Appendix E:
Geology and Soils Supporting Information

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EXHIBIT D

SHADELANDS
WALNUT CREEK, CALIFORNIA

PRELIMINARY GEOTECHNICAL STUDY

SUBMITTED TO
Mr. Eric Harrison
Senior Vice President
Signature Development Group
2335 Broadway, Suite 200
Oakland, CA 94612

PREPARED BY
ENGEO Incorporated

March 1, 2024
Revised April 3, 2024

PROJECT NO.
25146.000.001

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Expect Excellence

Project No.
25146.000.001

March 1, 2024
Revised April 3, 2024

Mr. Eric Harrison
Senior Vice President
Signature Development Group
2335 Broadway, Suite 200
Oakland, CA 94612

Subject: Shadelands
Walnut Creek, California

PRELIMINARY GEOTECHNICAL STUDY

Dear Mr. Harrison:

We prepared this preliminary geotechnical study for the proposed residential development at Shadelands in Walnut Creek, as outlined in our executed agreement dated February 2, 2023. We characterized the subsurface conditions at the site to develop our conclusions and provide preliminary recommendations for the planned development.

It is our opinion from a geotechnical engineering viewpoint, that the site is suitable for the proposed development, provided the preliminary recommendations and guidelines provided in this report are implemented during project planning. The scope of this report is limited to an initial desktop study, and we recommend a design-level geotechnical exploration should be conducted to further evaluate the geotechnical hazards identified in this report and to develop geotechnical parameters for grading plan preparation and foundation design.

We are pleased to have been of service on this project and are prepared to consult further with you and your design team as the project progresses. If you have any questions or comments regarding this preliminary report, please call and we will be glad to discuss them with you.

Sincerely,

ENGEO Incorporated

Bahareh Heidarzadeh, PhD, PE

Robert H. Boeche, CEG

bh/rhb/ca

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1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

We prepared this preliminary geotechnical study in support of your planning for the proposed development located at Shadelands in Walnut Creek, California. As outlined in our executed agreement dated February 2, 2024, Signature Development authorized us to perform the following scope of services.

- Existing document review
- Data analysis and development of preliminary geotechnical recommendations
- Report preparation

We received and reviewed the Phasing Exhibit prepared by Carlson, Barbee & Gibson (CBG), dated January 2024, the Conceptual Design plan prepared by KTGY, dated January 18, 2024, and the Parcel Map.

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1.2 SITE LOCATION AND DESCRIPTION

The approximately 22-acre site is located in the Shadelands area of Walnut Creek and is bound by Mitchell Drive to the north, Oak Grove Road and a three-wing three-story office structure to the east, Shadelands Drive to the south, and a developed parcel to the west.

The site is currently developed and occupied by three existing two-story commercial complexes (three buildings within each complex) with associated paved parking areas and landscaping. The central landscape area comprises artificial ponds. The topography of the site is relatively flat, ranging between approximately Elevation 107 and 113 feet (NAVD 29). The Site Plan (Figure 2) shows the boundaries of the project site.

1.3 PROPOSED DEVELOPMENT

Based on our review of the conceptual site plan and discussion with you, we understand the proposed project will consist of the following.

- Demolition of existing buildings, parking areas, hardscape and landscape areas
- Construction of 422 townhomes
- Paved streets, parking, and other hardscape improvements
- Underground utilities and other infrastructure improvements
- Bioretention areas, parks, open space, and landscape areas

Structural loads and final grading are yet to be determined; however, we assume that structural loads will be representative for this type of construction. We assume that only minor grading, cuts, and fills of up to 3 feet will be required.

2.0 FINDINGS

2.1 SITE HISTORY

To characterize and understand the site development history and geomorphology, we reviewed historical aerial photographs and topographic maps. We viewed numerous historical aerial photographs flown from 1939 to present, available on Google Earth and www.historicaerials.com. We also reviewed published historical topographic maps dating back to 1900 to consider the site's history before aerial photographic coverage was available.

Early aerial photographs show that the site was previously used as an orchard up to as late as 1968. Photographs taken in the late 1970s show that the site was developed with the three present-day commercial complexes and parking lot. The photograph taken in 1980 shows that the last present-day commercial complex on the southwestern corner of the site was constructed. Review of the historical topographic maps indicates that minor site grading was performed to develop the site to its current condition.

2.2 REGIONAL GEOLOGY AND SEISMICITY

2.2.1 Regional Geologic Setting

The site is located within the Coast Ranges geomorphic province of California. The Coast Ranges province is typified by a system of northwest-trending, fault-bounded mountain ranges and intervening alluvial valleys. Bedrock in the Coast Ranges consists of igneous, metamorphic, and sedimentary rocks that range in age from Jurassic to Pleistocene. The present physiography and geology of the Coast Ranges are the result of deformation and deposition along the tectonic boundary between the North American plate and the Pacific plate. Plate boundary fault movements are largely concentrated along the well-known fault zones, which in the area include the San Andreas, Hayward, and Calaveras faults, as well as other lesser-known faults.

Helley and Graymer (1997) (Figure 3) map the site as underlain by Pleistocene-age alluvial fan and fluvial deposits (Qpaf). These deposits primarily consist of clayey sand or clayey gravel that commonly have a fining upwards sequence to sandy clay. Graymer et al. (1994) map bedrock in the hills east of the site (Lime Ridge) as Nortonville Shale, Domingene Formation, and Great Valley Sequence.

2.2.2 Seismicity

The site is located in a seismically active area that contains numerous faults. Small earthquakes occur every year in the Northern California region and larger earthquakes have been recorded and can be expected to occur in the future. Faults have been cataloged and mapped by the United States Geological Survey (USGS) in the Quaternary Fault and Fold Database of the United States. An active fault is defined by the California Geologic Survey as one that experienced surface displacement within Holocene time (about the last 11,700 years) (CGS, 2018). Figure 4 shows the approximate locations of known active faults, along with other Quaternary faults, based on the USGS Quaternary Fault and Fold Database, as well as significant historical earthquakes recorded within the Northern California region. The proposed development is not located within a State of California Earthquake Fault Hazard Zone (Figure 5).

To identify nearby faults that are capable of generating strong seismic ground shaking at the site, we utilized the USGS Earthquake Hazard Toolbox and the 2018 National Seismic Hazard Model (NSHM) to perform a disaggregation of the seismic hazard at the peak ground acceleration (PGA) and at spectral periods up to 5 seconds for a return period of 2,475 years. The resulting faults are listed below in Table 2.2.2-1.

TABLE 2.2.2-1: Faults Considered Capable of Producing Strong Ground Shaking at the Site*

SOURCE NAME	RUPTURE DISTANCE, R_{RUP}		MOMENT MAGNITUDE, M_W
	(km)	(mi)	
Concord (2)	2.50	1.55	6.6
Mount Diablo (north) [1] (1)	3.81	2.37	7.2
Contra Costa (Larkey) [2] (1)	5.05	3.13	6.4
Franklin (1)	5.70	3.54	7.2
Clayton (0)	7.42	4.61	7.0
Concord (1)	7.81	4.85	6.6
Contra Costa (Connected) [1] (4)	8.29	5.15	7.3
Contra Costa (Lafayette) (1)	8.49	5.27	7.4
Calaveras (north) (0)	10.7	6.64	7.1
Hayward (north) (1)	20.2	12.6	7.5
San Andreas (Peninsula) (10)	50.5	31.4	8.09

*Based on USGS Earthquake Hazard Toolbox: NSHM Conterminous U.S. 2018

These results represent known fault sources contributing at least 1 percent to the seismic hazard at the site considering spectral periods ranging from the peak ground acceleration (PGA) to 5 seconds for the given return period. The rupture distances (R_{RUP}) and mean moment magnitudes (M_W) listed are based on values assigned according to the 2018 NSHM, and the numbers in parentheses after the fault names correspond to fault subsections assigned by the NSHM. Note that the above fault table is not an exhaustive list and other faults in the region may generate seismic shaking at the project site.

In 2014, the Working Group on California Earthquake Probabilities estimated the 30-year likelihood of one or more MW 6.7 or greater earthquake events in the Northern California region at approximately 95 percent, considering the known seismic sources in the region.

2.3 HISTORICAL DATA REVIEW

We obtained and reviewed public records associated with the project site and nearby buildings from the City of Walnut Creek. These records include, but are not limited to, the following.

- Lowney Kaldveer Associates (1972). Phase I – Foundation Investigation Executive Office Center, Walnut Creek Executive Park, Walnut Creek, California, dated January 25, 1972.
- R.C. Harlan and Associates (1977). Walnut Creek Executive Park, Phase II, Grading of Building Pads, dated April 28, 1977.
- R.C. Harlan and Associates (1978). Soil and Foundation Investigation, Integrated Executive Park, Phase III and Phase IV, Walnut Creek, CA, dated July 31, 1978
- R.C. Harlan and Associates (1978). Interland Executive Park Phase III, Transmittal of Daily Field Reports on Grading for Site Work, dated December 6, 1978.

- J.V. Lowney and Associates (1985). Geotechnical Investigation for Executive Center Building 12, Walnut Creek, CA, Dated September 4, 1985.

2.4 SURFACE AND SUBSURFACE CONDITIONS

Based on our review of the historical report noted in the previous section and our knowledge of the subsurface conditions in this general area of Walnut Creek, we expect the subsurface condition to consist of firm to hard, silty clay and sandy clay with medium to high plasticity. A 5-foot-thick layer of dense to very dense clayey sand with gravel was observed in some of the borings approximately 15 to 20 feet below ground surface. An isolated 2-foot-thick layer of loose sand was observed in one of the borings at a depth of approximately 18 feet below ground surface.

Based on our review of historical geotechnical and grading reports and topographic maps, we anticipate existing fill may exist in the upper 2 to 3 feet across the site.

2.5 GROUNDWATER CONDITIONS

Based on our review of historical data, we expect groundwater to be between 12 to 16 feet below ground surface. Fluctuations in the level of groundwater may occur due to variations in rainfall, irrigation practices, and other factors not evident at the time measurements were made.

3.0 GEOLOGIC AND GEOTECHNICAL HAZARDS

Based on our findings and experience, it is our opinion that development of the site is feasible, provided the anticipated geologic and geotechnical constraints are appropriately mitigated. The primary geological and geotechnical concerns that could affect development are the presence of fill, potentially expansive soil, and strong ground shaking. We summarize our preliminary conclusions below.

3.1 EXISTING FILL

The historical geotechnical borings do not indicate undocumented fill. However, based on records of grading, we anticipate existing fill may exist in the upper 2 to 3 feet across the site. In our public record review, we were able to locate satisfactory compaction testing for site developments in Phases II and III. Therefore, we anticipate that fill placement during site grading was done in an engineered manner. The extent and quality of existing fill should be evaluated at the time of the design-level study and mitigated during remedial grading activities, if deemed necessary.

Non-engineered fill can undergo excessive settlement, especially under new fill or building loads. In general, undocumented fill should be excavated, and if deemed suitable for reuse, replaced as engineered soil fill.

3.2 EXPANSIVE SOIL

Our review of the existing subsurface data suggests that medium to high plasticity clay may exist in the near-surface fill and naturally deposited materials. The presence of potentially expansive soil should be further evaluated during the design-level geotechnical exploration.

Expansive soil changes in volume with changes in moisture. It can shrink or swell and cause heaving and cracking of slabs-on-grade, pavements, and structures founded on shallow foundations. Building damage due to volume changes associated with expansive soil can be reduced by: (1) using a rigid mat foundation that is designed to resist the settlement and heave of expansive soil, (2) deepening the foundations to below the zone of moisture fluctuation, i.e., by using deep footings or drilled piers, and/or (3) using footings at normal shallow depths but bottomed on a layer of select fill having a low-expansion potential.

Post-tensioned rigid mat foundations are the preferred foundation system for the planned residential structures. We present design criteria for this foundation type in Section 4.1.

Successful performance of structures on expansive soil requires special attention during construction. It is imperative that exposed soil be kept moist prior to placement of concrete for foundation construction. It can be difficult to remoisturize clayey soil without excavation, moisture conditioning, and recompaction.

We have also provided specific grading recommendations for compaction of clay soil at the site. The purpose of these recommendations is to reduce the swell potential of the clay by compacting the soil at a high moisture content and controlling the amount of compaction. Expansive soil mitigation recommendations are presented in Section 4.2 of this report.

3.3 COMPRESSIBLE SOIL

Soil is subject to consolidation settlement when a new loading scenario is introduced by structures, earthworks, or equipment. The amount of consolidation settlement is dependent on the magnitude and duration of the applied load, the shape and size of the applied load area, the depth, thickness, and the stress history of the compressible soil. The time required for primary consolidation settlement to occur is highly dependent on the permeability of the deposit. Consequently, sandy soil will settle almost immediately, whereas clayey soil will settle much more slowly.

Based on review of historical data, it is our opinion that the subsurface clay and silt mixture material are primarily stiff to very stiff, and will likely experience negligible consolidation from the additional load of the proposed buildings. Based on our knowledge and experience, it is our opinion that a portion of any consolidation-induced settlement will occur during construction and that the remaining differential consolidation-induced settlement can be accommodated in the structural foundation design.

Laboratory testing and additional analysis should be performed in the design-level exploration to confirm the magnitude and extent of potentially compressible material and the potential consolidation-induced settlement.

3.4 SOIL CORROSION POTENTIAL

Sampling and testing for corrosion potential were not performed as part of this preliminary study. Representative samples of the foundation grade soil should be obtained during the design-level geotechnical exploration to determine the potential for corrosion on buried metal and the potential for sulfate attack on foundation concrete. Based on the test results, the corrosion potential can be described, and the recommended concrete design parameters can be developed in accordance with the guidelines presented in the 2022 CBC.

3.5 SEISMIC HAZARDS

Potential seismic hazards resulting from a nearby moderate to major earthquake can generally be classified as primary and secondary. The primary effect is ground rupture, also called surface faulting. Common secondary seismic hazards include ground shaking, liquefaction, and lateral spreading. The following sections present a discussion of these and other hazards, as they apply to the site. Based on topographic and lithologic data, the risk of regional subsidence or uplift, lurching, or landslides, is considered low to negligible at the site.

3.5.1 Ground Rupture

Since there are no active faults crossing the property and the site is not within an Earthquake Fault Special Study Zone (Figure 5), ground rupture is unlikely at the subject property.

3.5.2 Ground Shaking

An earthquake of moderate to high magnitude generated within the Northern California Region could cause considerable ground shaking at the site, similar to that which has occurred in the past. To mitigate the shaking effects, all structures should be designed using sound engineering judgment and the current California Building Code (CBC) requirements, as a minimum.

Seismic design provisions of current building codes generally prescribe minimum lateral forces, applied statically to the structure, combined with the gravity forces of dead and live loads. Structures designed to mitigate the effects of ground shaking should be able to: (1) resist minor earthquakes without damage, (2) resist moderate earthquakes without structural damage, but with some non-structural damage, and (3) resist major earthquakes without collapse, but with some structural, as well as non-structural damage. Conformance to the current building code recommendations does not constitute any kind of guarantee that significant structural damage would not occur in the event of a maximum magnitude earthquake; however, it is reasonable to expect that a well-designed and well-constructed structure will not collapse or cause loss of life in a major earthquake (SEAOC, 1999). Section 4.1 presents California Building Code (CBC, 2022) seismic design parameters.

3.5.3 Liquefaction/Cyclic Softening

According to mapping of liquefaction susceptibility in the central San Francisco Bay Region by the USGS (2006), which is also referenced in the most recent edition of the San Ramon General Plan, the site is located within a zone of low liquefaction susceptibility (Figure 6).

Soil liquefaction results from loss of strength during cyclic loading, such as imposed by earthquakes. Based on our review of the historical data, we anticipate the risk of liquefaction to be negligible at this site.

3.5.4 Lateral Spreading

Lateral spreading is a failure within a nearly horizontal soil zone (due to liquefaction) that causes the overlying soil mass to move toward a free-face or down a gentle slope. Generally, effects of lateral spreading are most significant at the free-face or the crest of a slope and diminish with distance from the slope. We anticipate final grades of the project site and surrounding area will be relatively flat, and sloping ground conditions were not observed in the project vicinity. Therefore, we conclude the risk of lateral spreading at the project site is very low.

3.6 CBC 2022 SEISMIC DESIGN PARAMETERS

Based on the review of the historical subsurface data, the shear-wave velocity map (Willis et al., 2015), we classify the site as Site Class C. This site classification should be confirmed during the design-level geotechnical studies. In Table 3.6-1 below, we provide the CBC seismic parameters based on the United States Geological Survey's (USGS') Seismic Design Maps for your use.

TABLE 3.6-1: 2022 CBC Seismic Design Parameters, Latitude: 37.93001 Longitude: -122.02043

PARAMETER	VALUE
Site Class	C
Mapped MCE_R Spectral Response Acceleration at Short Periods, S_S (g)	2.32
Mapped MCER Spectral Response Acceleration at 1-second Period, S_1 (g)	0.72
Site Coefficient, Fa	1.2
Site Coefficient, Fv	1.4
MCE_R Spectral Response Acceleration at Short Periods, S_{MS} (g)	2.78
MCE_R Spectral Response Acceleration at 1-second Period, S_{M1} (g)	1.01
Design Spectral Response Acceleration at Short Periods, S_{DS} (g)	1.86
Design Spectral Response Acceleration at 1-second Period, S_{D1} (g)	0.67
Mapped MCE Geometric Mean (MCE_G) Peak Ground Acceleration, PGA (g)	0.94
Site Coefficient, F_{PGA}	1.20
MCE_G Peak Ground Acceleration adjusted for Site Class effects, PGA_M (g)	1.13

4.0 PRELIMINARY RECOMMENDATIONS

From a geotechnical engineering viewpoint, the site is suitable for the proposed development, provided the preliminary geotechnical considerations in this report are properly considered through planning and preliminary design and that a geotechnical design-level study is performed.

4.1 PRELIMINARY FOUNDATION RECOMMENDATIONS

We anticipate the proposed residential development can be supported by a post-tensioned (PT) mat foundation. Based on our understanding of the presence of expansive soil in the area, we do not recommend the use of conventional footings with a concrete slab-on-grade as the most optimum foundation type. However, if desired, we can provide recommendations for deepened conventional footings with select non-expansive material under the slab-on-grade. We provide preliminary recommendations for the post-tensioned mat foundation below.

The foundation should be designed to tolerate up to 1 inch of total static and seismically induced settlement. The differential for static and seismic settlement can each be taken as one-half the total estimate over the width of the building, or a lateral distance of 30 feet, whichever is less.

4.1.1 Post-tension Mat Foundation

We recommend that the proposed residential structures be supported on PT mat foundations bearing on engineered fill. Refer to Sections 4.2.3 and 4.2.5 for engineered fill recommendations. On a preliminary basis, we recommend that PT mats be a minimum of 10 inches thick and have a thickened edge at least 2 inches greater than the mat thickness. The structural engineer should determine the actual PT mat thickness using the geotechnical recommendations in the design-level report. We recommend that the thickened edge be at least 12 inches wide.

PT mats are typically underlain by a moisture reduction system as recommended below. In addition, the building pad subgrade is typically moisture conditioned such that the subgrade soil is at a moisture content at least 4 percentage points above optimum immediately prior to foundation construction. The subgrade should not be allowed to dry prior to concrete placement.

4.1.2 Slab Moisture Vapor Reduction

When buildings are constructed with a concrete slab-on-grade, including post-tensioned mats, water vapor from beneath the slab will migrate through the slab and into the building. This water vapor can be reduced but not stopped. Vapor transmission can negatively affect floor coverings and lead to increased moisture within a building. When water vapor migrating through the slab would be undesirable, we typically recommend a moisture retarder system to reduce, but not stop, water vapor transmission upward through the slab-on-grade. This generally involves installing a Class A vapor retarder membrane (ASTM E1745, latest edition), underlain by 4 inches of clean crushed rock.

The structural engineer should be consulted as to the use of a layer of clean sand or pea gravel (less than 5 percent passing the U.S. Standard No. 200 Sieve) placed on top of the vapor retarder membrane.

Lastly, we typically recommend a concrete water-cement ratio for slabs-on-grade of no more than 0.50, special inspections during concrete placement, and moist curing slabs for a minimum of 3 days (or other equivalent curing specified by the structural engineer).

4.2 PRELIMINARY EARTHWORK RECOMMENDATIONS

4.2.1 Demolition and Site Preparation

Site preparation should commence with demolition of structures, asphalt parking, existing underground improvements, landscaping, and artificial ponds. Following demolition operations, grading and earthwork may begin. All excavations should be cleaned to a firm undisturbed soil surface, as determined by our representative. No loose or uncontrolled backfilling of depressions outside or below building foundations is permitted. The requirements for backfill materials and placement operations will be provided in the design-level report. Grading operations should be observed and tested by our field representative. Existing foundation elements within future structural areas should be removed entirely and backfilled with compacted fill following the fill placement recommendations in this report. If removal of existing foundations is not feasible, the foundation elements should be identified and the portion within 5 feet vertical of new foundation elements be cut off.

4.2.2 Undocumented Fill

As described previously, we anticipate that the majority of the fill was placed in some engineering manner. We recommend performing sampling and testing during the design-level geotechnical study to further evaluate the possibility of leaving all or some portion of the fill in place.

Where applicable, existing fill, existing utility trench backfill, existing foundation backfill, and existing landscape materials, including the material at the bottom of the artificial lakes, are considered undocumented and should be subexcavated to expose underlying competent native soil that is approved by the geotechnical engineer. If in a fill area, the base of the excavations should be processed, moisture conditioned, as needed, and compacted in accordance with the recommendations for engineered fill.

4.2.3 Acceptable Fill Material

On-site soil material may be suitable as fill material (pending environmental approval) provided it is processed to remove concentrations of organic material, debris, and particles greater than 6 inches in maximum dimension.

Imported fill materials should meet the above requirements and have a plasticity index less than 20 and at least 20 percent passing the No. 200 sieve. It is important that we sample and test proposed imported fill materials at least 5 days prior to delivery to the site.

4.2.4 Reuse of On-Site Recycled Materials

If desired, the existing pavement section materials and concrete from building demolition can be considered for use as recycled aggregate to replace some of the import aggregate base for pavements, as well as for structural fill. The material will need to be broken down, but not pulverized, to have a maximum particle size of less than 6 inches if used for fill and should conform to Caltrans Class 2 Aggregate Base specifications if used to substitute for roadway base.

4.2.5 Fill Compaction

We recommend removal of existing fills, if needed based on the design-level studies, stripping of organics, scarification, moisture conditioning, and compaction of the soil prior to fill placement, following cutting operations, and in areas left at grade. For land planning and cost estimating purposes, the following compaction control requirements should be anticipated for general fill areas.

- Test Procedures: ASTM D1557
- Required Moisture Content: Not less than 3 percentage points above optimum moisture content
- Minimum Relative Compaction: Not less than 90 percent

Relative compaction refers to the in-place dry density of soil expressed as a percentage of the maximum dry density of the same material. In the event that imported fill material is characterized and following the design-level geotechnical report, the recommendations may change with respect to the soil type.

4.2.6 Surface Drainage

The project civil engineer is responsible for designing surface drainage improvements. With regard to geotechnical engineering issues, we recommend that finish grades be sloped away from buildings and pavements to the maximum extent practical to reduce the potentially damaging effects of expansive soil. The latest CBC Section 1804.3 specifies minimum slopes of 5 percent away from foundations. As a minimum, we recommend the following.

1. Discharge roof downspouts into closed conduits and direct away from foundations to appropriate drainage devices.
2. Consider the use of surface drainage collection system to reduce ponding of water at the ground surface near the foundation, pavements, or exterior flatwork.

5.0 DESIGN-LEVEL GEOTECHNICAL REPORT

This report presents preliminary geotechnical findings, conclusions, and recommendations intended for preliminary planning purposes only. A design-level geotechnical exploration and assessment should be performed when more detailed development plans are available. We recommend the design-level exploration and reporting include the following scope items.

- Borings with soil sample collection to support design-level recommendations
- Laboratory testing, including, but not limited to, moisture content, unit weight, plasticity index, gradation, strength, and corrosivity testing
- Design-level assessment of geologic and geotechnical hazards, including, but not limited to:
  - Characterization of subsurface conditions, including further evaluation of the depth, lateral extent, and continuity of potentially non-engineered fill.
  - Static load-induced static settlement based on structural loading.
- Design recommendations for suitable foundations alternatives
- Design-level earthwork, improvement design, and construction recommendations

6.0 LIMITATIONS AND UNIFORMITY OF CONDITIONS

This report presents our preliminary geotechnical exploration for the Shadelands project discussed in Section 1.3. If changes occur in the nature or design of the project, we should be allowed to review this report and provide additional recommendations. It is the responsibility of the owner to transmit the information and recommendations of this report to the appropriate organizations or people involved in design of the project, including but not limited to developers, owners, buyers, architects, engineers, and designers. The conclusions and recommendations contained in this report are solely professional opinions and are valid for a period of no more than 2 years from the date of report issuance.

We strive to perform our professional services in accordance with generally accepted principles and practices currently employed in the area; there is no warranty, express or implied. There are risks of earth movement and property damages inherent in building on or with earth materials. We are unable to eliminate all risks; therefore, we are unable to guarantee or warrant the results of our services.

This report is based upon field and other conditions discovered at the time of report preparation. We developed this report with limited subsurface exploration data. We assumed that our subsurface exploration data are representative of the actual subsurface conditions across the site. Considering possible underground variability of soil, rock, fill, and groundwater, additional unexpected costs may be incurred in completing the project. We recommend that the owner establish a contingency fund to cover such costs. If unexpected conditions are encountered, we should be notified immediately to review these conditions and provide additional and/or modified recommendations, as necessary.

Our services outlined in this report did not include work to determine the existence of possible hazardous materials. If any hazardous materials are encountered during construction, the proper regulatory officials should be notified immediately.

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Actual field or other conditions will necessitate clarifications, adjustments, modifications, or other changes to our recommendations. Therefore, we must be engaged to prepare the necessary clarifications, adjustments, modifications, or other changes before construction activities commence or further activity proceeds. If our scope of services does not include on-site construction observation, or if other persons or entities are retained to provide such services, we cannot be held responsible for any or all claims arising from or resulting from the performance of such services by other persons or entities, and from any or all claims arising from or resulting from clarifications, adjustments, modifications, discrepancies, or other changes necessary to reflect changed field or other conditions.

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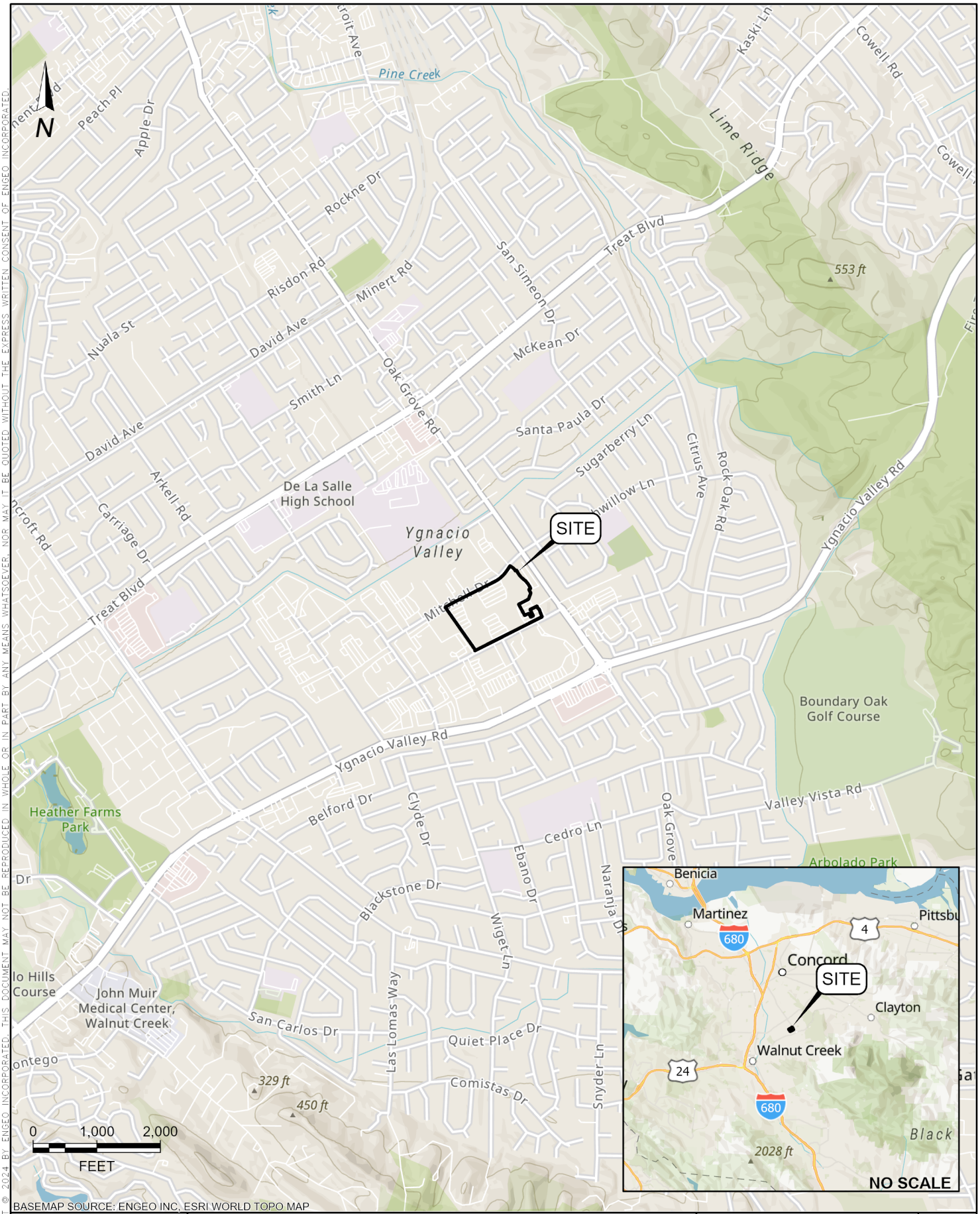
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FIGURES

FIGURE 1: Vicinity Map
FIGURE 2: Site Plan
FIGURE 3: Regional Geologic Map
FIGURE 4: Regional Faulting and Seismicity Map
FIGURE 5: Seismic Hazard Zone Map
FIGURE 6: Liquefaction Hazards Map



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BASEMAP SOURCE: ENGEO INC, ESRI WORLD TOPO MAP

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VICINITY MAP

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WALNUT CREEK, CALIFORNIA

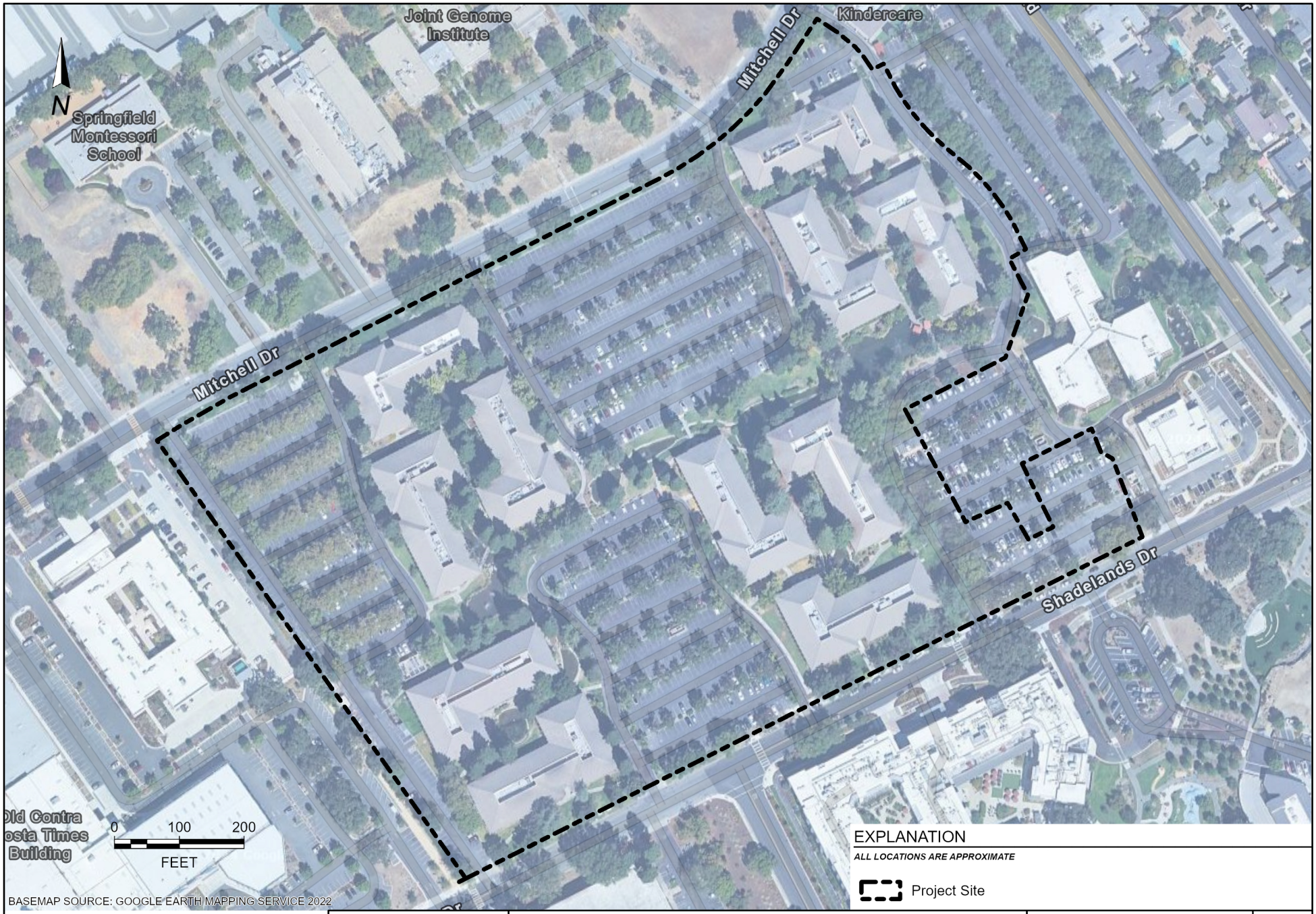
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SCALE:	AS SHOWN
DRAWN BY: CMG	CHECKED BY: RHB

FIGURE NO. 1

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LAYOUT: 01. VICINITY 8.5 X 11 PORTRAIT USER: CGUERIN

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SITE PLAN

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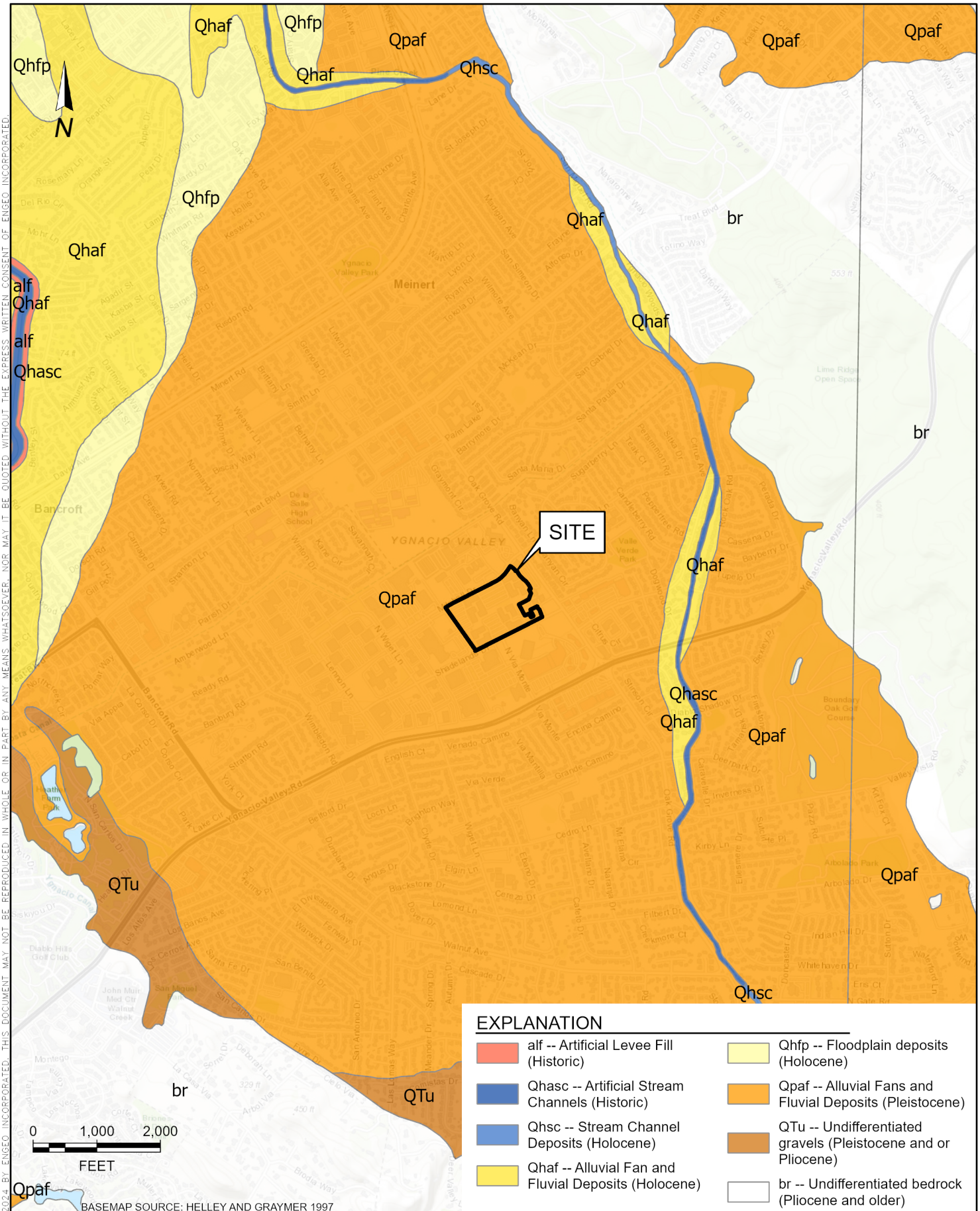
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FIGURE NO. 2

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LAYOUT: 02. SITE PLAN 8.5 X11 LANDSCAPE USER: NCLOUGH

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REGIONAL GEOLOGIC MAP

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WALNUT CREEK, CALIFORNIA

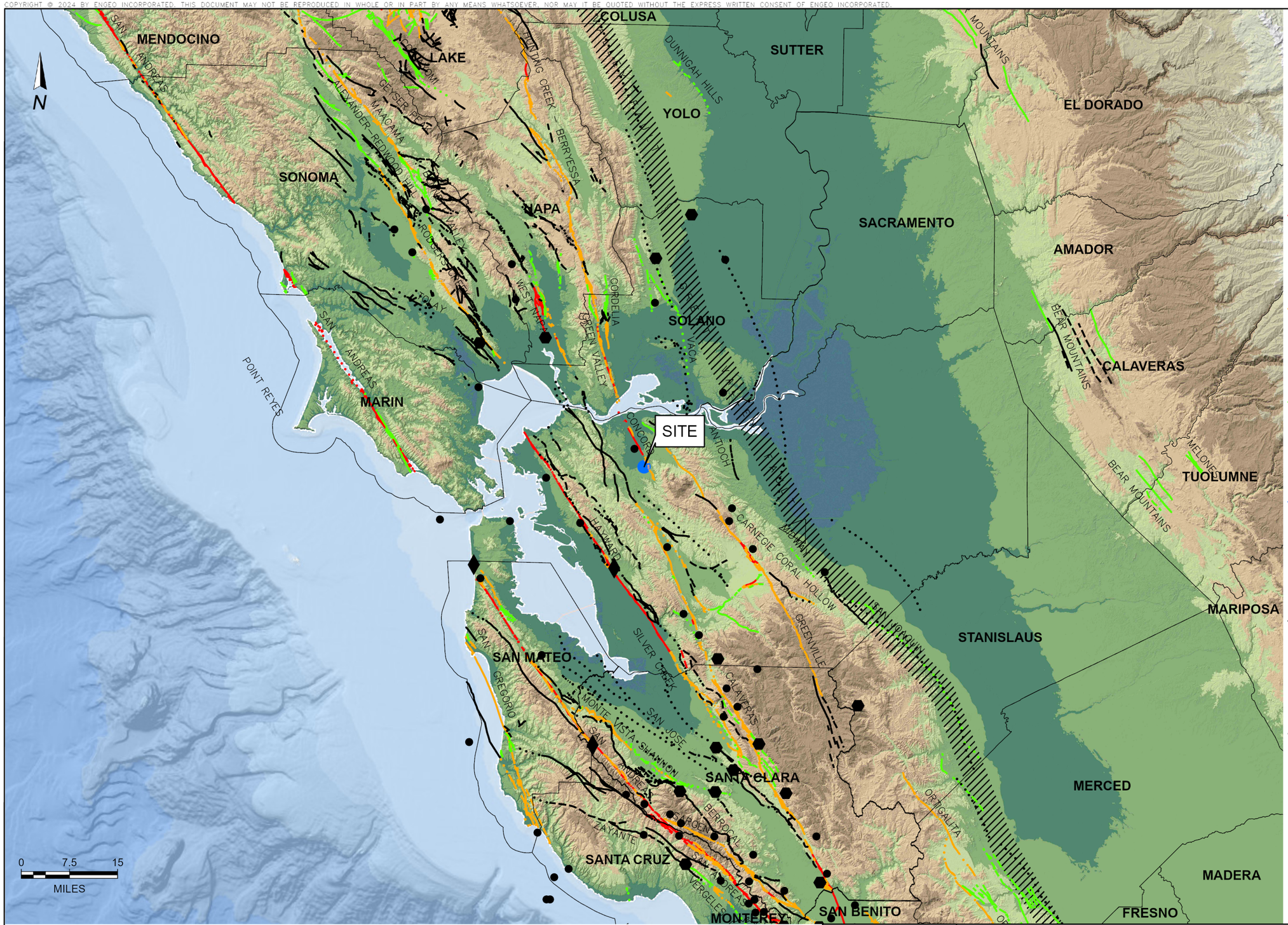
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FIGURE NO. 3

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LAYOUT: 03. GEOLOGIC 8.5 X 11 PORTRAIT USER: CGUERIN

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EXPLANATION

- Project Site

HISTORIC EARTHQUAKE EPICENTERS

- Magnitude 5-6
- Magnitude 6-7
- Magnitude 7+
- Historic Blind Thrust Fault Zone

QUATERNARY FAULTS 2020

Based on time of most recent surface deformation

- Historical (<150 Years), Well Constrained Location
- Historical (<150 Years), Moderately Constrained Location
- Historical (<150 Years), Inferred Location
- Latest Quaternary (<15,000 Years), Well Constrained Location
- Latest Quaternary (<15,000 Years), Moderately Constrained Location
- Latest Quaternary (<15,000 Years), Inferred Location
- Latest Quaternary (<15,000 Years), Inferred Location
- Late Quaternary (<130,000 Years), Moderately Constrained Location
- Late Quaternary (<130,000 Years), Inferred Location
- Middle And Late Quaternary (<750,000 Years), Well Constrained Location
- Middle And Late Quaternary (<750,000 Years), Moderately Constrained Location
- Middle And Late Quaternary (<750,000 Years), Inferred Location
- Undifferentiated Quaternary(<1.6 Million Years), Well Constrained Location
- Undifferentiated Quaternary(<1.6 Million Years), Moderately Constrained Location
- Undifferentiated Quaternary(<1.6 Million Years), Inferred Location
- Class B (Various Age), Well Constrained Location
- Class B (Various Age), Moderately Constrained Location
- Class B (Various Age), Inferred Location

BASE MAP SOURCE:
CSUMB, ESRI, GARMIN, NATURALVUE, ESRI, GEBCO, GARMIN, NATURALVUE
COLOR HILLSHADE IMAGE BASED ON THE NATIONAL ELEVATION DATA SET (NED) AT 30 METER RESOLUTION
U.S.G.S. QUATERNARY FAULT DATABASE, 2020
C.G.S. HISTORIC EARTHQUAKE DATABASE

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REGIONAL FAULTING AND SEISMICITY MAP

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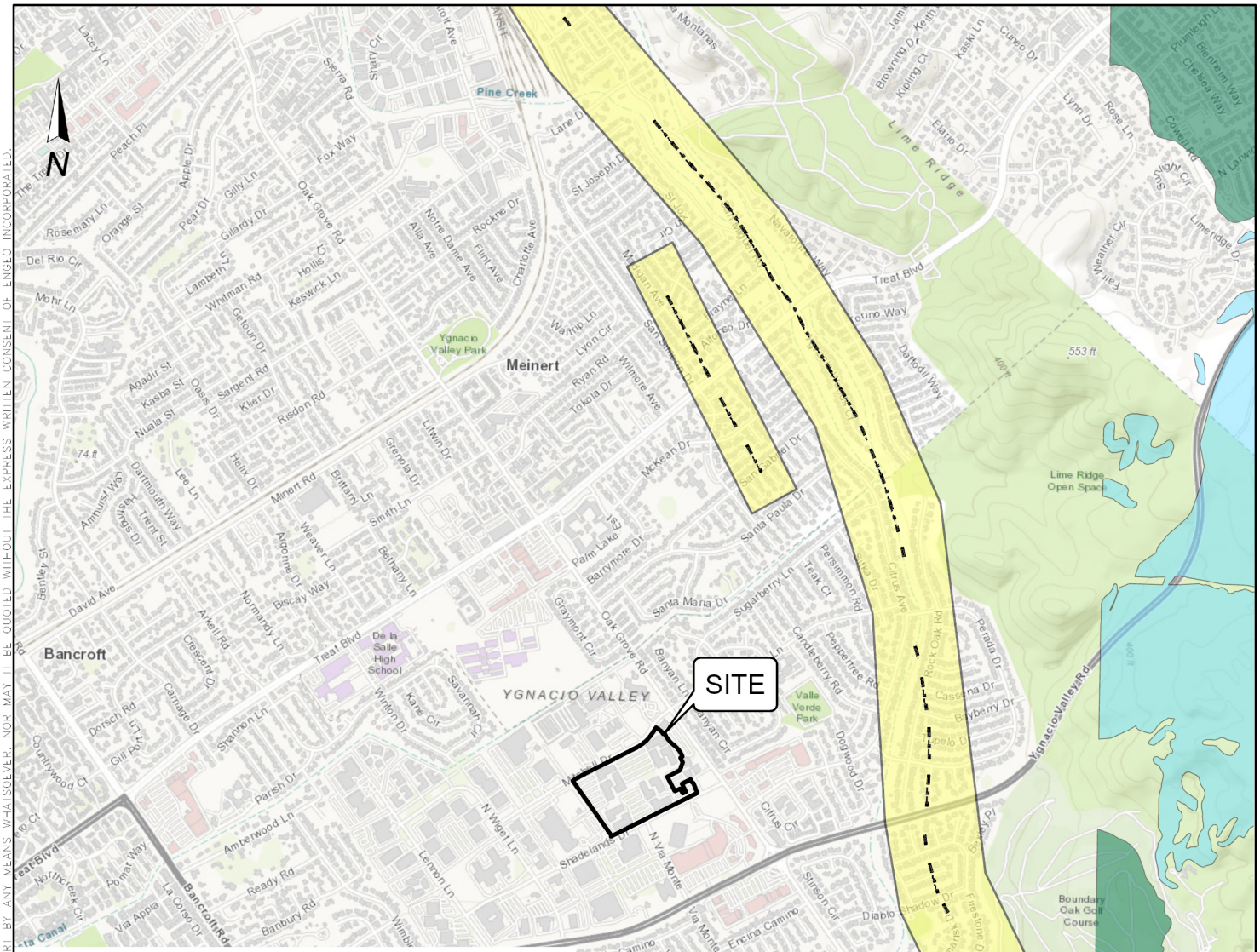
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FIGURE NO. 4

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LAYOUT: 04. FAULT&SEISMICITY 11 X 17 LANDSCAPE USER: CGUERIN

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EXPLANATION

Fault Traces

- Accurately Located
- Approximately Located
- Inferred

Earthquake Fault Zone
Zone Boundaries Are Delineated By Straight-line Segments; The Boundaries Define The Zone Encompassing Active Faults That Constitute A Potential Hazard To Structures From Surface Faulting Or Creep Such That Avoidance As Described In Public Resources Code Section 2621.5(A) Would Be Required

Liquefaction Zones
Areas Where The Historical Occurrence Of Liquefaction, Or Local Geological, Geotechnical And Groundwater Conditions Indicate A Potential For Permanent Ground Displacements Such That Mitigation As Defined In Public Resources Code Section 2693(C) Would Be Required

Earthquake-Induced Landslide Zones
Areas Where The Previous Occurrence Of Landslide Movement, Or Local Topographic, Geological, Geotechnical And Subsurface Water Conditions Indicate A Potential For Permanent Ground Displacements Such That Mitigation As Defined In Public Resources Code Section 2693(C) Would Be Required.

BASEMAP SOURCE: ESRI MAPPING SERVICE
CALIFORNIA DEPARTMENT OF CONSERVATION, CALIFORNIA GEOLOGICAL SURVEY

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SEISMIC HAZARD ZONE MAP

SHADELANDS

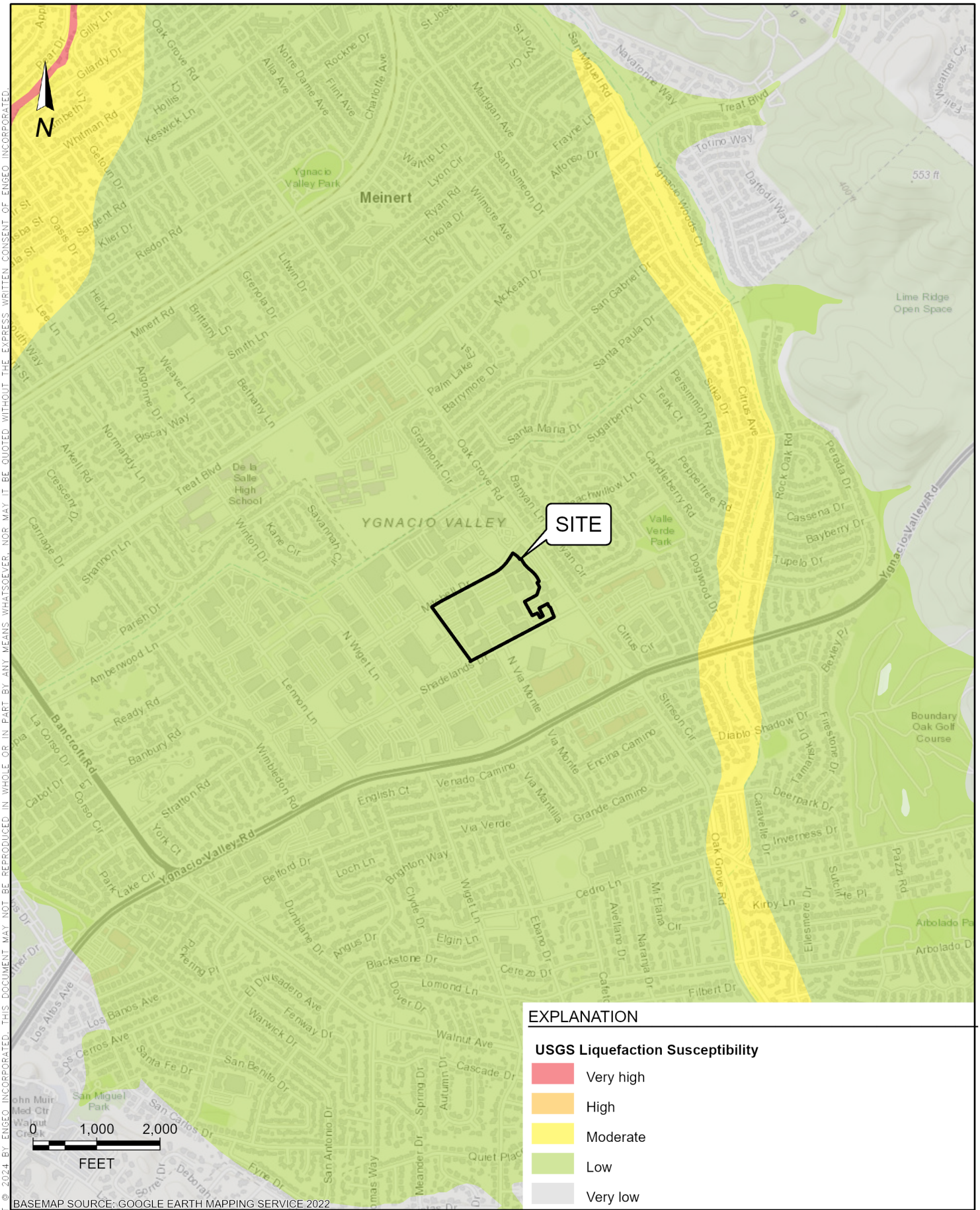
WALNUT CREEK, CALIFORNIA

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FIGURE NO. 5

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EXPLANATION

USGS Liquefaction Susceptibility

- Very high
- High
- Moderate
- Low
- Very low

BASEMAP SOURCE: GOOGLE EARTH MAPPING SERVICE 2022

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LIQUEFACTION HAZARDS MAP

SHADELANDS

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SCALE:	AS SHOWN
DRAWN BY: CMG	CHECKED BY: RHB

FIGURE NO. 6

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LAYOUT: 05. LIQUEFACTION 8.5 X 11 PORTRAIT USER: CGUERIN

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