIED WHERE EXISTENCE IS QUESTIONABLE

APPROXIMATE SCALE

0 2000 4000 FEET

N

NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

REFERENCE: KENNEDY, M.P., AND TAN, S.S., 2008, GEOLOGIC MAP OF THE SAN DIEGO 30' X 60' QUADRANGLE, CALIFORNIA.

Ninyo & Moore		GEOLOGIC MAP	FIGURE
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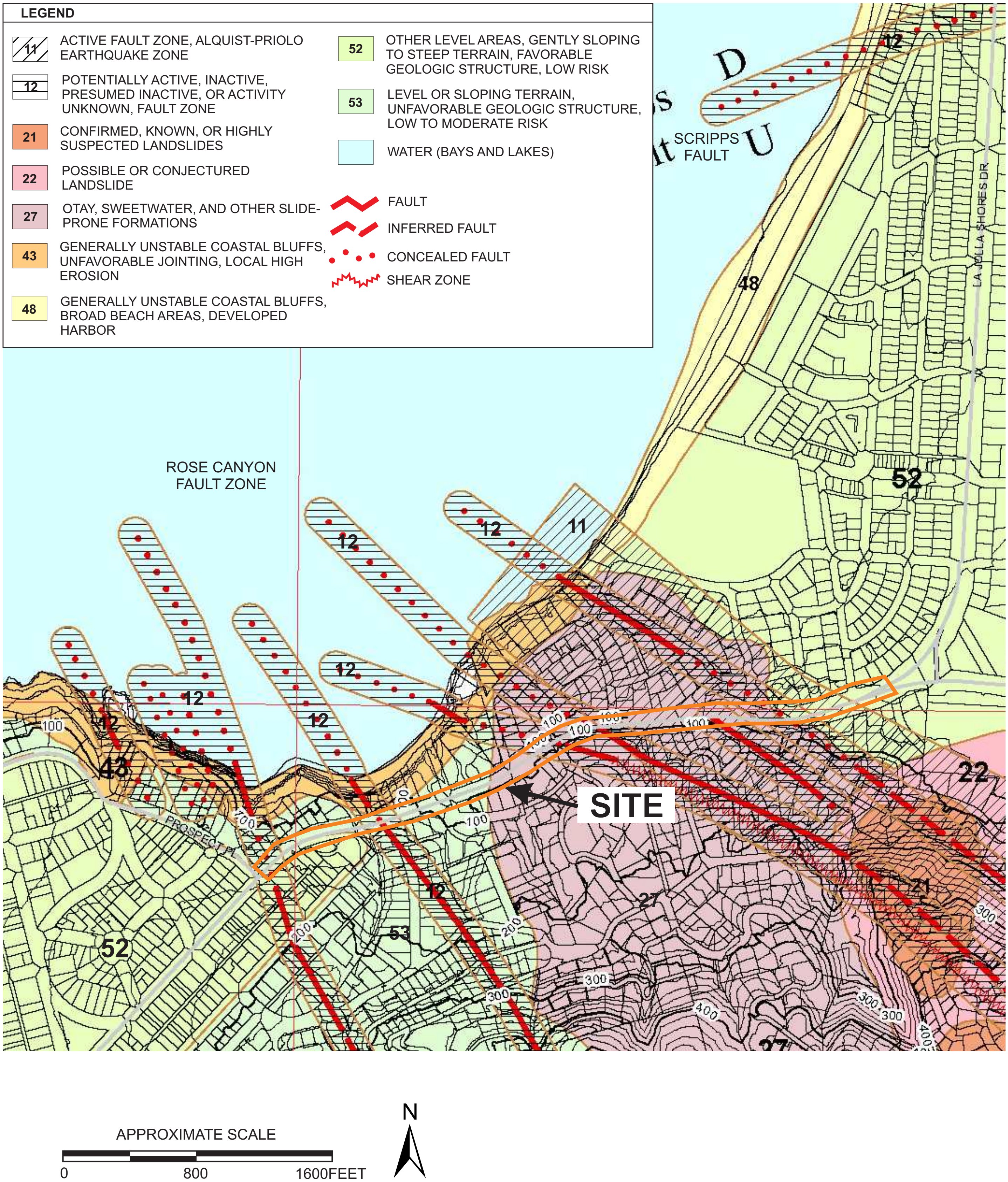

NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

REFERENCE: CITY OF SAN DIEGO SEISMIC SAFETY STUDY, 2008.

fig4 106843001 geo haz.cdr

Ninyo & Moore		GEOLOGIC HAZARDS MAP	FIGURE
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