Appendix E

Paleontological Resources Assessment

Storm Drain Maintenance Plan

Paleontological Resources Assessment

prepared for
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Executive Summary

Purpose and Scope

Rincon Consultants, Inc. (Rincon) was retained by the City of Monterey (City) to conduct a paleontological resources assessment of the Storm Drain Maintenance Plan (SDMP, or the project) in Monterey County, California. This study has been prepared in conformance with the California Environmental Quality Act (CEQA) and includes a records search, literature review, and paleontological sensitivity assessment consistent with the professional standards of the Society of Vertebrate Paleontology (SVP; 2010). The purpose of the literature review and records search was to identify the geologic unit(s) underlying the project area and to determine whether previously recorded paleontological localities occur either in the project boundaries or in the same geologic unit elsewhere. Using the results of the literature review and records search, the paleontological resource potential of the project area was determined in accordance with the SVP (2010) guidelines.

Results of Investigation

Published geologic mapping indicates that the project area is underlain by Cretaceous granodiorite, the Miocene Monterey Formation, Pleistocene marine terrace deposits, and Holocene surficial deposits. Online records for paleontological locality data in the project area and vicinity were obtained from the University of California Museum of Paleontology. According to the record searches, no vertebrate fossil localities have been previously recorded directly in the project boundary; however, at least one vertebrate locality was recorded from the Monterey Formation in the immediate vicinity of the study area on the Monterey Peninsula. At least seven additional localities from the Monterey Formation have been previously recorded nearby. These localities yielded scientifically significant fossilized specimens of marine mammals and fish. Based on this assessment, the project area is determined to have a high potential for paleontological resources and the likelihood of impacting scientifically significant vertebrate fossils as a result of project construction is high.

Recommendations

Rincon recommends that a qualified paleontologist be retained to develop and implement a Paleontological Resources Mitigation Plan during project construction in areas of high paleontological sensitivity. This plan would include mitigation measures that have been proven to be effective in reducing or eliminating adverse impacts to paleontological resources and would satisfy the requirements of CEQA. The recommended mitigation measures include paleontological monitoring by a qualified paleontologist and preparation of a paleontological monitoring report, which should be submitted to the approved curation facility, accompanied by all significant fossils recovered during construction monitoring.

1 Introduction

Paleontological resources (i.e., fossils) are the remains or traces of prehistoric life. Fossils are typically preserved in layered sedimentary rocks and the distribution of fossils across the landscape is controlled by the distribution and exposure of the fossiliferous sedimentary rock units at and near the surface. Construction-related impacts that typically affect or have the potential to affect paleontological resources include mass excavation operations, drilling/borehole excavations, trenching/tunneling, and grading.

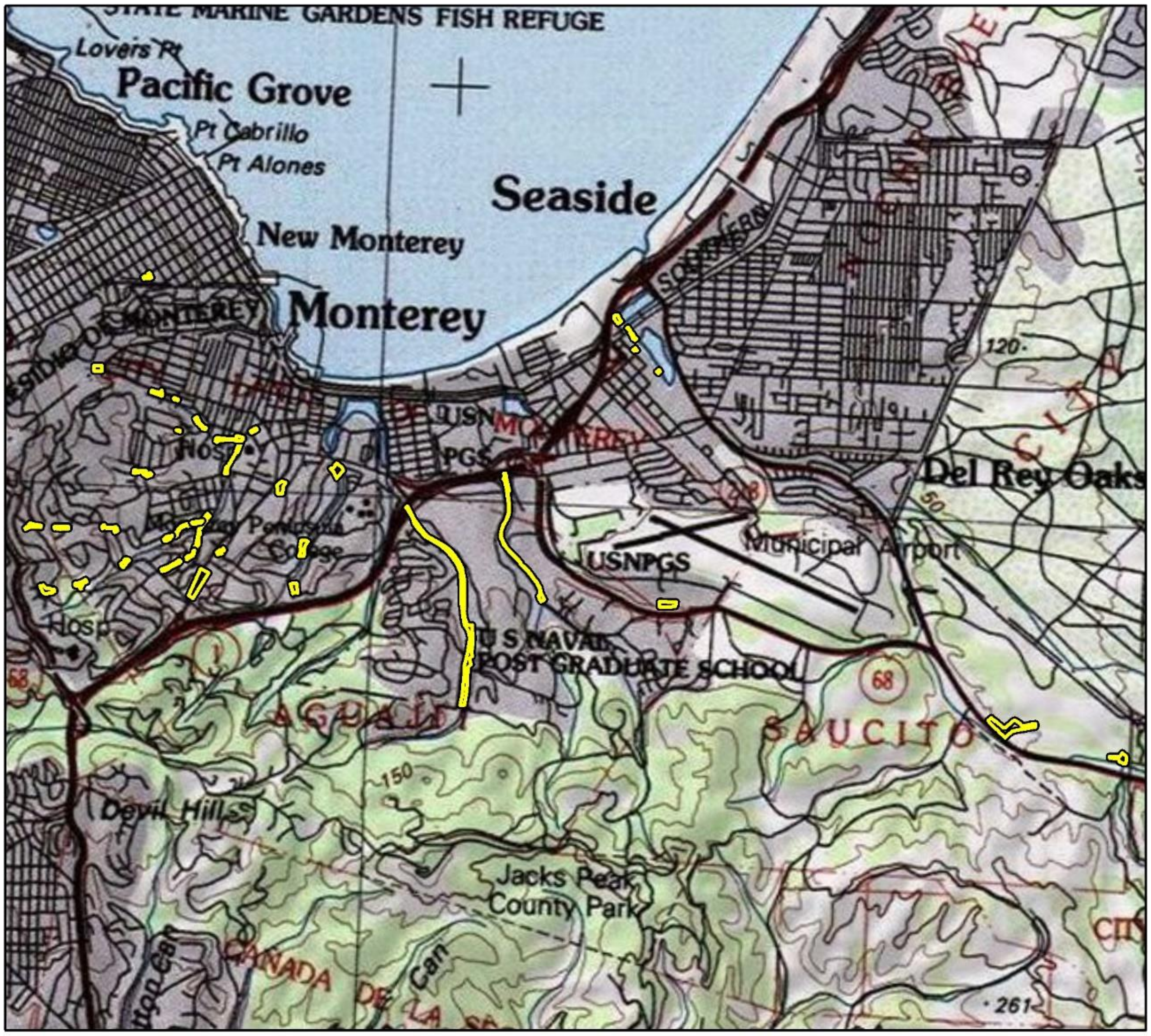
This Paleontological Resources Assessment provides a description of the geologic units mapped at the surface within the study area, including types of fossils known to occur within the units (if any), the paleontological sensitivity for each unit, a review of relevant agency regulation, an assessment of potential impacts from project development, and recommended mitigation measures for the protection and recovery of significant fossils that may be impacted.

1.1 Project Description and Location

Rincon Consultants, Inc. (Rincon) was retained by the City of Monterey (City) to conduct a paleontological resources assessment of the Storm Drain Maintenance Plan (SDMP, or the project) in Monterey County, California (Figure 1). Specifically, the project encompasses portions of the Punta de Peños, El Pescadero, City Lands of Monterey, Aguajit, Noche Buena, and Saucito landgrants within Township 15 South, Range 1 West; Township 15 South, Range 1 East; and Township 16 South, Range 1 East on the Monterey and Seaside, CA United States Geological Survey (USGS) 7.5-minute quadrangles. The City is the CEQA Lead Agency for the project.

The proposed project is intended, in part, to address concerns from both the Environmental Protection Agency and Regional Water Quality Control Board related to the City completing work without required regulatory permits or certifications. The storm drainage system maintenance locations included in the project encompass ephemeral channels, retention basins, and culvert crossings throughout the city, for a total of 38 locations (referred to hereafter as the study sites) (Figure 2). The City plans to conduct operation and maintenance activities in the identified system maintenance locations prior to the 2018/2019 wet season, with a longer-term goal to look at drainage more holistically with an eye to preparing a citywide, watershed-based SDMP.

Figure 1 Project Vicinity Map



Imagery provided by National Geographic Society, Esri and its licensors © 2018. Monterey & Seaside Quadrangles. T15S R1E S19,21,28-34; T16S R1E S1,2,5; T18S R1W S25,36. The topographic representation depicted in this map may not portray all of the features currently found in the vicinity today and/or features depicted in this map may have changed since the original topographic map was assembled.

Project Location

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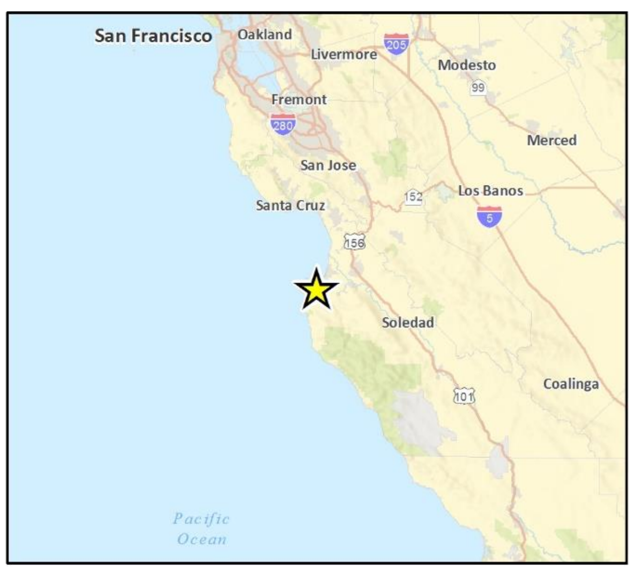

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Figure 2 Project Location Map

Site Number	Name
1	Culvert B03-H1
2	Madison Cyn @ Pebble
3	Culvert D03-H6 at Madison Rd
4	Culvert E04-H1 Study Area
5	Lower Madison Canyon
6	Culvert E04-H4 Martin at Pacific
7	Culvert E04-H6 b/w Hartnell & Munras
8	Culvert E03-H3 Via Paraiso Study Area
9	Culvert F02-H3 Wyndmere
10	Culvert F02-H2 - Crandall Road Study Area
11	Culvert F03-H1
12	Culvert G02-H2 Forest Knoll at Skyline
13	Culvert G02-H4 at Skyline & MarVista
14	Hartnell Creek at Soledad Place and Soledad Drive
15	Culvert F03-H2 San Bernabe
16	Culvert F04-H2 - Alameda
17	Culvert G03-H6 Via Esperanza
18	Culvert G03-H9 at San Bernabe and Pacific
19	Culvert F04-H4 at Pacific
20	Majors Creek - Soledad Dr. & Del Monte Center
21	Culvert F04-I7 at Don Dahvee
22	Majors Creek at El Dorado Street /Major Sherman Ln
23A	Iris Canyon, upstream End
23B	Iris Canyon, Downstream end
25	Aguajito Creek between Castro Way and MonHollan Rd
27	Wilson Road Basin
28	Ragsdale Basin
29	Virgin/Grant Street Swale
30	Laguna Grande Eastern Culvert
31	Roberts Lake West Outfall
32	Josselyn Canyon Culvert G07-H1 & F07-E1
33	Garden Court Basin
34	Encina Ave./Myers St. Swale
35	22 ViaDelRey
36	Veterans above American Legion
37	Glenwood at Iris
38	San Bernabe to Alameda Sewer Easement

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FigX Study Areas 11x17 20180216

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2 Regulations

Paleontological resources are considered nonrenewable scientific resources because once destroyed, they cannot be replaced. As such, paleontological resources are afforded protection under various federal, state, and local laws, ordinances, regulations, and standards. Regulations applicable to potential paleontological resources in the project area are summarized below.

2.1 State

California Environmental Quality Act

CEQA requires that public agencies and private interests identify the potential environmental consequences of their proposed projects on any object or site considered to be a historical resource of California (California Public Resources Code [PRC], section 21084.1, California Code of Regulations Title 14, section 15064.5). Appendix G of the *State CEQA Guidelines* (California Code of Regulations Title 14, Chapter 3) provides an Environmental Checklist of questions including a single question related to paleontological resources (Section V.c) as follows: “Would the project directly or indirectly destroy a unique paleontological resource or site…?”

CEQA does not define “a unique paleontological resource or site.” However, the Society of Vertebrate Paleontology (SVP) has defined a “significant paleontological resource” in the context of environmental review. The SVP (2010) defines Significant Paleontological Resources as:

> “Fossils and fossiliferous deposits, here defined as consisting of identifiable vertebrate fossils, large or small, uncommon invertebrate, plant, and trace fossils, and other data that provide taphonomic, taxonomic, phylogenetic, paleoecologic, stratigraphic, and/or biochronologic information. Paleontological resources are considered to be older than recorded human history and/or older than middle Holocene (i.e., older than about 5,000 radiocarbon years) [p. 11].”

The loss of paleontological resources that meet the criteria outlined above (i.e., are considered a significant paleontological resource) would be considered a significant impact under CEQA, and the CEQA lead agency is responsible for ensuring that paleontological resources are protected in compliance with CEQA and other applicable statutes.

The City of Monterey General Plan does not have specific requirements that address impacts to paleontological resources.

Public Resources Code Section 5097.5

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

> “No person shall knowingly and willfully excavate upon, or remove, destroy, injure or deface any historic or prehistoric ruins, burial grounds, archaeological or vertebrate paleontological site, including fossilized footprints, inscriptions made by human agency, or any other archaeological, paleontological or historical feature, situated on public lands, except with the express permission of the public agency having jurisdiction over such lands. Violation of this section is a misdemeanor.”

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

3 Resource Assessment Guidelines

Paleontological resources are limited, nonrenewable resources of scientific, cultural, and educational value and are afforded protection under CEQA. This assessment satisfies CEQA (13 PRC, 2100 et seq.) and PRC Section 5097.5 (Stat. 1965, c 1136, p. 2792) requirements, and follows guidelines and significance criteria specified by the SVP (2010).

3.1 Paleontological Sensitivity

Paleontological sensitivity refers to the potential for a geologic unit to produce scientifically significant fossils. Direct impacts to paleontological resources occur when earthwork activities, such as grading or trenching, cut into the geologic deposits (e.g., formations) within which fossils are buried and physically destroy the fossils. Because fossils are the remains of prehistoric animal and plant life, they are nonrenewable. Such impacts have the potential to be significant and may require mitigation under Appendix G of CEQA Guidelines

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

Paleontological sensitivity is determined by rock type, history of the geologic unit in producing significant fossils, and previously recorded fossil localities from that unit. Paleontological sensitivity is derived from the known fossil data collected from the entire geologic unit, not just from any one specific survey. The SVP system outlined in the SVP *Standard Procedures for the Assessment and Mitigation of Adverse Impacts to Paleontological Resources* (SVP 2010) is the generally accepted paleontological sensitivity classification scheme for projects on non-federal lands in California. Rincon has characterized the paleontological sensitivity of the study area according to the SVP (2010) procedures, as described below.

The SVP (2010) describes sedimentary rock units as having high, low, undetermined, or no potential for containing significant nonrenewable paleontological resources. This criterion is based on rock units within which vertebrate or significant invertebrate fossils have been determined by previous studies to be present or likely to be present. The SVP (2010) sensitivity categories are described below (given here verbatim):

I. **High Potential.** Rock units from which vertebrate or significant invertebrate, plant, or trace fossils have been recovered are considered to have a high potential for containing additional significant paleontological resources. Rocks units classified as having high potential for producing paleontological resources include, but are not limited to, sedimentary formations and some volcaniclastic formations (e. g., ashes or tephras), and some low-grade metamorphic rocks that contain significant paleontological resources anywhere within their geographical extent, and sedimentary rock units temporally or lithologically suitable for the preservation of fossils (e. g., middle Holocene and older, fine-grained fluvial sandstones, argillaceous and carbonate-rich paleosols, cross-bedded point bar sandstones, fine-grained marine sandstones, etc.). Paleontological potential consists of both: (a) the potential for yielding abundant or significant vertebrate fossils or for yielding a few significant fossils, large or small, vertebrate, invertebrate, plant, or trace fossils; and (b) the importance of recovered evidence for new and significant taxonomic, phylogenetic, paleoecologic, taphonomic, biochronologic, or stratigraphic data. Rock units which contain potentially datable organic remains older than late Holocene, including deposits associated with animal nests or middens, and rock units which may contain new vertebrate deposits, traces, or trackways are also classified as having high potential.

II. **Undetermined Potential.** Rock units for which little information is available concerning their paleontological content, geologic age, and depositional environment are considered to have undetermined potential. Further study is necessary to determine if these rock units have high or low potential to contain significant paleontological resources. A field survey by a qualified professional paleontologist (see "definitions" section in this document) to specifically determine the paleontological resource potential of these rock units is required before a paleontological resource impact mitigation program can be developed. In cases where no subsurface data are available, paleontological potential can sometimes be determined by strategically located excavations into subsurface stratigraphy.

III. **Low Potential.** Reports in the paleontological literature or field surveys by a qualified professional paleontologist may allow determination that some rock units have low potential for yielding significant fossils. Such rock units will be poorly represented by fossil specimens in institutional collections, or based on general scientific consensus only preserve fossils in rare circumstances and the presence of fossils is the exception not the rule (e. g., basalt flows or Recent colluvium). Rock units with low potential typically will not require impact mitigation measures to protect fossils.

IV. **No Potential.** Some rock units have no potential to contain significant paleontological resources, for instance high-grade metamorphic rocks (such as gneisses and schists) and plutonic igneous rocks (such as granites and diorites). Rock units with no potential require neither protection nor impact mitigation measures relative to paleontological resources.

4 Methods

Paleontological resources are not found in “soil” but are contained within the geologic deposits or bedrock that underlies the soil layer. Therefore, to determine whether a given project area has the potential to contain significant fossil resources at the subsurface, it is necessary to review relevant scientific literature to determine the geology and stratigraphy of the area. For this assessment, published geologic maps, fossil locality data, and literature were reviewed to identify the geologic units present at and below the surface within the project area boundaries, assess the paleontological sensitivity of the geologic units identified, and to determine the potential impacts to non-renewable paleontological resources from project development.

Rincon reviewed the online paleontological collections database of the University of California Museum of Paleontology (UCMP) to identify known fossil localities in Monterey County from the same (or similar) geologic formations that underlie the project area. Following the paleontological inventory, the paleontological sensitivity ratings of the geological units were assigned based on the results of the record search and literature review. Based on the paleontological sensitivity findings, the potential impact to nonrenewable paleontological resources from project development was determined in accordance with the professional standards of the SVP (2010).

Preparation of this paleontological resources assessment and inventory was directed by Rincon Paleontology Program Manager, Jessica DeBusk, who served as the Qualified Paleontologist per SVP (2010) guidelines. DeBusk has 15 years of professional experience as a consulting paleontologist and meets the SVP’s definition of a qualified professional paleontologist.

5 Description of Resources

5.1 Regional Geology

The project area is situated within the Coast Ranges, one of twelve major geomorphic provinces in California (California Geological Survey [CGS] 2002). A geomorphic province is a region of unique topography and geology that is readily distinguished from other regions based on its landforms and diastrophic history. The Coast Ranges extend about 600 miles from the Oregon border south to the Santa Ynez River in Santa Barbara County and are characterized by numerous north-south–trending peaks and valleys that range in elevation from approximately 500 feet above mean sea level (amsl) to 7,581 feet amsl at the highest summit.

The basement rocks of the Coast Ranges include the Jurassic to Cretaceous rocks of the Franciscan Assemblage, which consist of over 55,000 feet of greywacke, greenstone, bluestone, metasedimentary rocks, and ophiolite sequences. During the Mesozoic and into the Cenozoic, the area of the present-day Coast Ranges was covered by marine waters, resulting in the thick accumulation of marine and nonmarine shale, sandstone, and conglomerate on the Franciscan basement rock (Bartow and Nilsen 1990). Later, these deposits were unconformably overlain by Paleocene to Pliocene continental shelf marine sedimentary rocks (Barron 1989; Graymer et al. 1996). During the Late Miocene to the Late Pliocene, a mountain-building episode occurred in the vicinity of the present-day Coast Ranges, resulting in their uplift above sea level. Subsequently, from the Late Pliocene to Pleistocene, extensive deposits of terrestrial material, including alluvial fans and fluvial sediments, were deposited in the Coast Ranges (Norris and Webb 1990).

Ongoing tectonic deformation and sea level change related to Pleistocene climate fluctuations continued through the Quaternary Period, resulting in the formation of marine terrace platforms along the Coast Ranges, including Monterey Bay (Jefferson et al. 1992). The project area is situated within a tectonically active region on the southern edge of Monterey Bay, east of the Monterey Peninsula and north of the Sierra de Salinas mountain range. Nearby faults include the Monterey Bay-Tularcitos fault zone, San Andreas fault zone approximately 20 miles northwest, and Sur-Nacimiento fault zone approximately 5 miles southwest (Clark et al. 1974).

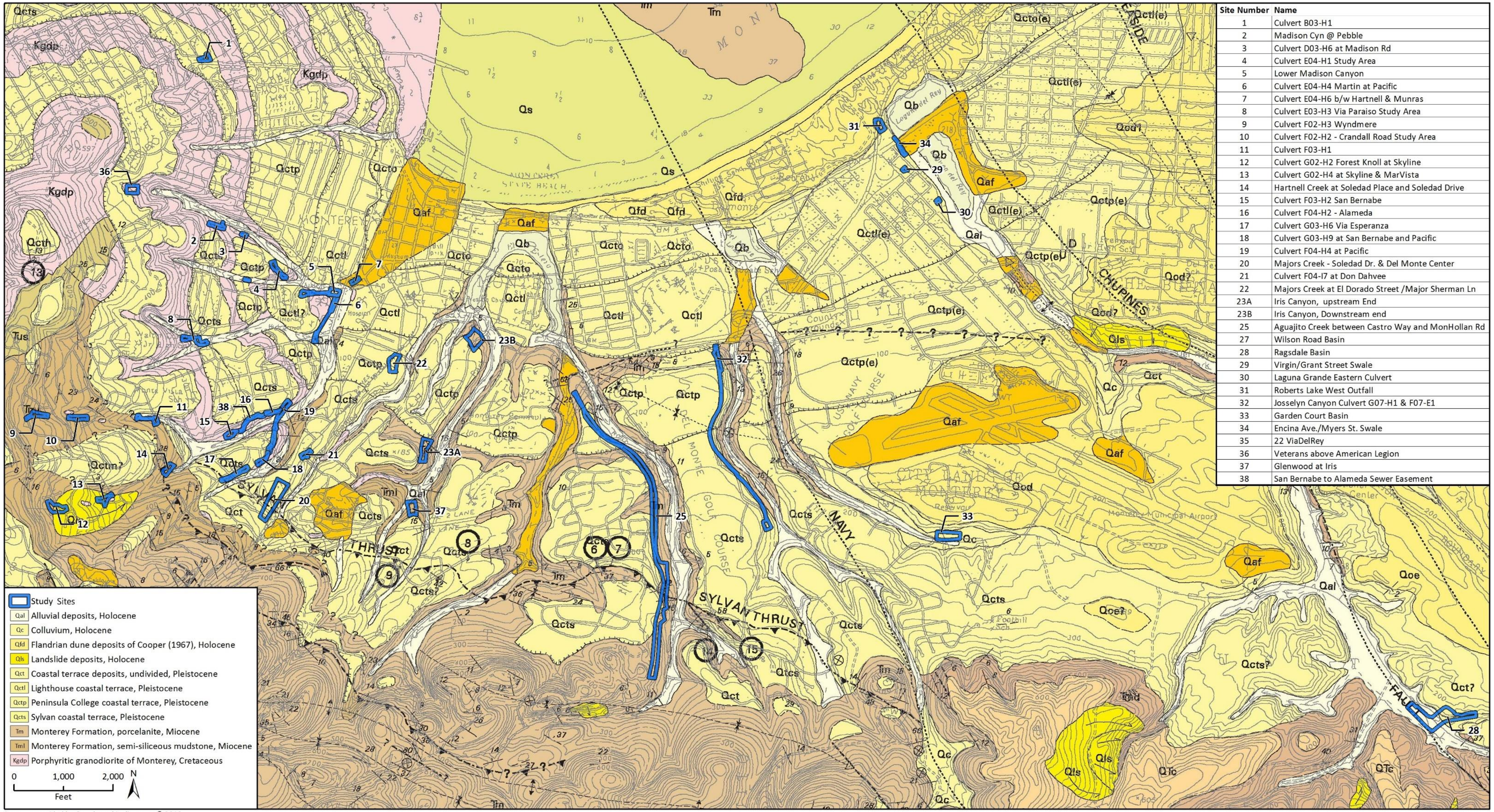
Geology and Paleontology of the Project Area

The project area includes five (5) geologic units mapped at the surface by Clark et al. (1997): Cretaceous granodiorite (Kdgp); the Miocene Monterey Formation (Tm, Tml); Pleistocene marine terrace deposits (Qct, Qctl, Qctl[e], Qctp, Qcts, and Qctm); Holocene surficial deposits (Qal, Qb, Qc, Qfd); and Holocene landslide deposits (Qls). In addition, artificial fill is mapped at the surface of the project area as Qaf. Refer to Figure 3 for the geologic units in the project area.

Monterey Formation

The Miocene Monterey Formation is mapped in the southern project area and is well exposed along coastal California from San Francisco south to Los Angeles. The Monterey Formation is named after exposures at its type section in coastal Monterey County and, although its lithology is variable, the unit is typically recognized by its pale buff to white fine-grained deposits, dark brown to black

Figure 3 Geologic Units in the Project Area



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16	Culvert F04-H2 - Alameda
17	Culvert G03-H6 Via Esperanza
18	Culvert G03-H9 at San Bernabe and Pacific
19	Culvert F04-H4 at Pacific
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37	Glenwood at Iris
38	San Bernabe to Alameda Sewer Easement

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Additional data provided by Clark, J.C., Dupre, W.R., and Rosenberg, L.I., 1997, U.S. Geological Survey, Open-File Report OF-97-30, scale 1:24,000.

PaleoFig 3 Geologic Units

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siliceous laminations, and common fossils (Berndmeyer et al. 2012). The deposit is up to 5,000 feet thick and is dominated by finely laminated fine-grained diatomaceous and siliceous mudrocks; limestone and dolomite; calcareous and phosphatic mudrocks; chert and porcelanite; and subordinate tuff, sandstone, and conglomerate (Bramlette 1946; MacKinnon 1989). The Monterey Formation was deposited in deep submarine basins during a time of subsidence, marine transgression, and scant terrestrial sediment delivery; as a result, the unit contains abundant biologic material in relation to limited terrigenous material (Behl 1999; Berndmeyer et al. 2012; Pisciotto and Garrison 1981).

The stratigraphy of the Monterey Formation is regionally variable, with many localized formal and informally named members. As a result, correlation of members is typically based on microfossils rather than lithology. At the type section, the basal member of the Monterey Formation is composed of sandstone, sandy shale, and calcareous shale unconformably overlying granodiorite bedrock. The middle member is composed of brittle, light-brown to white porcellanite and thinly-bedded, yellow-brown siliceous shale, siltstone, and chert. The upper member is primarily composed of diatomite and diatomaceous shale (Bramlette 1946). In the project area, porcellanite and siliceous mudstone of the middle member are mapped by Clark et al. (1997). In the vicinity of the project area, the Monterey Formation is unconformably underlain by unnamed terrestrial sandstone deposits and volcanic rock and is unconformably overlain by Pleistocene sedimentary deposits.

Numerous vertebrate localities have been documented from the Monterey Formation, which yielded specimens of large sea turtles, whale, dolphins, sea lions, shark bones and teeth, sea cows, desmostylians, fish, birds, and many other fauna (Bramlette 1946; Harden 1998; Koch et al. 2004). In many cases, fossilized remains in the Monterey Formation, such as Cetacea (whale and dolphin), Chondrichthyes (cartilaginous fish), and Osteichthyes (bony fish), are remarkably well preserved and have previously yielded fully articulated specimens (Koch et al. 2004). Typically, the specimens from the Monterey Formation have been recovered from the diatomite and shale deposits, but the limestone and sandstone beds have yielded abundant remains, as well. In addition, the deposit has yielded numerous species of scientifically significant invertebrates, foraminifera, and plants, such as kelps and other large soft-bodied seaweeds (UCMP online database 2018).

Pleistocene Marine Terrace Deposits

Pleistocene marine terrace deposits (Qct; undivided) are extensively mapped throughout the project area (Clark et al. 1997). These terrace deposits consist of marine sediments and terrestrial alluvium that accumulated on a series of wave-cut platforms formed during late Pleistocene (Clark 1981). Six marine terrace platforms are identified by Dupre (1990), from youngest to oldest: Oceanview, Lighthouse (Qctl, Qctl[e]), Peninsula College (Qctp), Sylvan (Qcts), Monte Vista (Qctm), and Huckleberry. The marine terrace deposits surrounding Monterey Bay are 20 feet thick on average and are composed of well sorted nearshore marine gravel and sand overlain by fine-grained, well-sorted, dune and beach sand (Brabb et al. 1997). Deposits locally include fluvial and colluvial silt, sand, and gravel. Cretaceous granodiorite (Kdgp) is exposed along the scarps between each marine terrace platform on the Monterey Peninsula (Clark et al. 1997). Plutonic igneous rock does not have the potential for fossilized remains due to the extreme heat during solidification of molten rock.

Pleistocene terrace deposits have a record of vertebrate fossil preservation in coastal California and have yielded scientifically significant specimens from multiple localities. In southern and central coastal California, Pleistocene marine terrace deposits have yielded vertebrate fossil specimens of camel, horse, ground sloth, whale, and dolphin, shark, and fish (Jefferson et al. 1992; Woodring et al. 1946). Across Monterey Bay, near the city of Santa Cruz, sediments similar to the Pleistocene terrace deposits in the project area have preserved invertebrate, plant, and microfossil specimens from multiple localities (Clark 1981; Weber and Allwardt 2001); however, vertebrate localities have not been published or recorded in museum collections.

Quaternary Surficial Deposits

Quaternary surficial deposits (Qal, Qb Qc, Qfd) of Holocene age are intermittently exposed along drainages between terrace platforms in the project area. The Quaternary surficial deposits are composed of unconsolidated, poorly sorted clay, silt, sand, and gravel deposited in stream channels, flood basins, marshes, slopes, and coastal dunes (Clark et al. 1997). Large Holocene landslides (Qls) are mapped within the project area and are especially common within the Monterey Formation. No previously recorded fossils have been documented in Quaternary surficial deposits in the vicinity of the project area. Holocene-age alluvial deposits, particularly those younger than 5,000 years old, are generally too young to contain fossilized material, but they may overlie sensitive older deposits (i.e., the Miocene Monterey Formation and Pleistocene marine terrace deposits) at an unknown depth.

5.2 Locality Record Search Results

A review of the museum records maintained in the UCMP online collections database (2018) was conducted to determine if vertebrate localities have been previously recorded in project area or nearby.

The database contains at least one record for a vertebrate locality in the Monterey Formation in the immediate vicinity of the project area on Huckleberry Hill, near study sites nine and ten. Locality V68140 yielded an upper mandible from the extinct ray-finned fish, *Oligodiodon vetus*. The UCMP online database contains at least seven additional vertebrate localities from the Monterey Formation (or Monterey Group) in the area surrounding Monterey Bay, mostly from the Carmel Valley. UCMP localities V3111, V5525, V6226, -1299, V6279, V79042 yielded several significant fossils from sandy shale and diatomaceous shale Monterey Formation deposits, including specimens of pinniped (seal or walrus), desmostylian (marine mammal), *Carcharodon* sp. (shark), *Paralabrax* sp. (rock bass), and other unidentified mammals.

The UCMP online database (2018) contains no vertebrate locality records for the Pleistocene marine terrace deposits in the project area or vicinity; however, at least four vertebrate localities have been previously recorded in Pleistocene deposits throughout northern Monterey County, near Soledad, Moss Landing, and Salinas. These localities (V4002, V4856, V4918, and V5576) yielded fossil specimens of *Equus* sp. (horse), *Glossotherium* sp. (ground sloth), *Camelops* sp. (camel), and *Bison latifrons* (bison). Collection records maintained in the UCMP online database provide only an approximate geographic location for the fossil locality records. Depth of recovery unreported.

6 Evaluation, Impacts, and Recommendations

6.1 Paleontological Sensitivity Evaluation

Based on the literature review and records search results, the paleontological sensitivity of the geologic units underlying the project area were determined in accordance with criteria set forth by the SVP (2010). The Cretaceous granodiorite has no paleontological potential due to the extreme heat during solidification of magma deep below the surface of the earth. The Miocene Monterey Formation (Tm, Tml) and Pleistocene marine terrace deposits (Qct, Qctl, Qctl[e], Qctp, Qcts, Qctm) have a high potential to contain buried intact paleontological resources because the unit has proven to yield significant vertebrate fossils near the project area and elsewhere in Monterey County. The Holocene alluvium (Qal), colluvium (Qc), dune (Qfd), and landslide deposits (Qls) mapped in the project area are determined to have a low paleontological resource potential because they are likely too young to contain fossilized material or have been disturbed and lack original geologic context. The paleontological sensitivity of the geologic units underlying each study site in the project area is depicted in Appendix A.

6.2 Impacts

Paleontological resources are nonrenewable and are vulnerable to impacts from development related activities. Fossils provide important information for our understanding of past environments, the history of life, past species diversity, how species respond to climate change, and many other lines of scientific inquiry. Impacts to fossils and fossil localities, and loss of fossils from looting or other destructive activity at fossil sites results in the direct loss of scientific data and directly impacts the ability to conduct scientific research on evolutionary patterns and geological processes. Construction and grading activities associated with any development that will impact previously undisturbed, paleontologically sensitive geologic deposits have the potential for the destruction of significant paleontological resources.

A portion of the geologic deposits underlying the project area have a high potential to contain paleontological resources. The geologic units with high paleontological sensitivity (i.e., the Miocene Monterey Formation and Pleistocene marine terrace deposits) underlie study sites 1,4, 5, 9-14, 16-22, 23A, 23B, 25, 28-32, 34, 37, and 38 (see Appendix A). As such, ground disturbing activities in previously undisturbed portions of the project area with high paleontological sensitivity may result in impacts to significant fossils under Appendix G of CEQA. Impacts would be significant if construction activities result in the destruction, damage, or loss of scientifically important paleontological resources and associated stratigraphic and paleontological data. The activities may include grading, excavation, drilling, or any other activity that disturbs the surface or subsurface geologic formations with a high paleontological sensitivity.

6.3 Recommendations

The following recommended mitigation would address the potentially significant impacts relating to the potential discovery of paleontological resources during project implementation. These measures would apply to all phases of project construction and would ensure that any significant fossils present on-site are preserved. Implementation of the following recommended mitigation measures would reduce potential project impacts to paleontological resources to a less-than-significant level pursuant to the requirements of CEQA.

Paleontological Monitoring. Should any ground disturbance extend beyond the removal of recently accumulated sediments and into native sediments determined to have a high paleontological resource potential for the maintenance activities included in the SDMP, those ground-disturbing activities shall be observed by a paleontological monitor under the direction of a qualified paleontologist meeting the qualifications set forth by the Society of Vertebrate Paleontology (2010). The same monitor may perform monitoring for mitigation measures GEO-1 and CUL-1, if qualifications suffice. Paleontological monitoring may be reduced or halted at the discretion of the qualified paleontologist, if after 50 percent of excavations are complete and no fossils of any kind have been discovered. If monitoring is reduced to spot-checking, spot-checking shall occur when ground disturbance moves to a new location or impacts a different geologic unit that is determined to be sensitive for paleontological resources.

Unanticipated Discovery of Paleontological Resources. If paleontological resources (a fossilized bone or other preserved plant or animal remains recognized by work crews or monitors) are encountered during ground-disturbing activities, work in the immediate area shall halt until the find is assessed for scientific significance and collected. Staff performing maintenance activities shall contact the City of Monterey. If a qualified paleontologist meeting the qualifications set forth by the Society of Vertebrate Paleontology (SVP 2010) was not already contracted, one shall be contracted in the event that a paleontological resource is encountered. The qualified paleontologist will have authority to determine when work can be resumed following the discovery of a paleontological resource. Once salvaged, significant fossils shall be prepared to a curation-ready condition and curated in a scientific institution with a permanent paleontological collection. A copy of a final report describing the results of the paleontological mitigation monitoring efforts shall also be submitted to the curation facility.

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Appendix A

Paleontological Sensitivity in the Project Area

Figure 1 Paleontological Sensitivity in the Project Area, Study Site 1

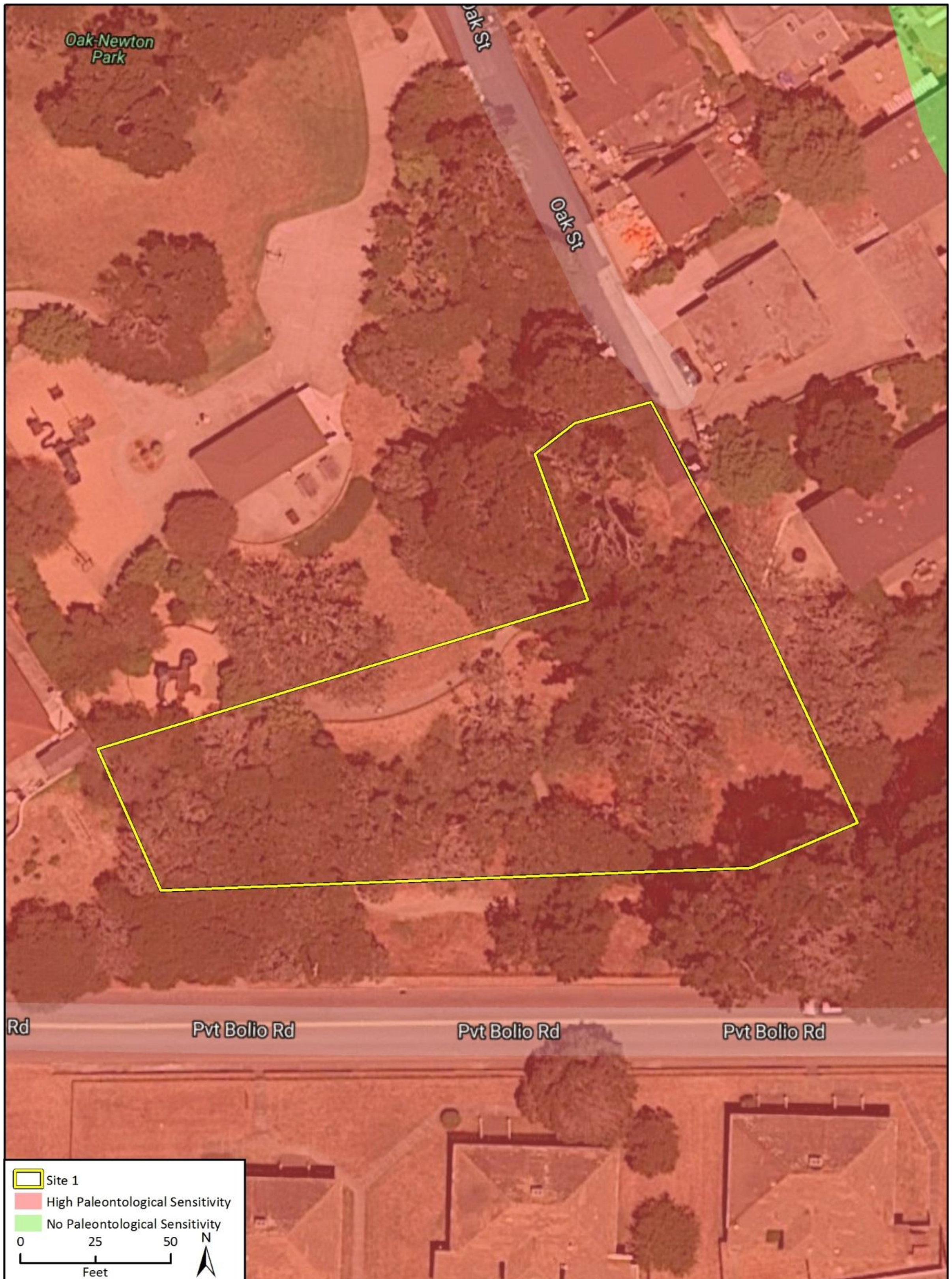

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Figure 2 Paleontological Sensitivity in the Project Area, Study Site 2

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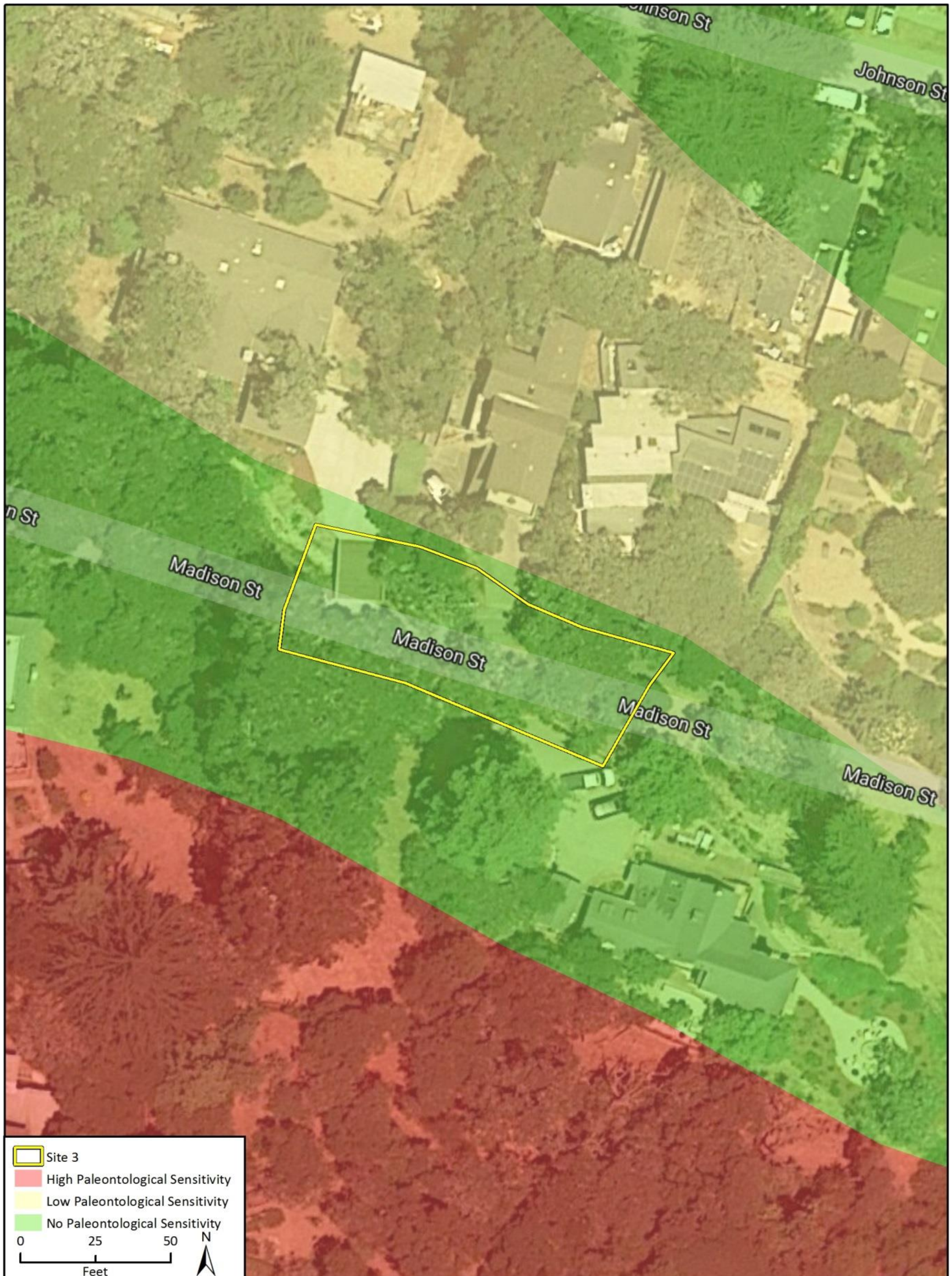
Figure 3 Paleontological Sensitivity in the Project Area, Study Site 3



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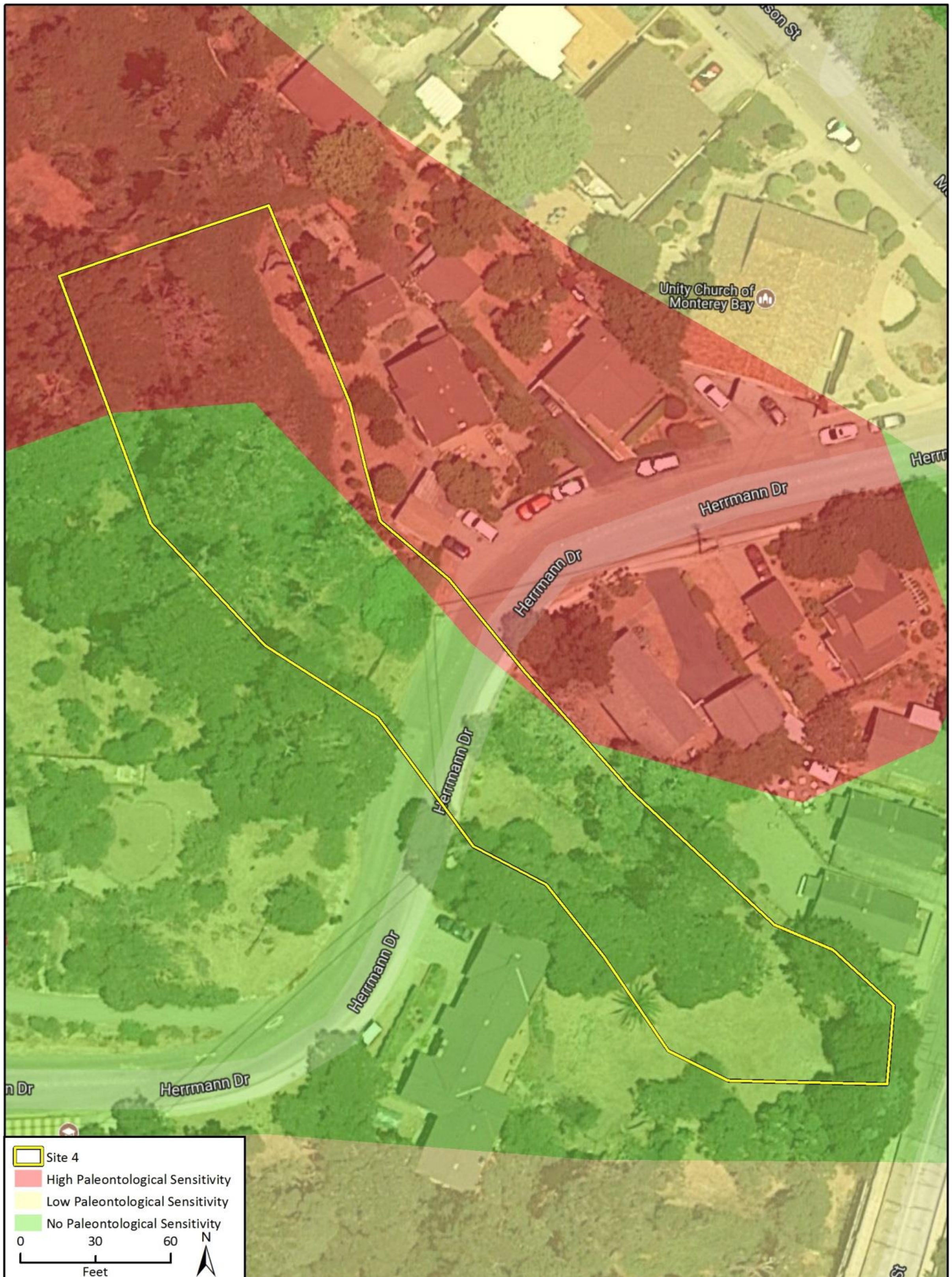
Additional data provided by Clark, J.C., Dupre, W.R., and Rosenberg, L.I., 1997, U.S. Geological Survey, Open-File Report OF-97-30, scale 1:24,000.

PaleoApndx Paleo Sensitivity

Figure 4 Paleontological Sensitivity in the Project Area, Study Site 4



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Additional data provided by Clark, J.C., Dupre, W.R., and Rosenberg, L.I., 1997, U.S. Geological Survey, Open-File Report OF-97-30, scale 1:24,000.

Figure 5 Paleontological Sensitivity in the Project Area, Study Site 5

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Figure 6 Paleontological Sensitivity in the Project Area, Study Site 6 (A)

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Figure 7 Paleontological Sensitivity in the Project Area, Study Site 6 (B)

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Figure 8 Paleontological Sensitivity in the Project Area, Study Site 7

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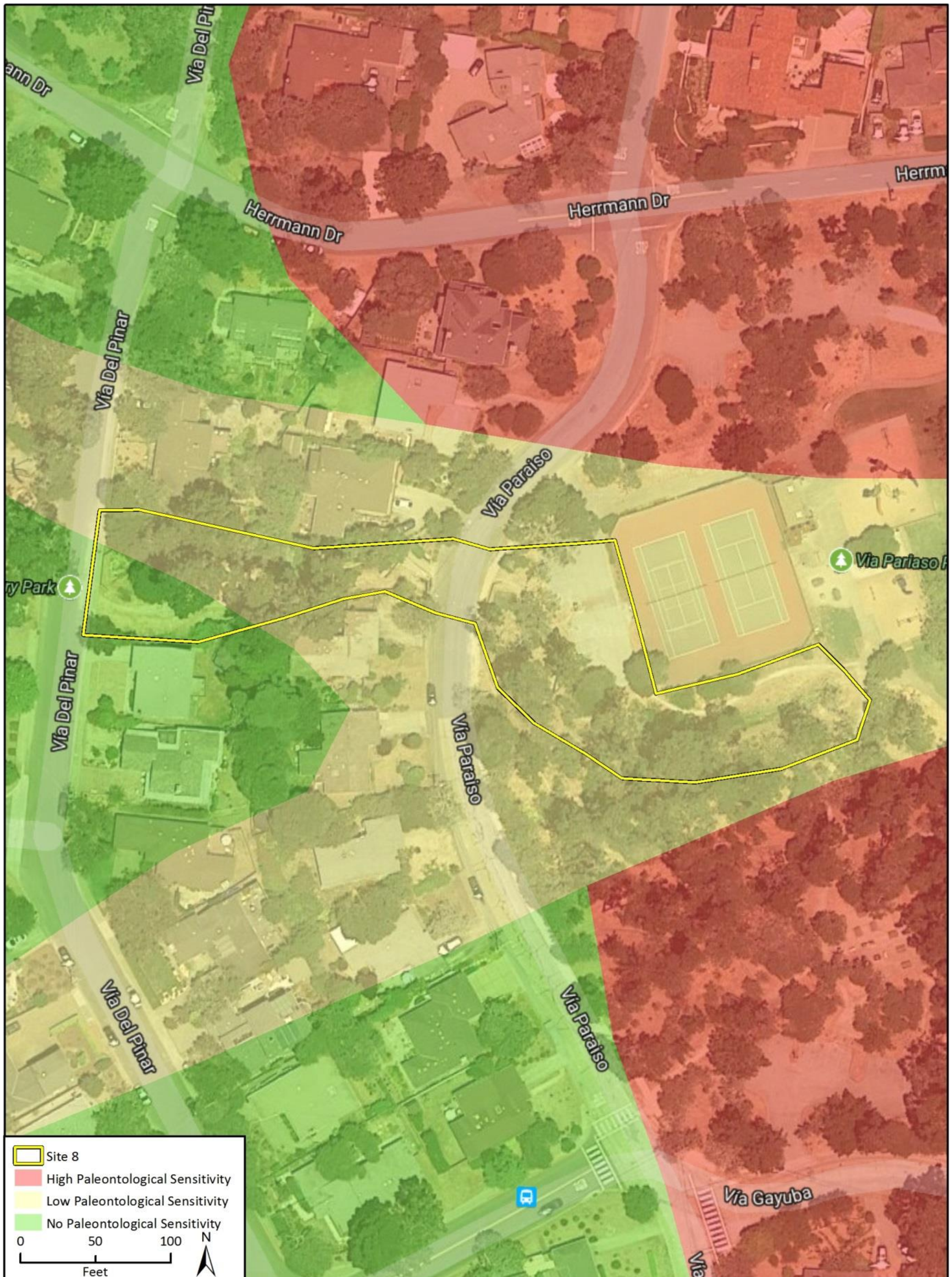
Figure 9 Paleontological Sensitivity in the Project Area, Study Site 8



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Additional data provided by Clark, J.C., Dupre, W.R., and Rosenberg, L.I., 1997, U.S. Geological Survey, Open-File Report OF-97-30, scale 1:24,000.

Figure 10 Paleontological Sensitivity in the Project Area, Study Site 9

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Figure 11 Paleontological Sensitivity in the Project Area, Study Site 10

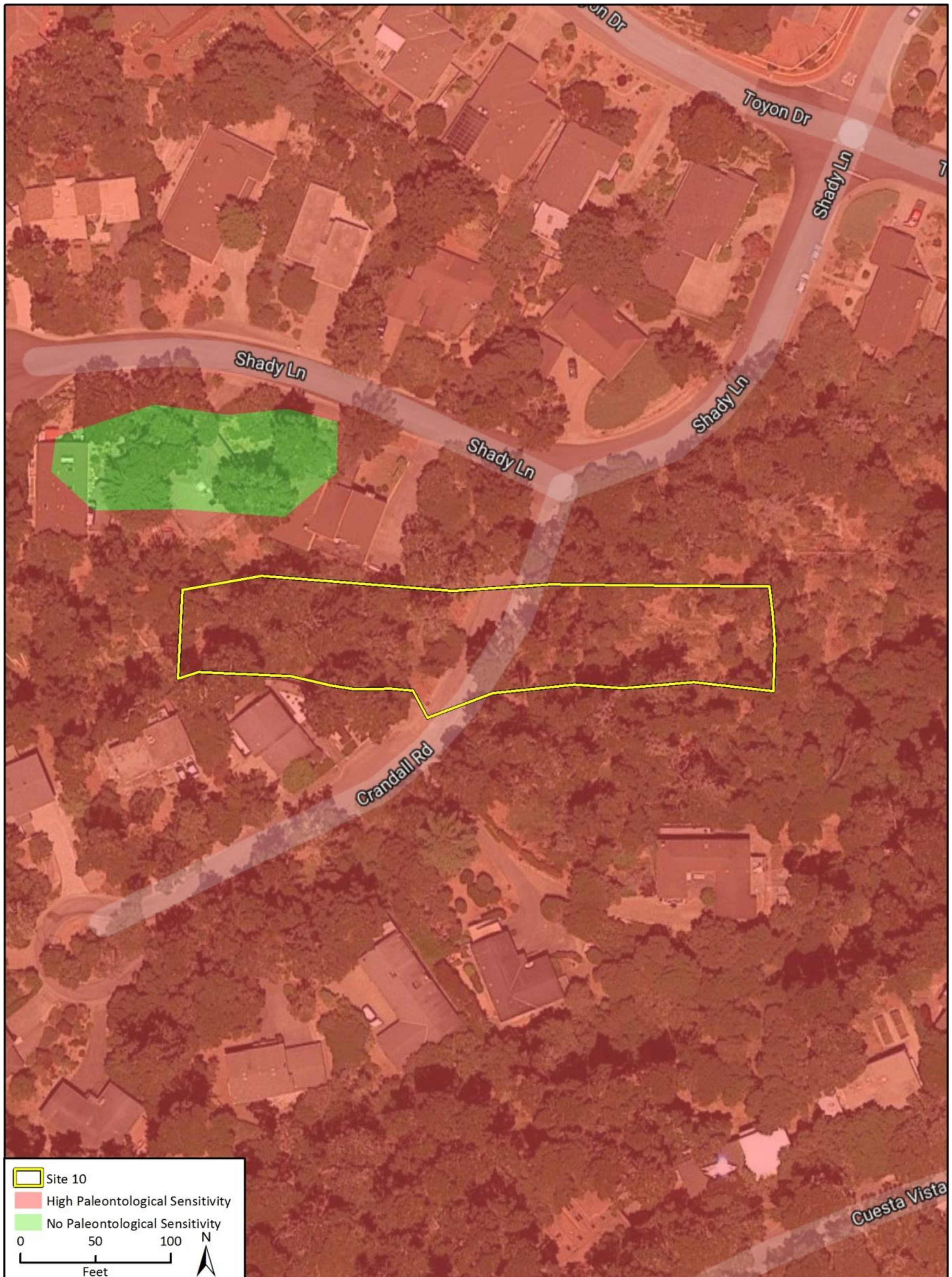

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Figure 12 Paleontological Sensitivity in the Project Area, Study Site 11

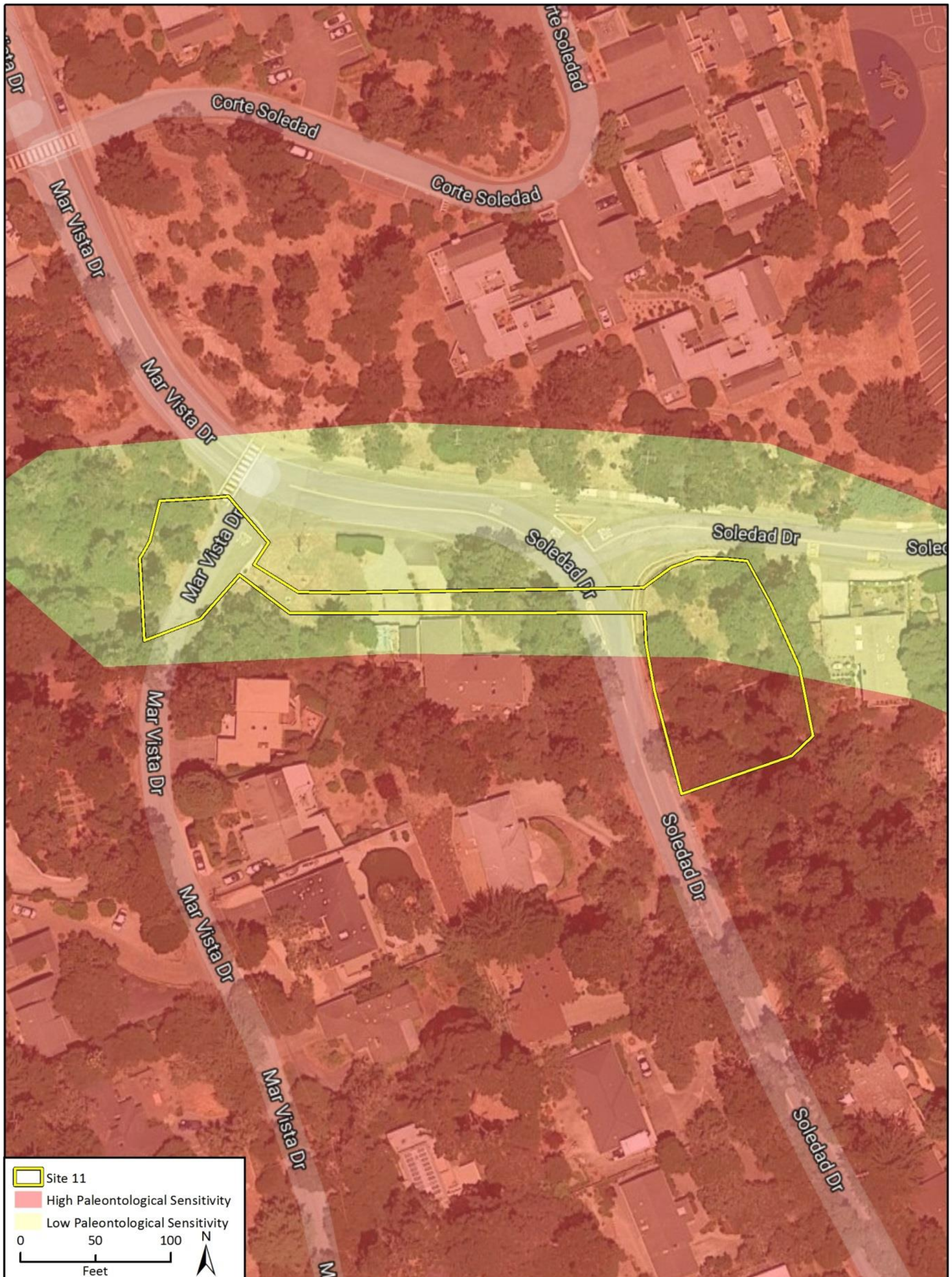

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Figure 13 Paleontological Sensitivity in the Project Area, Study Site 12

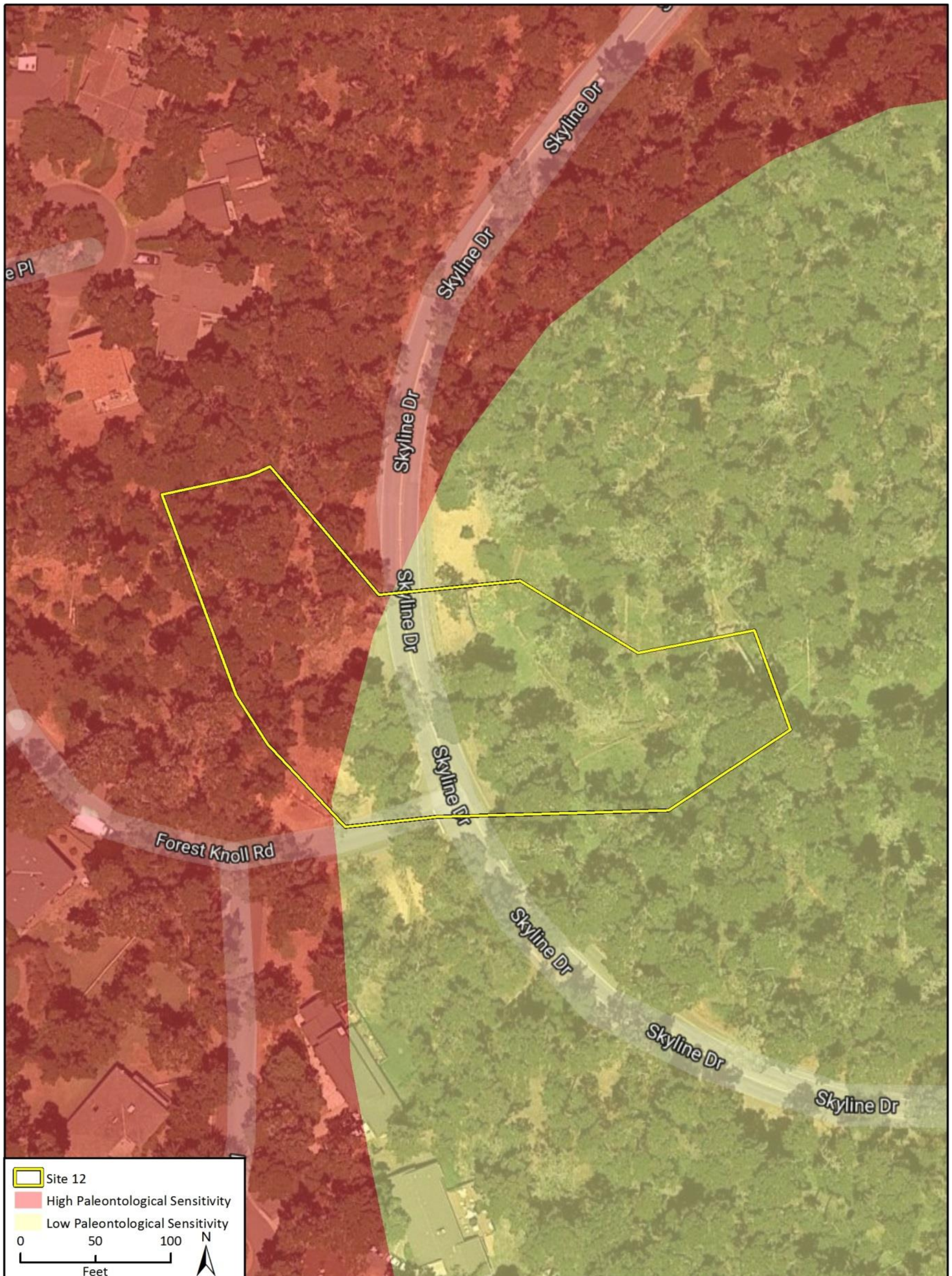

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Figure 14 Paleontological Sensitivity in the Project Area, Study Site 13

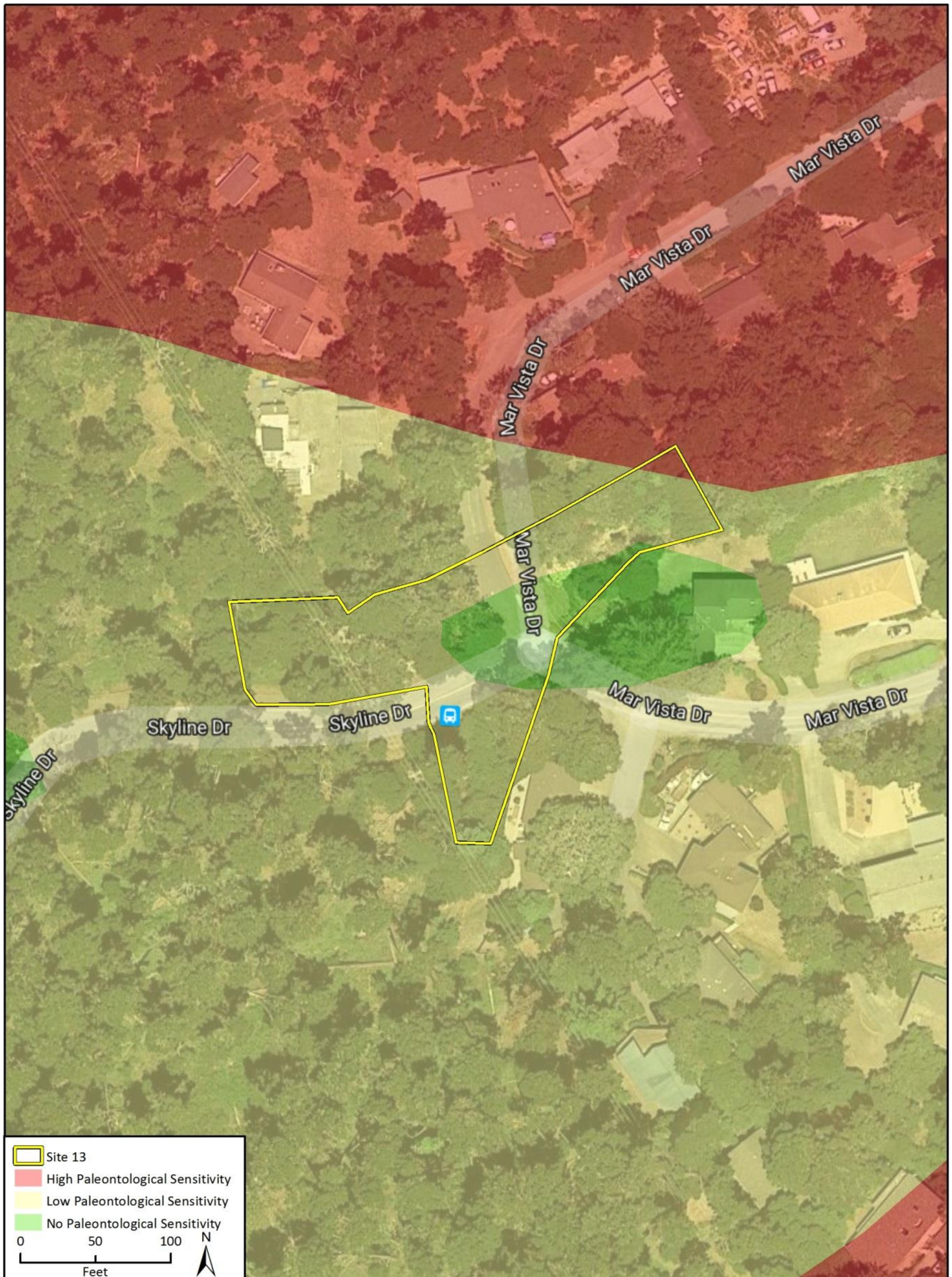

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Figure 15 Paleontological Sensitivity in the Project Area, Study Site 14

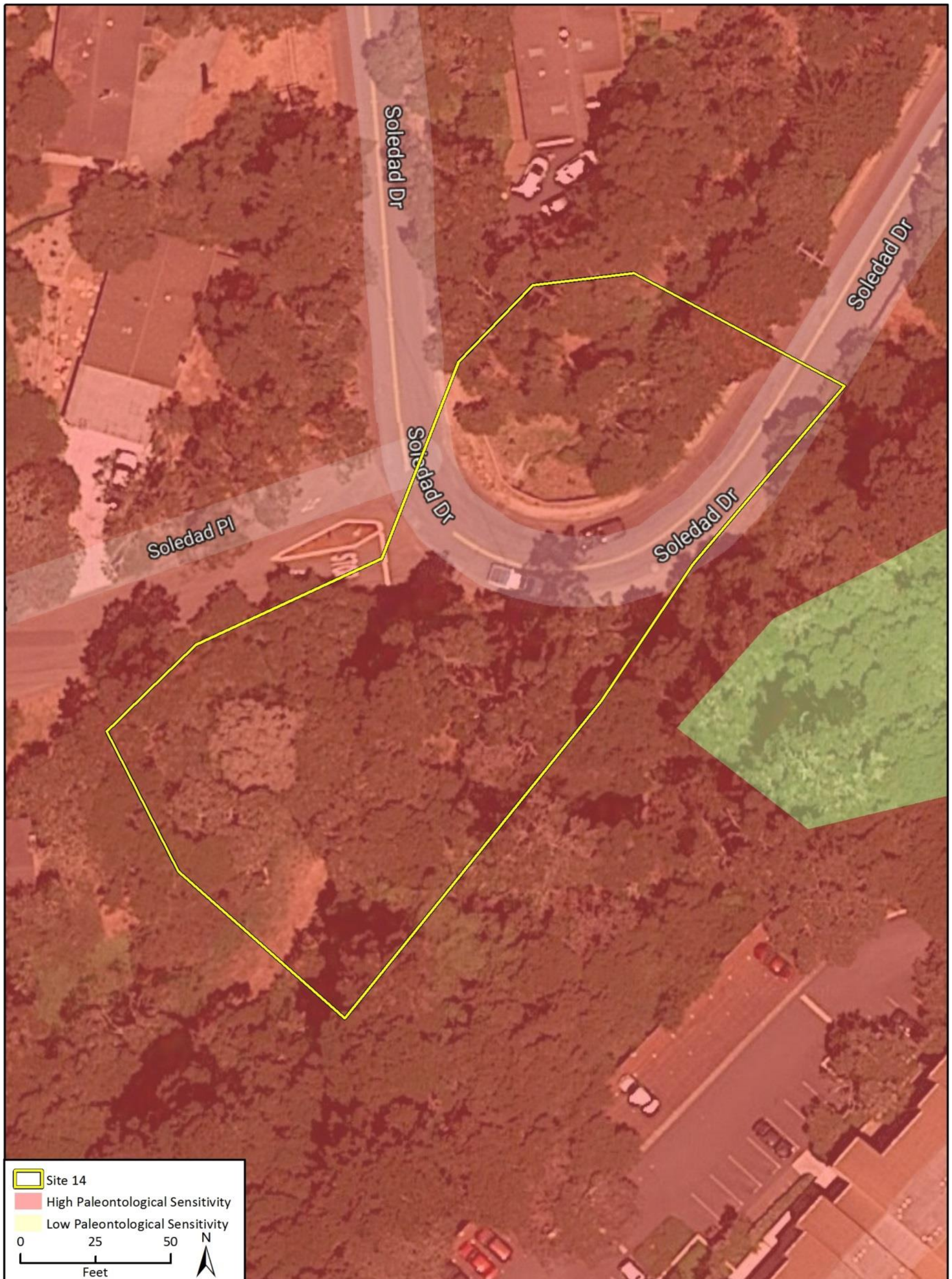

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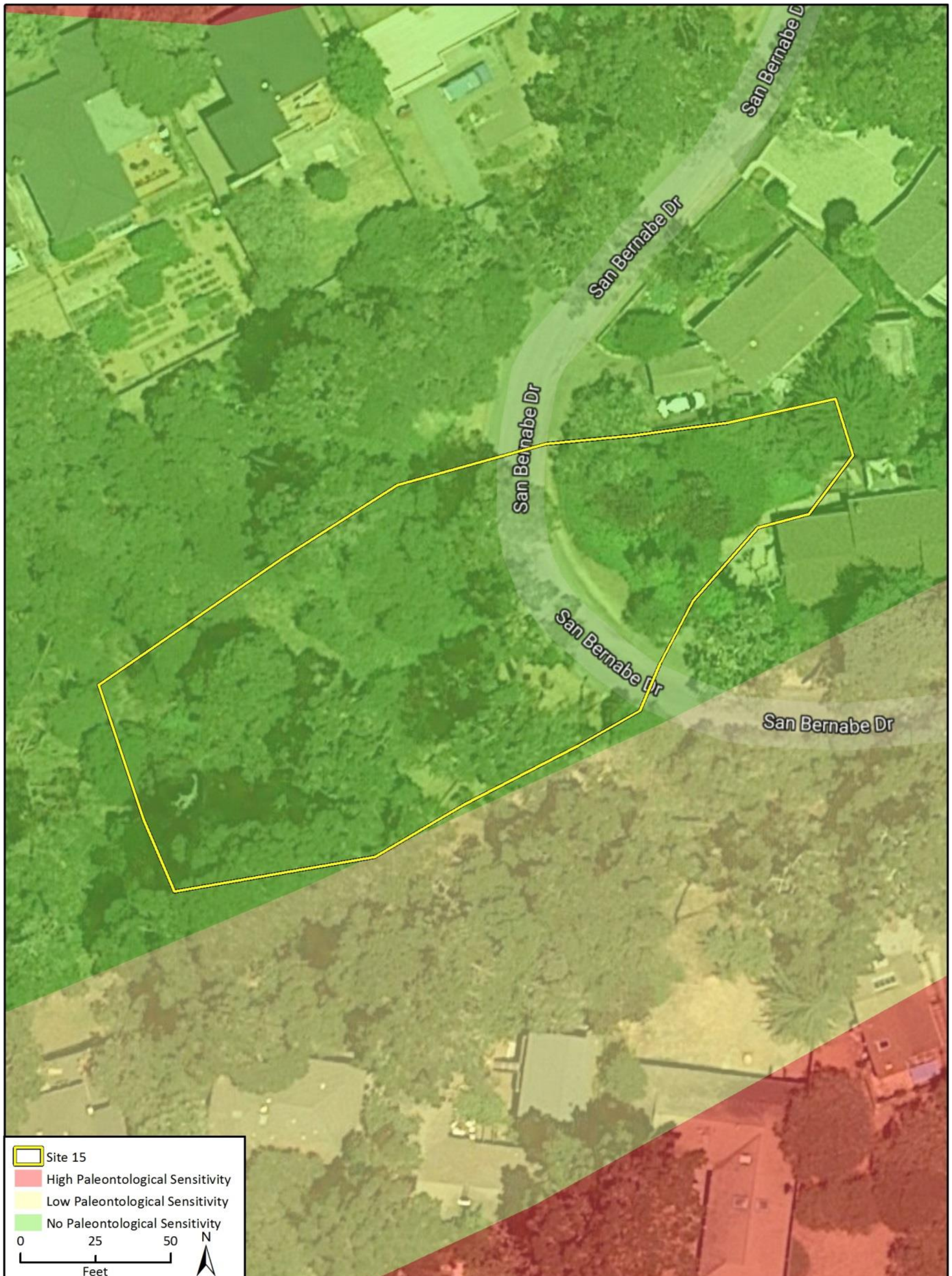
Figure 16 Paleontological Sensitivity in the Project Area, Study Site 15



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Additional data provided by Clark, J.C., Dupre, W.R., and Rosenberg, L.I., 1997, U.S. Geological Survey, Open-File Report OF-97-30, scale 1:24,000.

Figure 17 Paleontological Sensitivity in the Project Area, Study Site 16

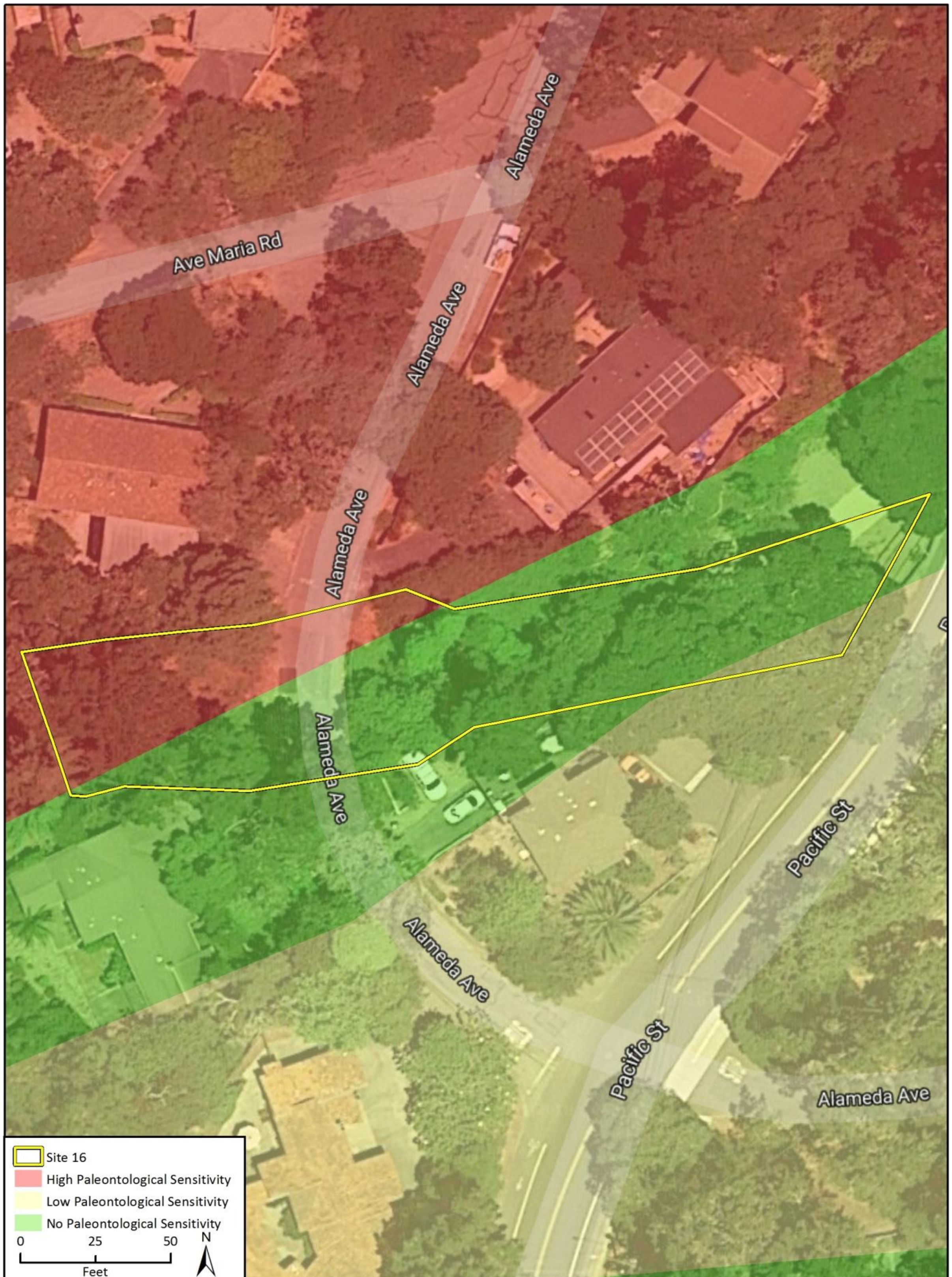

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Figure 18 Paleontological Sensitivity in the Project Area, Study Site 17

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Figure 19 Paleontological Sensitivity in the Project Area, Study Site 18

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Figure 20 Paleontological Sensitivity in the Project Area, Study Site 19 (A)

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Figure 21 Paleontological Sensitivity in the Project Area, Study Site 19 (B)

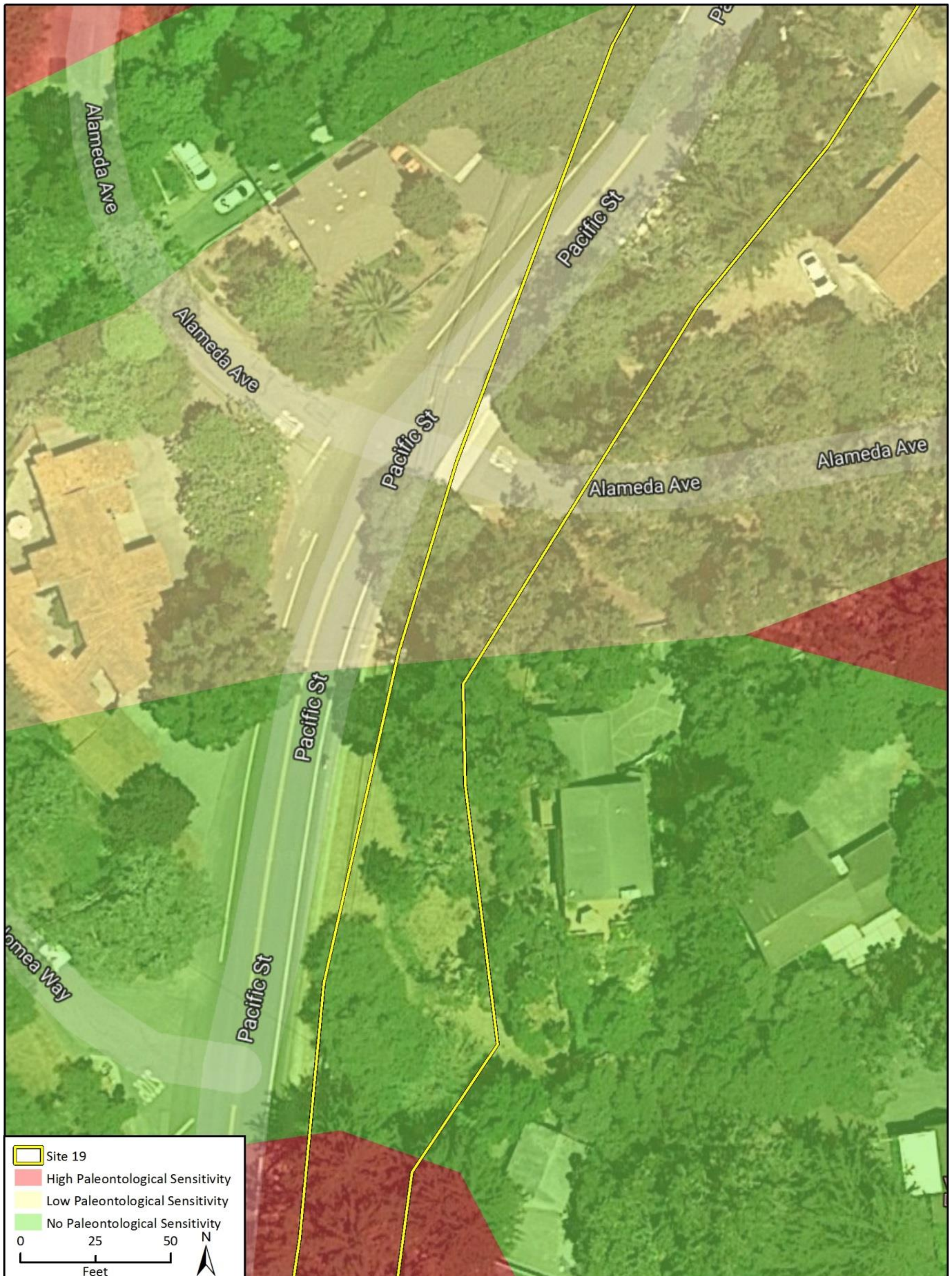

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Figure 22 Paleontological Sensitivity in the Project Area, Study Site 19 (C)

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Figure 23 Paleontological Sensitivity in the Project Area, Study Site 20

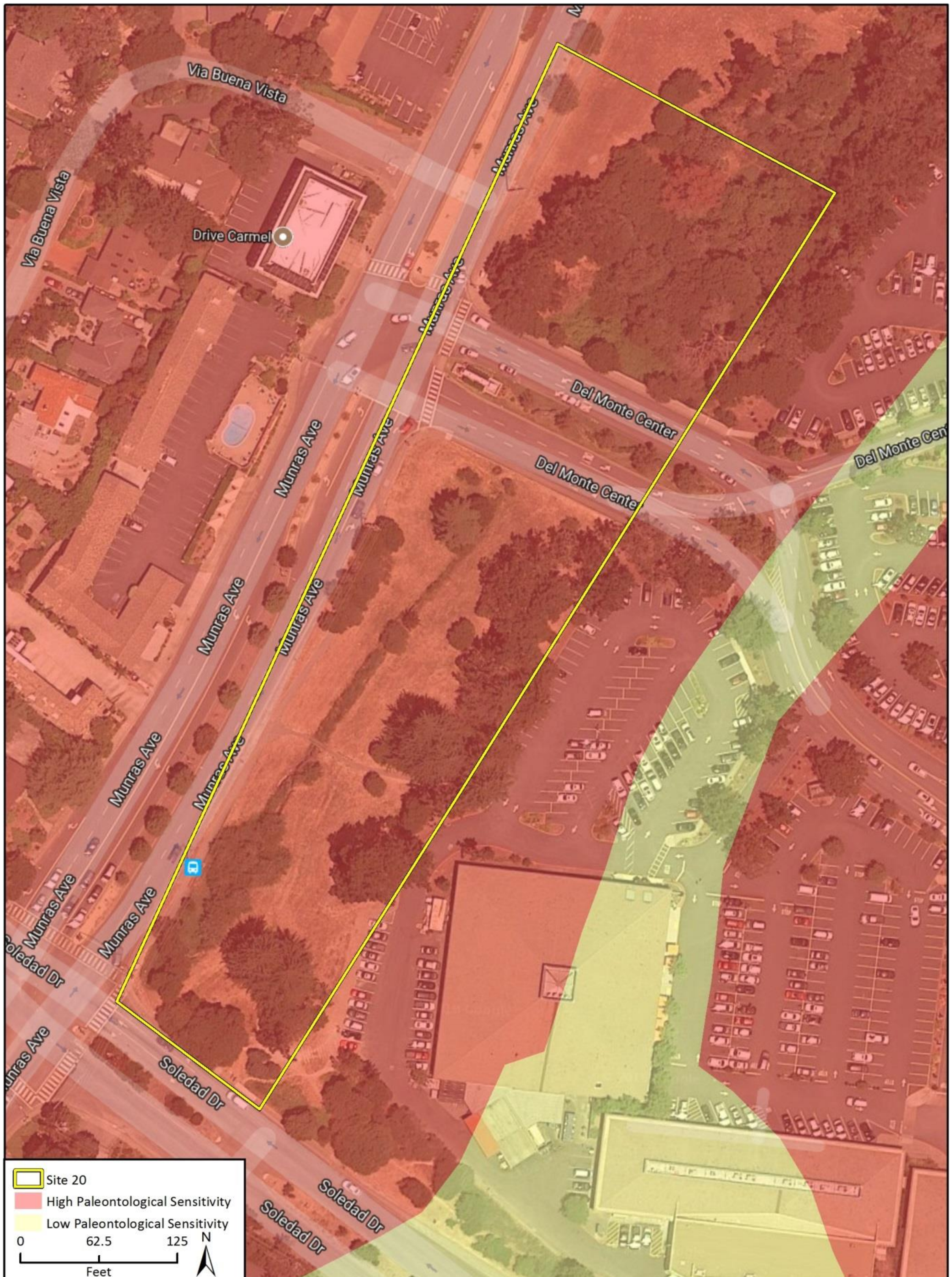

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Figure 24 Paleontological Sensitivity in the Project Area, Study Site 21

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Figure 25 Paleontological Sensitivity in the Project Area, Study Site 22

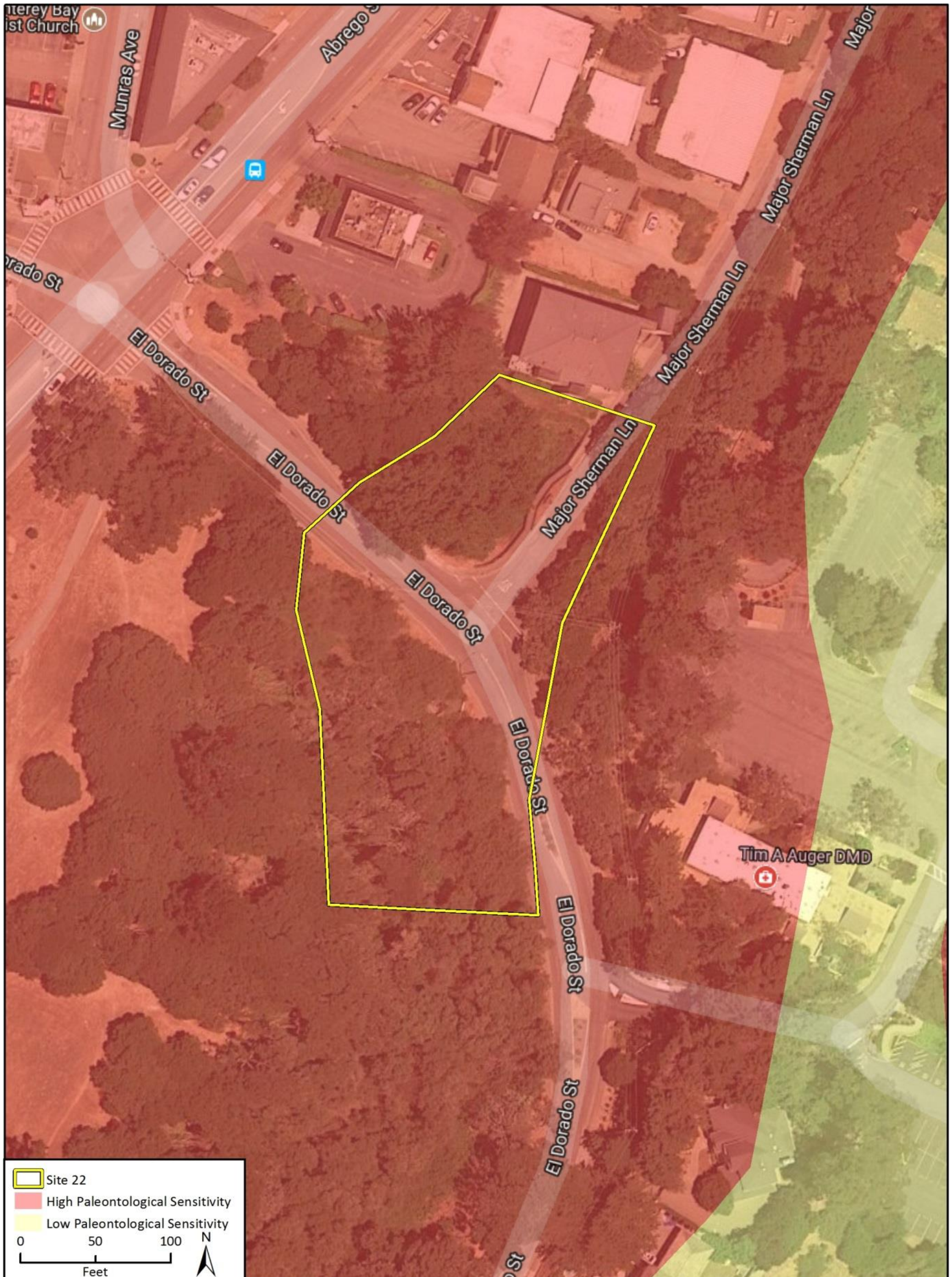

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Figure 26 Paleontological Sensitivity in the Project Area, Study Site 23A

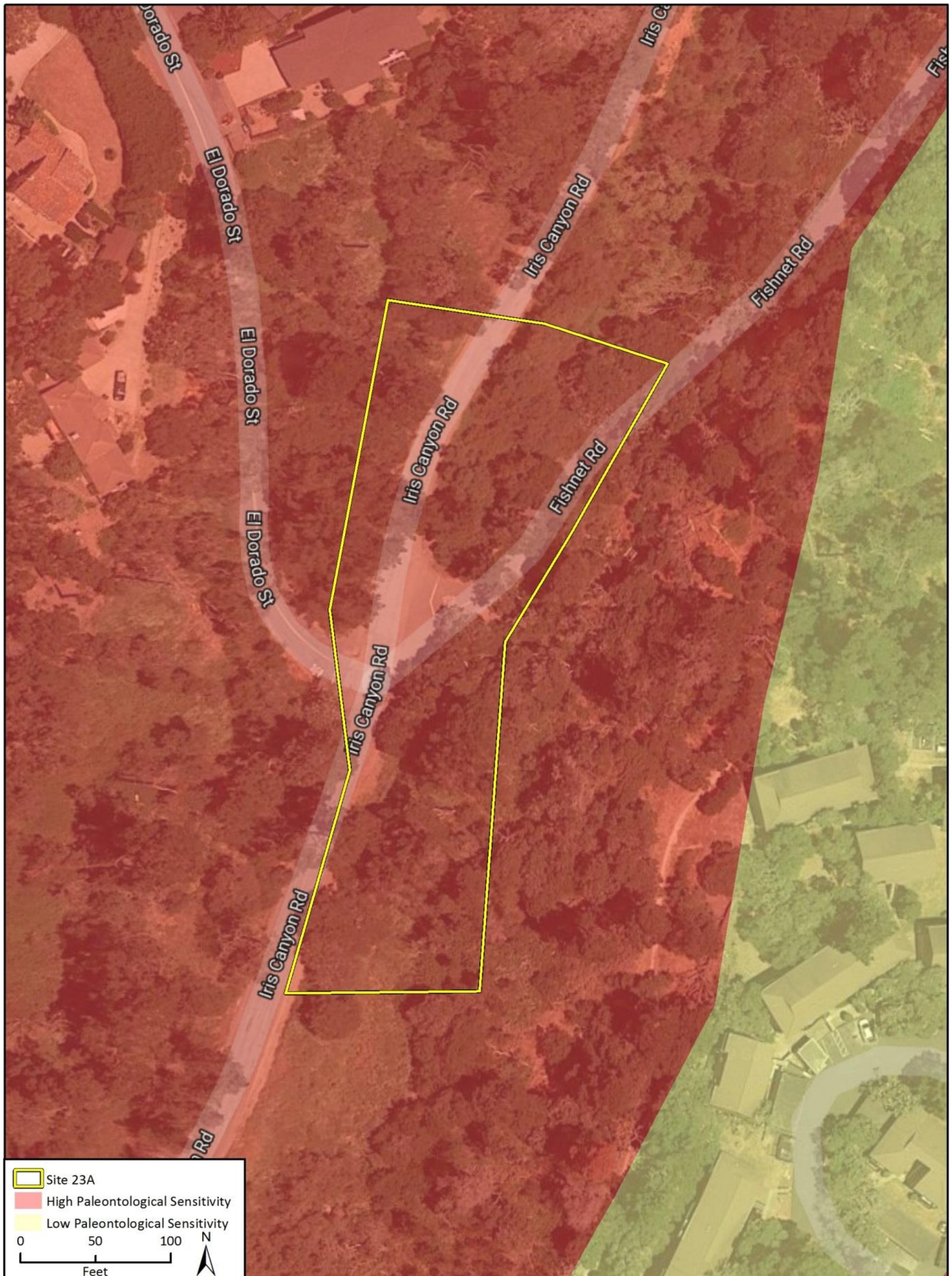

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Figure 27 Paleontological Sensitivity in the Project Area, Study Site 23B

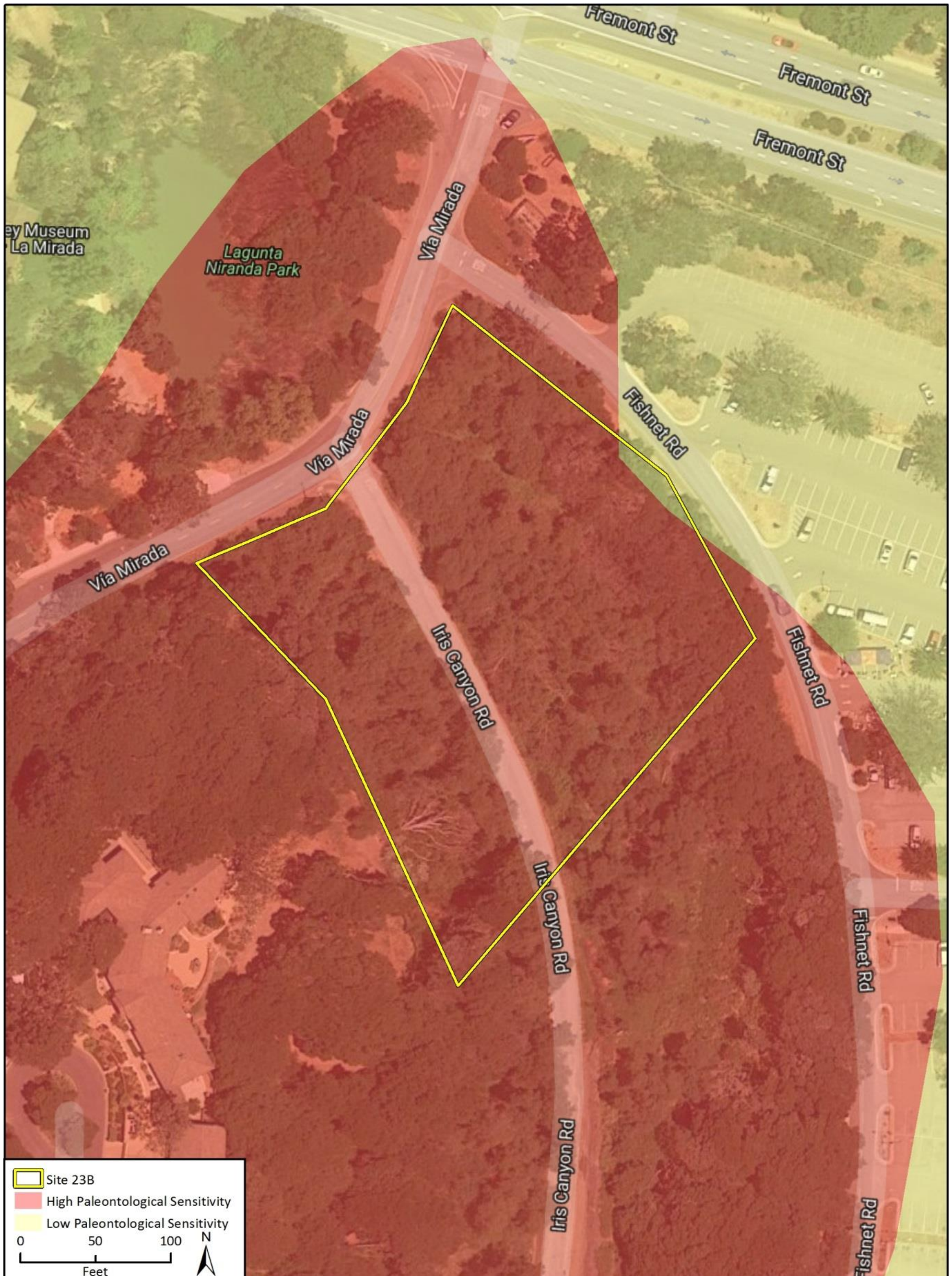

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Figure 28 Paleontological Sensitivity in the Project Area, Study Site 25 (A)

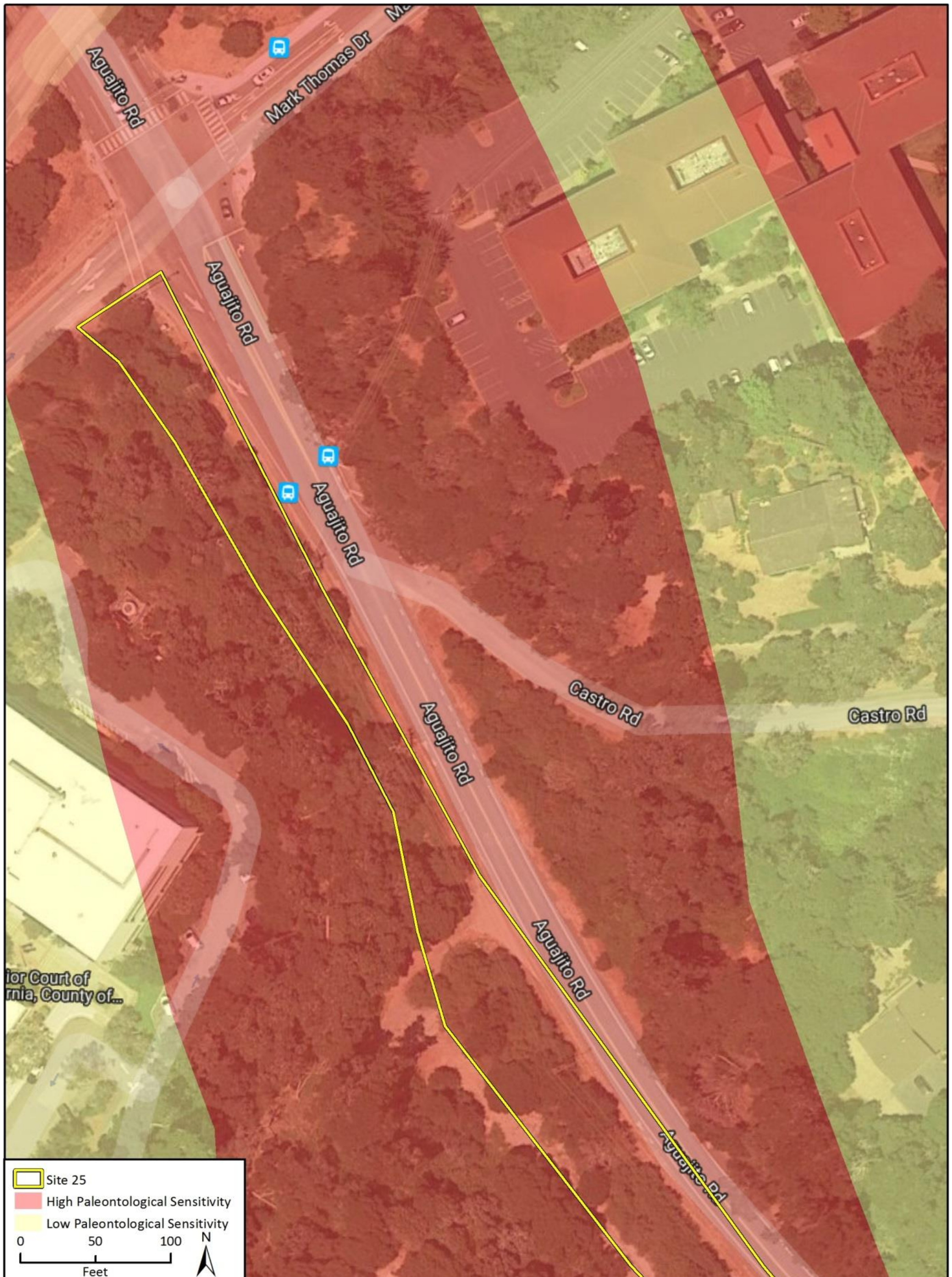

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Figure 29 Paleontological Sensitivity in the Project Area, Study Site 25 (B)

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Figure 30 Paleontological Sensitivity in the Project Area, Study Site 25 (C)

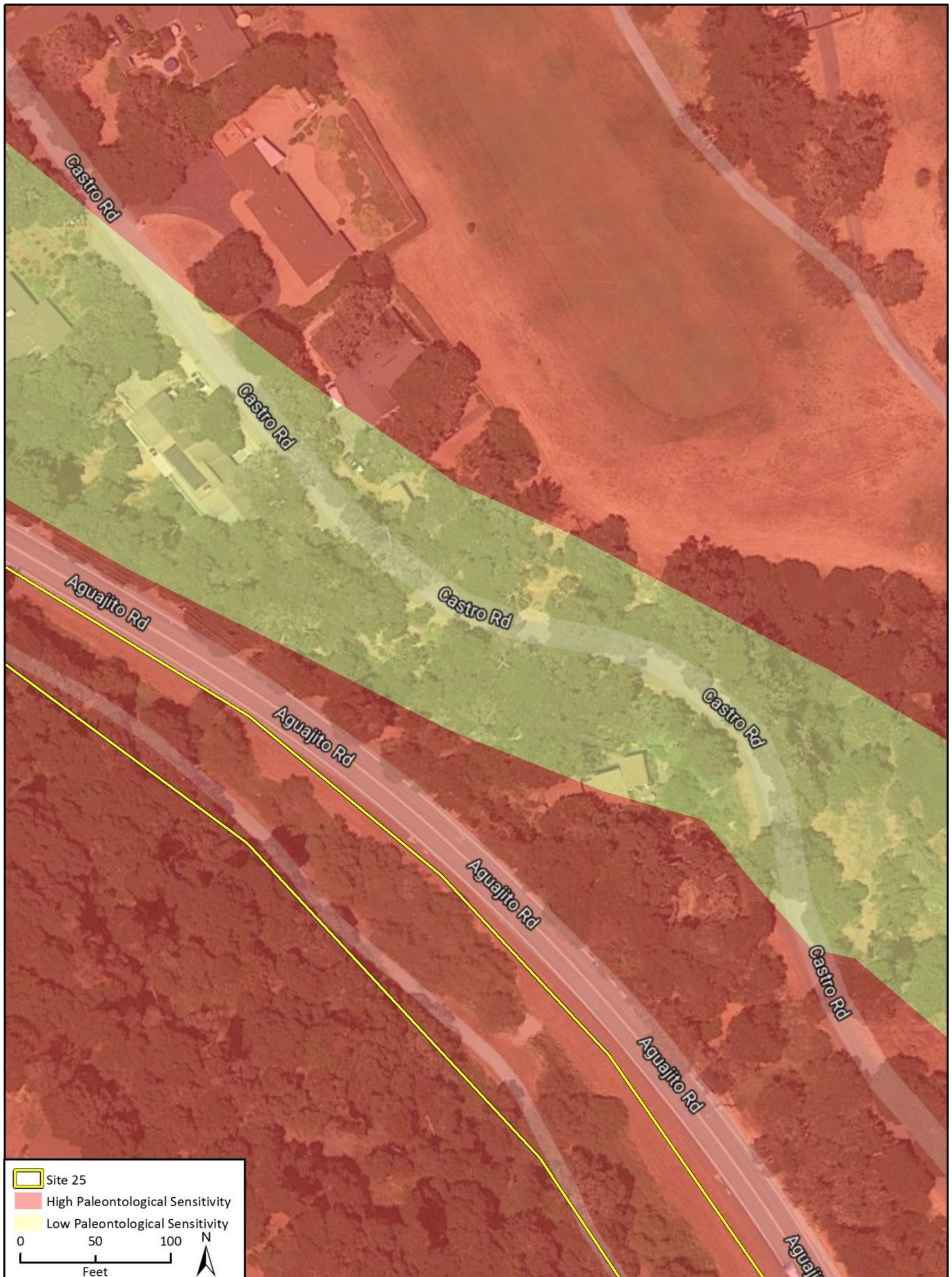

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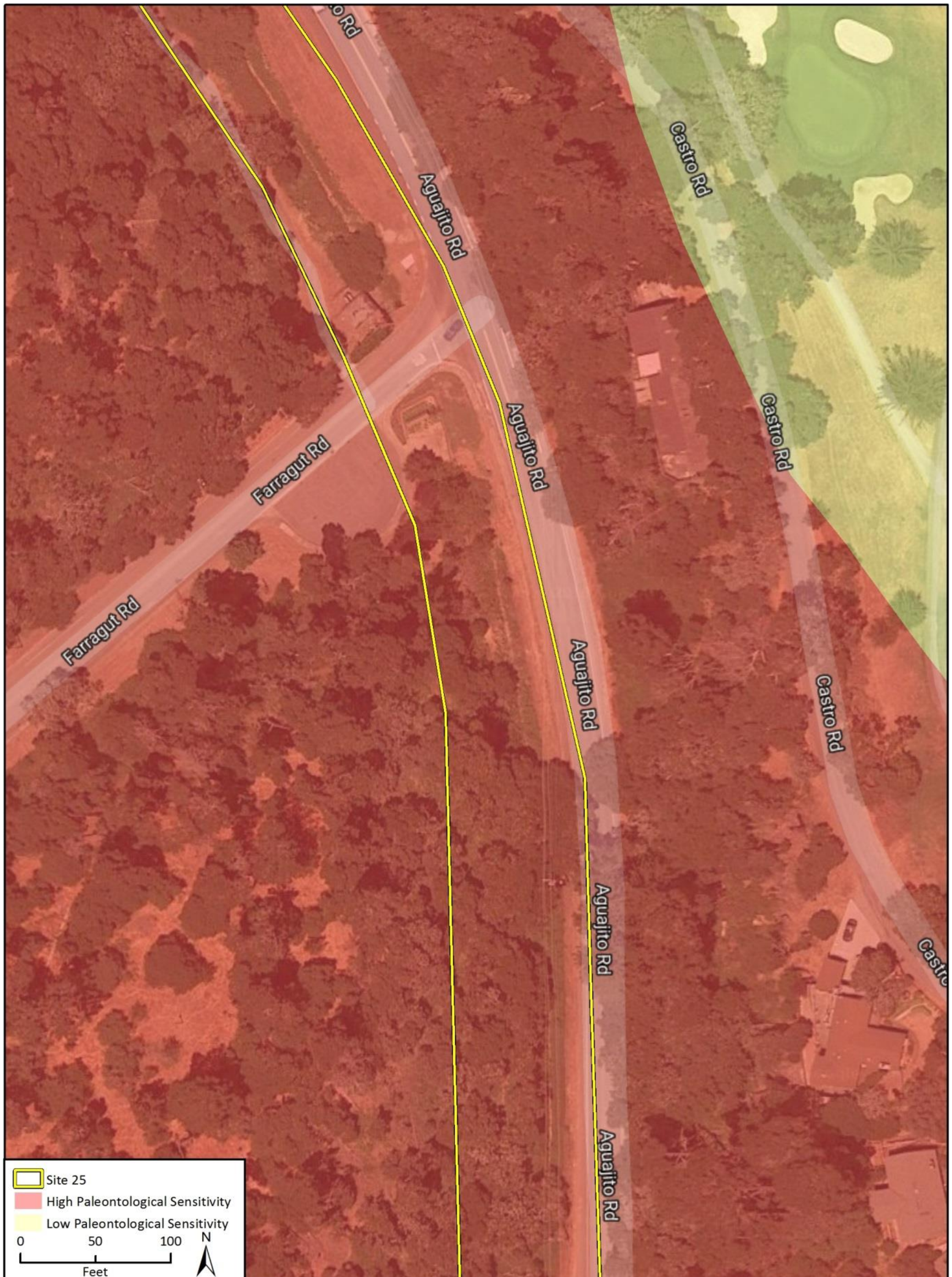
Figure 31 Paleontological Sensitivity in the Project Area, Study Site 25 (D)



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Additional data provided by Clark, J.C., Dupre, W.R., and Rosenberg, L.I., 1997, U.S. Geological Survey, Open-File Report OF-97-30, scale 1:24,000.

Figure 32 Paleontological Sensitivity in the Project Area, Study Site 25 (E)

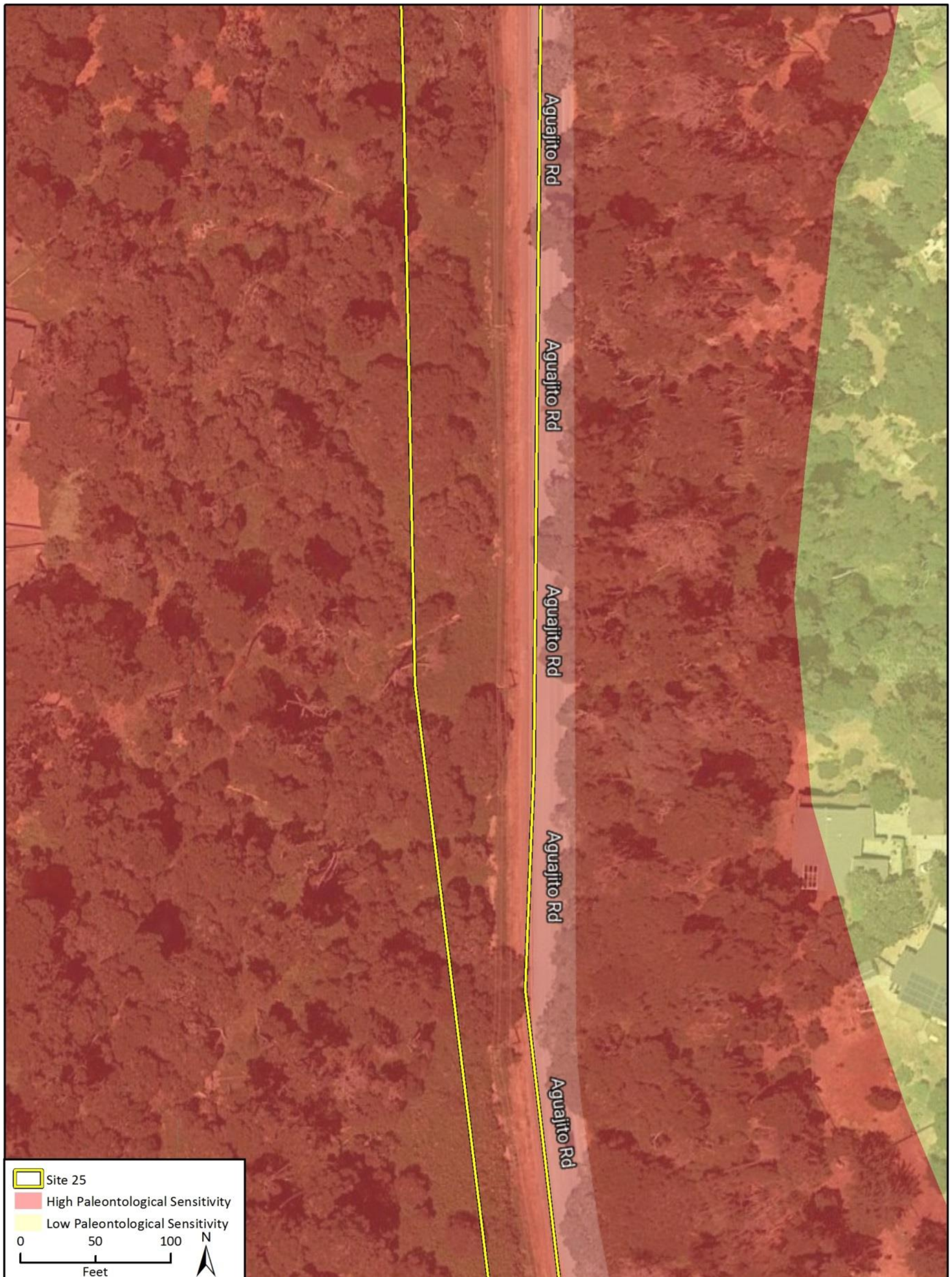

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Figure 33 Paleontological Sensitivity in the Project Area, Study Site 25 (F)

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Figure 34 Paleontological Sensitivity in the Project Area, Study Site 25 (G)

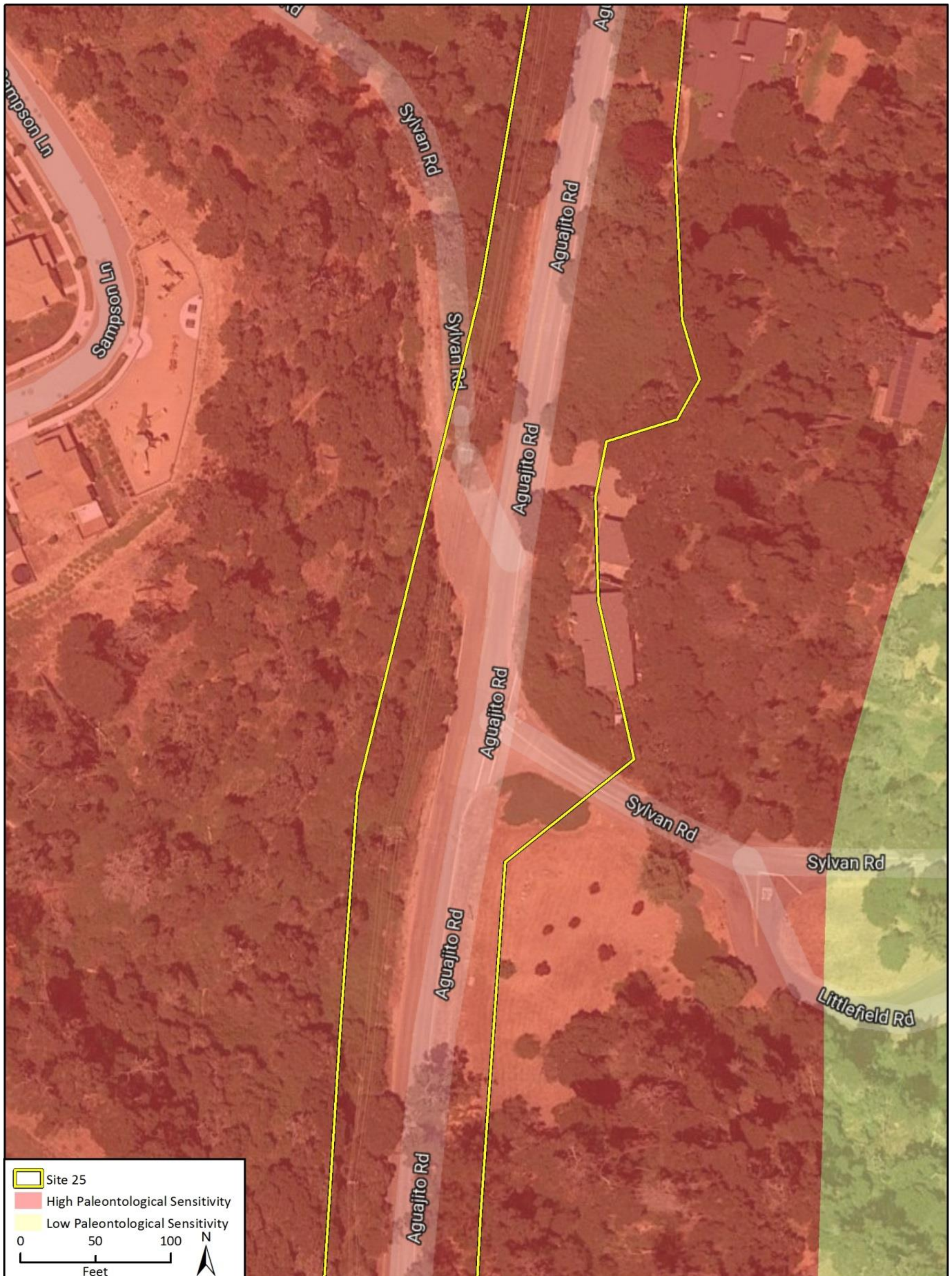

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Figure 35 Paleontological Sensitivity in the Project Area, Study Site 25 (H)

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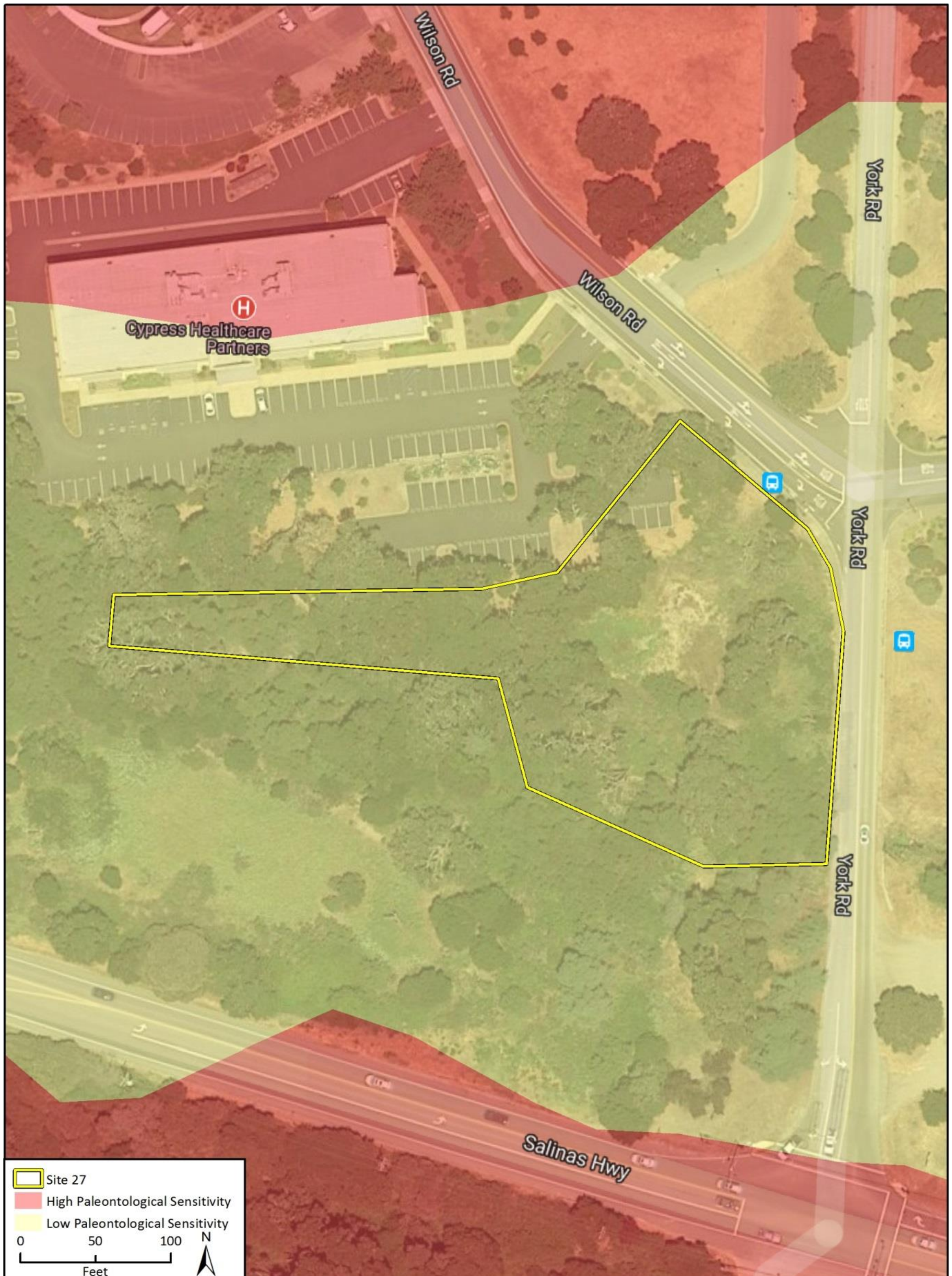
Figure 36 Paleontological Sensitivity in the Project Area, Study Site 27



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Additional data provided by Clark, J.C., Dupre, W.R., and Rosenberg, L.I., 1997, U.S. Geological Survey, Open-File Report OF-97-30, scale 1:24,000.

Figure 37 Paleontological Sensitivity in the Project Area, Study Site 28

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PaleoApndx Paleo Sensitivity

Figure 38 Paleontological Sensitivity in the Project Area, Study Site 29

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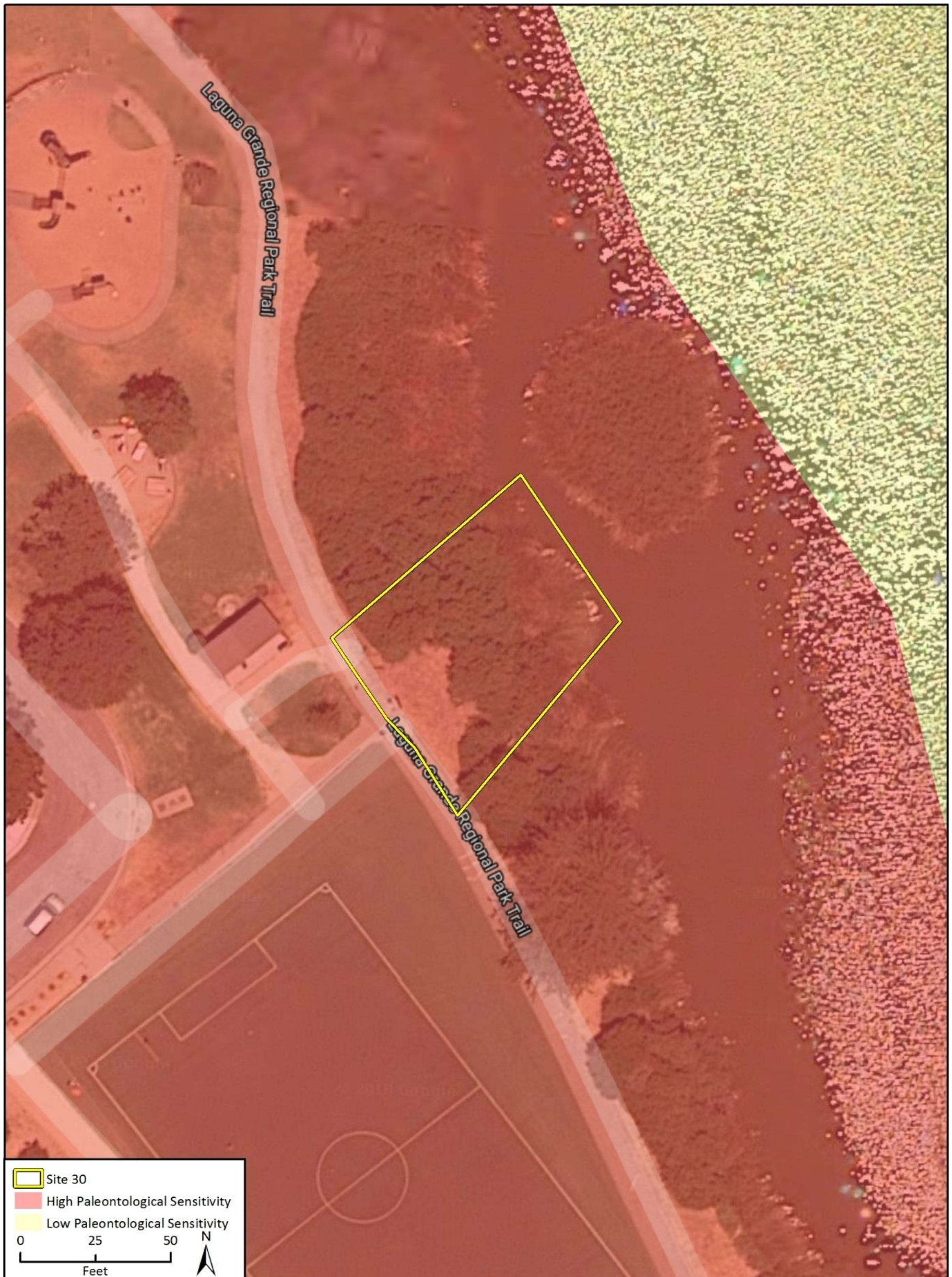
Figure 39 Paleontological Sensitivity in the Project Area, Study Site 30



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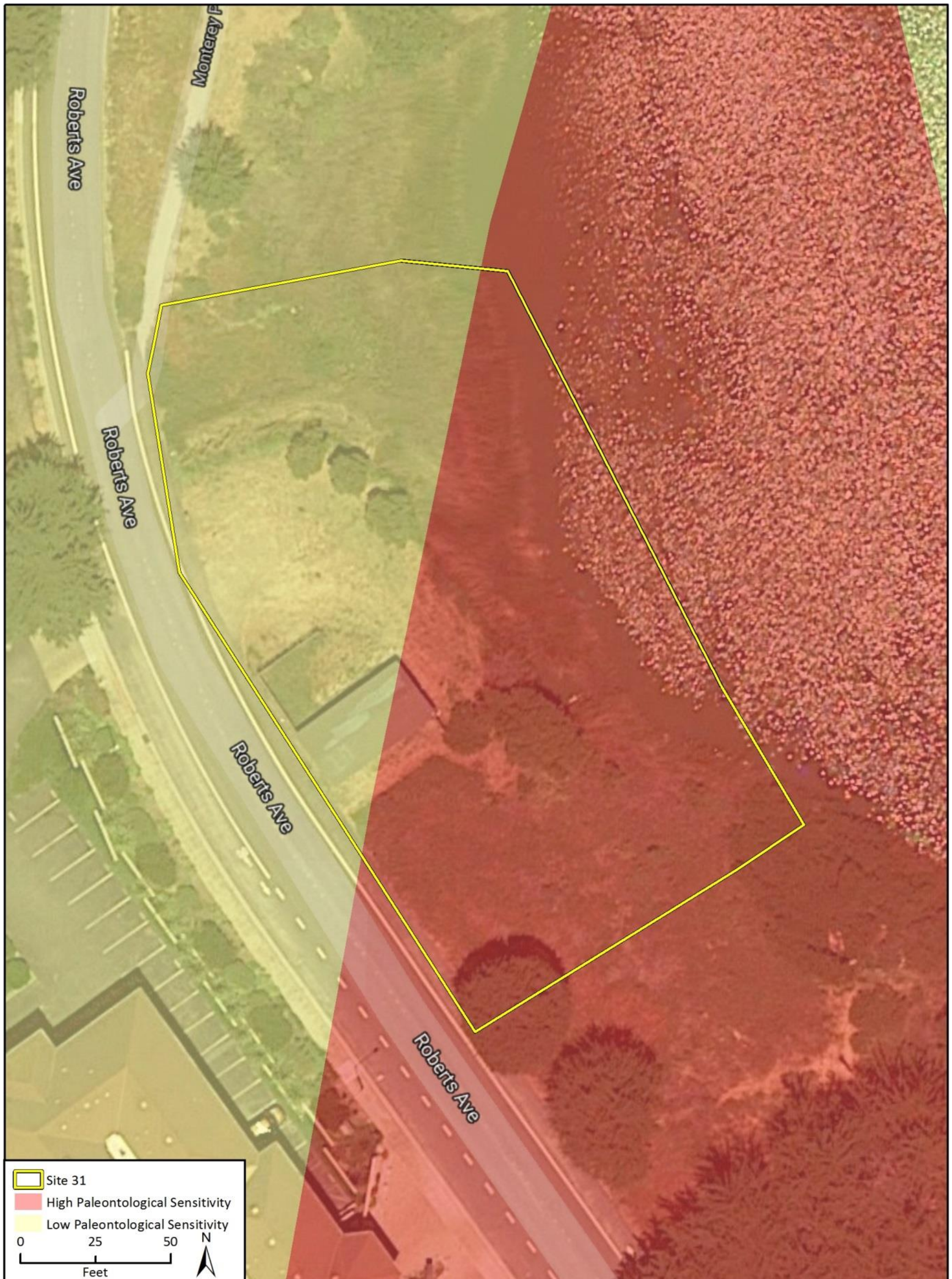
Additional data provided by Clark, J.C., Dupre, W.R., and Rosenberg, L.I., 1997, U.S. Geological Survey, Open-File Report OF-97-30, scale 1:24,000.

Figure 40 Paleontological Sensitivity in the Project Area, Study Site 31



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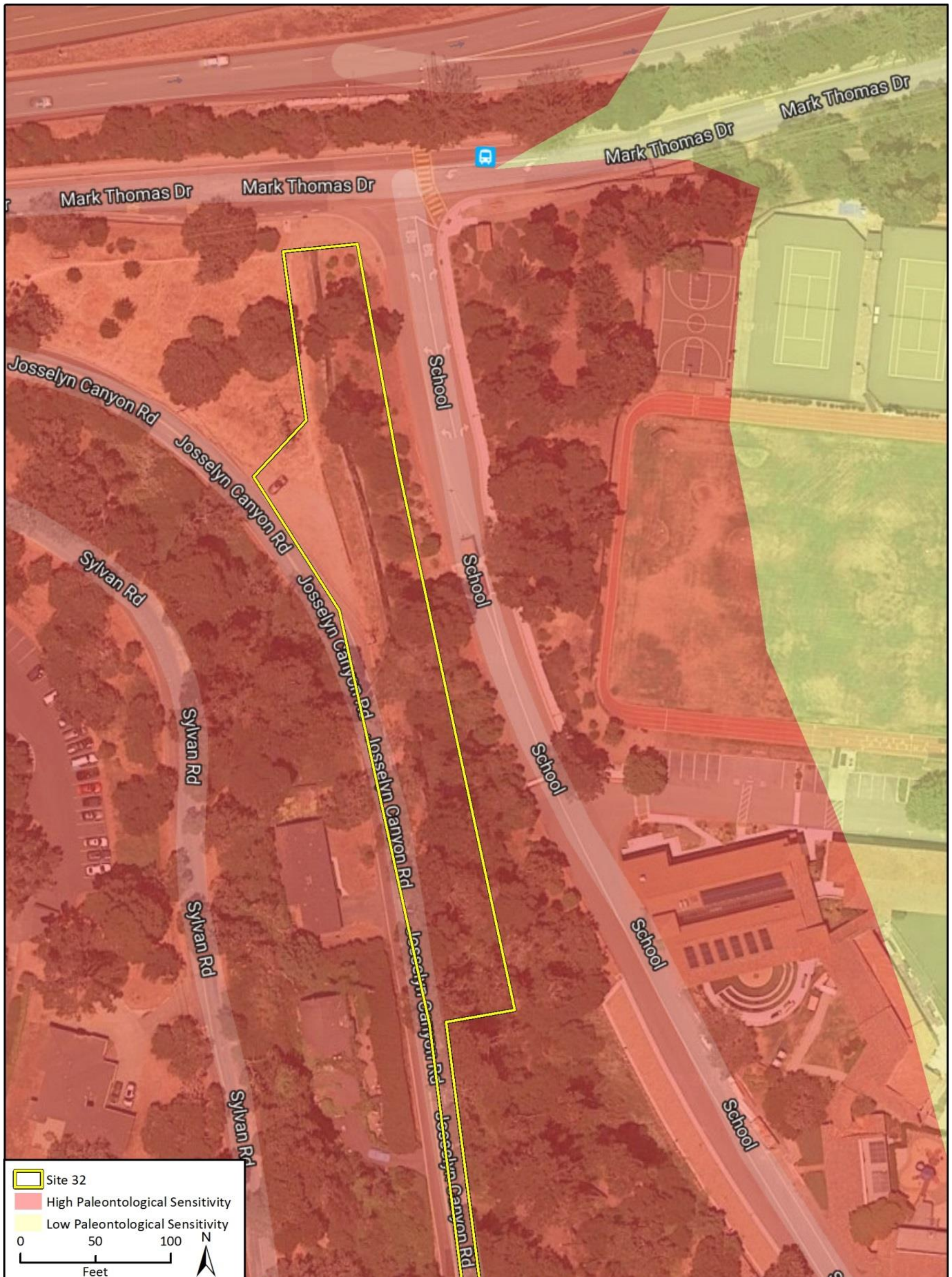
Additional data provided by Clark, J.C., Dupre, W.R., and Rosenberg, L.I., 1997, U.S. Geological Survey, Open-File Report OF-97-30, scale 1:24,000.

Figure 41 Paleontological Sensitivity in the Project Area, Study Site 32 (A)



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PaleoApndx Paleo Sensitivity

Figure 42 Paleontological Sensitivity in the Project Area, Study Site 32 (B)

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Figure 43 Paleontological Sensitivity in the Project Area, Study Site 32 (C)

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Figure 44 Paleontological Sensitivity in the Project Area, Study Site 32 (D)

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Figure 45 Paleontological Sensitivity in the Project Area, Study Site 32 (E)

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Figure 46 Paleontological Sensitivity in the Project Area, Study Site 33

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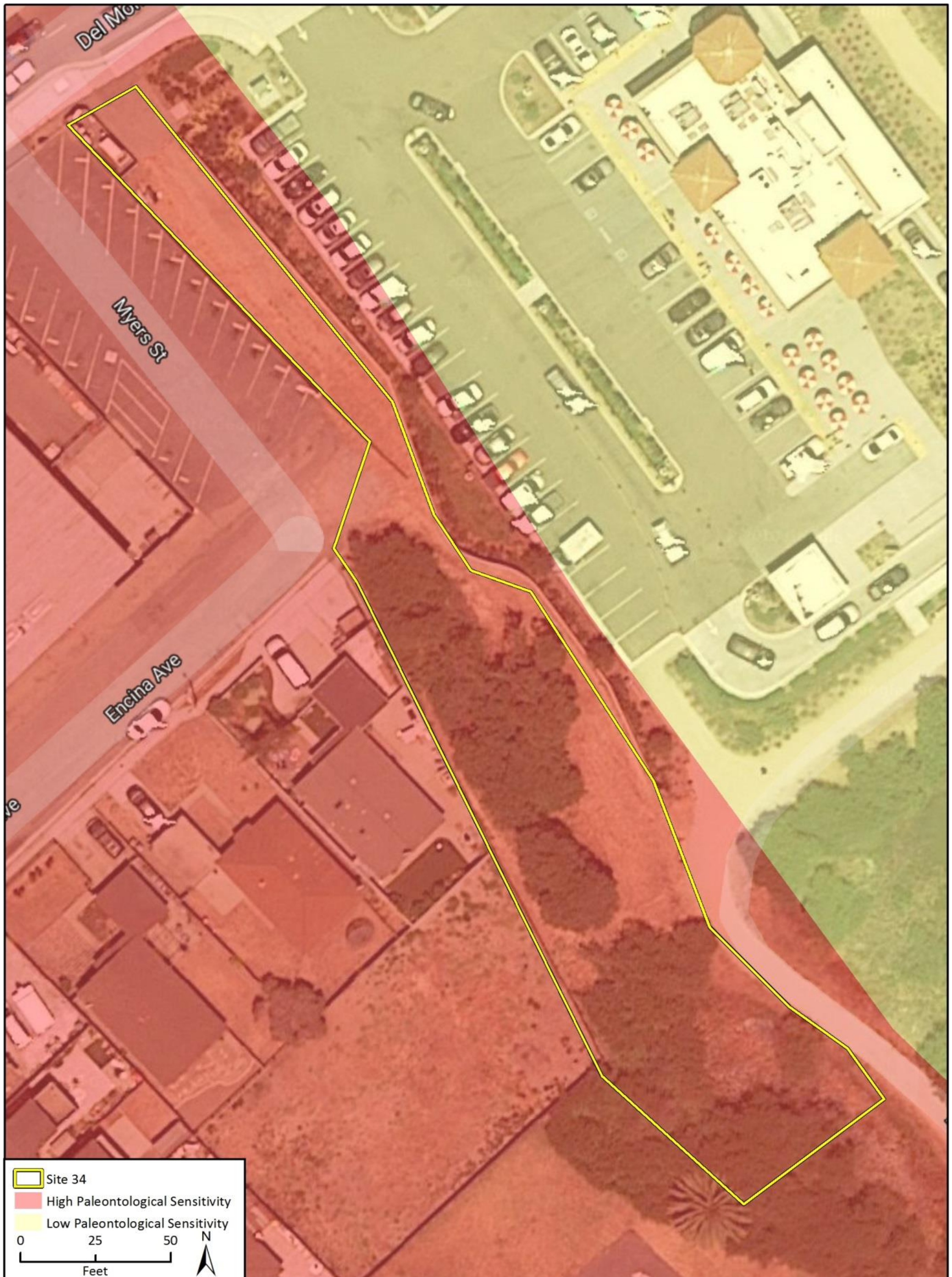
Additional data provided by Clark, J.C., Dupre, W.R., and Rosenberg, L.I., 1997, U.S. Geological Survey, Open-File Report OF-97-30, scale 1:24,000.

Figure 47 Paleontological Sensitivity in the Project Area, Study Site 34



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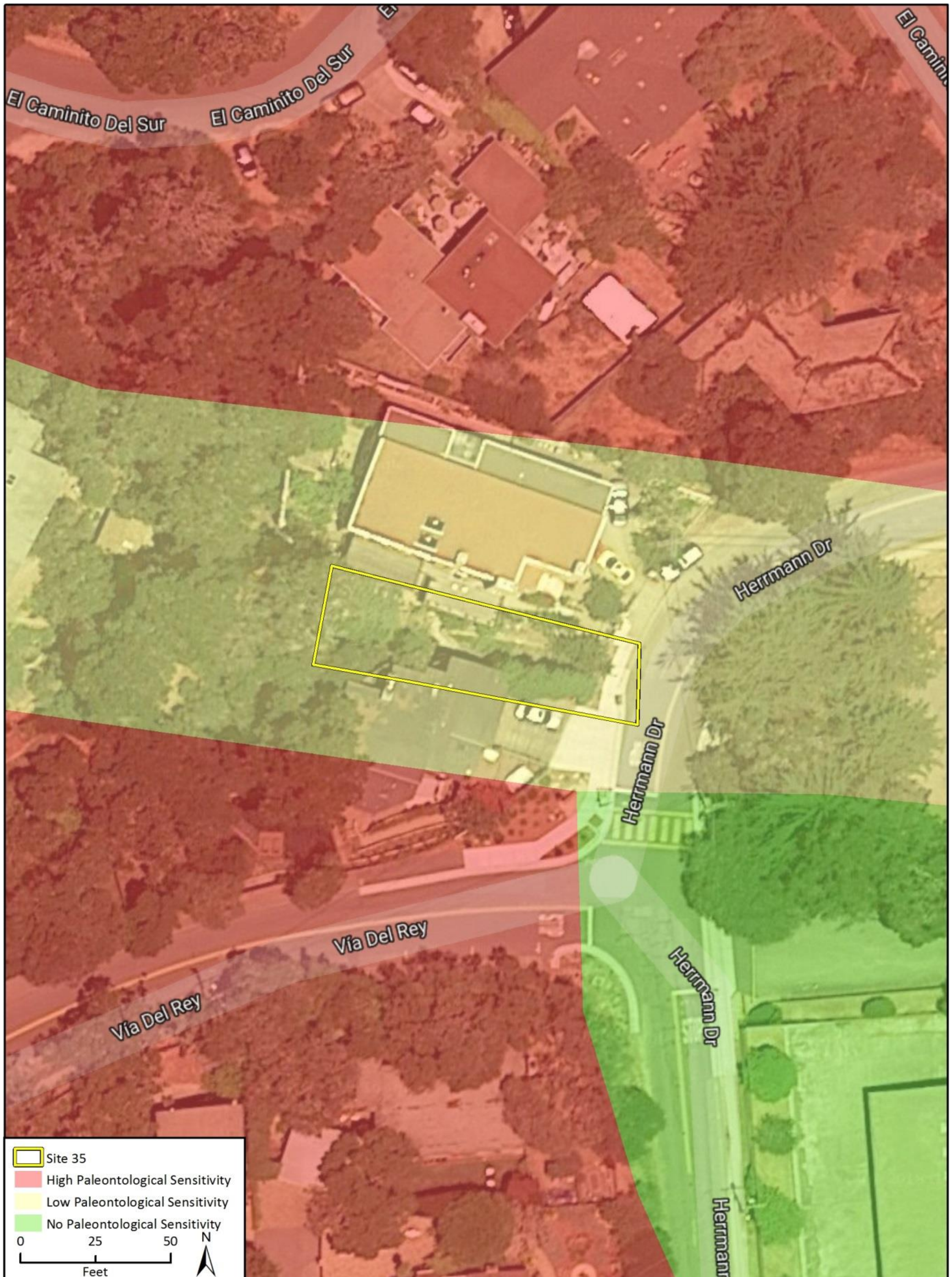
Additional data provided by Clark, J.C., Dupre, W.R., and Rosenberg, L.I., 1997, U.S. Geological Survey, Open-File Report OF-97-30, scale 1:24,000.

PaleoApndx Paleo Sensitivity

Figure 48 Paleontological Sensitivity in the Project Area, Study Site 35



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Additional data provided by Clark, J.C., Dupre, W.R., and Rosenberg, L.I., 1997, U.S. Geological Survey, Open-File Report OF-97-30, scale 1:24,000.

PaleoApndx Paleo Sensitivity

Figure 49 Paleontological Sensitivity in the Project Area, Study Site 36

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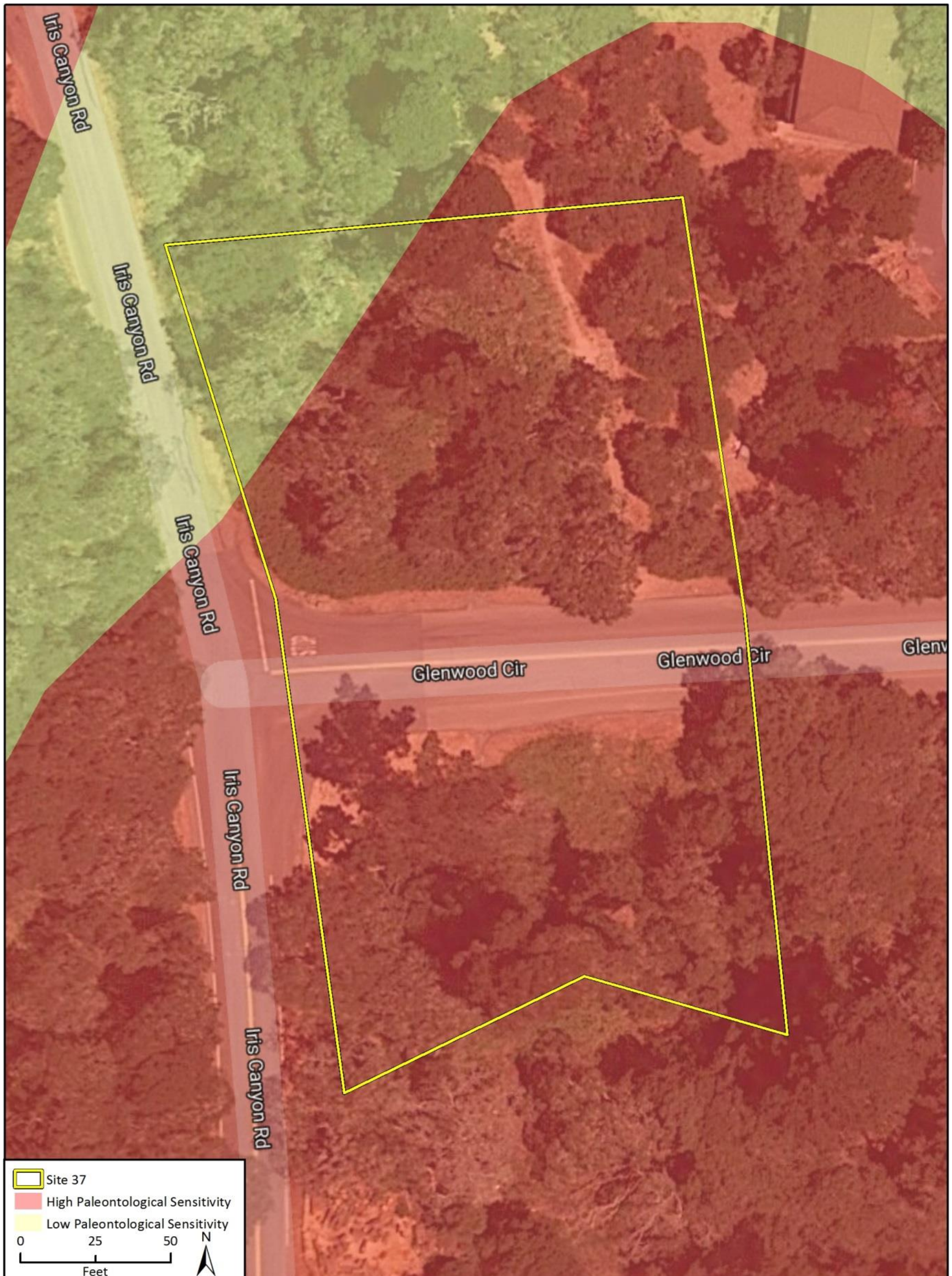
Additional data provided by Clark, J.C., Dupre, W.R., and Rosenberg, L.I., 1997, U.S. Geological Survey, Open-File Report OF-97-30, scale 1:24,000.

Figure 50 Paleontological Sensitivity in the Project Area, Study Site 37



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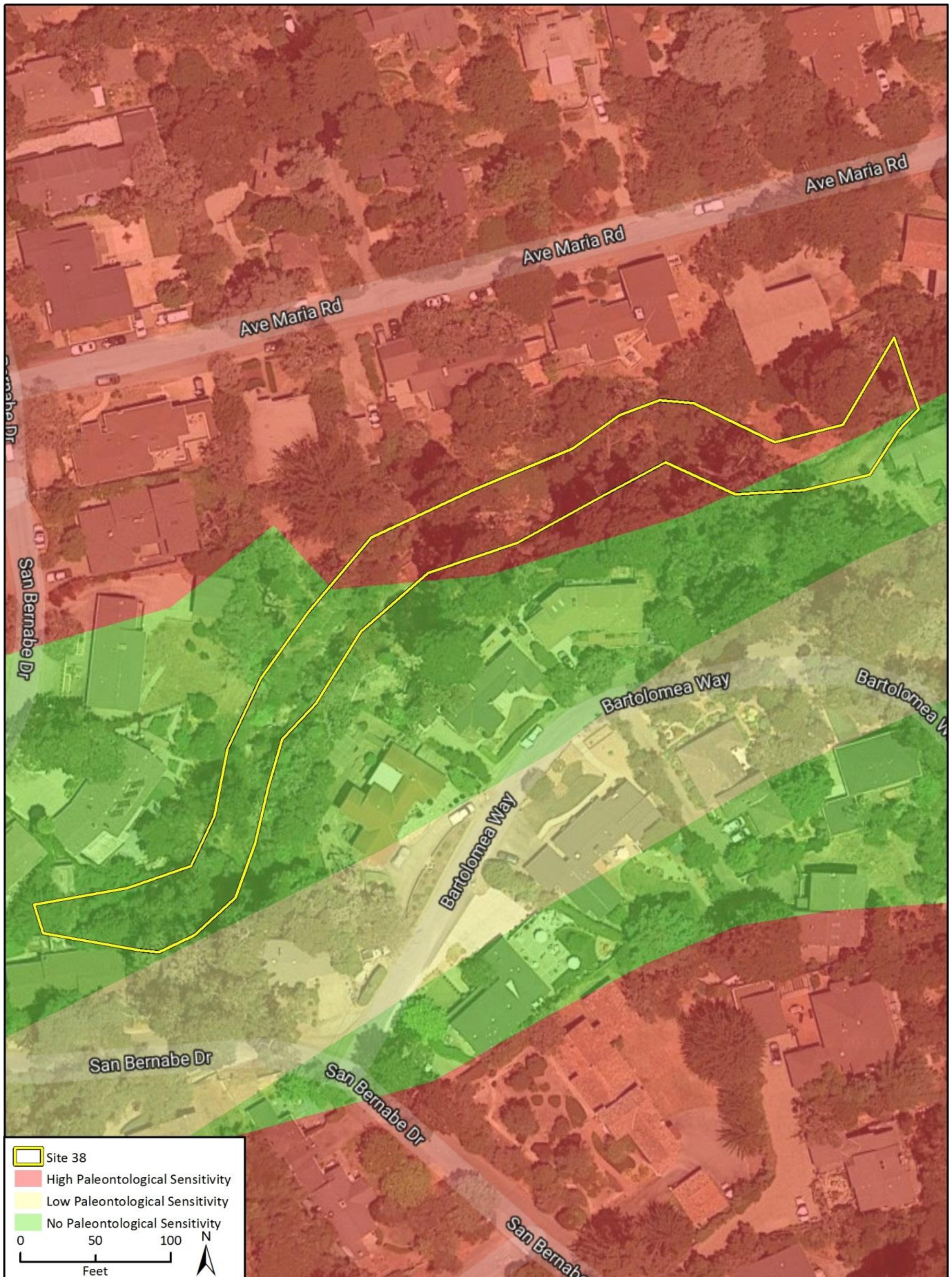
Additional data provided by Clark, J.C., Dupre, W.R., and Rosenberg, L.I., 1997, U.S. Geological Survey, Open-File Report OF-97-30, scale 1:24,000.

PaleoApndx Paleo Sensitivity

Figure 51 Paleontological Sensitivity in the Project Area, Study Site 38



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Additional data provided by Clark, J.C., Dupre, W.R., and Rosenberg, L.I., 1997, U.S. Geological Survey, Open-File Report OF-97-30, scale 1:24,000.

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