Geology and Soils Technical Study

Mission San Marcos Industrial Park

528 East Mission Road

San Diego, California

Helix Project No. 04658.00002.001

City Project No. SDP-22-0009

Helix Environmental Planning

7578 El Cajon Boulevard | La Mesa, California 91942

Geotechnical | Environmental | Construction Inspection & Testing | Forensic Engineering & Expert Witness

Geophysics | Engineering Geology | Laboratory Testing | Industrial Hygiene | Occupational Safety | Air Quality | GIS

Ninyo & Moore

Geotechnical & Environmental Sciences Consultants

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants

35+ YEARS

Geology and Soils Technical Study

Mission San Marcos Industrial Park

528 East Mission Road
San Marcos, California
Helix Project No. 04658.00002.001
City Project No. SDP-22-0009

Ms. Yara Fisher

Helix Environmental Planning

7578 El Cajon Boulevard | La Mesa, California 91942

May 2, 2024 | Project No. 109768001

Nissa M. Morton, PG, CEG
Senior Project Geologist

Robert T. Wheeler, PG, CEG
Principal Geologist

NMM/RTW/mp

CONTENTS

EXECUTIVE SUMMARY 1
1. INTRODUCTION 1
2. SCOPE OF SERVICES 1
3. SITE DESCRIPTION AND PROJECT DESCRIPTION 1
4. GEOLOGIC AND SUBSURFACE CONDITIONS 2
4.1. Regional Geologic Setting 2
4.2. Site Geology 3
4.2.1. Fill 3
4.2.2. Alluvium 3
4.2.3. Metasedimentary/Metavolcanic Rock 3
4.3. Groundwater 4
5. GEOLOGIC HAZARDS 4
5.1. Faulting and Seismicity 4
5.2. Ground Rupture 4
5.3. Ground Motion 5
5.4. Liquefaction and Seismically Induced Settlement 5
5.5. Landsliding and Slope Failure 6
5.6. Tsunamis and Seiches 6
5.7. Flood Hazards 6
5.8. Expansive Soils 6
5.9. Corrosive Soils 7
5.10. Soils 7
5.11. Mineral Resources 7
6. CONCLUSIONS 7
7. IMPACT ANALYSIS 8
7.1. Significance Thresholds 8
7.2. Project Impacts and Significance 9

8. RECOMMENDATIONS 11
9. LIMITATIONS 13
10. REFERENCES 14

FIGURES

1 – Site Location
2 – Site Aerial
3 – Fault Locations
4 – Geology

EXECUTIVE SUMMARY

Ninyo & Moore has performed a Geology and Soils Technical Study for an approximately 10.8-acre property located at 528 East Mission Road in the city of San Marcos, California (site). The site is designated as San Diego County Assessor's Parcel Number 220-210-2600. The site includes a relatively level area that supports the existing improvements as well as an undeveloped hillside that generally ascends to the north. Site elevations range from approximately 605 feet above mean sea level (MSL) to 660 feet MSL. The approximate global coordinates of the site are 33.1459° latitude and -117.1516° longitude.

The site is currently developed with a one-story, approximately 43,500 square-foot warehouse-type building and a two- and three-story commercial/office building with a footprint of approximately 25,200 square feet. Other site improvements include smaller sheds and outbuildings, canopies, asphalt and concrete pavements, fencing, and overhead and underground subsurface utilities.

Based on our study, the following general items were noted:

- Surface and near-surface earth materials at the project site are mapped as alluvium and undivided metasedimentary and metavolcanic rock (Kennedy et al., 2007). Fill materials associated with the construction of the existing building, pavements, and utilities are also anticipated at the project. Geotechnical constraints related to soils at the project are:
    - *Soft Ground* – Areas with soft ground or loose soils may be located within the fill materials throughout the site.
    - *Expansive Soils* – The soils at the project site are expected to have a low to high potential for expansion.
    - *Fill Soils* – Man-made fill soils placed without engineering supervision may be loosely or inadequately compacted, may contain oversize materials unsuitable for reuse in engineered fills, and may contain unsuitable organic or expansive materials and debris that may preclude their use in engineered fills.
- The closest known major active fault is the Rose Canyon Fault, which is located approximately 13 miles west of the project. Geotechnical constraints related to faulting and seismic events at the project are:
    - *Ground Shaking* – The project has a moderate potential for strong ground motions due to earthquakes on nearby active faults.
    - *Liquefaction* – The project has a potential for liquefaction due to the presence of alluvial soils, shallow groundwater, and nearby active faults.
- Shallow groundwater is anticipated at depths as shallow as 3½ feet in the low-lying portions of the site. In addition, perched water may occur beneath portions of the project site.
- The potential for landsliding at the project site is considered low.
- The site is not located in an area considered susceptible to flooding or tsunami inundation.

- Based on previous work in the general vicinity of the project area, the soils at the project site may be corrosive.

The conditions related to soils and geology, identified in in thus technical study report, would increase the cost and duration of grading and construction of the project, but would not preclude the feasibility of development of the project.

1. INTRODUCTION

Ninyo & Moore has completed a Geology and Soils Technical Study for the proposed Mission San Marcos Industrial Park project located at 528 East Mission Road in San Marcos, California (Figure 1). Our evaluation is based on review of published and non-published reports, aerial photographs, in-house data, a site reconnaissance, and the assessment of the potential geologic hazards in the project area. The purpose of this study was to evaluate the potential for existing environmental impacts related to geologic or soils conditions to affect the project site and adjoining areas, and to discuss measures that can be implemented to reduce or mitigate the potential impacts with respect to the design and construction of the proposed project.

2. SCOPE OF SERVICES

Ninyo & Moore's scope of services for this geologic study have included the activities listed below:

- Review of readily available regional, local, and site-specific geologic, geotechnical, and environmental reports.
- Review of readily available background information including topographic, soils, mineral resources, geologic, and seismic and geologic hazard maps, and stereoscopic aerial photographs.
- Performance of a site reconnaissance by a professional from our office.
- Compile and analyze the data obtained from our background review.
- Prepare report presenting our findings, conclusions, and preliminary recommendations regarding potential geologic and soil impacts at the site.

3. SITE DESCRIPTION AND PROJECT DESCRIPTION

The site is located north of East Mission Road and approximately 350 feet west of Mulberry Drive in the city of San Marcos, California (Figure 1). The site consists of approximately 10.8-acres of land and is addressed as 528 East Mission Road. The site is designated as San Diego County APN 220-210-2600. The approximate global coordinates of the site are 33.1459° latitude and -117.1516° longitude.

As shown on Figure 2, the site is currently developed with two main buildings, several smaller structures including sheds and a construction trailer, and asphalt and concrete pavements. One of the two main buildings is a one-story, approximately 43,500 square-foot warehouse-type building on the southwest side of the property. This building was first constructed in the 1950/1960's with various additions made through the 1980's. The other main building is a two- and three-story commercial/office building in the south-central portion of the site with a footprint of approximately

25,200 square feet. This building has been on the site since at least 1938. Other site improvements include canopies, fencing, and overhead and underground subsurface utilities. A storm drain traverses the eastern portion of the site and drains to an open box structure present near the front of the property by East Mission Road. The northwestern portion of the site consists of an undeveloped hillside vegetated with low lying brush and shrubs. The site is accessible from East Mission Road to the south. Ninyo & Moore reviewed available topographic maps of the project area. The developed area of the site slopes gently down to the south with elevations ranging from approximately 605 feet above mean sea level (MSL) to 615 feet MSL. The northern portion of the property consists of an undeveloped, southerly-trending, 50-foot high ridge that slopes moderately down from an approximate elevation of 660 feet MSL to the south, west, and east.

Based on our review of site plans (Douglas Franz Architects, 2023), the proposed industrial park development is anticipated to consist of demolition of the existing improvements and construction of three new two-story buildings. Additional improvements will include loading docks, parking areas, trash enclosures, fencing, landscaping, and a stormwater basin. The new improvements will be located in the relatively flat, low-lying areas of the site. The hillside in the northwestern portion of the site will remain undeveloped. A due-diligence evaluation report for the site has been prepared by Geocon (2020) that includes data from seven borings drilled at the site.

4. GEOLOGIC AND SUBSURFACE CONDITIONS

Our findings regarding regional and site geology and groundwater conditions at the project site are provided in relation to three topics: regional geologic setting; site geology; and groundwater.

4.1. Regional Geologic Setting

The project area is situated in the San Diego County coastal section of the Peninsular Ranges Geomorphic Province. This geomorphic province encompasses an area that extends approximately 900 miles from the Transverse Ranges and the Los Angeles Basin south to the southern tip of Baja California (Norris and Webb, 1990; Harden 2004). The province varies in width from approximately 30 to 100 miles. In general, the province consists of rugged mountains underlain by Jurassic metavolcanic and metasedimentary rocks, and Cretaceous igneous rocks of the southern California batholith. In the coastal plain portion of the province where the project is located, Quaternary-age sedimentary deposits overlie Tertiary- and Cretaceous-age sedimentary units.

The Peninsular Ranges Province is traversed by a group of sub-parallel faults and fault zones trending roughly northwest. Several of these faults, which are shown on Figure 3, are considered active faults. The Elsinore, San Jacinto, and San Andreas faults are active fault systems located

northeast of the project area. The Rose Canyon, Coronado Bank, San Diego Trough, and San Clemente faults are active faults located west of the project area. The Rose Canyon Fault Zone, the nearest active fault system, has been mapped approximately 13 miles west of the project site. Major tectonic activity associated with these faults within this regional tectonic framework consists primarily of right-lateral, strike-slip movement. 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 review of published geologic maps, geotechnical boring logs (Geocon, 2020) and our site reconnaissance, surficial soils at the project site consist of fill, alluvium, and metasedimentary/metavolcanic bedrock (Kennedy et al., 2007; Figure 4). No significant geologic features at the site will be impacted by the project. A brief description of these units, as described in the cited literature or as observed on the site, is presented below.

4.2.1. Fill

Fill soils are anticipated to underlie portions of the site area due to previous land use, building construction, and burial of utility lines. As observed at the site and encountered in borings previously drilled onsite, the fill soils are generally anticipated to be composed of loose clayey sand, silty sand, and gravel (Geocon, 2020). Documentation of the existing fill material was not available for our review.

4.2.2. Alluvium

Quaternary-age young alluvial flood-plain deposits (Kennedy et al., 2007), also referred to as alluvium, underlie the fill and pavements in the lower-lying portions of the site. As encountered in borings previously drilled onsite, the alluvial soils are anticipated to be composed of dense, sand and gravel and soft to hard, sandy clay and clayey silt (Geocon, 2020).

4.2.3. Metasedimentary/Metavolcanic Rock

Mesozoic-age undivided metasedimentary and metavolcanic rock is mapped in the northwestern portion of the site and outcrops on the hillside. As encountered in borings previously drilled onsite by Geocon (2020), the metasedimentary/metavolcanic rock also underlies the fill and alluvium at the site. As encountered in the borings, the bedrock is slightly weathered to completely weathered, weak to moderately strong rock. Although not mapped at the site, granitic rock was encountered and described in Geocon's boring logs.

4.3. Groundwater

Sources provided by the California Water Data Library Resources (DWR) and the California State Water Resources Control Board (SWRCB) were reviewed for information pertaining to groundwater quality and occurrence in the vicinity of the project. According to the State of California Regional Water Quality Control Plan, the project is located within the Richland Hydrologic Subarea of the San Marcos Hydrologic Area of the Carlsbad Hydrologic Unit.

Ninyo & Moore reviewed the State Water Resources Control Board's GeoTracker website (GeoTracker) for groundwater information in the site vicinity. According to GeoTracker, the depth to groundwater in the project area is generally anticipated at depths of 20 feet below the existing ground surface (bgs) and shallower. Groundwater depths encountered in the borings performed by Geocon (2020) at the site ranged from approximately 3½ feet to 9 feet bgs. Groundwater is expected to follow the topographic gradient and flow generally towards the south. Groundwater depths and flow directions can vary due to seasonal variations, groundwater withdrawal or injection, and other factors.

5. GEOLOGIC HAZARDS

In general, potential geologic hazards at the site include faulting and seismicity as they relate to seismic design of structures. These considerations and other geologic hazards such as liquefaction, landsliding, slope failure, and tsunamis, are discussed in the following sections.

5.1. Faulting and Seismicity

As shown on Figure 3, there are several active faults in the region. Therefore, like most of California, the project area is considered to be seismically active. The closest known active fault is the Rose Canyon fault, which is capable of generating an earthquake magnitude of 6.9 (USGS, 2023). The Rose Canyon fault is located approximately 13 miles west of the project site.

5.2. Ground Rupture

Ground surface rupture due to active faulting is not considered likely in the project area due to the absence of known active faults underlying the site. However, lurching or cracking of the ground surface as a result of nearby seismic events is possible. Proposed structures should be designed to mitigate ground shaking.

5.3. Ground Motion

Considering the proximity of the site to the Rose Canyon fault which is capable of producing a maximum moment magnitude of 6.9, the project area has a high potential for experiencing strong ground motion. The 2022 California Building Code (CBC) specifies that the risk-targeted maximum considered earthquake (MCE_R) ground motion response accelerations be used to evaluate seismic loads for design of buildings and other structures. Based on our review of shear wave velocity maps, the average shear wave velocity in the upper 30 meters (100 feet) of the subsurface profile (V_{s30}) is estimated to be 352 meters per second (1,155 feet per second) (Wald & Allen, 2007). In accordance with Chapter 20 of the American Society of Civil Engineers (ASCE) Publication 7-16 (2017) for the Minimum Design Loads and Associated Criteria for Building and Other Structures, the site classification is Site Class D.

In accordance with ASCE 7-16, the mapped MCE_R ground motion response accelerations were determined using the 2023 Applied Technology Council (ATC) seismic design tool (web-based). The MCE_R ground motion response accelerations are based on the spectral response accelerations for 5 percent damping in the direction of maximum horizontal response and incorporate a target risk for structural collapse equivalent to 1 percent in 50 years with deterministic limits. ASCE 7-16 specifies that the potential for liquefaction and soil strength loss be evaluated, where applicable, for the maximum considered earthquake geometric mean (MCE_G) peak ground acceleration adjusted for site effects (PGA_M). The MCE_G peak ground acceleration with adjustment for site class effects (PGA_M) was calculated as 0.47g for Site Class D. Proposed structures should be designed to mitigate strong ground motion.

5.4. 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. Based on our review of site data (Geocon, 2020), the alluvium at the site generally consists of dense sand and gravel and soft to very stiff sandy clay and clayey silt. However, loose and medium dense, granular, alluvial soils situated below the groundwater table may be subject to liquefaction. In addition, loose granular soils above and below the groundwater surface may experience seismic induced settlement. It is the responsibility of the geotechnical engineer of record to verify the potential for liquefaction and dynamic settlement and to provide appropriate design recommendations after performing a complete geotechnical evaluation.

5.5. Landsliding and Slope Failure

Landslides have not been mapped on or adjacent to the site and evidence of landsliding was not observed in our review of aerial photographs or during our site reconnaissance. Based on our understanding of the project, the proposed development will be limited to the relatively level, low-lying areas of the site and cut slopes in the northwestern portion of the site are not anticipated. Therefore, the potential for landsliding or slope instability to impact the project development is considered low. Slope stability of the site based on the proposed project design should be further evaluated by a comprehensive geotechnical evaluation.

5.6. Tsunamis and Seiches

Tsunamis are long wavelength seismic sea waves (long compared to the ocean depth) generated by sudden movements of the ocean bottom during submarine earthquakes, landslides, or volcanic activity. Based on the inland location and elevation of the project, the potential for a tsunami to impact the site is not a design consideration.

Seiches are oscillations of enclosed or partially enclosed bodies of water often generated by seismic activity. Based on the elevation of the site and the absence of nearby bodies of water, the potential for seiches to impact the site is not s design consideration.

5.7. Flood Hazards

Based on review of Federal Emergency Management Agency (FEMA) Mapping Information Platform website (2023), the project site is located within the mapped Flood Zone X. Flood Zone X is considered to be outside of the 0.2% annual chance floodplain. Based on review of the flood maps, the potential for significant flooding to impact the site is not a design consideration.

5.8. Expansive Soils

Expansive soils generally result from specific clay minerals that have the capacity to shrink or swell in response to changes in moisture content. Shrinking or swelling of foundation soils can lead to damage to slabs, foundations, and other engineered structures, including tilting and cracking. Clayey fill and alluvial soils may be expansive. In general, the soils and earth materials at the project site may be expected to have a low to high potential for expansion. Expansive soils should be further evaluated during a geotechnical evaluation of the site and can be mitigated through selective grading techniques or special foundation design.

5.9. Corrosive Soils

Caltrans corrosion (2021) criteria define corrosive soils as soil with an electrical resistivity less than 1,500 ohm-cm, a chloride content more than 500 parts per million (ppm), more than 0.15 percent sulfates (1,500 ppm), and/or a pH less than 5.5. Based on laboratory testing performed on soil samples from Ninyo & Moore projects near the project area and Caltrans corrosion (2021) criteria, soils in the general vicinity of the project site have been classified as corrosive. The potential for similar soils to occur at the project is considered high and should be evaluated during a geotechnical evaluation of the site. If corrosive soils exist on the site, a corrosion engineer should be retained to assist in the design of improvements in contact with the soil.

5.10. Soils

Based on the interactive map using the Web Soil Survey website (USDA, 2023), the soil units mapped on the project site include the Escondido Lithic bedrock and the Huerhuero loam. Mapped in the north portion of the site, the Escondido Lithic bedrock is classified as a very fine sandy loam, with a slow infiltration rate. The Huerhuero loam, mapped in the southern portion of the site, is classified as a loam to clay loam with a very slow infiltration rate. Based on the previous development of the site, preexisting native soils are anticipated to have been removed and/or disturbed in the lower-lying portions of the project site. Native soils may be present outside of previously developed areas, including the slope in the northwestern portion of the site.

5.11. Mineral Resources

According to the City of San Marcos General Plan (2012) the project site is located within two Mineral Resource Zones (MRZ). The northwestern portion of the site is located within MRZ-1 and the rest of the site is located in MRZ-4. MRZ-1 is described as areas where available geologic information indicated that little likelihood exists for the presence of significant mineral resources. MRZ-4 is described as areas where available information is inadequate to assign to any other MRZ category. There are currently no active mines within the City of San Marcos.

6. CONCLUSIONS

Based on our review of the referenced background data and our geologic field reconnaissance it is our opinion that the following geological characteristics of the project site will require specific consideration when designing the project.

- Surface and near-surface geologic units at the project site are mapped as alluvium and metasedimentary/metavolcanic rock. Bedrock materials consisting of granitic rock were also identified from borings drilled on site (Geocon, 2020) , and is also mapped in the

project area. Fill materials associated with the construction of the existing building and utilities are also anticipated to be present at the project site. Geotechnical constraints related to soils at the project are:

- *Soft Ground* – Areas with soft ground or loose soils can be found in areas underlain by existing fill and alluvium.
- *Expansive Soils* – The project soils are expected to have a low to high potential for expansion.
- *Fill Soils* – Man-made fill soils placed without engineering supervision may be loosely or inadequately compacted, may contain oversize materials unsuitable for reuse in engineered fills, and may contain unsuitable organic or expansive materials and debris that may preclude their use in engineered fills.
- The closest known major active fault is the Rose Canyon fault, which is located approximately 13 miles west of the project. Geotechnical constraints related to faulting and seismic events at the project are:
- *Ground Shaking* – The project has a moderate potential for strong ground motions due to earthquakes on nearby active faults.
- *Liquefaction* – The project has a potential for liquefaction due to the presence of alluvial soils and shallow groundwater.
- Shallow groundwater is anticipated at depths as shallow as 3½ feet in the low-lying portions of the site. In addition, perched water may occur beneath portions of the project site.
- The potential for landsliding in the project area is considered low.
- The site is not mapped in a flood zone or floodway.
- Based on the clay content of site soils as well as previous work in the project area, some soils at the project site may be expansive and corrosive.

7. IMPACT ANALYSIS

Based upon the results of our geologic desktop assessments, our findings, conclusions, and recommendations regarding potential geological impacts to the project are summarized in the following sections.

7.1. Significance Thresholds

In evaluating the significance of potential environmental concerns in a particular study area, the criteria to consider, as they relate to geologic and soil conditions, are presented in the California Environmental Quality Act (CEQA) Guidelines (2023). In accordance with the scope of work, the findings of this study were evaluated with respect to Geology and Soils thresholds of significance within Appendix G of the CEQA Guidelines (2023).

7.2. Project Impacts and Significance

Based on the above criteria and the results of the evaluation, the potential impact by geologic and soil conditions at the project have been identified, and are discussed below.

VII. GEOLOGY AND SOILS

A. Would the project expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:

i. Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of known fault?

The potential for ground surface rupture due to active faulting is considered low in the project area due to the absence of known active faults underlying the site (less than significant impact). However, lurching or cracking of the ground surface as a result of nearby seismic events is possible.

ii. Strong seismic ground shaking?

The project has a moderate potential for strong ground motions due to earthquakes on nearby active faults (less than significant impact with construction methods and specifications incorporated).

iii. Seismic related ground failure, including liquefaction?

The presence of loose to medium dense granular soil and shallow groundwater at the site could render the site as being susceptible to liquefaction and seismic settlement hazards. Liquefaction potential should be evaluated as part of a comprehensive geotechnical evaluation performed prior to project development that conforms to the requirements of Chapter 18 of the 2022 California Building Code. Such an evaluation would be performed so an opinion can be made regarding the hazard for liquefaction and seismic settlement and that structural design and mitigation techniques can be implemented during design, as appropriate. Common and appropriate methods for evaluating and mitigating liquefaction potential and other seismic-related ground failures are provided in California Geological Survey Special Publication 117A. Where liquefaction hazards are identified, appropriate mitigating engineering measures specified in the comprehensive geotechnical evaluation should be employed to account for liquefaction and associated seismically induced settlement, lateral spreading, and other ground failures. Such measures may include removal and replacement of soils susceptible to liquefaction, densification of these soils through geotechnical engineering methods (e.g. stone column, compaction grouting, or dynamic compaction), or use of an engineered foundation design to accommodate the

expected effects of liquefaction. In following recommendations of the design-level geotechnical evaluation, project risks with respect to liquefaction and other seismic-related ground failure can be mitigated. This impact is considered less than significant with mitigation incorporated.

iv. Landslides?

Our review of geologic literature, aerial photos and topographic maps, does not indicate the presence of mapped landslides on the project site. Additionally, landslides were not mapped by others adjacent to the project site. Therefore, the potential impact of existing landslides is considered low (less than significant impact). Nevertheless, the potential presence for landslides, the potential for deep-seated movement, and recommended construction methods and specifications should be evaluated during a geotechnical evaluation that includes a subsurface exploration of the site.

B. Would the project result in substantial soil erosion or the loss of topsoil?

If the site is developed in accordance with current building codes, industry standards, and the recommendations of the geotechnical evaluation, the potential for substantial soil erosion is considered to be low (less than significant impact). The potential for substantial loss of topsoil due to the proposed development is considered low due the proposed development being located in areas previously developed at the site.

C. Would the project be located on geologic unit or soil that is unstable or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?

Based on our review of background data and our understanding of the project construction, site soils are not susceptible to on- or off-site landslides or lateral spreading subsidence as a result of the project. As such, the project is not anticipated to have significant impacts to on-site or off-site landslides and lateral spreading. However, potential soil settlement related to subsidence as a result of construction dewatering and liquefaction at the site as a result of proposed structures should be evaluated by a design-level geotechnical evaluation performed for the project. Where soil settlements are identified, appropriate engineering measures should be employed as recommended in a design-level geotechnical evaluation or by the project structural engineer (less than significant with appropriate design and construction methods incorporated).

D. Would the project be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?

Based on our review of onsite boring data (Geocon, 2020), the fill and alluvium on the project site are expected to have a low to high potential for expansion and should be further evaluated by geotechnical laboratory testing. The risk associated with expansive soils can be addressed during design of the project, in accordance with the requirements of Chapter 18 of the 2022 California Building Code. Should expansive soils be identified, mitigation techniques can be readily implemented. Such techniques include overexcavation and replacement with non-expansive soil, moisture control, soil mixing, lime treatment and/or development of specific structural design for expansive soil condition. In following recommendations of the design-level geotechnical evaluation, project risks with respect to expansive soils can be adequately mitigated. This impact is considered less than significant with mitigation incorporated.

E. Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?

The soils on the project site are expected to be able to support adequately designed septic tanks or alternative waste water disposal systems, in areas away from shallow groundwater and expansive soils. However, the site and general vicinity is actively served the City of San Marcos sewer system, which will be utilized by the project. We consider this impact to be less than significant.

F. Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

Unique and potentially unique geological features in the San Diego region have been documented by the County of San Diego (2007). No unique geologic features are listed in the project area of San Marcos. Furthermore, unique geologic features were not observed during our site reconnaissance. We consider this impact to be less than significant.

8. RECOMMENDATIONS

Based on the geologic and geotechnical considerations at the project site presented in the previous section, we recommend further geotechnical evaluation of the project site, including subsurface evaluation and laboratory testing. Specific recommendations to be addressed prior to issuance of grading and building permits would include:

Soft Ground – Soils in areas with soft ground or loose soils in the area of the proposed project may be subject to settlement. Recommendations to mitigate this condition can typically include

removal and/or replacement of soils as engineered compacted fill. The extent of soft soils and recommended removals may be evaluated by subsurface exploration and laboratory testing.

Expansive Soils – Expansive soils may lead to damage to foundations and engineered structures. If expansive soils exist on site, the following recommendations may be implemented during construction: the soils may be removed from sensitive areas and placed in deeper fill areas; the soils may be excavated and removed from the site; or the expansive soils may be treated (i.e., lime treatment) to mitigate their potential for expansion. Special foundation designs to mitigate expansive soils may also be incorporated in the final design of the project. The extent of expansive soils and recommended mitigation measures may be evaluated by subsurface exploration and laboratory testing.

Ground Shaking – Proposed structures should be designed appropriately to mitigate strong ground shaking in the event of an earthquake on a nearby fault.

Liquefaction – Due to the presence of loose granular soils and shallow groundwater at the site, hazards associated with liquefaction and dynamic settlement should be evaluated. If liquefaction hazards are indicated, structural design and/or earthwork mitigation techniques may be implemented. Specifically, in-situ ground modification, removal of liquefiable layers and replacement with compacted fill, or support of project improvements with piles to sufficient depths can mitigate damage as a result of liquefaction and make the site safe for development

Shallow groundwater – Groundwater has been encountered onsite at depths as shallow as approximately 3½ feet (Geocon, 2020). Shoring and dewatering may be needed if construction is proposed in areas of shallow groundwater.

Landsliding – Landslides have not been mapped on the site or reported in the available literature.

Corrosive Soils – If corrosive soils exist on the site, a corrosion engineer may be retained to assist in the design of improvements in contact with the soil. The extent of corrosive soils and recommended mitigation measures may be further evaluated by subsurface exploration and laboratory testing.

The conditions related to soils and geology, identified in conjunction with the Geology and Soils Technical Study, would increase the cost and duration of grading and construction of the project, but would not preclude the feasibility of development of the project.

9. 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 area 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 preliminary geotechnical evaluation report to assist in the preparation of environmental impact documents for the project. A comprehensive geotechnical evaluation, including subsurface exploration and laboratory testing, should be performed prior to design and construction of structural improvements.

10. REFERENCES

American Society of Civil Engineers (ASCE), 2016, Minimum Design Loads and Associated Criteria for Building and Other Structures, ASCE Standard 7-16.

The Applied Technology Council (ATC), 2023, Hazards by Location, https://hazards.atcouncil.org: accessed in October.

California Building Standards Commission, 2022, California Building Code: California Code of Regulations, Title 24, Part 2, Volumes 1 and 2, based on the 2021 International Building Code.

California Department of Transportation (Caltrans), 2021, Corrosion Guidelines (Version 3.2), Division of Engineering and Testing Services, Corrosion Technology Branch: dated May.

California Department of Water Resources, 2023, Water Data Library Website: http://www.water.ca.gov/waterdatalibrary: accessed in October.

California Geological Survey (CGS), 2015, CGS Map Sheet 48: Shear-wave Velocity in Upper 30m of Surficial Geology (Vs30); https://maps.conservation.ca.gov/cgs/DataViewer/, dated May 24.

California Environmental Quality Act (CEQA), 2023, CEQA Guidelines.

California Geological Survey, 1999, Seismic Shaking Hazard Maps of California: Map Sheet 48.

California Geological Survey, 2008, Guidelines for Evaluating and Mitigating Seismic Hazards in California, CGS Special Publication 117A.

City of San Marcos, Planning Department, 2012, General Plan, Adopted by City Council Resolution: dated February 14.

County of San Diego, 1958, Topographic Survey, Sheet 354-1719, Scale 1:2,400.

County of San Diego, 1975, Topographic Survey (Orthotopo), Sheet 354-1719, Scale 1:2,400.

County of San Diego, 2007, Guideline for Determining Significance – Unique Geology, Land Use and Environment Group: dated July 30.

Douglas Franz Architects, Inc., 2023, Mission San Marcos Industrial Park, Mission Road, San Marcos, CA 92069: revised October 2.

Geocon, Inc, 2020, Transmittal of Geotechnical Information, 528 East Mission Road, San Marcos, California, Project No. G2540-32-01: dated May 8.

Google Inc., 2024, www.googleearth.com: accessed in April.

Groundwater Technology, Inc., 1993, Closure Request, Teledyne Aero-Cal, 528 E. Mission Road, San Marcos, California: dated August 27.

Harden, D.R., 2004, *California Geology* – 2nd ed.: Prentice Hall, Inc.

Hart, E.W., and Bryant, W.A., 2007, Fault-Rupture Hazard Zones in California, Alquist-Priolo Earthquake Fault Zoning Act with Index to Earthquake Fault Zones Maps: California Department of Conservation, California Geological Survey, Special Publication 42, with Supplement 1 added in 2012, Supplement 2 added in 2014, Supplement 3 added in 2015, and Supplement 4 added in 2016.

Historic Aerials, 2024, Aerial Photographs 1938-2020, http://www.historicaerials.com/: accessed in April.

Jennings, C.W., 2010, Fault Activity Map of California and Adjacent Areas: California Geological Survey, California Geological Map Series, Map No. 6.

Kennedy, M.P., Tan, S.S., Bovard, K.R., Alvarez, R.M., Watson, M.J., and Gutierrez, C.I., 2007, Geologic Map of the Oceanside 30' x 60' Quadrangle and adjacent areas, California, Regional Geologic Map RGM-2, Scale 1:100,000.

Ninyo & Moore, In-house proprietary information.

Norris, R.M. and Webb, R.W., 1990, Geology of California: John Wiley & Sons.

State of California Water Resources Control Board (SCWRCB), 2024; website: http://geotracker.waterboards.ca.gov/: accessed in April.

Tan, S.S. and Giffen, D.G., 1995, Landslide Hazards in the Northern Part of the San Diego Metropolitan Area, San Diego County, California, Plate B, San Marcos Quadrangle: California Geological Survey, Landslide Hazard Identification Map No. 35, Open-File Report 95-04.

United States Department of Agriculture (USDA), 2023, Web Soil Survey Website: https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx: accessed in October.

United States Federal Emergency Management Agency (FEMA), 2023, FEMA Mapping Information Platform, World Wide Web, https://hazards.fema.gov/femaportal/wps/portal/: accessed in October.

United States Geological Survey (USGS), 2022, San Marcos Quadrangle, California, 7.5-Minute Series: Scale 1:24,000.

United States Geological Survey (USGS), 2023, 2008 National Seismic Hazard Maps – Fault Parameters; http://geohazards.usgs.gov/efusion/hazardfaults_search/hf_search_main.efm: accessed in October.

Wald, D. J., and Allen, T.I., 2007, Topographic slope as a proxy for seismic site conditions and amplification, Bulletin of the Seismological Society of America, 97, no. 5, 1379-1395.

FIGURES

N

FEET

0 1,500 3,000

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE. | SOURCE: ESRI WORLD TOPO, 2023

1_109768001_SL.mxd 4/29/2024 AOB

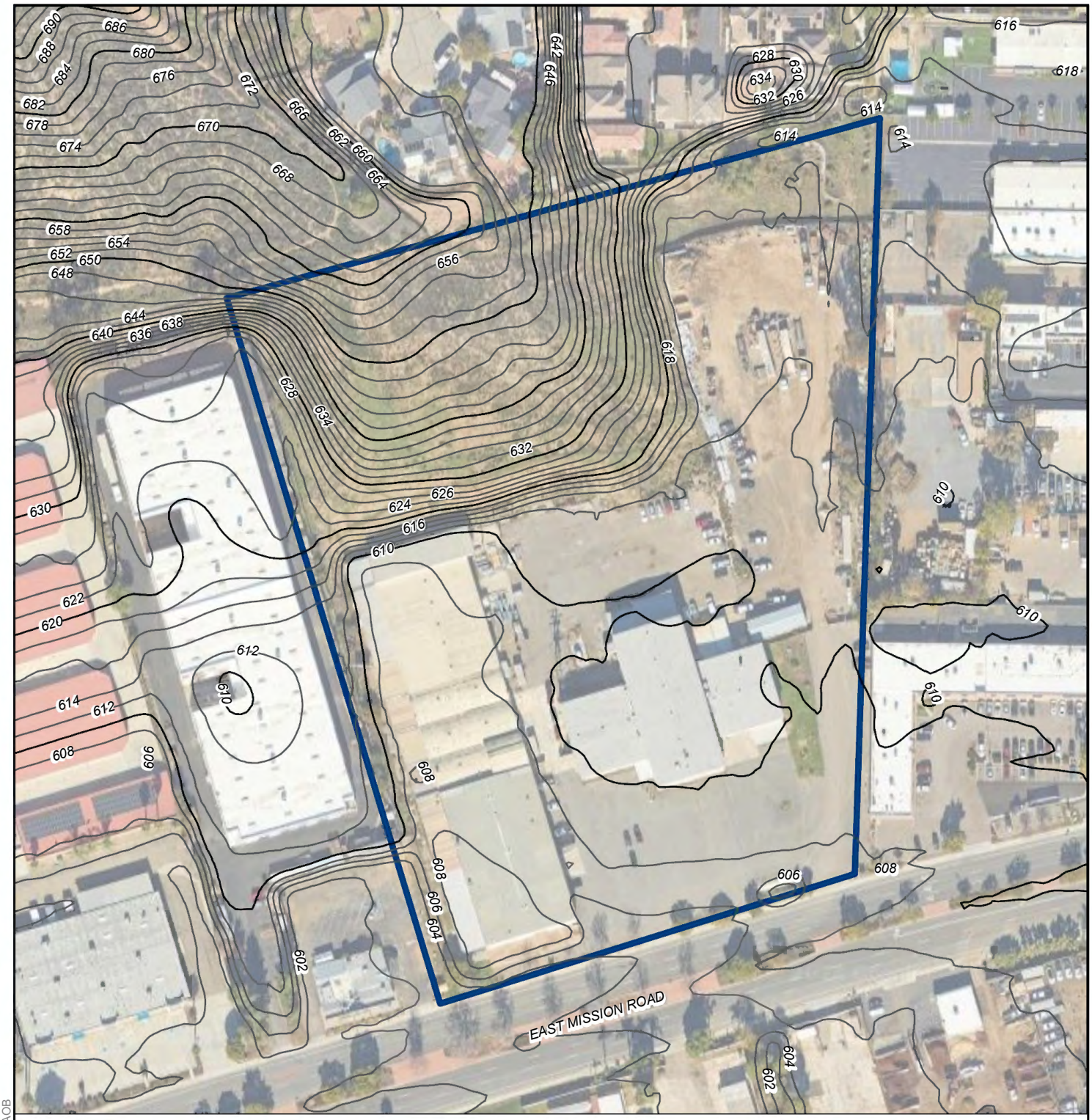
FIGURE 1

SITE LOCATION

MISSION SAN MARCOS INDUSTRIAL PARK
528 EAST MISSION ROAD
SAN MARCOS, CALIFORNIA

109768001 | 5/24

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants



LEGEND

SITE BOUNDARY

690 TOPOGRAPHIC CONTOURS (NOAA, 2014)

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE. | SOURCE: GOOGLE EARTH, 2023

N

FEET

0 150 300

2_109768001_SA.mxd 4/29/2024 AOB

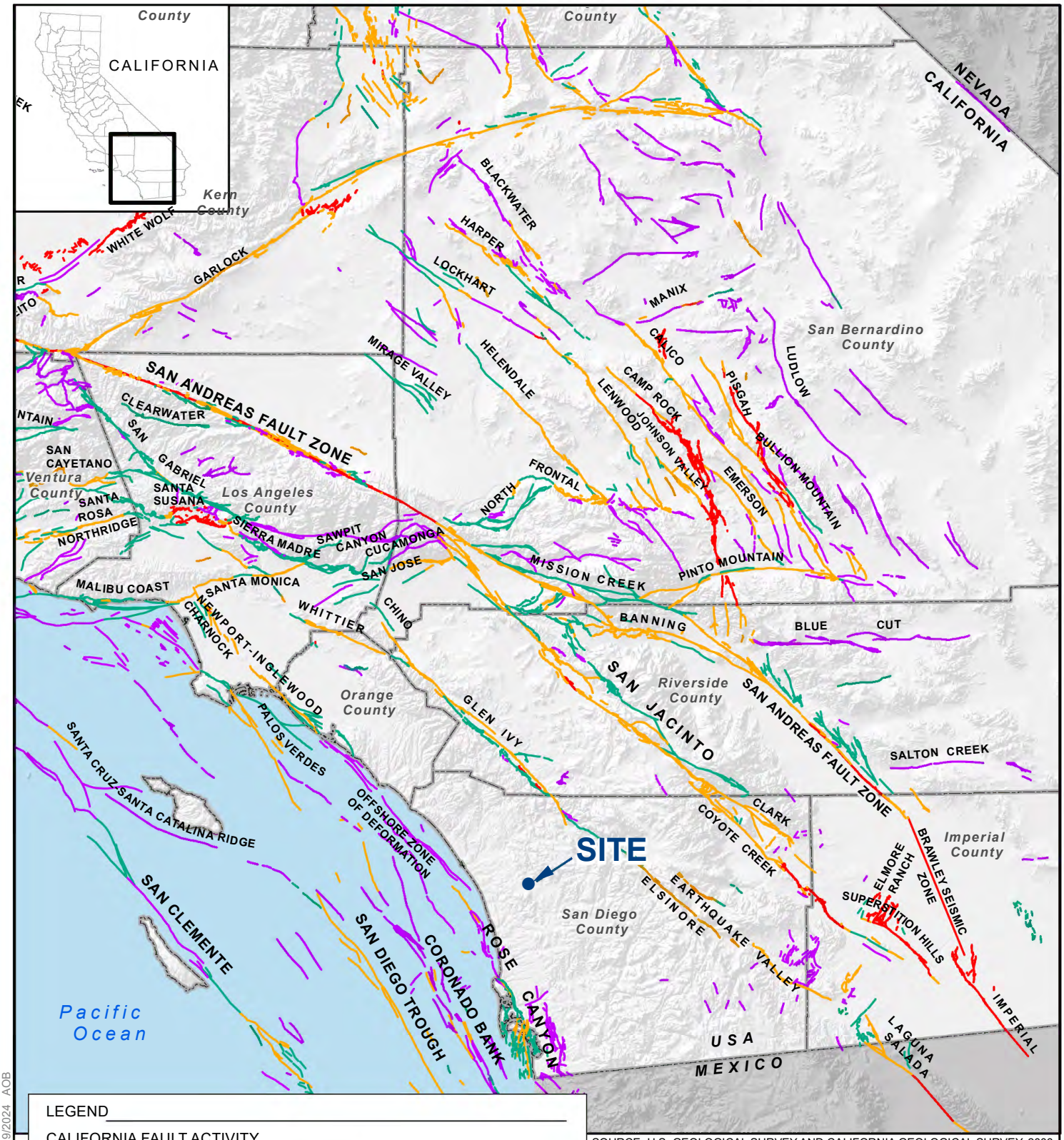
FIGURE 2

SITE AERIAL

MISSION SAN MARCOS INDUSTRIAL PARK
528 EAST MISSION ROAD
SAN MARCOS, CALIFORNIA

109768001 | 5/24

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants



SOURCE: U.S. GEOLOGICAL SURVEY AND CALIFORNIA GEOLOGICAL SURVEY, 2006, QUATERNARY FAULT AND FOLD DATABASE FOR THE UNITED STATES.

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE.

3_109768001_FL.mxd 4/29/2024 AOB

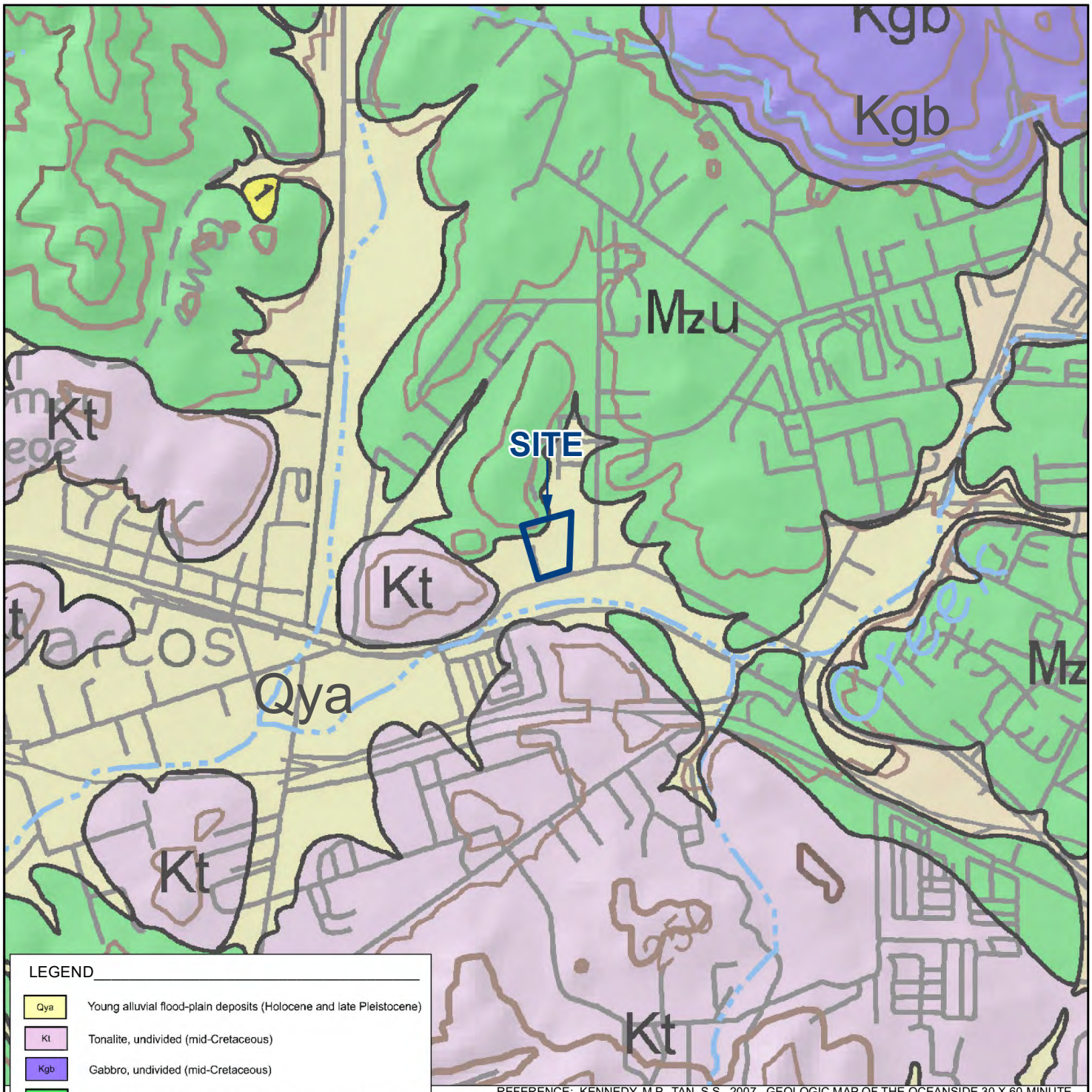
FIGURE 3

FAULT LOCATIONS

MISSION SAN MARCOS INDUSTRIAL PARK
528 EAST MISSION ROAD
SAN MARCOS, CALIFORNIA

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants

109768001 | 5/24



REFERENCE: KENNEDY, M.P., TAN, S.S., 2007, GEOLOGIC MAP OF THE OCEANSIDE 30 X 60-MINUTE QUADRANGLE, CALIFORNIA

LEGEND

Qya	Young alluvial flood-plain deposits (Holocene and late Pleistocene)
Kt	Tonalite, undivided (mid-Cretaceous)
Kgb	Gabbro, undivided (mid-Cretaceous)
Mzu	Metasedimentary and metavolcanic rocks, undivided (Mesozoic)
Qls?	Landslide - Arrows indicate principal direction of movement. Queried where existence is questionable.
70 U D	Fault - Solid where accurately located; dashed where approximately located; dotted where concealed. U = upthrown block, D = downthrown block. Arrow and number indicate direction and angle of dip of fault plane.
70	Strike and dip of beds

N

FEET

0 2,000 4,000

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE.

4_109768001_G.mxd 4/29/2024 AOB

FIGURE 4

GEOLOGY

MISSION SAN MARCOS INDUSTRIAL PARK
528 EAST MISSION ROAD
SAN MARCOS, CALIFORNIA

109768001 | 5/24

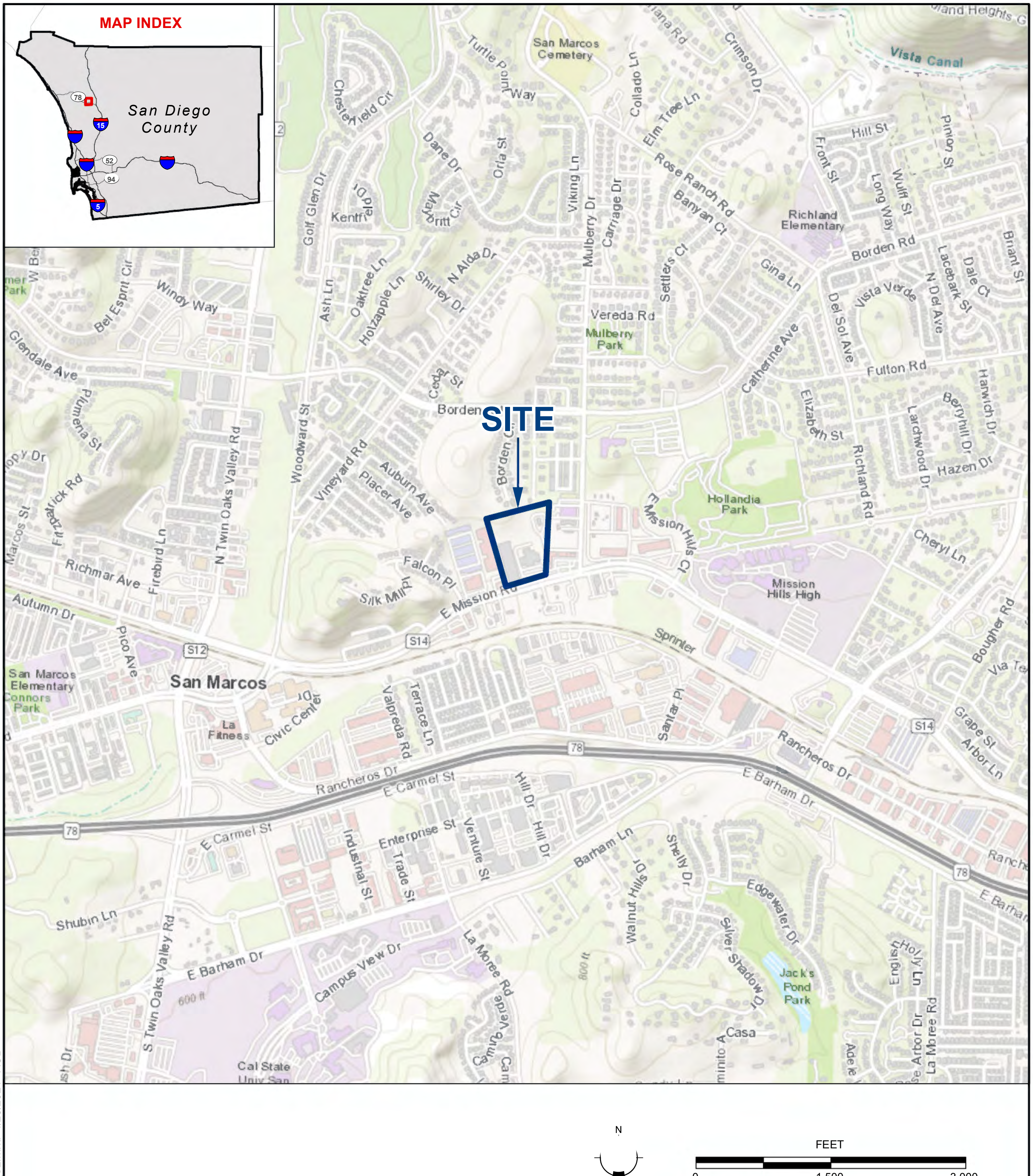
Ninyo & Moore
Geotechnical & Environmental Sciences Consultants

5710 Ruffin Road | San Diego, California 92123 | p. 858.576.1000

ARIZONA | CALIFORNIA | COLORADO | NEVADA | TEXAS | UTAH

ninyoandmoore.com

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants



1 109768001 SL.mxd 4/29/2024 AOB

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE. | SOURCE: ESRI WORLD TOPO, 2023

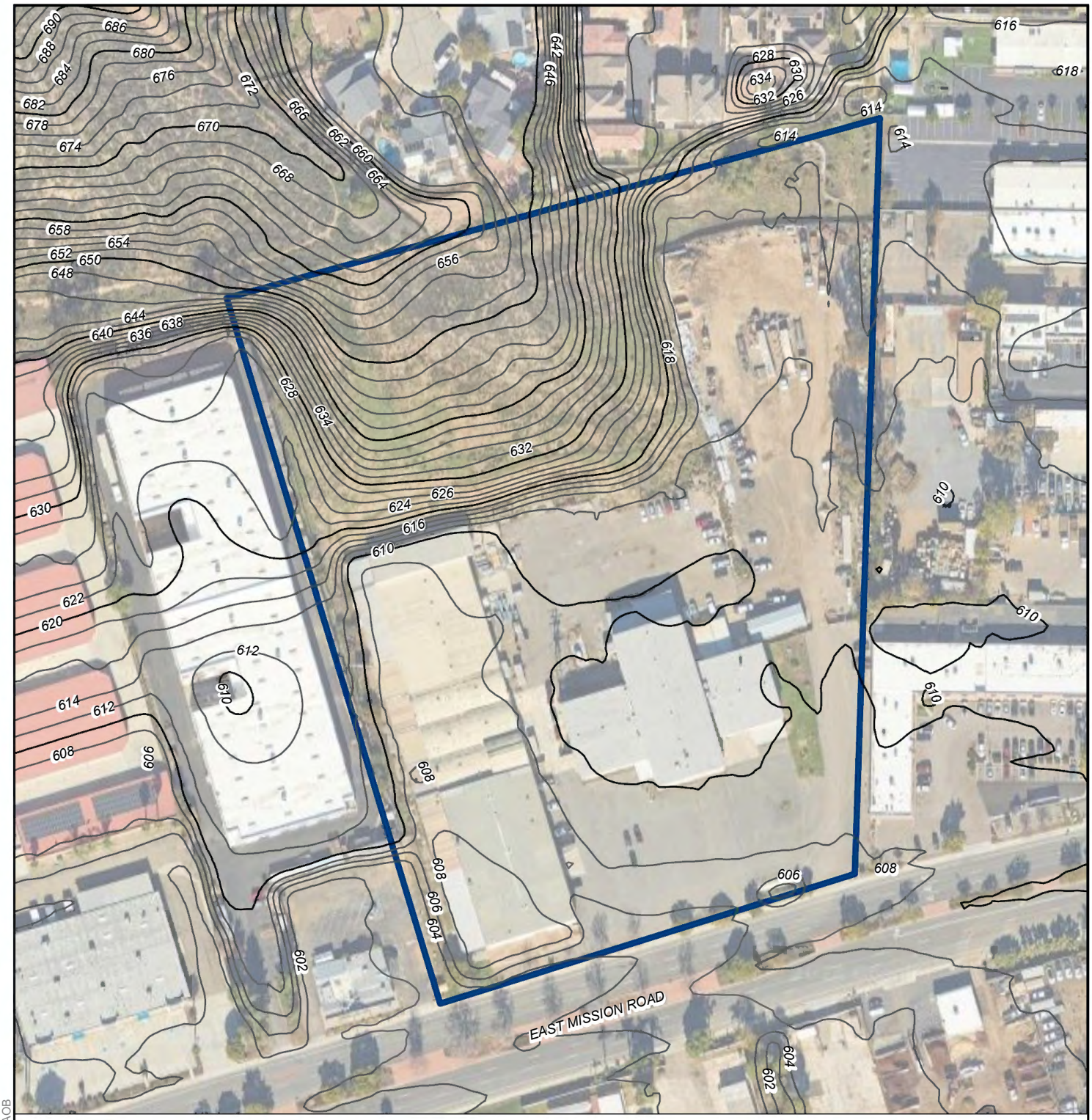
FIGURE 1

SITE LOCATION

MISSION SAN MARCOS INDUSTRIAL PARK
528 EAST MISSION ROAD
SAN MARCOS, CALIFORNIA

109768001 | 5/24

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants



LEGEND

SITE BOUNDARY

690 TOPOGRAPHIC CONTOURS (NOAA, 2014)

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE. | SOURCE: GOOGLE EARTH, 2023

N

FEET

0 150 300

2_109768001_SA.mxd 4/29/2024 AOB

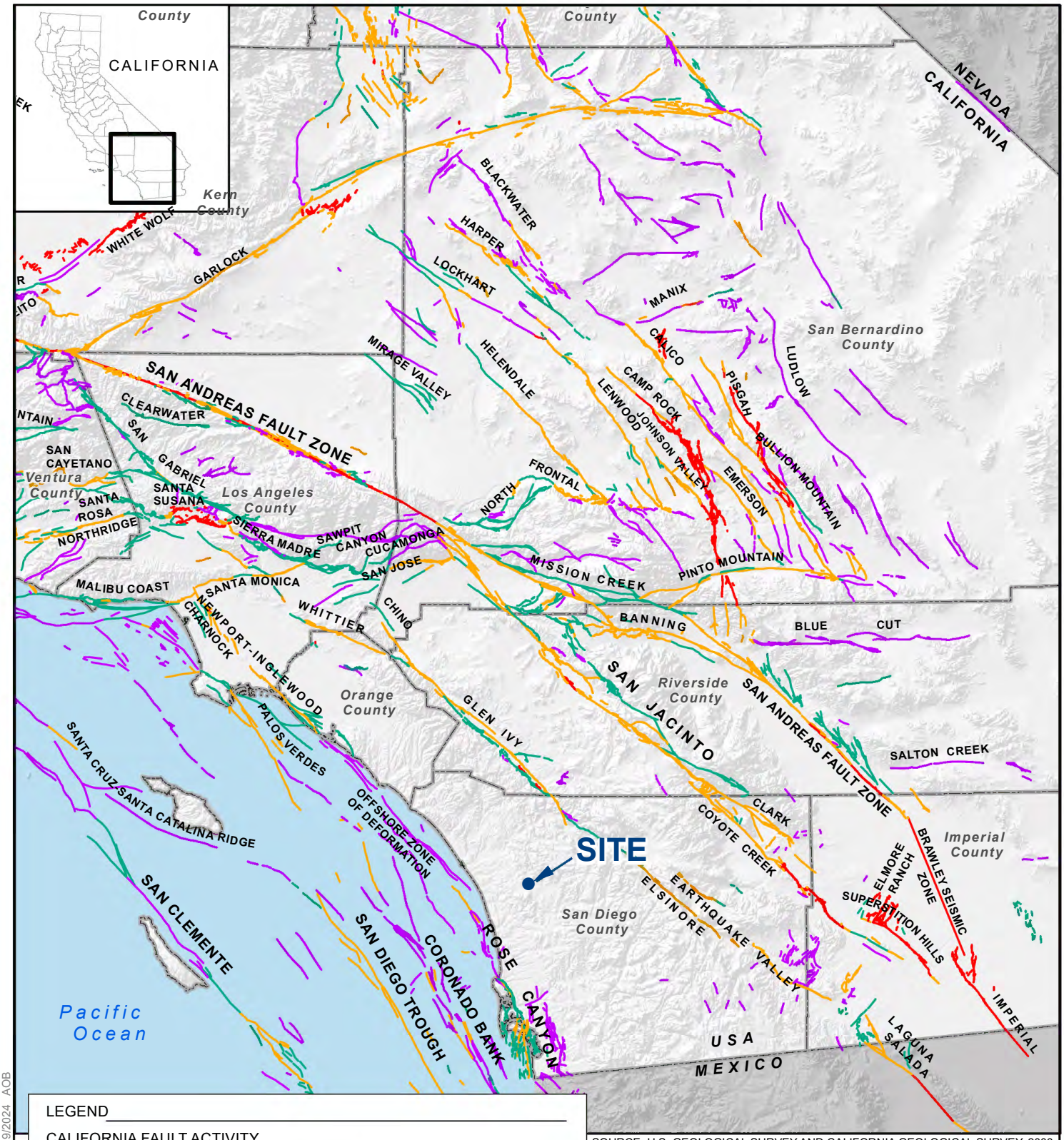
FIGURE 2

SITE AERIAL

MISSION SAN MARCOS INDUSTRIAL PARK
528 EAST MISSION ROAD
SAN MARCOS, CALIFORNIA

109768001 | 5/24

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants



SOURCE: U.S. GEOLOGICAL SURVEY AND CALIFORNIA GEOLOGICAL SURVEY, 2006, QUATERNARY FAULT AND FOLD DATABASE FOR THE UNITED STATES.

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE.

3_109768001_FL.mxd 4/29/2024 AOB

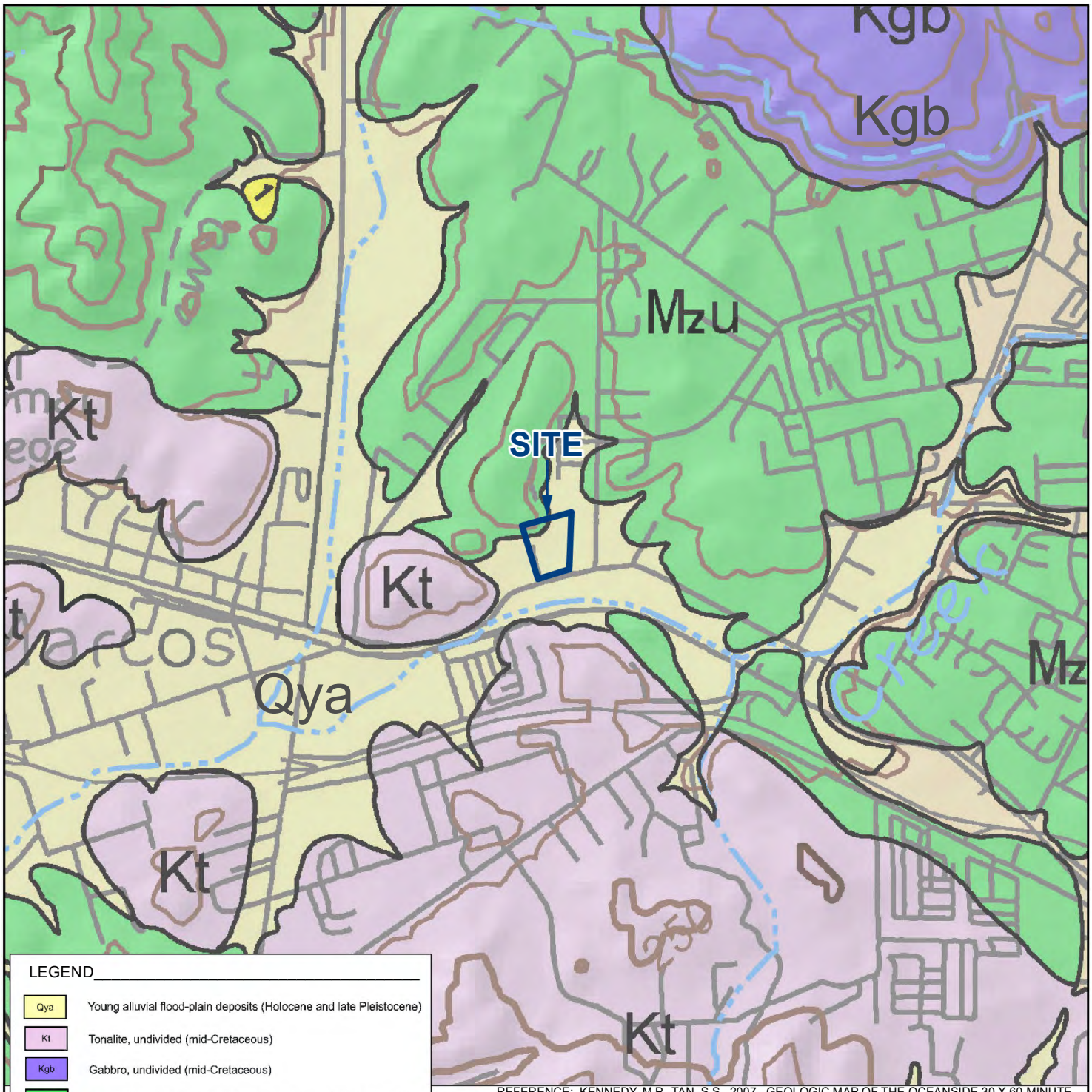
FIGURE 3

FAULT LOCATIONS

MISSION SAN MARCOS INDUSTRIAL PARK
528 EAST MISSION ROAD
SAN MARCOS, CALIFORNIA

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants

109768001 | 5/24



REFERENCE: KENNEDY, M.P., TAN, S.S., 2007, GEOLOGIC MAP OF THE OCEANSIDE 30 X 60-MINUTE QUADRANGLE, CALIFORNIA

LEGEND

Qya	Young alluvial flood-plain deposits (Holocene and late Pleistocene)
Kt	Tonalite, undivided (mid-Cretaceous)
Kgb	Gabbro, undivided (mid-Cretaceous)
Mzu	Metasedimentary and metavolcanic rocks, undivided (Mesozoic)
Qls?	Landslide - Arrows indicate principal direction of movement. Queried where existence is questionable.
70 U D	Fault - Solid where accurately located; dashed where approximately located; dotted where concealed. U = upthrown block, D = downthrown block. Arrow and number indicate direction and angle of dip of fault plane.
70	Strike and dip of beds

N

FEET

0 2,000 4,000

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE.

4_109768001_G.mxd 4/29/2024 AOB

FIGURE 4

GEOLOGY

MISSION SAN MARCOS INDUSTRIAL PARK
528 EAST MISSION ROAD
SAN MARCOS, CALIFORNIA

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants

109768001 | 5/24

5710 Ruffin Road | San Diego, California 92123 | p. 858.576.1000

ARIZONA | CALIFORNIA | COLORADO | NEVADA | TEXAS | UTAH

ninyoandmoore.com

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants