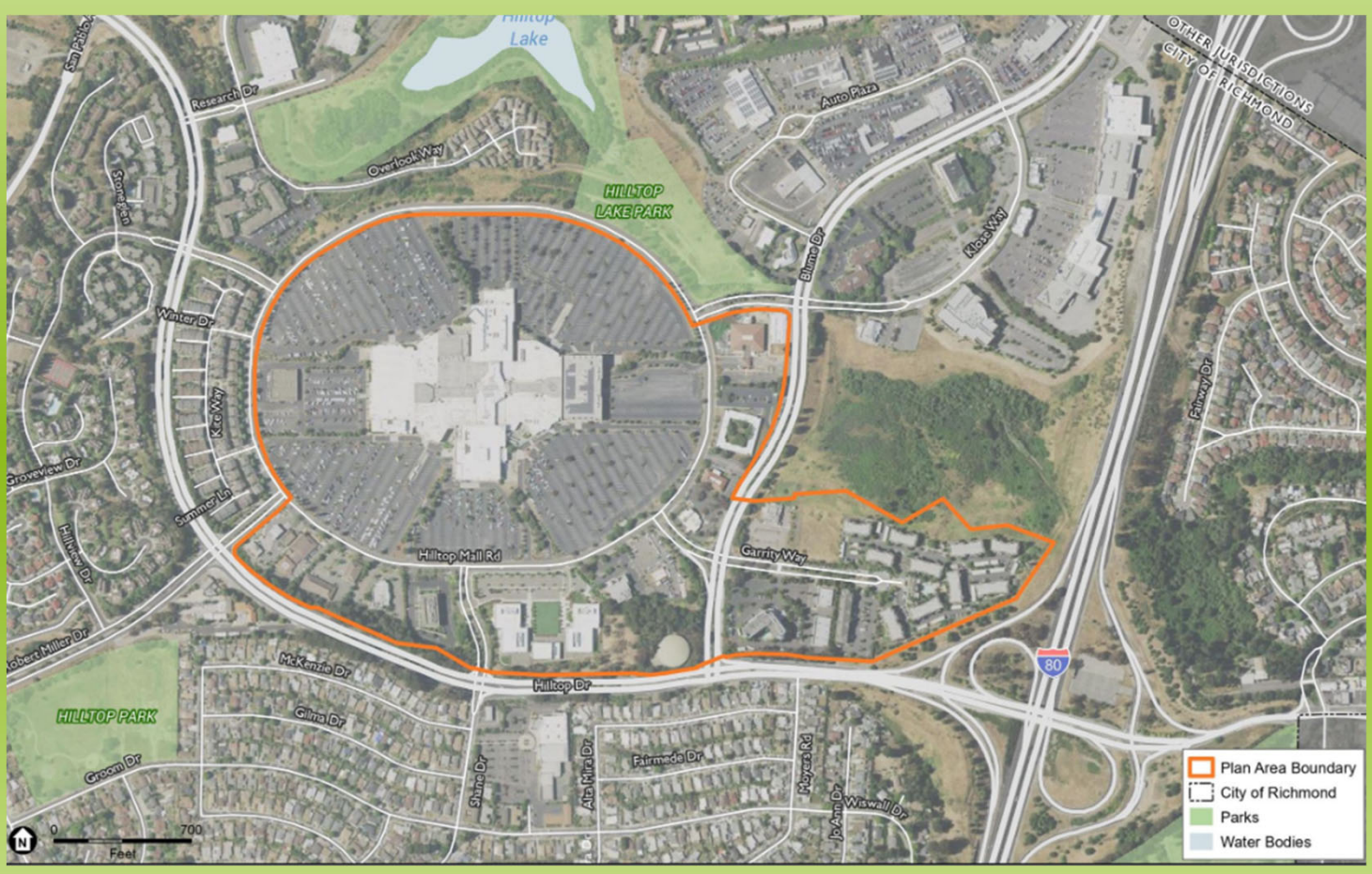
Preliminary Geotechnical Evaluation Report

Hilltop Horizon Specific Plan
Richmond, California



SUBMITTED TO:

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May 02, 2022

A3GEO

May 2, 2022

Beverly Choi
Community Program Manager, Northern California
Environmental Science Associates, ESA
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RE: Preliminary Geotechnical Evaluation Report
Richmond Hilltop Specific Plan
Richmond, California

Dear Ms. Choi:

This preliminary geotechnical evaluation report presents the final deliverable of A3GEO's geotechnical consultation services in support of preparing a Specific Plan and Addendum to the Richmond General Plan 2030 Environmental Impact Report (EIR). This work has been conducted under the Professional Services Agreement between Environmental Science Associates (ESA), and A3GEO dated 24 January 2022.

The geotechnical evaluation presented in this report are based on existing data and historical research. The scope of our services did not include acquiring new subsurface data through borings, laboratory testing, or other means. The report includes figures, plates, and appendices with relevant geological and geotechnical maps, historical aerial photographs of the Plan Area, and existing geotechnical investigation data.

Based on our review, it is anticipated that the main geotechnical considerations for the new mixed-use, higher intensity developments within the Plan Area are likely:

- Strong earthquake ground shaking
- Near-surface expansive soils and rocks
- Undocumented fill
- Old landslide deposits
- Existing below-grade improvements

We believe that the potential developments are feasible from a geologic and geotechnical hazard standpoint, provided that the considerations presented in this report are appropriately incorporated.

The interpretations, conclusions, and recommendations presented in this report were developed according to generally accepted geotechnical principles and practices at the time that the report was prepared. Should you have any questions or comments concerning our findings, the concepts discussed, or our recommendations, please do not hesitate to contact us.

Sincerely,

A3GEO, Inc.

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1. INTRODUCTION

1.01 Overview

We understand that ESA is assisting the City of Richmond in preparing a Specific Plan (Hilltop Horizon Specific Plan) and addendum to the Richmond General Plan 2030 Environmental Impact Report (EIR). The Plan Area is located within the Hilltop Priority Development Area (PDA) and situated south of Richmond Parkway, between San Pablo Avenue and Interstate 80, in Richmond, CA (Plate 1).

This area is currently characterized by auto-oriented development including the Hilltop regional shopping mall and nearby low and medium density housing and local serving retail (Plate 2). According to the City of Richmond Hilltop Horizon Specific Plan web-page, "The Specific Plan will guide the development of the 143-acre site to support the City's General Plan vision to promote the transformation of the Plan Area from a low-intensity auto-oriented retail center to a higher intensity, mixed use regional destination. The overarching goal of the Specific Plan is to develop a comprehensive plan to guide future development that will attract people, businesses, and investments. The intended result is to create a shovel ready development framework to allow the revitalization of the Plan Area after the adoption of the Specific Plan and environmental document. The ultimate mix of uses and development program will be determined as part of the planning process that will involve and be informed by community and stakeholder engagement."

1.02 Purpose and Scope of Services

The purpose of our work was to identify the soil and geologic conditions in the Plan Area, assess the potential geotechnical constraints, and provide preliminary geotechnical considerations in support of the potential future developments. The evaluations and conclusions in this report are based solely on a desktop study of available data in the vicinity of the Plan Area. The scope of our services included:

- Reviewing existing literature, geological and historical maps, and other relevant materials pertaining to geologic, geotechnical, and topographic conditions in the project vicinity.
- Acquiring and reviewing any relevant geotechnical reports pertaining to nearby projects or geotechnical investigations from various sources.
- Developing preliminary conclusions pertaining to:
    - Potential geological hazards and geotechnical conditions.
    - Suitability of the Plan Area for mixed-use, higher intensity development.
    - Probable foundation types for new structures.
    - Construction considerations.
    - Limitations/risks associated with the absence of site-specific subsurface data.
- Preparing this report documenting our findings and conclusions.

Our scope was limited to aspects of the project that are geotechnical and/or geologic in nature. The scope of our services did not include an environmental assessment or investigation for the presence of hazardous, toxic, or corrosive materials on, below, or around the Plan Area.

1.03 Report Organization

The remainder of this report is organized as follows:

- Section 2 summarizes the published sources and reports reviewed as part of this evaluation.
- Section 3 describes the geologic and seismic settings of the Plan Area.

- Section 4 summarizes the Plan Area's development history, subsurface materials, and groundwater conditions.
- Section 5 discusses potential geologic hazards, geotechnical conditions, overall suitability of the Plan Area for the mixed-use, higher intensity developments, probable foundation types for new structures, and potential construction considerations.
- Section 6 describes the limitations of our study and associated risks with the absence of site-specific subsurface data.
- Section 7 contains references.

Figures and plates are provided following the text of the report to illustrate the information described in the report. Appendix A following the illustrative figures and plates presents the reviewed existing geotechnical investigations in the vicinity of the Plan Area.

2. EXISTING DATA REVIEW

2.01 Review of Published Geologic, Seismic, and Historical Information

We reviewed published and unpublished references containing information on geologic, seismic, and historical conditions in the vicinity of the Plan Area. A list of references used in this analysis is presented at the end of this report; selected references are noted below:

- U.S. Geological Survey (USGS) regional geologic maps by Graymer (2000), and Graymer and others (2006).
- Geologic map of the Richmond quadrangle, Contra Costa & Alameda Counties, California by Dibblee, T.W., and Minch, J.A, 2005.
- Historical aerial photographs and historical USGS Topographic Maps.
- California Geological Survey (CGS) map titled “CGS Fault Activity Map of California”.
- California Geological Survey (CGS) maps titled “Earthquake Zones of Required Investigation” (CGS, 2003a), Fault Activity Map of California” (Jennings and Bryant, 2010), and “Tsunami Inundation Map for Emergency Planning” (CGS, 2009).
- USGS Liquefaction Susceptibility and Quaternary Deposits maps by Knudsen and others (2000), and Witter and others (2006).
- USGS Detailed Maps of Landslides in The San Francisco Bay Region, California, by R.J. Pike (1999).
- Federal Emergency Management Agency (FEMA) National Flood Insurance Rate Maps (2009).

2.02 Review of Previous Subsurface Investigations

We reviewed various geotechnical and environmental studies conducted in the vicinity of the Plan Area to assess general geological and hydrologic conditions. The approximate locations of these studies are shown on Figure 1 and data from the studies are included in Appendix A. A summary of the data reviewed is provided below:

- California Department of Transportation, “Hilltop Drive Overcrossing Logs of Test Borings”, 1955-1975.
- Terrasearch, Inc., “Geotechnical Investigation on Proposed Residential Developments, Hilltop Villas”, 2004 (Provided by City of Richmond).
- Contra Costa County, “Water Well Monitoring Data at 2900 Hilltop Mall Road”, 2003-2008.

3. SITE GEOLOGIC SETTING

3.01 Regional Geology

The San Francisco Bay Region (SFBR) is characterized by hills and valleys that generally trend southeast/northwest. This characteristic topography is partly the result of the SFBR's location at the boundary between the North American and Pacific crustal plates, which are in relative motion with respect to each other. Over geologic time, the region's topography formed through a complex series of processes that have included deposition, accretion, faulting, folding, uplift, volcanism, and changes in sea level. San Francisco Bay and the adjacent flatlands presently occupy a structural depression between the East Bay Hills and the roughly parallel hills of the San Francisco Peninsula and Marin County.

The SFBR includes three "basement" rock complexes: the Great Valley Complex, the Franciscan Complex, and the Salinian Complex. All were formed during the Mesozoic Era (225 to 65 million years ago) and have been brought together by movement occurring along faults. These Mesozoic basement rock complexes are locally overlain by a diverse sequence of Cenozoic Era (younger than 65 million years) sedimentary and volcanic rocks. Since their deposition, the Mesozoic and Cenozoic rocks have been extensively deformed by repeated episodes of folding and faulting. Significantly, the Bay Area experienced several episodes of uplift and faulting during the late Tertiary Period (about 25 million to 2 million years ago), which produced the region's characteristic northwest-trending mountain ranges, hills, and valleys.

The Plan Area is located at the northwestern end of San Pablo Ridge, one of a series of northwest-trending ridges and valleys. This region is underlain by the Miocene-Pliocene age Orinda Formation, consisting of continental flood plain deposits eroded from highlands that lay to the southwest. The Orinda Formation overlies the Franciscan Complex, which forms the basement material in this area.

3.02 Regional Active Faults

Within the SFBR, the relative motion of the Pacific and North American crustal plates is presently accommodated by a series of active northwest-trending faults that exist over a width of more than 50 miles. Faults that are defined as active exhibit one or more of the following: (1) evidence of Holocene-age (within about the past 11,700 years) displacement, (2) measurable aseismic fault creep, (3) close proximity to linear concentrations or trends of earthquake epicenters, and (4) prominent tectonic-related geomorphology. Potentially active faults are defined as those that are not known to be active but have evidence of Quaternary-age displacement (within about the past 2 million years).

As mapped by Jennings and Bryant, 2010 (Plate 3), major active faults within the project region include the Hayward, Concord-Green Valley, Rodgers Creek, Calaveras, San Andreas, San Gregorio, and Greenville faults. These major faults are near-vertical and generally exhibit right-lateral strike-slip movement (which means that the movement is predominantly horizontal, and when viewed from one side of the fault, the opposite side of the fault is observed as being displaced to the right). Approximate distances and directions from the Plan Area to major Bay Area active faults as mapped by Jennings and Bryant (2010) are presented in Table 1.

Table 1 – Approximate Distances and Directions to Principal Bay Area Active Faults

Fault System	Approximate Distance from Plan Area	Approximate Direction from Plan Area
Hayward-Rodgers Creek	0.6 mile	West-Southwest
Concord-Green Valley	13.5 miles	East-Northeast
West Napa	14 miles	North-Northeast
San Andreas	18 miles	West-Southwest
Calaveras	20 miles	East-Southeast
Greenville – Clayton – Marsh Creek	20.5 miles	East-Southeast
Pleasanton	22 miles	East-Southeast
San Gregorio	23 miles	West-Southwest

As noted in the preceding table, the closest regional Holocene active fault to the Plan Area is the Hayward Fault, located approximately 0.6 miles southwest of the Plan Area. The Hayward/Rodgers Creek fault system is one of the primary active faults in the SFBR, and overall has the highest probability of generating a large-magnitude earthquake (M>6.7) within the next 30 years (WGCEP, 2014). The Hayward/Rodgers Creek fault system extends approximately 95 miles from Fremont to Healdsburg. Due to Hayward fault activity, strong to moderate ground shaking can be expected at the Plan Area. Other active faults within the region can also cause strong to moderate ground shakings at the Plan Area.

3.03 Regional Seismicity

The San Francisco Bay region is seismically active. Since 1800, five earthquakes of magnitude (M) ≥ 6.5 have occurred in the Bay Area (Bakun 1999). These include the: 1836 M6.5 event east of Monterey Bay; 1838 M6.8 event on the Peninsula section of the San Andreas fault; 1868 M6.8-7.0 Hayward event on the southern Hayward fault; 1906 M7.9 San Francisco earthquake on the San Andreas fault; and 1989 M6.9 Loma Prieta event in the Santa Cruz Mountains.

The Working Group on California Earthquake Probabilities (WGCEP) has developed authoritative estimates of the magnitude, location, and frequency of future earthquakes in California, which are published in Uniform California Earthquake Forecast (UCERF) reports. Table 2 summarizes the most recent UCERF3 forecast of likelihoods for one or more earthquake events of the specified magnitude occurring within the SFBR in the next 30 years (starting in 2014).

Table 2 – UCERF3 San Francisco Region Earthquake Likelihood Forecast

Earthquake Magnitude (greater than or equal to)	30-year Likelihood of one or more earthquake events
≥ 5.0	100%
≥ 6.0	98%
≥ 6.7	72%
≥ 7.0	51%
≥ 7.5	20%
≥ 8.0	4%

Compared to the previous UCERF forecast, the likelihood of moderate-sized earthquakes (magnitude 6.5 to 7.5) is generally lower whereas the magnitude of larger earthquakes is higher. While UCERF3 results are generally in line with previous forecasts, UCERF 3 indicates lower probabilities for earthquakes occurring on the most well-known faults of the SFBR (Hayward and San Andreas), while the probabilities for earthquakes on

lesser-known faults has increased substantially in some cases. These changes reflect a better understanding of the regional fault system and the potential for multi-fault ruptures on many faults.

3.04 Local Geology

The Plan Area is located on the northern slopes of the east Richmond hills, which trend northwest parallel to the Hayward Fault, toward San Pablo Bay. The Regional Geologic Map on Plate 4 (Graymer, 2000) illustrates the bedrock geology of the area. The Plan Area is mainly underlain by Orinda Formation rocks, which consist of non-marine sedimentary deposits of the late Miocene age. The Orinda Formation (map symbol Tor) is the predominant bedrock unit in the east Richmond hills and overlays the basement rocks of the Franciscan Complex in this area. The Orinda Formation is described by Graymer as follows:

> *"Distinctly to indistinctly bedded, nonmarine, pebble to boulder conglomerate, conglomeratic sandstone, coarse- to medium-grained lithic sandstone, and green and red siltstone and mudstone. Conglomerate clasts are subangular to well-rounded and contain a high percentage of detritus derived from the Franciscan complex."*

The conglomerates of the Orinda Formation were deposited under alluvial fan conditions, and the sandstone, siltstone, and claystone were deposited as floodplain and channel material (Jones and Curtis, 1992). The Orinda Formation includes materials that are relatively weak and compressible for rock formations (i.e., siltstone and claystone), and subject to landsliding and erosion.

Local geology is also shown on Plate 5 (Dibblee and Minch, 2005), which depicts areas of Holocene age surficial deposits (map symbol Qa) over the Orinda formation rocks along the historic footprint of Garrity Creek (also called Hilltop Creek) on the northwest and northeast sides of the Plan Area. These surficial deposits are characterized as alluvial gravel, sand, and clay of valley areas.

3.05 Geologic Hazard Mapping

According to Earthquake Zones of Required Investigation Map (CGS, 2003), the Plan Area is not within an Alquist-Priolo Fault Zone (Plate 6). The Plan Area is located in an area that CGS has not yet evaluated for seismic landslide and liquefaction hazards.

The regional liquefaction susceptibility map (Plate 7) shows the Plan Area as located within an area of "Very Low" liquefaction susceptibility (Knudsen et al., 2000 and Witter et al., 2006). A 1999 USGS landslides map (Plate 8) shows areas of "Mostly Landslides" on the east, northwest, and west sides of the Plan Area. Several landslides are visible in these areas on the pre-development 1939 historical aerial photograph presented on Plate 9.

4. SITE CONDITIONS

4.01 Plan Area Development History

Based on a review of historical documents and aerial photographs, the Plan Area was mostly undeveloped prior to the construction of the Hilltop Mall. Photographs from 1939 and 1965, with the approximate Plan Area overlain, show that three oil tanks of San Pablo Oil Tank Farm (belonging to former Standard Oil Company of California) existed near the present-day location of the Hilltop Mall (Plates 9 and 10). The oil tanks were likely constructed in the early 1900's, along with development of other oil infrastructure at that time. These pre-development photos also show landslides on the slopes along the natural drainages, west (unnamed creek) and northeast (Garrity Creek) of the Plan Area. The 1965 historical aerial photograph (Plate 10) shows grading activities for development on the southeastern part of the Plan Area.

The Richmond Hilltop Mall was constructed in the late 1970's. The 1980 historical aerial photograph (Plate 11) indicates that as a result of the development, the oil tanks were removed, the unnamed drainage in the southwest portion of the Plan Area was filled in, some re-routing of Garrity Creek was performed, and the natural pre-development undulations in topography were graded to a relatively flat surface. In the years following the Hilltop Mall development, residential and commercial buildings were constructed adjacent to the mall within the Plan Area (Plate 12).

The current aerial photograph of the Plan Area (Plate 2) shows the Plan Area is currently occupied by the Hilltop Mall and surrounding parking lots, several low to medium density residential and commercial buildings, and parking lots.

4.02 Subsurface Material

Based on the review of published geologic documents and available geotechnical data in the vicinity of the Plan Area (as shown on Figure 1), the subsurface material can generally be described as follows:

Artificial Fill (unmapped): Artificial fill, interpreted as brown to black, moderate plasticity silty clay material was observed in a few of the borings performed by Terrasearch (2004). Artificial Fill is likely to be present in many areas throughout the Plan Area. The Artificial Fill's location, extent, and suitability for support of new developments will need to be determined during site-specific geotechnical investigations. Generally, undocumented fill, where no records are available that document placement and testing, are considered unsuitable for the support of structures.

Alluvium Surficial Deposits: Surficial alluvium deposits, including highly weathered alluvial gravel, sand, and clay with variable thickness, are mapped on the west and northeast sides of the Plan Area, along the historical drainage locations, including the unnamed creek and Garrity Creek (Plate 5).

Landslide Deposits: Landslide deposits are mapped on the east and west sides of the Plan Area (Plate 8), where steeper natural slopes along drainage channels existed pre-development. The existing borings by Terrasearch (2004) show possible landslide deposits interpreted as silty clay and clayey-silty sand to a depth of approximately 20 feet below the ground surface (bgs). Landslide deposits are generally variable in composition and strength and typically include soft or loose materials. The location and extend of landslide deposits, and suitability for support of new developments will need to be confirmed during site-specific geotechnical investigations.

Bedrock: According to the geological maps (Plates 4 and 5), the Plan Area is generally underlined by Orinda formation bedrock, consisting of gray to greenish-gray pebble conglomerate, sandstone, and claystone. Based on the review of Caltrans logs of test borings in the proximity of the Plan Area (Figure 1), the subsurface material to the east of the Plan Area consisted of highly weathered residual silty clayey soil which grades to siltstone, claystone and friable sandstone at shallow depths (less than 5 feet).

4.03 Groundwater Conditions

Groundwater was not encountered in any of the borings drilled to the depth of 26.5 feet bgs by Terrasearch in 2004. Three groundwater monitoring wells were installed in 2003, at the locations shown on Figure 1, in order to monitor contamination at a Chevron Service Station (2900 Hilltop Mall Road). The data from these monitoring wells indicate a minimum groundwater depth of 6.8 feet bgs and a maximum groundwater depth of 29 feet bgs at MW-1 and MW-2. It should be anticipated that groundwater levels can fluctuate significantly with location and in response to precipitation throughout the Plan Area, surface runoff patterns, or other seasonal factors.

5. PRELIMINARY GEOTECHNICAL EVALUATION AND CONSTRUCTION CONSIDERATIONS

5.01 Potential Geological and Geotechnical Hazards

The potential geologic and geotechnical hazards that could affect future developments are described in the following sections.

5.01.1 Earthquake Ground Shaking

The Plan Area is located within the seismically-active coastal region of California (coast range geomorphic province). Strong ground shaking is a hazard shared throughout the region. There is a high potential for future strong earthquake shaking. Direct risks posed to structures by ground shaking are mitigated through the structural design provisions of the California Building Code (CBC).

The seismic design provisions of the 2019 CBC include a methodology based on ASCE 7-16, by which sites are classified as A through F based on geotechnical properties within the upper 100 feet of the subsurface profile. In the absence of site-specific data to accurately determine the seismic site class and based on the available information, we judge that most of the Plan Area will be classified as seismic site class C or D. According to ASCE 7-16, site-modified Peak Ground Acceleration (PGA_M) at the Plan Area is specified as 1.215 and 1.113 for seismic site classes C and D, respectively.

5.01.2 Landsliding

The Plan Area's location is not evaluated in the official State of California Zone of Required Investigation for seismically induced landsliding. The 1939 and 1965 historical aerial photographs (Plates 9 and 10) show evidence of landslides on the east, northwest, and west of the Plan Area prior to development of the Hilltop Mall. Based on the grading associated with the Hilltop Mall and surrounding development, the current topography is relatively flat. Based on current topography, there is low potential for landsliding in the central portion of the Plan Area; however, there is a potential that future grading and/or strong earthquake shaking could trigger landslides on the east, northwest, and west of the Plan Area.

5.01.3 Liquefaction and Lateral Spreading

According to the reviewed data liquefaction is not considered as potential geologic hazards for the Plan Area. The potential for liquefaction and related hazards to impact future developments within the Plan Area is low.

5.01.4 Faulting and Ground Surface Rupture

The Plan Area is not within an Alquist-Priolo (AP) Fault Hazard Zones, and no active faults are mapped in the direct vicinity of the Plan Area. The closest AP Zone surrounds the active Hayward fault, which is approximately 0.6 miles southwest of the Plan Area. Based on the foregoing, we consider the potential hazard for surface fault rupture within the Plan Area to be low.

5.01.5 Tsunami and Flooding

FEMA Flood Hazard Map (Plate 13) shows the Plan Area outside the areas considered susceptible to significant flooding. The Plan Area is mapped as “Zone X – Areas of Minimal Flood Hazard.” Based on the foregoing, we consider the potential hazard for a tsunami and flooding within the Plan Area to be low.

The closest special flood hazard areas (Mapped as Zone A) are located around the Hilltop Lake, about 680 feet north of the Plan Area, and a relatively narrow band located on the undeveloped hills, 400 feet

east of the plan area. Zone A is defined as “Areas with a 1% annual chance of flooding”. An evaluation of potential flooding within these areas was not within the scope of our services.

5.01.6 Undocumented Fill

Any encountered Artificial Fill within the Plan Area should be considered undocumented fill unless an engineer's record of compaction and documents pertaining to the source and characteristics of the material can be obtained. Undocumented fills are unsuitable for support of structures or structural fill and, where placed on slopes, are subject to downslope movements such as creeping and sliding. Moreover, undocumented fill may consist of variable material, expansive soils, or environmentally contaminated soils. We consider there to be a high potential for encountering undocumented fill within the Plan Area.

Mitigation of undocumented fill beneath new structures typically includes removal and replacement with new engineered fill. Site-specific geotechnical investigations should be performed to evaluate the presence of undocumented fill for future developments.

5.01.7 Expansive Soils and Rocks

Expansive soils and rocks shrink and swell with changes in moisture content and can damage overlying improvements, including buildings, roads, walkways, and utilities, unless appropriately mitigated. Based on a review of geologic maps and available geotechnical data, we consider there to be a high potential for expansive soil and rock within the Plan Area.

Mitigation of expansive soils can typically include the following: removal and replacement with non-expansive material, chemical treatment, deepened spread footings, and/or deep foundations (i.e. piers or piles). Site-specific geotechnical investigations should be performed to evaluate the presence of expansive soil or rock for future developments.

5.01.8 Old Landslide Deposits

Old landslide deposits are generally considered unsuitable for support of structures or structural fill and are subject to downslope movements such as creeping and sliding. The 1939 and 1965 historical aerial photographs (Plates 9 and 10) show evidence of landslides on the east, northwest, and west of the Plan Area prior to development of the Hilltop Mall. Based on the grading associated with the Hilltop Mall and surrounding development, some of these areas were likely covered with Artificial Fill to create the present-day relatively flat topography. The method and engineering of the fill placement is unknown. Based on the foregoing, we consider the potential hazard for encountering old landslide deposits to be high in the east, northwest, and west of the Plan Area, near the historical drainage channels. We consider there to be low potential for encountering landslide deposits in other areas of the Plan Area.

Mitigation of old landslide deposits beneath new improvements typically includes: remedial grading, removal and replacement with new engineered fill, ground improvement, or construction of retaining elements. Site-specific geotechnical investigations should be performed to evaluate the possible presence of old landslide deposits for future developments.

5.02 Suitability of the Plan Area for the Mixed-Use, Higher Intensity Development

Based on the results of our study, it is our opinion that the potential developments are feasible from a geologic and geotechnical hazard standpoint, provided that the considerations presented in this report are appropriately incorporated. A site-specific geotechnical investigation should be performed in the design phase to evaluate and mitigate the potential geological hazards and geotechnical conditions discussed in Section 5.01 of this report.

5.03 Probable Foundation Types for New Structures

Based on our review of existing literature, geological and historical maps, aerial photographs, existing geotechnical data, and other relevant materials pertaining to geologic, geotechnical, and topographic conditions in the project vicinity, it is anticipated that the principal geotechnical considerations for the new developments within the Plan Area are likely to include: 1) Strong earthquake ground shaking; 2) near-surface expansive soils and rocks; 3) undocumented fill; 4) old landslide deposits; and 5) existing below-grade improvements.

Based on the available data, typical buildings of four-stories or less in height can likely be supported on shallow foundations (footings, structural mats, and/or post-tensioned slabs). In some cases, mitigation of geologic and geotechnical hazards identified in this report, or other hazards identified as part of a design-level investigation, may be required prior to development. Buildings with heights greater than four-stories may need to be supported with deep foundations (drilled piers or similar system) that gains support in natural undisturbed and competent rocks beneath the surficial soils and deeply weathered rock.

5.04 Construction Considerations

As previously discussed, the Plan Area is generally underlain by Orinda formation bedrock and potentially expansive soils. The following conditions and considerations should be anticipated during the construction:

- The demolition and removal of existing near-surface and below-grade improvements (e.g., footings, slabs, walls, pavements, and abandoned utilities) prior to constructing the new structures.
- The excavations for foundations, utility trenches, or drilling for piles may encounter: 1) zones of hard rock that are difficult to penetrate; and 2) zones of soft, weak soil-like rock, squeezing ground, or other conditions that would require mitigation temporarily. We anticipate that subsurface soils and rocks can be excavated with conventional earth-moving equipment. However, hard rocks could be encountered that would require specific excavation equipment.
- Buried obstructions, including footings, piers, walls, slabs, pipes, culverts, and other underground utilities, may be encountered during excavations. It should be anticipated that removal of buried obstructions may require equipment capable of breaking concrete or cutting steel.
- Potentially contaminated soils may be encountered during excavations which would need to be evaluated, removed, and disposed of according to State of California environmental regulations.
- Undocumented fill may be encountered within the footprints of potential developments.
- Protection of nearby and on-site improvements during construction may be required. In some areas, the sides of excavations may need to be supported by temporary shoring to protect adjacent utilities, pavements, and other site improvements.
- Water may tend to collect/pool within site excavations, and deeper excavations may extend below groundwater, depending upon the conditions present at the site at the time that the work is performed. Temporary dewatering throughout construction, which includes the design, permitting, installation, and appropriate abandonment of site dewatering systems and appropriate storage, testing, and discharge of the water generated, may be required.

6. LIMITATIONS AND RISKS ASSOCIATED WITH THE ABSENCE OF SITE-SPECIFIC DATA

The findings in this preliminary geotechnical evaluation report are based on a review of existing data and interpretations of subsurface exploration conducted by previous consultants for other projects in the vicinity of the Plan Area. We note that within the Plan Area, there was no existing geotechnical subsurface exploration data available for review. Consequently, the interpretations and findings presented in this report are primarily based on existing available regional data. As such, variations from the general geologic and geotechnical conditions described in this report should be anticipated within the Plan Area. This report was prepared to

support the existing conditions analysis of the Project and should not be used for the final design. A site-specific geotechnical investigation, including design-level subsurface exploration and laboratory testing, should be performed in support of the engineering analysis and design of the potential developments.

The findings presented in this report were developed following generally-accepted geotechnical and engineering geologic principles and practices. No other warranty, expressed or implied, is made. In the event that any changes in the nature or design of the project are planned, the findings contained in this report should not be considered valid unless the changes are reviewed, and the conclusions of this report are modified or verified in writing.

The findings of this report are valid as of the present date. However, the passing of time will likely change the conditions of the existing property due to natural processes or the works of man. In addition, due to legislation or the broadening of knowledge, changes in applicable or appropriate standards will occur. Accordingly, this report should not be relied upon after a period of three years without being reviewed by this office.

7. REFERENCES

1. California Building Standards Commission, 2019, California Building Code (CBC): California Code of Regulations, Title 24, Part 2, Volumes 1 and 2.
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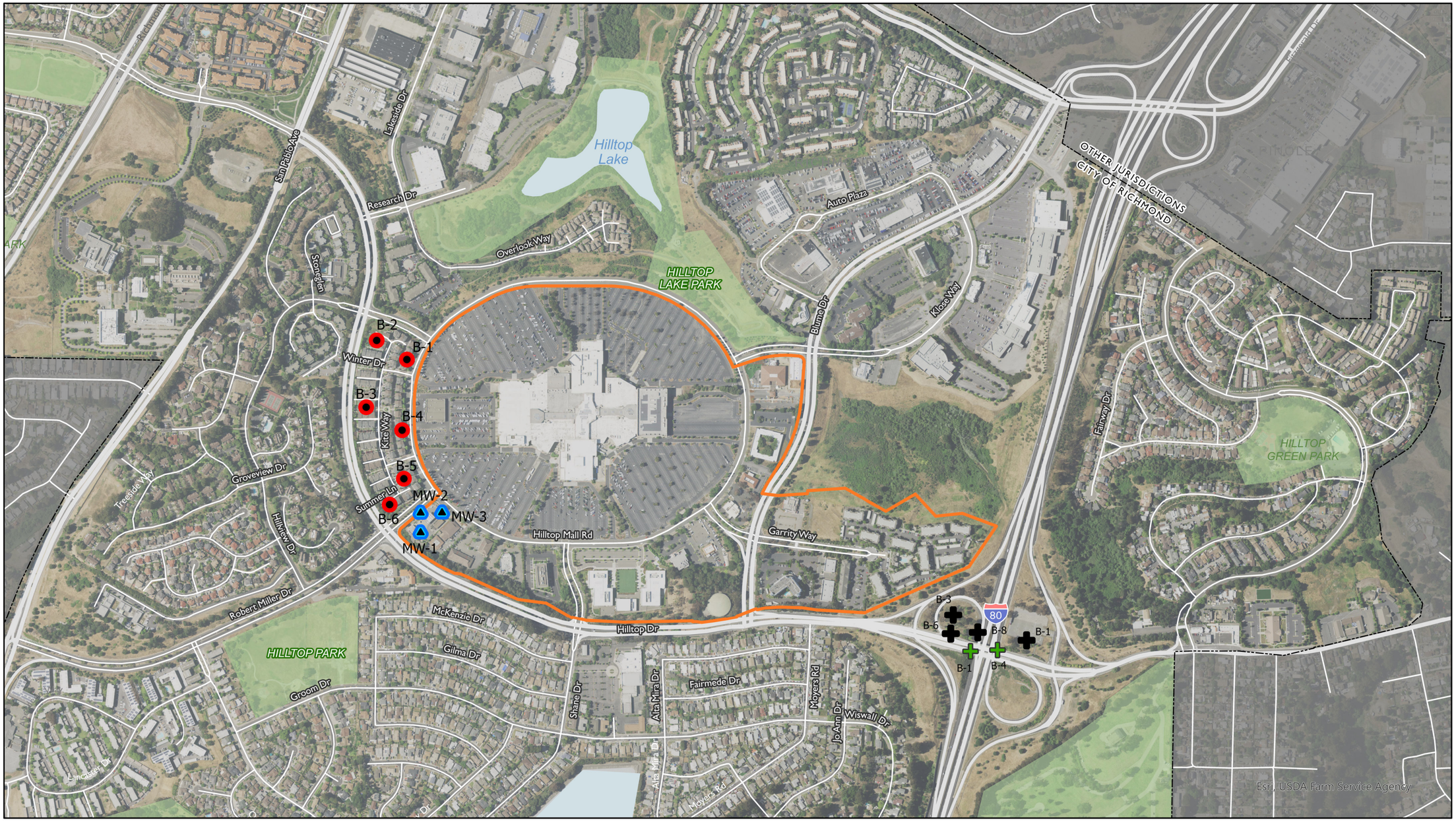
15. Witter, R.C., et al., 2006, Maps of Quaternary Deposits and Liquefaction Susceptibility in the Central San Francisco Bay Region, California, U.S. Geological Survey Open-File Report, 2006-1037.
16. Working Group on California Earthquake Probabilities (WGCEP), 2013, Uniform California Earthquake Rupture Forecast, Version 3 (UCERF3) – Time Independent Model, U.S. Geological Survey Open-File Report 2013-1165, 97 p., California Geological Survey Special Report 228, and Southern California Earthquake Center Publication 1792, http://pubs.usgs.gov/of/2013/1165/.
17. Working Group on California Earthquake Probabilities (WGCEP), 2008, The Uniform California Earthquake Rupture Forecast, Version 2 (UCERF 2): for 2007-2036, U.S. Geological Survey Open File Report 2007-1437, California Geological Survey Special Report 203; and Southern California Earthquake Center Contribution #1138.



0 700
Feet

- Plan Area Boundary
- City of Richmond
- Parks
- Water Bodies

- Geotechnical Borings, by TerraSearch (2004)
- Groundwater Monitoring Well, By Chevron (2003-2008)
- Geotechnical Borings by Caltrans (1955)
- Geotechnical Borings by Caltrans (1975) - Approximate Locations

Richmond Hilltop Specific Plan
Richmond, California

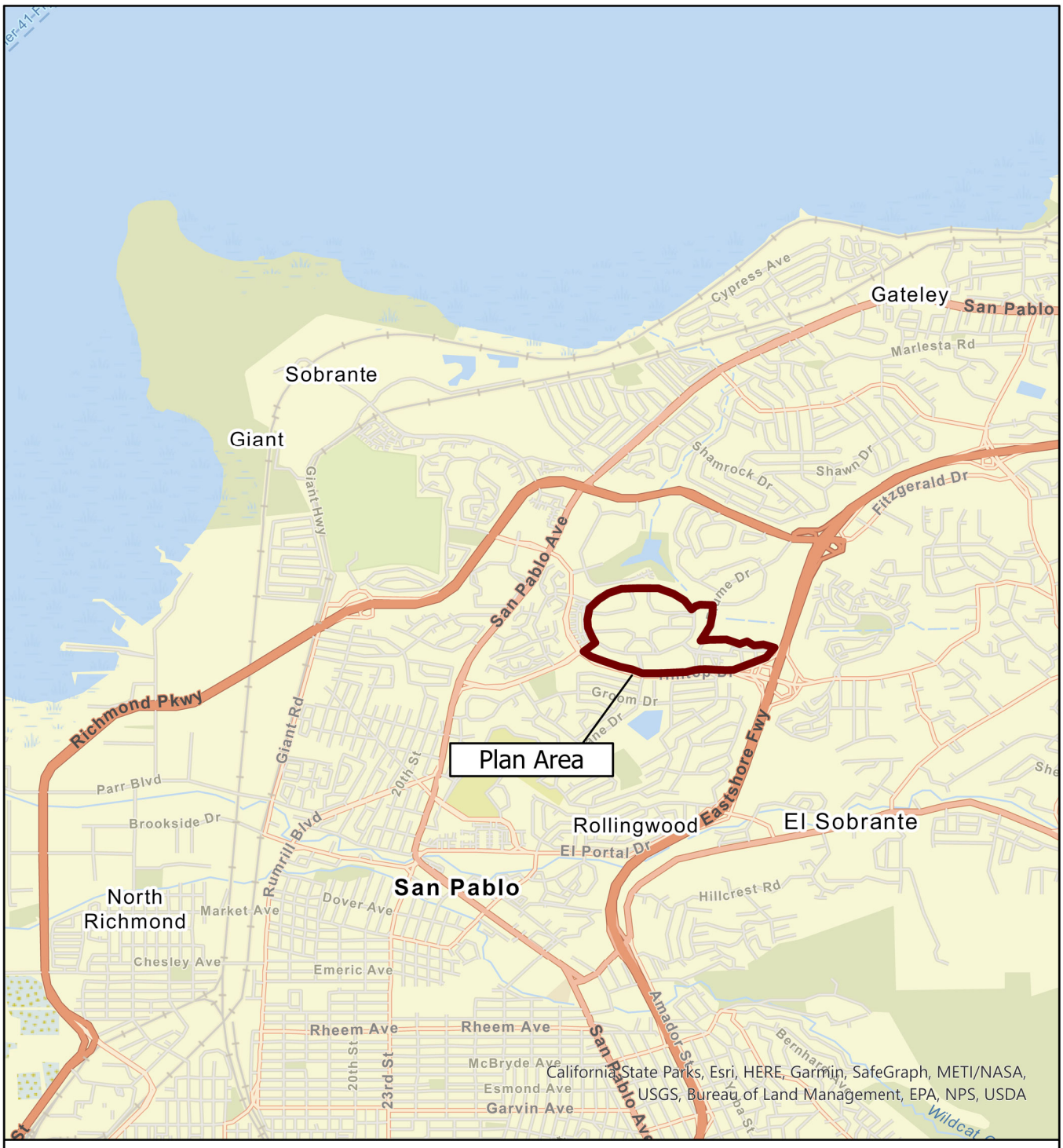
Project No. 1110-18A

Map of Existing Investigations

A3GEO

Figure 1

PLATES



N

(SCALE IN MILES)

0 0.5 1 1.5 2

Richmond Hilltop Specific Plan
Richmond, California

Project No. 1110-18A

Vicinity Map

A3GEO

Plate 1

N

(SCALE IN MILES)

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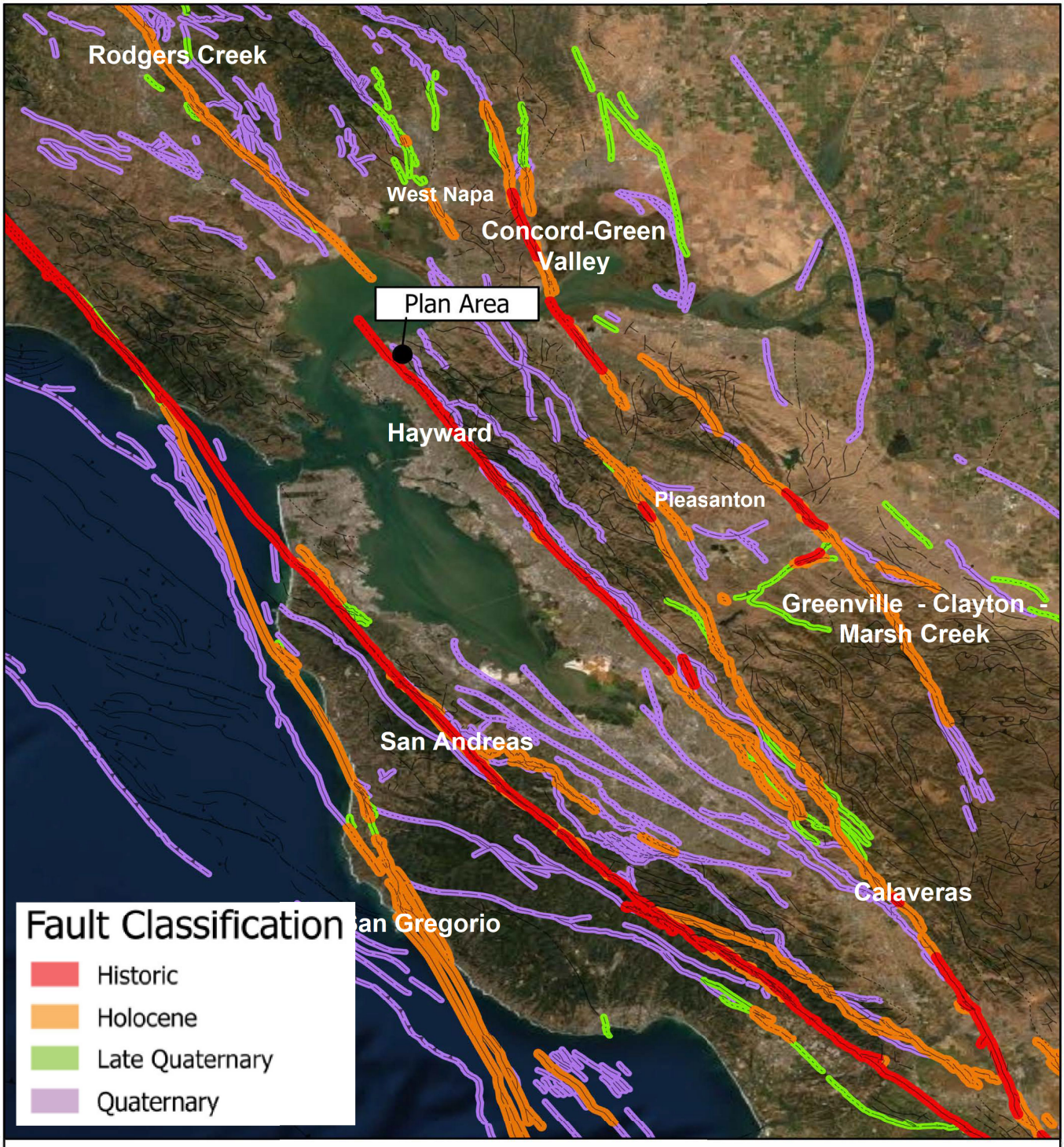
Richmond Hilltop Specific Plan
Richmond, California

Project No. 1110-18A

Location Map

A3GEO

Plate 2



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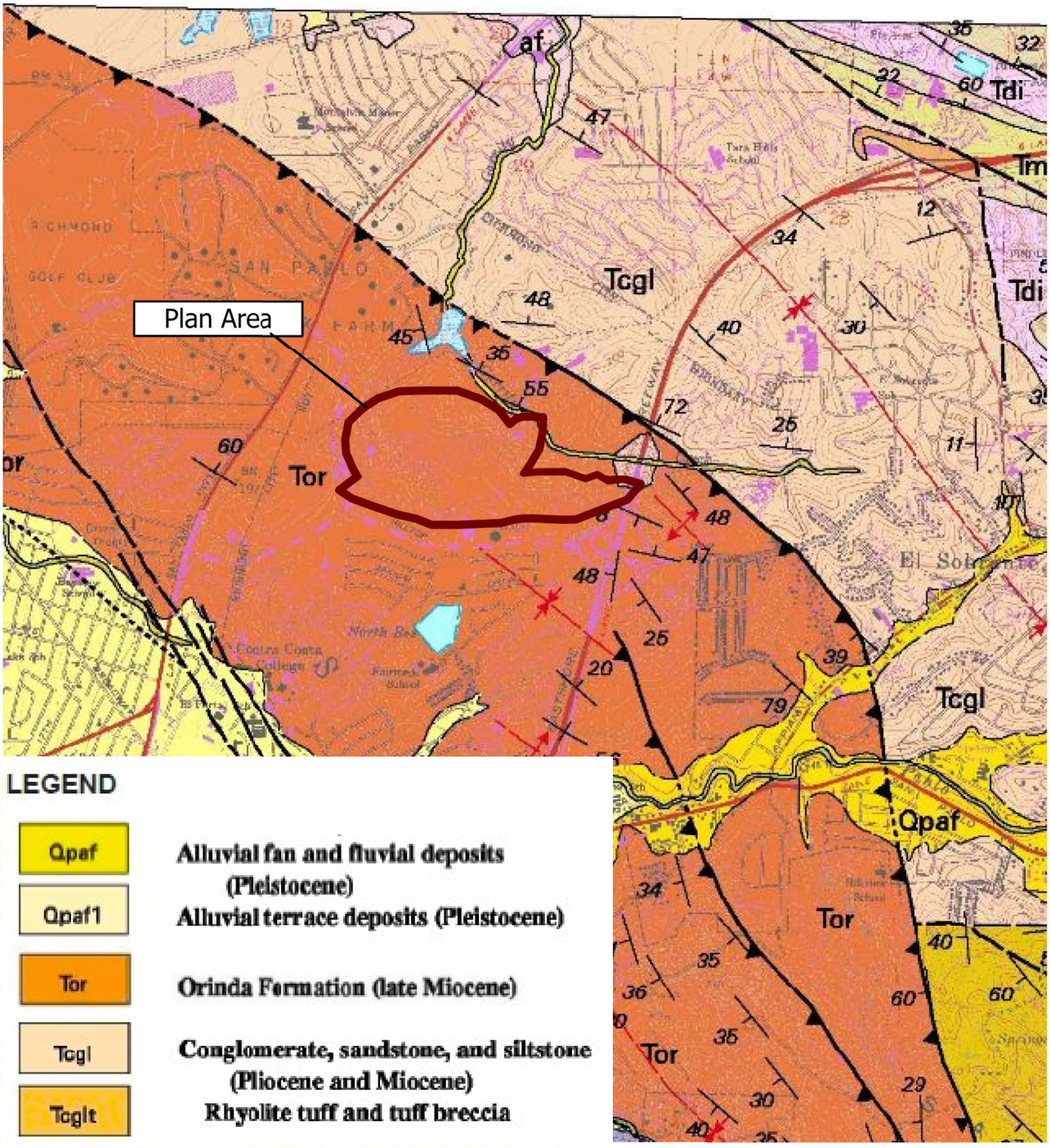
Richmond Hilltop Specific Plan
Richmond, California

Project No. 1110-18A

Fault Map

A3GEO

Plate 3



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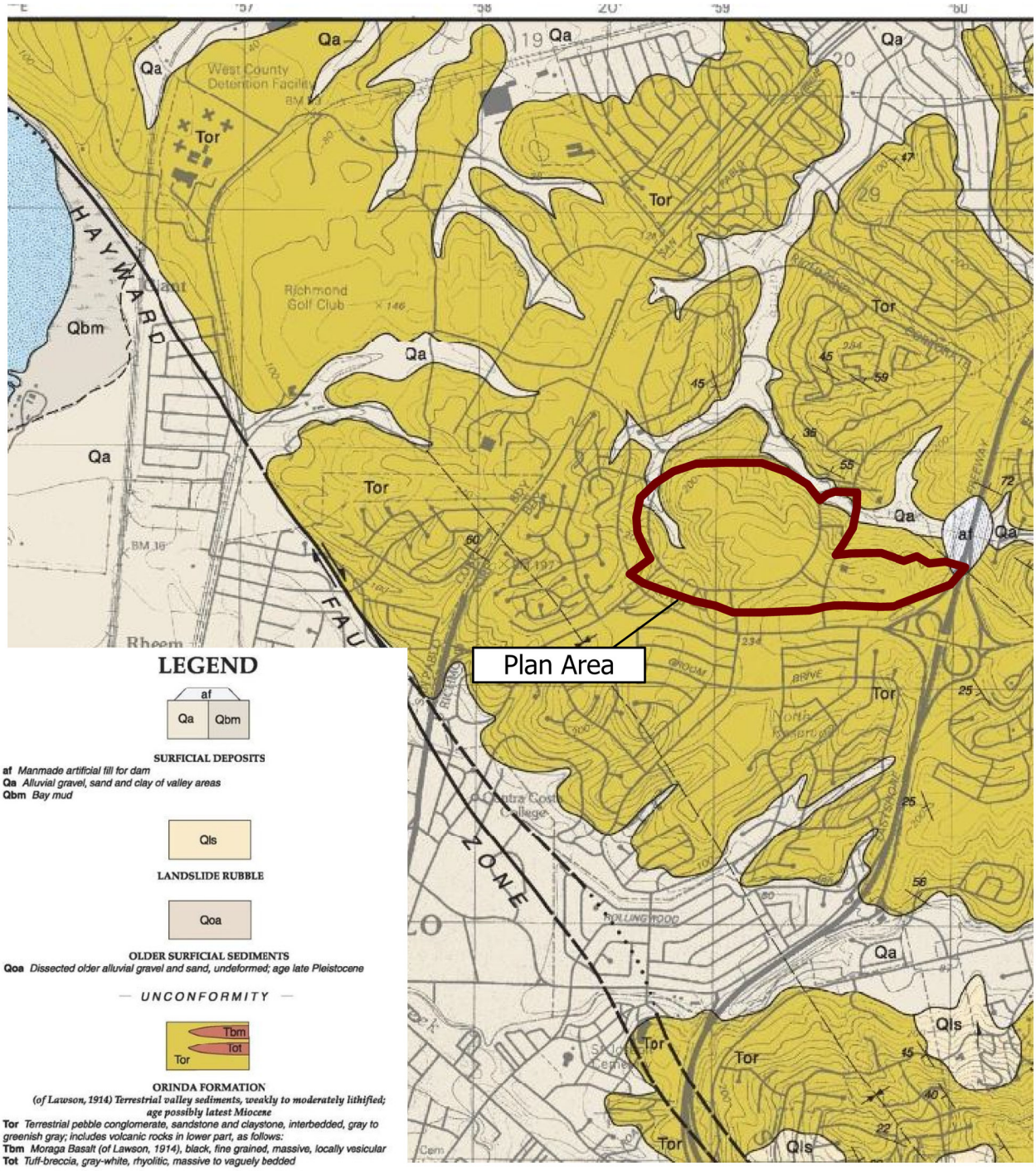
Richmond Hilltop Specific Plan
Richmond, California

Project No. 1110-18A

Regional Geologic Map (Graymer , 2000)

A3GEO

Plate 4



N

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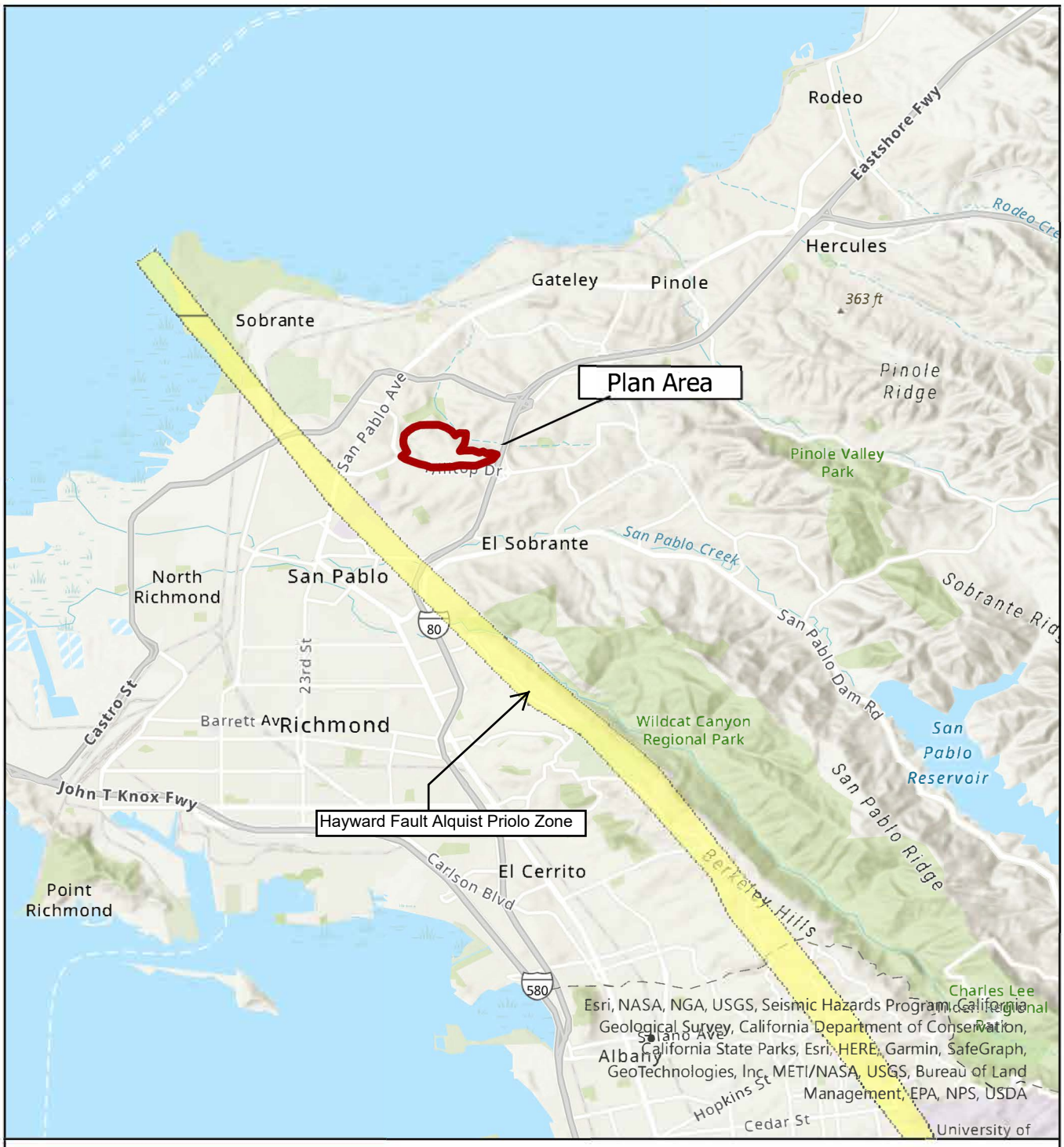
Richmond Hilltop Specific Plan
Richmond, California

Project No. 1110-18A

Regional Geologic Map (Dibblee and Minch, 2005)

A3GEO

Plate 5



N

(SCALE IN MILES)

0 1 2 3 4

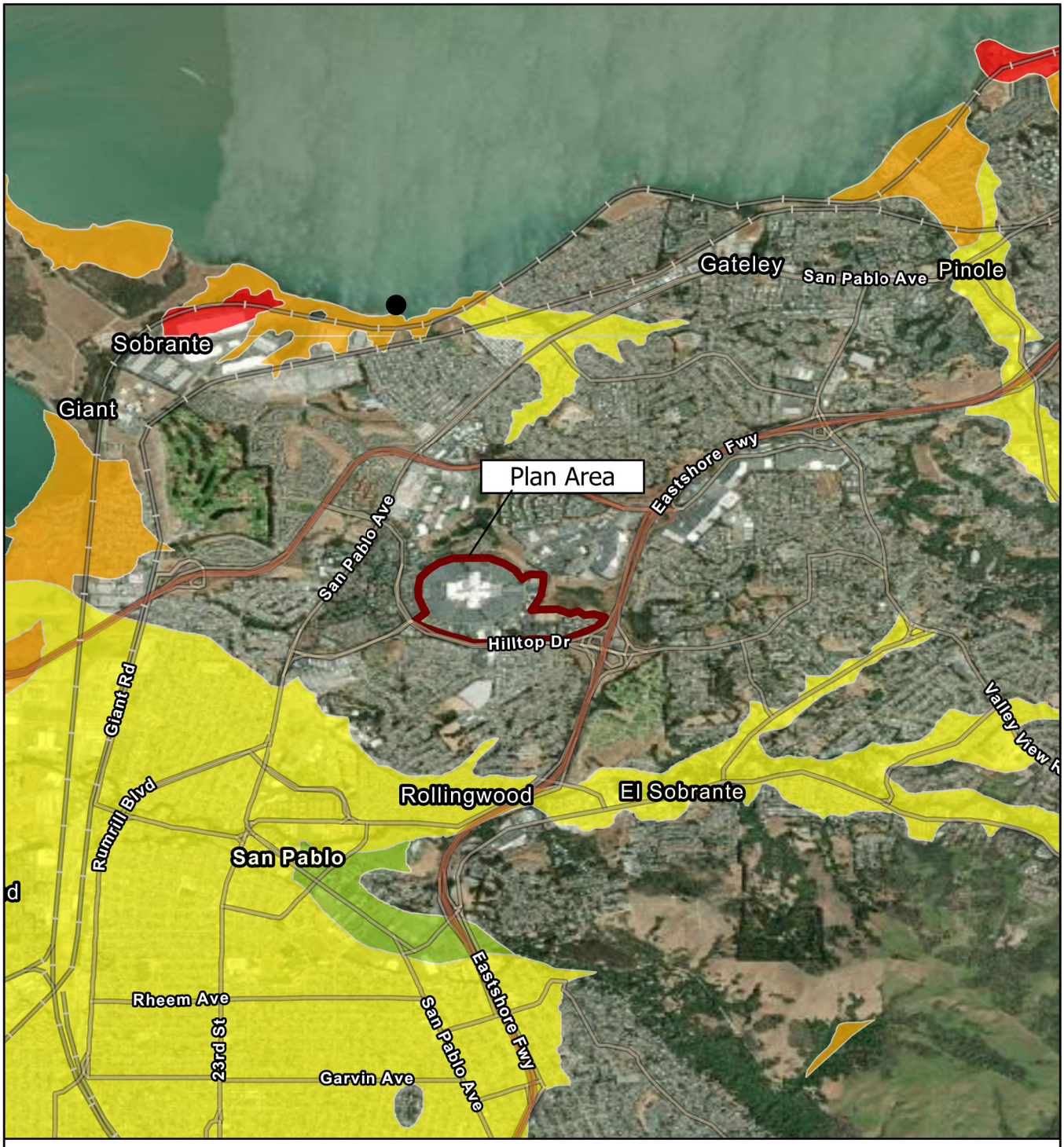
Richmond Hilltop Specific Plan
Richmond, California

Project No. 1110-18A

Alquist-Priolo Fault Hazard Zones

A3GEO

Plate 6



N

(SCALE IN MILES)

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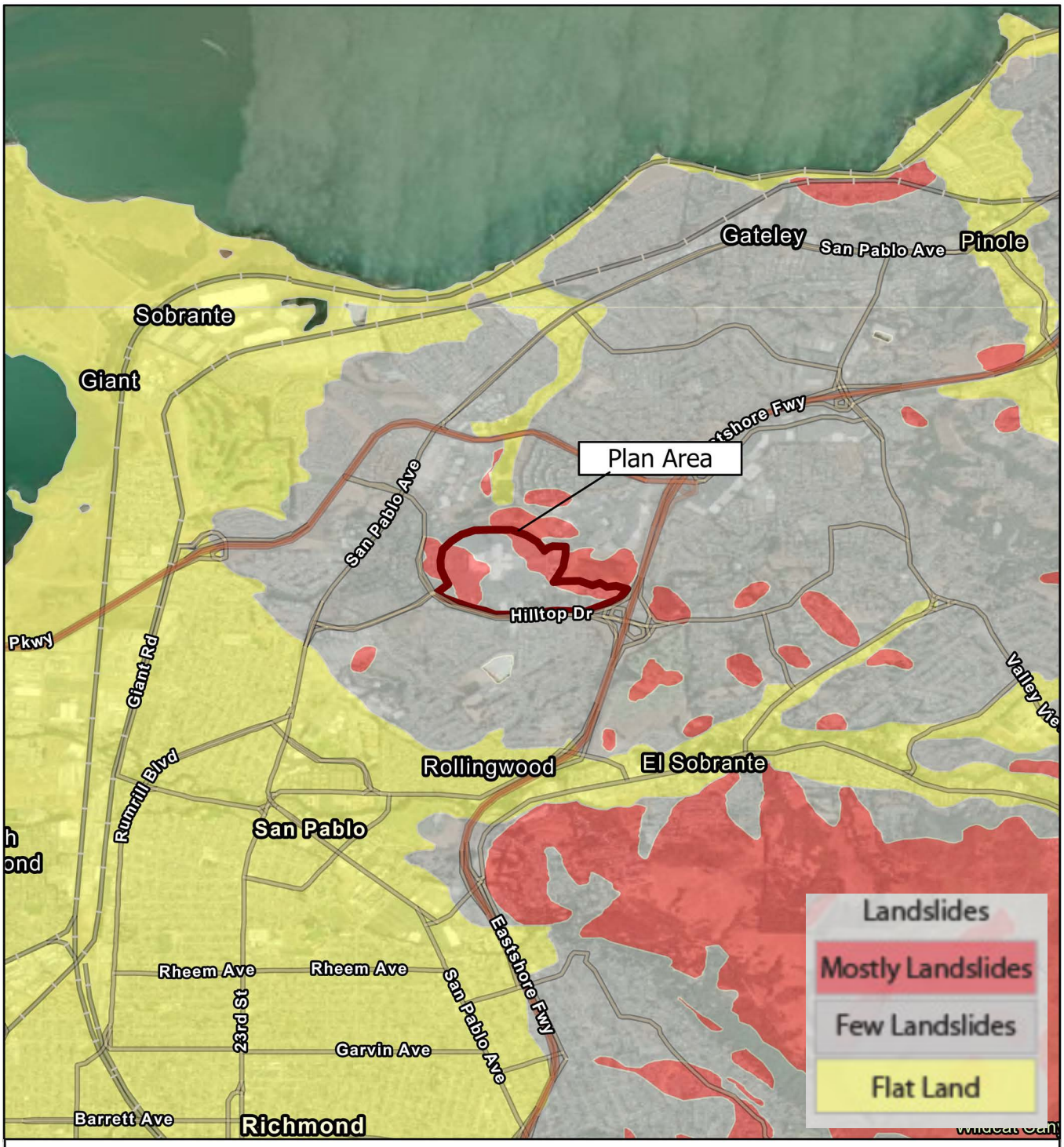
Richmond Hilltop Specific Plan
Richmond, California

Project No. 1110-18A

Regional Liquefaction Susceptibility Map

A3GEO

Plate 7



N

(SCALE IN MILES)

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Richmond Hilltop Specific Plan
Richmond, California

Project No. 1110-18A

USGS Landslides Map

A3GEO

Plate 8

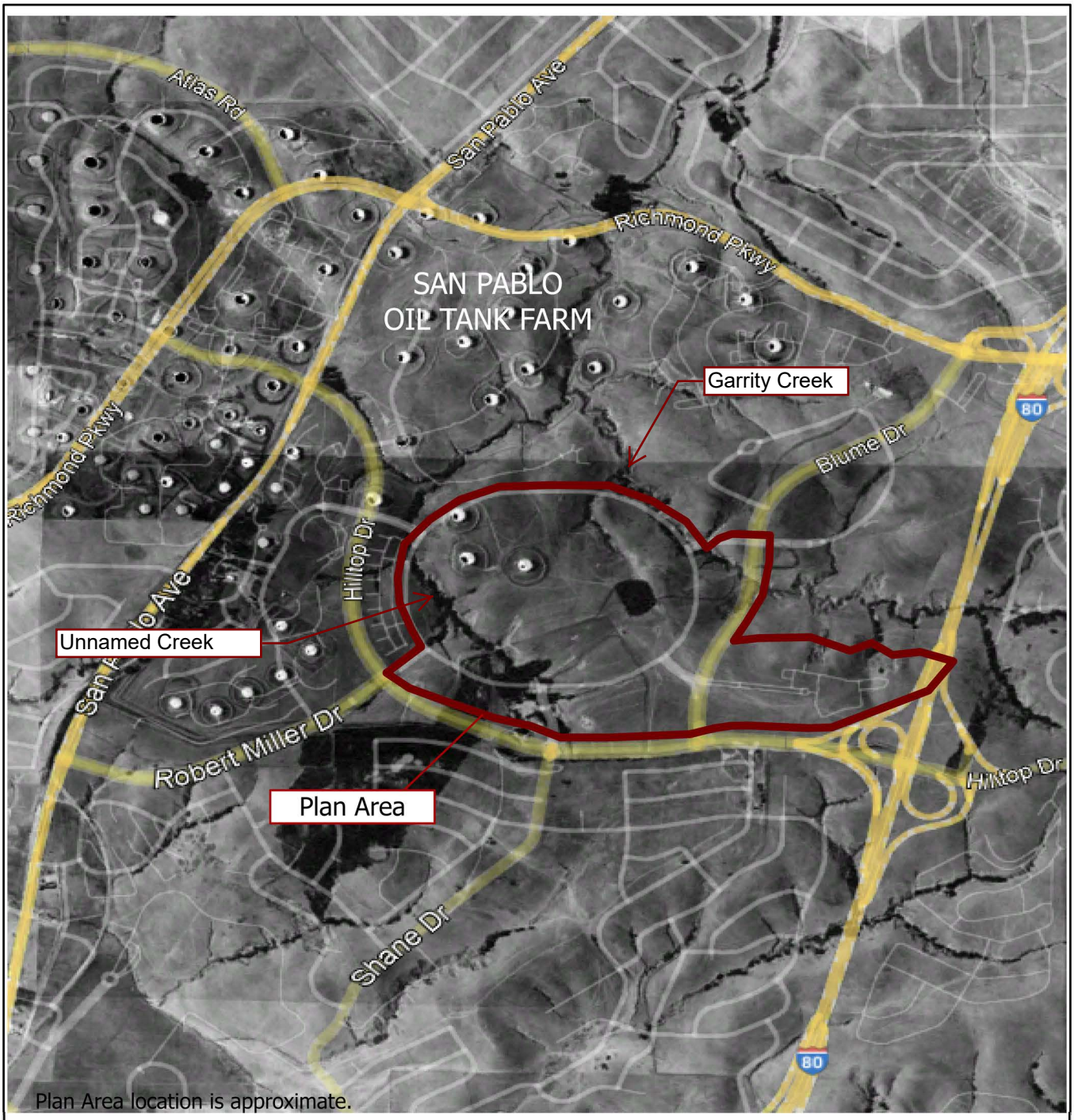

Photo Source: University of Santa Barbara Library, FrameFinder , Imagery Report: Flight C-5750

N

(SCALE IN MILES)

0 0.15 0.3 0.45 0.6

Richmond Hilltop Specific Plan
Richmond, California

Project No. 1110-18A

1939 Historical Aerial Photograph

A3GEO

Plate 9

Plan Area location is approximate.

Photo Source: University of Santa Barbara Library, FrameFinder , Imagery Report: Flight CAS-65-130

N

(SCALE IN MILES)

0 0.15 0.3 0.45 0.6

Richmond Hilltop Specific Plan
Richmond, California

Project No. 1110-18A

1965 Historical Aerial Photograph

A3GEO

Plate 10

Plan Area location is approximate.

Photo Source: University of Santa Barbara Library, FrameFinder , Imagery Report: Flight GS-VEZR

N

(SCALE IN MILES)

0 0.15 0.3 0.45 0.6

Richmond Hilltop Specific Plan
Richmond, California

Project No. 1110-18A

1980 Historical Aerial Photograph

A3GEO

Plate 11

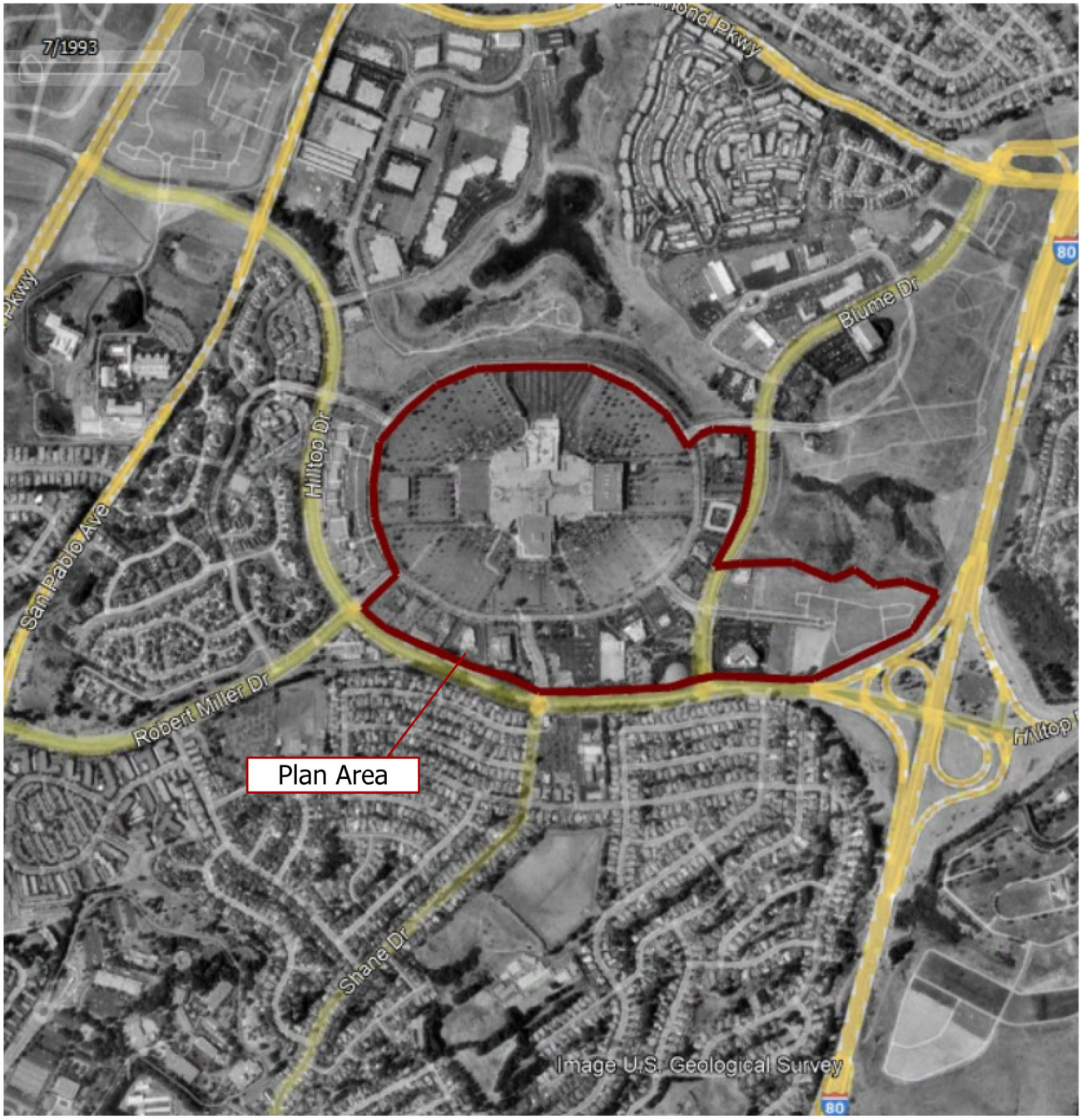

Photo Source: Google Earth

N

(SCALE IN MILES)

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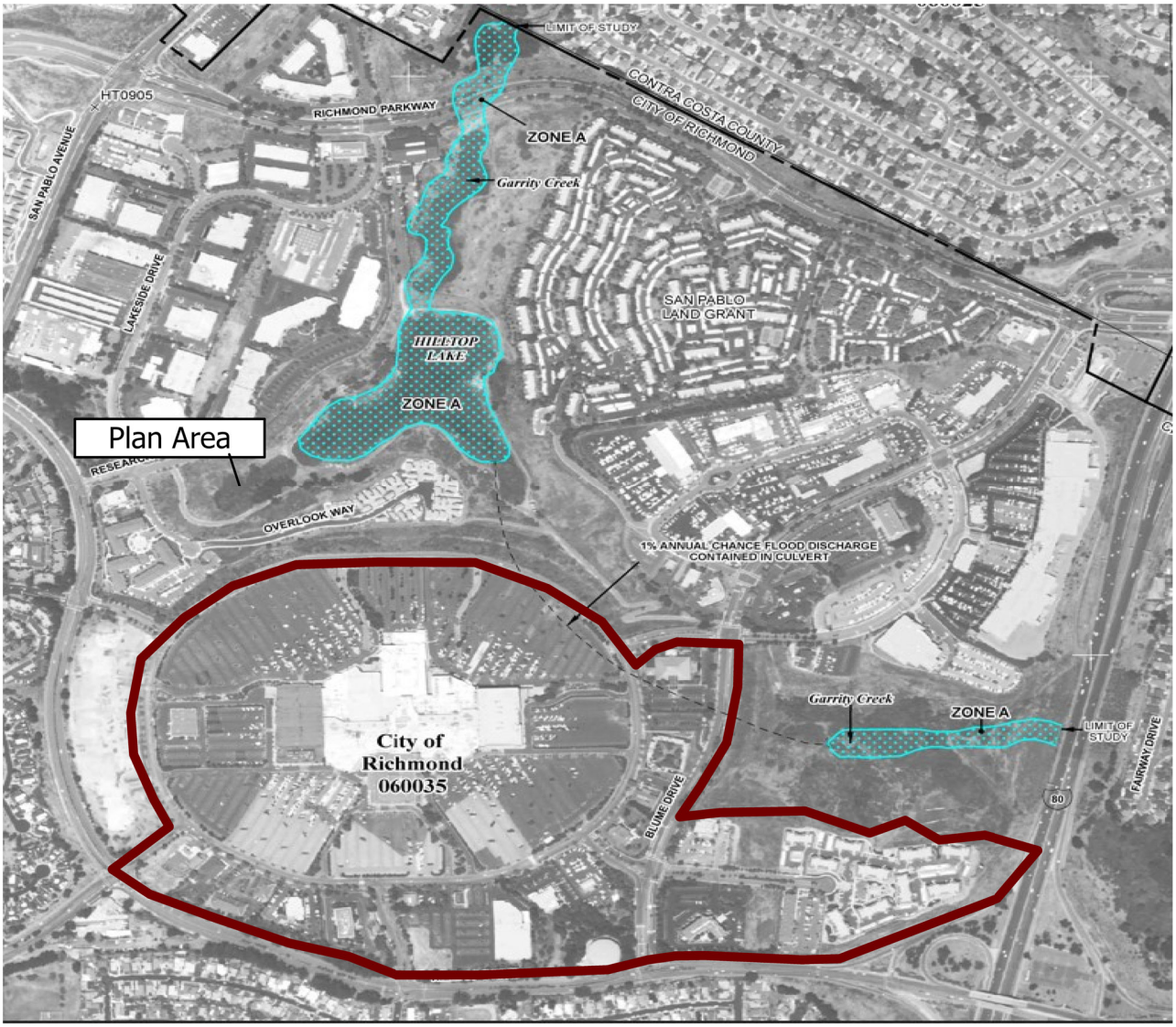
Richmond Hilltop Specific Plan
Richmond, California

Project No. 1110-18A

1993 Historical Aerial Photograph

A3GEO

Plate 12



LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

OTHER FLOOD AREAS

ZONE X

Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X

Areas determined to be outside the 0.2% annual chance floodplain.

N

(SCALE IN MILES)

0 0.1 0.2 0.3 0.4

Richmond Hilltop Specific Plan
Richmond, California

Project No. 1110-18A

FEMA Flood Map

A3GEO

Plate 13

APPENDIX A

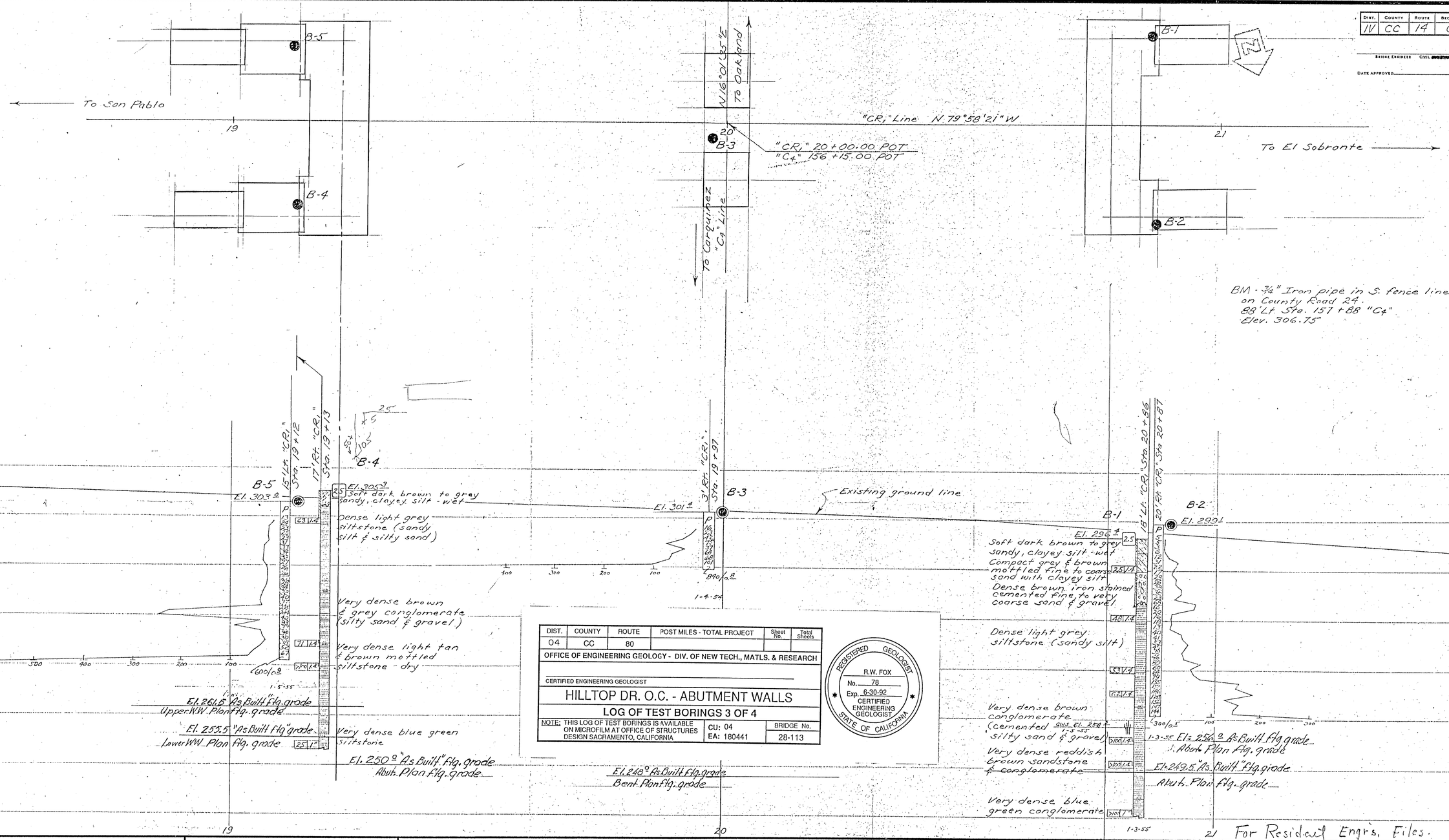
Existing Geotechnical Investigations

FED. ROAD DIV. NO.	STATE	PROJ. No.	FISCAL YEAR	No.	SHEETS
7	CAL.				

DIST.	COUNTY	ROUTE	SECTION	SHEET No.	TOTAL SHEETS
IV	CC	14	C		

BRIDGE ENGINEER CIVIL ENGINEER—LICENSE 9585

DATE APPROVED



DIST.	COUNTY	ROUTE	POST MILES - TOTAL PROJECT	Sheet No.	Total Sheets
04	CC	80			

OFFICE OF ENGINEERING GEOLOGY - DIV. OF NEW TECH., MATLS. & RESEARCH

CERTIFIED ENGINEERING GEOLOGIST

HILLTOP DR. O.C. - ABUTMENT WALLS

LOG OF TEST BORINGS 3 OF 4

NOTE: THIS LOG OF TEST BORINGS IS AVAILABLE ON MICROFILM AT OFFICE OF STRUCTURES DESIGN SACRAMENTO, CALIFORNIA

CU: 04
EA: 180441

BRIDGE No. 28-113

REGISTERED GEOLOGIST
R.W. FOX
No. 78
Exp. 6-30-92
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

CLASSIFICATION OF MATERIAL BASED ON STANDARD GRADE SIZE LIMITS

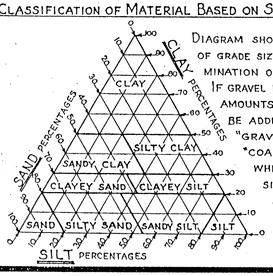


DIAGRAM SHOWING THE BASIS FOR ESTIMATES OF GRADE SIZE DISTRIBUTION USED IN DETERMINATION OF CLASS NAMES.

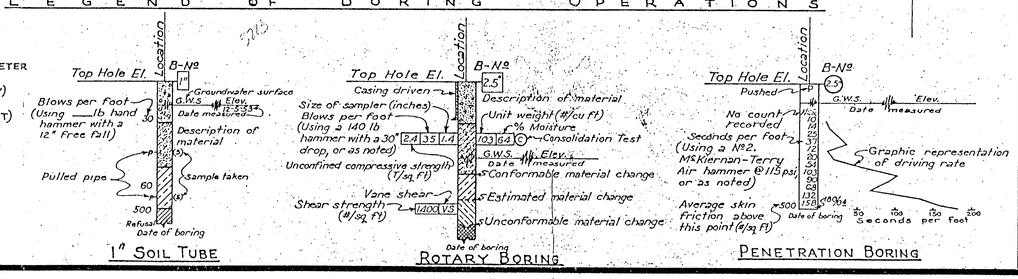
IF GRAVEL IS PRESENT IN APPRECIABLE AMOUNTS THE TERM "GRAVELLY" MAY BE ADDED TO THE CLASS NAME, VIZ, "GRAVELLY SAND." THE TERMS "COARSE", "MEDIUM" AND "FINE" WHEN USED TO DESCRIBE SAND, SILT AND GRAVEL REFER TO STANDARD GRADE SIZE LIMITS.

LEGEND OF EARTH MATERIALS

- GRAVEL
- SAND
- SILT
- CLAY
- SANDY CLAY OR CLAYEY SAND
- SANDY SILT OR SILTY SAND
- SILTY CLAY OR CLAYEY SILT
- PEAT AND/OR ORGANIC MATTER
- FILL MATERIAL
- IGNEOUS ROCK
- SEDIMENTARY ROCK
- METAMORPHIC ROCK

LEGEND OF BORING OPERATIONS

- PLAN OF ANY BORING
- PEN — PENETROMETER
- 2½" CONE PENETROMETER
- SAMP — SAMPLER BORING (DRY)
- ROT — ROTARY BORING (WET)
- AUG — AUGER BORING (DRY)
- JET — JET BORING
- CORE — CORE BORING
- TEST PIT



NOTES

The contractor's attention is directed to Section 2, Article (c) of the Standard Specifications and to the Special Provisions accompanying this set of plans.

Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

Hilltop Drive
ROAD 24 OVERCROSSING

LOG OF TEST BORINGS

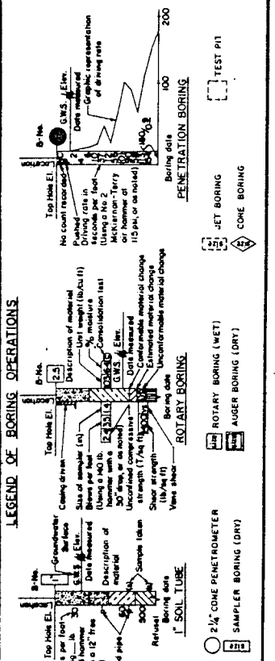
SCALE	BRIDGE	FILE	DRAWING
1" = 10'	28-113		FR-3867-5

DIST.	COUNTY	ROUTE	POST MILES — TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
04	CC	80	5.5/6.4	70	70

Keith F. Hansen 271
BRIDGE ENGINEERING GEOLOGIST — CERT. ENGINEERING GEOLOGIST NO.
DATE APPROVED March 29, 1976

REDUCED PLAN
USE SCALE BELOW
0 1 2 3
3 INCHES ON ORIGINAL PLAN

LEGEND OF BORING OPERATIONS



LEGEND OF EARTH MATERIALS

GRAVEL · SAND · SILT · CLAY · SANDY CLAY or CLAYEY SAND · SANDY SILT or SILTY SAND · SILTY CLAY or CLAYEY SILT · ORGANIC MATTER · FILL MATERIAL · IGNEOUS ROCK · SEDIMENTARY ROCK · METAMORPHIC ROCK

NOTE: Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.

CONSISTENCY CLASSIFICATION FOR SOILS

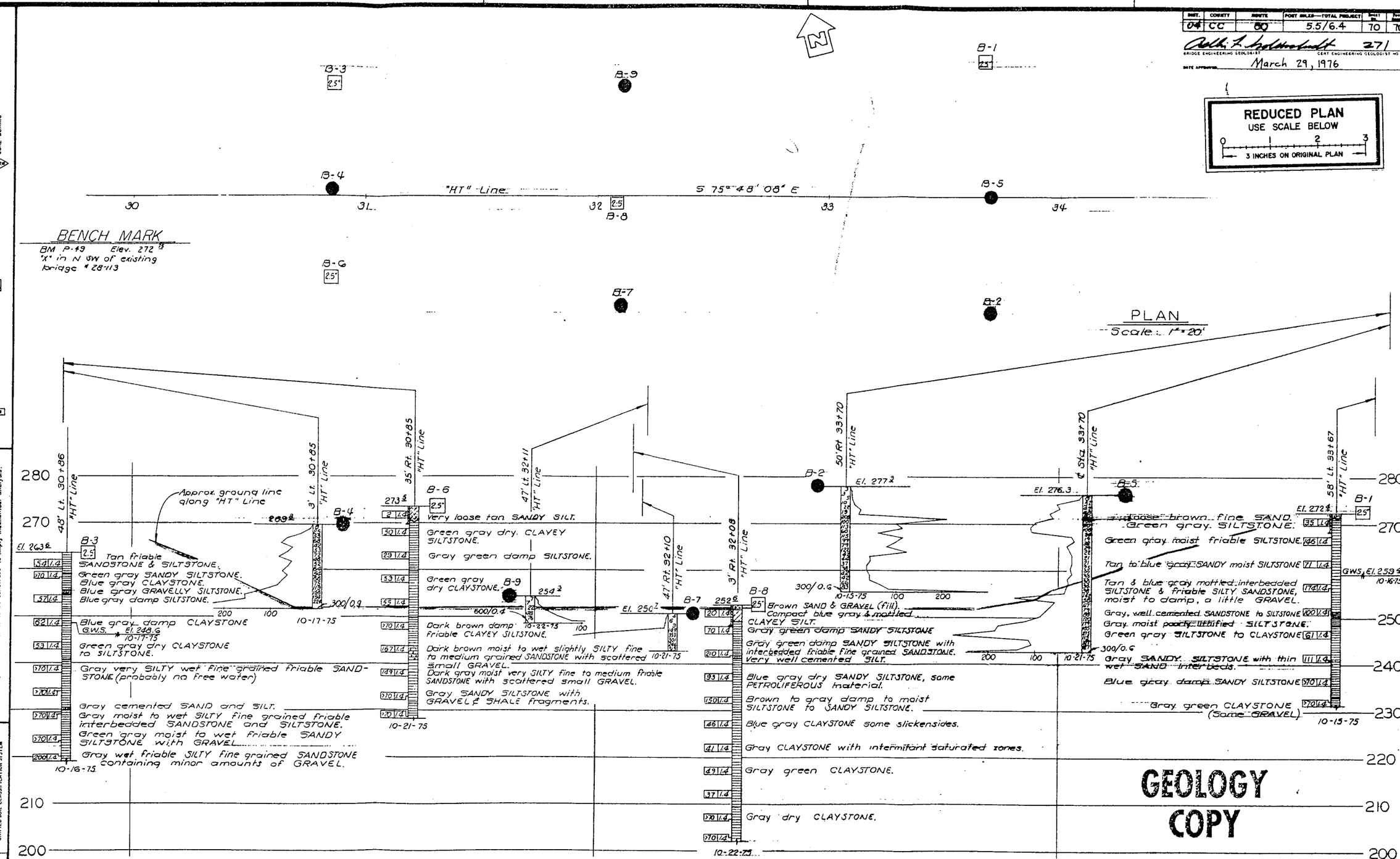
According to the Standard Penetration Test

Penetration Index (Blows/Ft)	Granular	Cohesive
0-5	Very loose	Very soft
5-10	Loose	Soft
10-20	Slightly compact	Stiff
20-35	Compact	Very stiff
35-70	Dense	Hard
70	Very dense	Very hard

UNIFIED SOIL CLASSIFICATION SYSTEM

Major Division	Group Symbols	Typical Names	Laboratory Classification
Coarse-grained Soils — Gravels (More than half of coarse fraction is larger than No. 4 sieve size)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	
	GP	Poorly graded gravels, gravel-sand mixtures, little or no fines	
	GM	Silty gravels, gravel-sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4
	GC	Clayey gravels, gravel-sand-clay mixtures	Atterberg limits above "A" line with P.I. greater than 7
Sands (50% or more of coarse fraction is smaller than No. 4 sieve size)	SW	Well-graded sands, gravelly sands, little or no fines	
	SP	Poorly graded sands, gravelly sands, little or no fines	
	SM	Silty sands, sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4
	SC	Clayey sands, sand-clay mixtures	Atterberg limits above "A" line with P.I. greater than 7
Fine-grained Soils — Silts and Clays (Liquid limit less than 50)	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity	
	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	
	OL	Organic silts and organic silty clays of low plasticity	
Silts and Clays (Liquid limit greater than 50)	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts	
	CH	Inorganic clays of high plasticity, fat clays	
	OH	Organic clays of medium to high plasticity, organic silts	
Highly Organic Soils	Pt	Peat and other highly organic soils	

NOTE: Classification of earth materials as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.



GEOLOGY COPY

ENGINEERING GEOLOGY SECTION		
FIELD STUDY	By K. F. Hayer	Approved/Recommended By Kirkwood F. Hayer
DRAWN	By Ken Johnson 1/76	ENGINEERING GEOLOGIST
CHECKED	By K. F. Hayer 2-1-76	CERTIFIED ENGINEERING GEOLOGIST NUMBER 779

State of CALIFORNIA
DEPARTMENT OF TRANSPORTATION

OFFICE OF STRUCTURES
DESIGN GROUP
PROJECT ENGINEER E. C. Terry Hansen

BRIDGE NO. 28-281
POST MILE 5.9

HILLTOP DRIVE O. C.
LOG OF TEST BORINGS

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 04205
WO 397071

Disregard prints bearing earlier revision dates →

REVISION DATES (PRELIMINARY STAGE ONLY)

SHEET	OF
13	13

DEPTH (feet)	SAMPLE NO.	SAMPLE	GRAPHIC LOG	SOIL DESCRIPTION	SOIL CLASSIFICATION	CONVERTED SPT BLOW COUNT (BLOWS/FT.)	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	COMMENTS
1				2" Asphalt over 10" Gravel.					
				Gravelly CLAY with Sand, black, orange - brown, mottled, stiff, damp, medium plasticity (Possible FILL material).					
	B2-1					18	109.9	15.1	
5				Silty CLAY with gravel and cemented silt, olive brown, stiff, damp, medium plasticity.					
	B2-2					17	97.6	22.4	
10				Silty CLAY, olive brown, stiff, damp.					
	B2-3			Sandy CLAY with silt and coarse sand, olive - brown, stiff, damp - moist, medium plasticity.		18	105.9	18.1	
15	B2-4					19	104.9	20.4	
20				Silty CLAY with cemented silt, light brown - olive brown, stiff, damp - saturated, medium plasticity.					
25	B2-5					19			
				Boring terminated @ 26.5' below ground surface. No groundwater encountered.					
30									
35									

Logged by:	Date Drilled:	Diameter:	Drill Rig:
A.T.	3/02/04	4"	

EXPLORATORY BORING LOG B-2

GEOTECHNICAL ENGINEERS AND GEOLOGISTS
TERRASEARCH INC.
257 WRIGHT BROTHERS AVENUE, LIVERMORE CALIFORNIA 94550 PHONE: (925) 243-6662

HILLTOP
HILLTOP MALL ROAD
RICHMOND, CALIFORNIA

Figure No. 3

Project No.	Drawn by:	Scale:	Date:	Sheet:
9897.G	E.PACREM	1" = 5'	03/2004	1 of 1

DEPTH (feet)	SAMPLE NO.	SAMPLE	GRAPHIC LOG	SOIL DESCRIPTION	SOIL CLASSIFICATION	CONVERTED SPT BLOW COUNT (BLOWS/FT.)	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	COMMENTS
1				2" Asphalt over 10" Gravel.					
				Silty CLAY, grayish - olive to black, medium stiff, damp, medium plasticity, traces of organics and minor fine gravel.					
	B3-1					10	97.7	21.9	
5				Silty SAND, orange, dense.					
	B3-2			Silty CLAY with fine sand, olive, medium stiff, damp.		12	99.3	23.9	
10									
	B3-3			Silty CLAY, black, medium stiff, damp, medium plasticity, traces of organics.		13	101.3	21.4	
				Silty CLAY (CL), light brown, hard, damp, medium plasticity, iron deposit.					
15									
	B3-4					48	101.8	22.2	
				Boring terminated @ 16.5' below ground surface. No groundwater encountered.					
20									
25									
30									
35									

Logged by:	Date Drilled:	Diameter:	Drill Rig:
A.T.	3/02/04	6"	

EXPLORATORY BORING LOG B-3

GEOTECHNICAL ENGINEERS AND GEOLOGISTS
TERRASEARCH INC.
257 WRIGHT BROTHERS AVENUE, LIVERMORE CALIFORNIA 94550 PHONE: (925) 243-6662

HILLTOP
HILLTOP MALL ROAD
RICHMOND, CALIFORNIA

Figure No. 4

Project No.	Drawn by:	Scale:	Date:	Sheet:
9897.G	E.PACREM	1" = 5'	03/2004	1 of 1

DEPTH (feet)	SAMPLE NO.	SAMPLE	GRAPHIC LOG	SOIL DESCRIPTION	SOIL CLASSIFICATION	CONVERTED SPT BLOW COUNT (BLOWS/FT.)	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	COMMENTS
1				2" Asphalt over 10" Gravel.					
				Silty SAND with fine gravel, light brown, dense, moist (FILL)					
	B4-1					22	88.4	22.3	
5				Silty SAND with clay and gravel, mottled, black, medium dense, moist.					
	B4-2					20	107.4	16.8	
10				Silty CLAY (CL), olive brown, stiff, damp - moist, medium plastcity, cemented silt, black inclusion.					
	B4-3					20	92.4	26.0	
15				Silty CLAY (CL), black, stiff, damp, medium plasticity, traces of organics.					
	B4-4					15	106.1	17.8	
20									
	B4-5								
				Boring terminated @ 21.5' below ground surface. No groundwater encountered.					
25									
30									
35									

Logged by:	Date Drilled:	Diameter:	Drill Rig:
A.T.	3/02/04	6"	

EXPLORATORY BORING LOG B-4

GEOTECHNICAL ENGINEERS AND GEOLOGISTS
TERRASEARCH INC.
257 WRIGHT BROTHERS AVENUE, LIVERMORE CALIFORNIA 94550 PHONE: (925) 243-6662

HILLTOP
HILLTOP MALL ROAD
RICHMOND, CALIFORNIA

Figure No. 5

Project No.	Drawn by:	Scale:	Date:	Sheet:
9897.G	E.PACREM	1" = 5'	03/2004	1 of 1

DEPTH (feet)	SAMPLE NO.	SAMPLE	GRAPHIC LOG	SOIL DESCRIPTION	SOIL CLASSIFICATION	CONVERTED SPT BLOW COUNT (BLOWS/FT.)	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	COMMENTS
1				4" Asphalt over 22" Gravel.					
				Silty CLAY with fine sand, olive - light brown, very stiff - hard, moist, medium plasticity, black stain, iron deposit (FILL Material).					
	B1-1			Coarse SAND, brown, wet.		31	90.5	30.6	
5				Silty CLAY with sand and gravel, olive.					
	B1-2			Gravelly coarse SAND with Silt, brown, wet, very dense, with cemented silt, wet.		32	90.0	17.5	
10				Clayey fine SAND, light gray, moist.					
	B1-3					50-8"	115.9	13.7	
15				Silty CLAY, olive brown, damp, hard, medium plasticity, traces of iron deposit.					
	B1-4					50-4"	104.3	19.3	
20									
	B1-5					50-4"			
				Boring terminated @ 21.5' below ground surface. No groundwater encountered.					
25									
30									
35									

Logged by:	Date Drilled:	Diameter:	Drill Rig:
A.T.	3/02/04	6"	

EXPLORATORY BORING LOG B-1

GEOTECHNICAL ENGINEERS AND GEOLOGISTS
TERRASEARCH INC.
257 WRIGHT BROTHERS AVENUE, LIVERMORE CALIFORNIA 94550 PHONE: (925) 243-6662

HILLTOP
HILLTOP MALL ROAD
RICHMOND, CALIFORNIA

Figure No. 2

Project No.	Drawn by:	Scale:	Date:	Sheet:
9897.G	E.PACREM	1" = 5'	03/2004	1 of 1

DEPTH (feet)	SAMPLE NO.	SAMPLE	GRAPHIC LOG	SOIL DESCRIPTION	SOIL CLASSIFICATION	CONVERTED SPT BLOW COUNT (BLOWS/FT.)	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	COMMENTS
1				2" Asphalt over 10" Gravel.					
				Sitly CLAY with fine sand, light brown.					
				Silty CLAY, olive brown, hard, damp, medium plasticity with fine sand.					
	B5-1					50-8"	102.9	34.4	
5				Gravelly coarse SAND, olive, very dense, moist.					
	B5-2			SAND with silt, olive, hard, moist.		50-8"			
10				Silty CLAY, olive, hard, damp, medium plasticity.					
	B5-3					50-4"			
				Boring terminated @ 11.5' below ground surface.					
				No groundwater encountered.					
15									
20									
25									
30									
35									

Logged by:	Date Drilled:	Diameter:	Drill Rig:
A.T.	3/02/04	6"	

EXPLORATORY BORING LOG B-5

GEOTECHNICAL ENGINEERS AND GEOLOGISTS
TERRASEARCH INC.
257 WRIGHT BROTHERS AVENUE, LIVERMORE CALIFORNIA 94550 PHONE: (925) 243-6662

HILLTOP
HILLTOP MALL ROAD
RICHMOND, CALIFORNIA

Figure No. 6

Project No.	Drawn by:	Scale:	Date:	Sheet:
9897.G	E.PACREM	1" = 5'	03/2004	1 of 1

DEPTH (feet)	SAMPLE NO.	SAMPLE	GRAPHIC LOG	SOIL DESCRIPTION	SOIL CLASSIFICATION	CONVERTED SPT BLOW COUNT (BLOWS/FT.)	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	COMMENTS
1				1" Asphalt over 8" Gravel.					
				Silty CLAY with gravel, gray - olive brown, stiff, damp, medium plasticity.					
	B6-1			Silty CLAY, black, stiff, damp.		17	109.9	15.1	
5				Silty CLAY with fine gravel, orange - red brown, damp - moist, stiff, medium plasticity.					
	B6-2			Silty CLAY, olive brown, moist, stiff, medium plasticity, iron deposit, black staining.		15	97.6	22.4	
10				Silty CLAY, black, stiff, damp - moist, some organics.					
	B6-3					13	105.9	18.1	
15				Silty CLAY, gray.					
	B6-4			Silty CLAY, light brown, stiff, damp - moist, medium plastcity.		15	104.9	20.4	
				Boring terminated @ 16.5' below ground surface. No groundwater encountered.					
20									
25									
30									
35									

Logged by:	Date Drilled:	Diameter:	Drill Rig:
A.T.	3/02/04	6"	

EXPLORATORY BORING LOG B-6

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HILLTOP
HILLTOP MALL ROAD
RICHMOND, CALIFORNIA

Figure No. 7

Project No.	Drawn by:	Scale:	Date:	Sheet:
9897.G	E.PACREM	1" = 5'	03/2004	1 of 1

END OF REPORT