Appendix N

Paleontological Resource Assessment

PALEOSERVICES
SAN DIEGO NATURAL HISTORY MUSEUM

Paleontological Resource Assessment

Kearny Mesa Community Plan Update
City of San Diego
San Diego County, California

May 24, 2018

Prepared for:
City of San Diego Planning Department
9485 Aero Drive, M.S. 413
San Diego, CA 92123

Under contract to:
HELIX Environmental Planning, Inc.
7578 El Cajon Boulevard
La Mesa, CA 91942

Prepared by:
Department of PaleoServices
San Diego Natural History Museum
P.O. Box 121390
San Diego, California 92112-1390

Katie M. McComas, M.S., Paleontological Collections Assistant
Thomas A. Deméré, Ph.D., Principal Paleontologist

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Executive Summary

This paleontological resource assessment was prepared for the Kearny Mesa Community Plan Update. The approximately 4,420 acre Kearny Mesa Community Plan Area (Project Area) is located in the central portion of the City of San Diego, San Diego County, California, and is bordered to the west by Interstate 805, to the north by State Route 52, to the east by Interstate 15, and to the south by primarily residential developments within the Serra Mesa Community Plan Area. The City of San Diego's update to the Kearny Mesa Community Plan will provide a roadmap with a 20-year timeline to address housing demand, industrial and business growth, infrastructure needs, and climate change.

The paleontological resource assessment identifies and summarizes existing paleontological resource data in the vicinity of the Project Area, classifies and discusses the significance of these resources, evaluates and summarizes future development-related construction activities that may impact paleontological resources, and outlines mitigation measures to reduce these development-related impacts to paleontological resources to less than significant levels. The report includes the results of an institutional records search and a pedestrian survey.

The Project Area is underlain by several geologic units, including artificial fill (Recent); Holocene-age alluvial flood plain deposits (generally less than 11,000 years old); Pleistocene-age alluvial flood plain deposits (approximately 500,000 to 11,000 years old); the early to middle Pleistocene-age, marine to paralic Lindavista Formation (1.5 to 0.5 million years old); the Eocene-age, open marine Mission Valley Formation (approximately 43 million years old); the Eocene-age, alluvial fan and nearshore marine Stadium Conglomerate (approximately 44 to 42 million years old), the Eocene-age, fluvial and estuarine Friars Formation (approximately 47 to 46 million years old), and the Eocene-age, open marine Scripps Formation (approximately 47 million years old), as mapped by Kennedy and Tan (2008). This general sequence of strata was confirmed during the pedestrian survey. The records search results indicate that there are 52 known fossil collection localities that lie within the Project Area, and an additional 32 localities within a 1-mile radius of the Project Area. The known localities are from the Lindavista Formation, Mission Valley Formation, Stadium Conglomerate, Friars Formation, and Scripps Formation.

A paleontological potential rating was assigned to each geologic unit based on the records search findings, surficial geology observed during the pedestrian survey, and the results of previous paleontological mitigation programs carried out in the Project Area. The Mission Valley Formation, Stadium Conglomerate, Friars Formation, and Scripps Formation are assigned a high paleontological potential, Pleistocene alluvial flood plain deposits and the Lindavista Formation are assigned a moderate paleontological potential, Holocene alluvial flood plain deposits are assigned a low paleontological potential, and artificial fill is assigned no paleontological potential.

Typically, only development requiring earthwork has the potential to impact paleontological resources, and only impacts to geologic units with high or moderate paleontological potential ratings are considered to be significant and require mitigation. Based on these factors, development across nearly all parts of the Project Area will require mitigation, with the exception of shallow excavation into: areas that were previously developed and are underlain by extensive volumes of documented or undocumented artificial fill, and surficial fluvial and colluvial deposits exposed along the floors of Murphy Canyon and San Clemente Canyon.

Included as part of the paleontological resource assessment are suggested future mitigation measures that may be implemented for specific projects prior to the start of construction (i.e., contracting a Qualified Project Paleontologist, attendance of the Qualified Project Paleontologist at pre-construction meetings, paleontological resource training provided for earth excavation personnel), during construction (i.e., paleontological monitoring of excavations into deposits of high or moderate paleontological potential, salvage of discovered fossils), and post-construction (i.e., preparation and curation of any salvaged fossils, completion of final paleontological mitigation report). Implementing the suggested mitigation measures will reduce any potential development-related impacts to paleontological resources to less than significant levels.

Contents

1.0 Introduction

1.1 Project Description

This technical report provides an assessment of paleontological resources for the Kearny Mesa Community Plan Update. The approximately 4,420 acre Kearny Mesa Community Plan Area (Project Area) is located in the central portion of the City of San Diego, San Diego County, California, and is bounded to the west by Interstate 805 (I-805), to the north by State Route 52 (SR-52), to the east by Interstate 15 (I-15), and to the south by primarily residential and recreational developments within the Serra Mesa Community Plan Area (Figure 1). The adjacent community plan areas of Clairemont Mesa, Lindavista, Serra Mesa, and Tierrasanta border Kearny Mesa to the west, south, and east, respectively, while Marine Corps Air Station Miramar lies to its north (Figure 2).

Existing land use within the Kearny Mesa Community Plan Area is dominated by industrial facilities (over 1,000 acres, including industrial park, light industrial, and warehousing), transportation (960 acres, including road rights-of-way), the Montgomery-Gibbs Executive Airport (500 acres), commercial facilities (490 acres, including commercial, office, shopping centers, and retail/dining), and recreational facilities/open space (nearly 470 acres, including parks, recreation centers, naturalized slope and canyon areas in the east, and sensitive habitat areas in the north along SR-52). Current residential land use is limited to 195 acres. The remaining land uses consist of office facilities (363 acres), government and community facilities (168 acres), communication/utilities (69 acres), schools/educational facilities (44 acres), parking lots (35 acres), health care facilities (27 acres), and mixed use development (8 acres). The remaining 79 acres are vacant or undeveloped.

The City of San Diego is preparing an update to the Kearny Mesa Community Plan with a 20-year timeline to address housing demands, industrial and business growth, infrastructure needs, and climate change. Specifically, the plan will outline a roadmap for the Kearny Mesa Community to:

- adjust to changing demographics and population growth within the community that have increased the need for residential and mixed-use development;
- maintain and expand the community's role as a job center while accommodating quality of life considerations during future industrial development;
- improve mobility and increase transportation options for a growing population of residents and workers; and
- create community-specific policies and recommended actions to adhere to the recently-adopted Climate Action Plan, which calls for a 50% reduction in greenhouse gas emissions in the City of San Diego by 2035.

Within Kearny Mesa, the supplemental New Century Center Master Plan was adopted to allow development of the former General Dynamics property, a 242-acre mixed-use retail, commercial, and industrial business park, and residential development area south of Clairemont Mesa Boulevard and north of Tech Way, between Ruffin Road and SR-163. In addition, the supplemental Stonecrest Specific Plan was adopted to develop the former Fenton Quarry site, a 318-acre primarily residential community located south of Aero Drive, west of I-15, and north of Friars Road.

Kearny Mesa is also home to the Montgomery-Gibbs Executive Airport, which occupies more than 11% of the community footprint and is receiving its own master plan update within the City of San Diego

Airports Division. Future development plans for the surrounding areas within Kearny Mesa will need to be compatible with the updated airport master plan.

1.2 SDNHM Scope of Work

For the Project, the San Diego Natural History Museum (SDNHM) was contracted to complete a paleontological resource assessment, including a paleontological records search and literature review, and a pedestrian survey of the Project Area. The resource assessment is intended to identify and summarize existing paleontological resource data in the vicinity of the Project Area, classify and discuss the significance of these resources, determine whether future development within the Project Area will impact paleontological resources, and outline suggested mitigation measures to reduce any potential development-related impacts to paleontological resources to less than significant levels.

This report was prepared by Katie M. McComas and Thomas A. Deméré of the Department of PaleoServices, SDNHM.

1.3 Definition of Paleontological Resources

As defined here, paleontological resources (i.e., fossils) are the buried remains and/or traces of prehistoric organisms (i.e., animals, plants, and microbes). Body fossils such as bones, teeth, shells, leaves, and wood, as well as trace fossils such as tracks, trails, burrows, and footprints, are found in geologic units composed of the sediments that originally buried them. The primary factor determining whether an object is a fossil is not how the organic remain or trace is preserved (e.g., "petrified"), but rather the age of the organic remain or trace. Although it is typically assumed that fossils must be older than approximately 11,000 years (i.e., the generally accepted end of the last glacial period of the Pleistocene Epoch), organic remains of early Holocene age can also be considered to represent fossils because they are part of the record of past life.

Fossils are considered important scientific and educational resources because they serve as direct and indirect evidence of prehistoric life and are used to understand the history of life on Earth, the nature of past environments and climates, the membership and structure of ancient ecosystems, and the patterns and processes of organic evolution and extinction. In addition, fossils are considered to be non-renewable resources because typically the organisms they represent no longer exist. Once destroyed, a particular fossil can never be replaced. And finally, for the purposes of this report, paleontological resources can be thought of as including not only the actual fossil remains and traces, but also the fossil collecting localities and the geologic units containing those localities.

1.4 Regulatory Framework

As discussed above, paleontological resources are scientifically and educationally significant nonrenewable resources, and as such are protected under federal, state, and local laws, regulations, and ordinances. The Project is located within the City of San Diego, San Diego County, California. Therefore, state and local laws, ordinances, and regulations are applicable to the Project.

1.4.1 State

Notable state legislative protection for paleontological resources includes the California Environmental Quality Act and the Public Resources Code.

The California Environmental Quality Act (CEQA, Public Resources Code Section 21000 *et seq.*) protects paleontological resources on both state and private lands in California. This act requires the identification of environmental impacts of a Project, the determination of significance of the impacts, and the identification of alternative and/or mitigation measures to reduce adverse environmental impacts. The Guidelines for the Implementation of CEQA (Title 14, Chapter 3, California Code of Regulations: 15000 *et seq.*) outlines these necessary procedures for complying with CEQA. Paleontological resources are specifically included as a question in the CEQA Environmental Checklist (Section 15023, Appendix G): “Will the proposed project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.” Also applicable to paleontological resources is the checklist question: “Does the project have the potential to… eliminate important examples of major periods of California history or pre-history.”

Other state requirements for paleontological resource management are included in the Public Resources Code (Chapter 1.7), Sections 5097.5 and 30244. These statutes prohibit the removal of any paleontological site or feature on public lands without permission of the jurisdictional agency, defines the removal of paleontological sites or features as a misdemeanor, and requires reasonable mitigation of adverse impacts to paleontological resources from developments on public (state) lands.

1.4.2 Local

The County of San Diego primarily addresses management of paleontological resources through CEQA. In addition, Section 87.430 of the County’s Grading Ordinance specifically establishes procedures for the mitigation of potential impacts to paleontological resources during earthwork operations. Detailed guidelines for determining significance and mitigation procedures for paleontological resources are provided by the County’s Department of Public Works (Stephenson et al., 2009).

The City of San Diego has developed specific guidelines for the implementation of CEQA regarding the management of paleontological resources within the City’s boundaries (City of San Diego, 2011). Specifically, the City provides Initial Study Questions and Significance Thresholds to determine whether a proposed project will significantly impact paleontological resources. If it is determined that a project may impact paleontological resources, the City provides guidelines for the mitigation of these impacts, most commonly through implementation of a monitoring program.

Figure 1. Vicinity map of western San Diego County showing the location of the Kearny Mesa Community Plan Area.

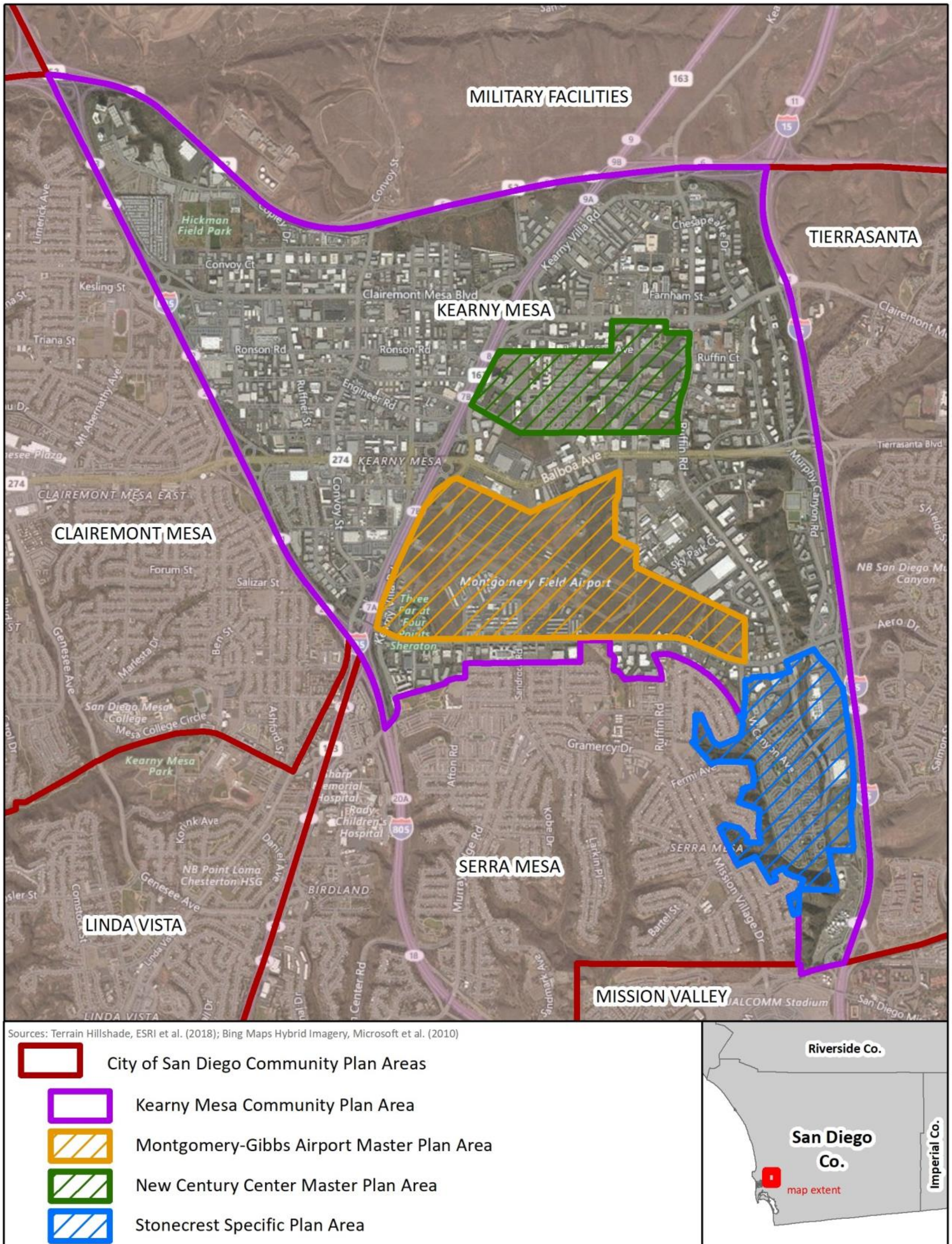

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FIGURE 2

Project Site Map
Kearny Mesa Community Plan Update
City of San Diego, San Diego County, California

2.0 Methods

2.1 Paleontological Records Search and Literature Review

A paleontological records search was conducted at the SDNHM in order to determine if any documented fossil collection localities occur within or immediately surrounding the Project Area. The records search involved examination of the SDNHM paleontological database for any records of known fossil collection localities within a 1-mile radius of the Project Area.

Additionally, a review was conducted of relevant published geologic maps (e.g., Kennedy and Tan, 2008), published geological and paleontological reports (e.g., Kennedy and Moore, 1971; Walsh et al., 1996), and other relevant literature (e.g., geologic field trip guidebooks and unpublished paleontological mitigation reports). This approach was followed in recognition of the direct relationship between paleontological resources and the geologic formations within which they are entombed. Knowing the geologic history of a particular area and the fossil productivity of geologic formations that occur in that area, it is possible to predict where fossils will or will not be encountered.

2.2 Pedestrian Survey

A pedestrian survey was conducted on May 8, 2018 by SDNHM Department of PaleoServices personnel to confirm the mapped geology, to field check the results of the literature and records searches, and to determine the paleontological potential of strata present in the vicinity of the Project site. The pedestrian survey involved inspection of available exposures of sedimentary rocks in order to collect stratigraphic data (e.g., bedding type, thickness, geologic contacts), lithologic descriptions of strata (e.g., color, sorting of grains, texture, sedimentary structures, and grain size of sedimentary rocks), and prospect for any fossil remains present at the surface. The field paleontologists were equipped with standard field equipment (e.g., rock hammer, camera, hand lens, tape measure), and a Garmin Handheld GPS unit.

The pedestrian survey primarily focused on portions of the Project Area that were expected to contain vertical exposures of native geologic units. These areas were generally restricted to natural slopes along Murphy and San Clemente canyons and their tributary drainages, manmade slopes related to previous development along Murphy Canyon, and road cuts for major roadways (I-15, I-805, SR-163, and SR-52). Some areas of exposure were inaccessible due to the presence of physical barriers (e.g., fencing, high retaining walls) or safety concerns (e.g., high speed traffic along major roadways). These outcrops were characterized and photographed from a distance, but lithologic details could not be described.

2.3 Evaluation of Paleontological Potential

Procedures for evaluating the paleontological potential (or sensitivity) of a given project site involve assigning ranks to individual geologic rock units based on the relative abundance of vertebrate fossils or scientifically significant invertebrate or plant fossils they contain (e.g., Bureau of Land Management, 2007, 2016; Society of Vertebrate Paleontology [SVP], 2010). Following the City of San Diego paleontological guidelines (2011), a four-tiered scale is used here that assigns each geologic unit within the Project Area a High Potential, Moderate Potential, Low Potential, or No Potential rating. An expanded description of each potential rating is outlined below.

2.3.1 High Potential

High potential is assigned to geologic units known to have produced, or are likely to produce, significant vertebrate, invertebrate, or paleobotanical remains. High potential geologic units may contain fossil materials that are rare, well-preserved, critical for stratigraphic or paleoenvironmental interpretation, and/or provide important information about the paleobiology and evolutionary history (phylogeny) of animal and plant groups.

2.3.2 Moderate Potential

Moderate potential is assigned to geologic units known to contain paleontological localities with fossil material that is poorly preserved, common elsewhere, or stratigraphically unimportant. The moderate potential category is also applied to geologic units that are judged to have a strong, but unproven, potential for producing important fossil remains.

2.3.3 Low Potential

Low potential is assigned to geologic units that, based on their relatively young age and/or high-energy depositional history, are judged unlikely to produce important fossil remains. Typically, low potential units produce fossil remains in low abundance, or only produce common/widespread invertebrate fossils whose taphonomy, phylogeny, and ecology is already well understood.

2.3.4 No Potential

Geologic units with no potential are either entirely igneous in origin and therefore do not contain fossil remains, or are moderately to highly metamorphosed and thus any contained fossil remains have been destroyed. Artificial fill materials also have no potential, because the stratigraphic and geologic context of any contained organic remains (i.e., fossils) has been lost.

2.4 Paleontological Impact Analysis

Direct impacts to paleontological resources occur when earthwork activities, such as mass grading, augering, and trenching, cut into the geologic units in which fossils are preserved and physically destroy the fossil remains. As such, only earthwork activities that will disturb potentially fossil-bearing sedimentary rocks (i.e., those rated with a high or moderate paleontological potential) have the potential to significantly impact paleontological resources. Paleontological mitigation typically is recommended as a means to reduce any negative impacts to paleontological resources to less than significant levels, though avoidance of paleontological resources may sometimes be a feasible alternative.

The purpose of the impact analysis is to determine whether future development in the Project Area may involve earthwork that would disturb potentially fossil-bearing sedimentary rocks. The paleontological impact analysis involved examination of potential earthwork operations that may occur during future development, and comparison with geological and paleontological data gathered during the records and literature searches, as well as the surficial conditions observed during the pedestrian survey.

3.0 Regional Geological Setting

The Kearny Mesa Community Plan Area is located within the coastal plain of San Diego County, which lies at the western edge of the Peninsular Ranges Geomorphic Province of California. Along the coastal plain, crystalline basement rocks of the Jurassic- to Cretaceous-age Santiago Peak Volcanics and the Cretaceous-age Peninsular Ranges Batholith are nonconformably overlain by a “layer cake” sequence of sedimentary strata of late Cretaceous, Eocene, Oligocene, Miocene, Pliocene, and/or Pleistocene age (Givens and Kennedy, 1979; Hanna, 1926; Kennedy, 1975; Kennedy and Moore, 1971; Kennedy and Peterson, 1975; Peterson and Kennedy, 1974; Walsh and Deméré, 1991). Kennedy and Moore (1971) divided the Eocene portion of this sequence into the early middle Eocene-age La Jolla Group and the late middle Eocene-age Poway Group, which together include nine geologic units or formations.

Together the La Jolla Group and Poway Group represent a series of intertonguing marine and terrestrial geologic units that accumulated in or adjacent to a large depositional basin (the San Diego Embayment) that spanned a relatively short geographic distance from east to west. This depositional basin was actively accumulating sediments over a period of approximately 10 million years (50 to 40 million years ago). A large river system occupied the eastern portion of the embayment, and, to the west, these alluvial and fluvial paleoenvironments mixed with nearshore marine paleoenvironments in a river-dominated, braid delta. Farther west were paralic, continental shelf, slope, and submarine canyon paleoenvironments. The Project Area lies within the central portion of this Eocene depositional basin, and is directly underlain by strata of the Poway Group (Mission Valley Formation, and Stadium Conglomerate) and La Jolla Group (Friars Formation and Scripps Formation).

Following deposition of the Eocene strata, the geologic record for the region encompassing the Project Area is marked by a prolonged gap that lasted until the Pleistocene, approximately 40 million years later. Any strata that may have accumulated during this interval was subsequently removed by erosion. During the Pleistocene, dramatic changes in global sea level, combined with regional uplift, created the flat mesas and deep valleys characteristic of the San Diego region today. During periods of high sea level, marine transgressions (coastal flooding) led to wave-erosion of planar marine abrasion platforms (ancient seafloors) into the soft Eocene rocks, and subsequent deposition of shallow marine and nonmarine sediments by prograding deltas from the east (the Lindavista Formation). During periods of low sea level, marine regressions resulted in the carving out of deep river valleys (e.g., Murphy Canyon, San Clemente Canyon) by the prehistoric rivers and streams of San Diego County. Subsequent marine transgressions caused flooding of the ancient river valleys and the formation of estuaries and small bays, which were eventually filled in by alluvium transported from the east by local rivers and streams. The repetition of sea level rise and fall, combined with localized uplift, led to the formation of the elevated marine terraces (mesas) observed west of I-15, and the localized patches of old alluvial flood plain deposits now exposed along Mission Valley.

A final marine transgression at the beginning of the Holocene followed by stabilization of sea level during the late Holocene led to the formation of the modern alluvial flood plains observed in the central portions of the river valleys in the Project Area.

3.1 Discrepancies with Published Geologic Mapping

Paleontological fieldwork (including mitigation programs) and research by the SDNHM over the past 30 years have compiled a rich record of the geology, stratigraphy, and paleontology of western San Diego County, which, taken together, suggests that the Eocene stratigraphic record is more complex than originally described in the simple transgressive-regressive depositional model of Kennedy and Moore (1971) and the mapping of Kennedy and Tan (2008). Mammalian fossils are particularly useful when considering the mapping of Eocene strata, because such fossils provide the relative age control necessary for differentiating between geologic units (e.g., Walsh, 1996; Walsh et al., 1996).

Within the Project Area, in the vicinity of Clairemont Mesa Boulevard and northward, mammalian fossils recovered from conglomeratic deposits mapped as the Stadium Conglomerate suggest that these deposits are actually older, and are likely referable to the conglomerate tongue of the Friars Formation, as described by Walsh et al. (1996). Figure 3 shows the revised stratigraphy for the Eocene sedimentary rocks along the eastern margin of the Project Area, as exposed within Murphy Canyon.

It is noteworthy that both the Stadium Conglomerate and Friars Formation are known to possess a high paleontological potential, and thus the mapping discrepancies described above are not a critical point for the purposes of paleontological resource management. However, the following discussions of specific geologic units in this report will utilize the revised Eocene stratigraphy of Walsh et al. (1996). Note, in contrast, that Figure 4 and Appendix 2 utilize the original Eocene mapping of Kennedy (1975), and the revised Quaternary mapping of Kennedy and Tan (2008).

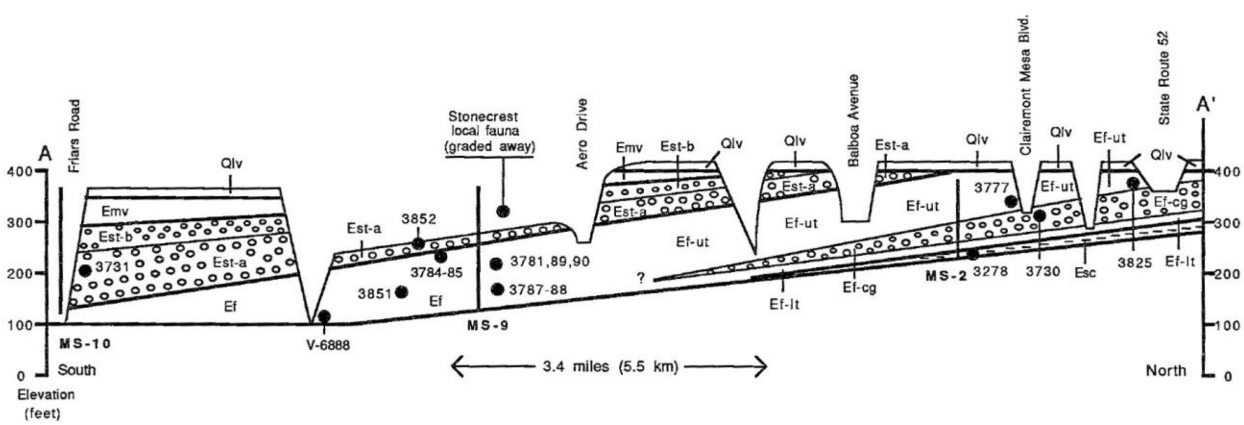
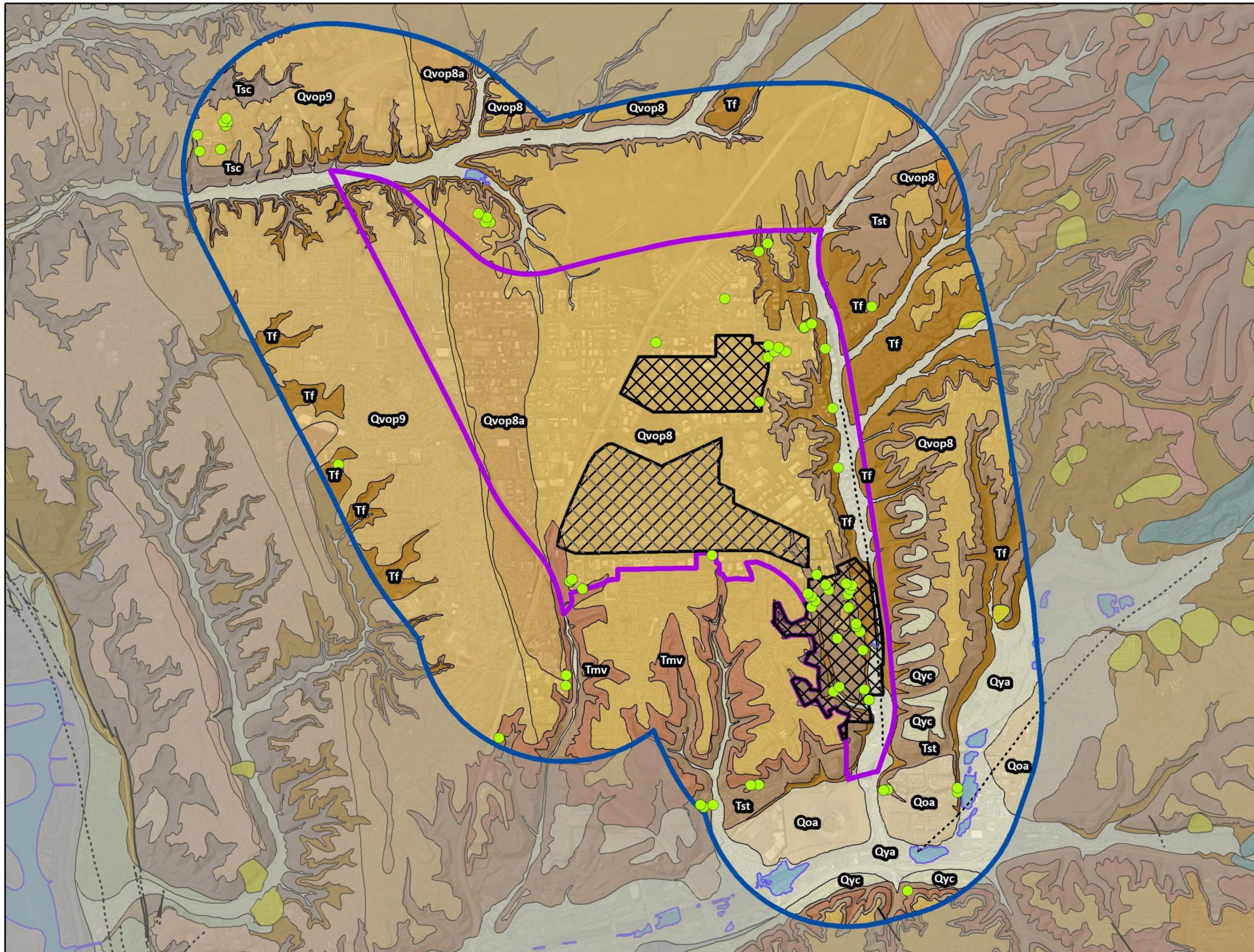


Figure 3. Geologic cross section of the west wall of Murphy Canyon between Friars Road in the south and SR-52 in the north, from Walsh et al. (1996). Geologic units are (from oldest to youngest): Scripps Formation (Esc); lower tongue (Ef-lt), conglomerate tongue (Ef-cg), and upper tongue (Ef-ut) of the Friars Formation; lower (Est-a) and upper (Est-b) members of the Stadium Conglomerate; Mission Valley Formation (Emv); and Lindavista Formation (Qlv). SDSNH fossil collection localities are indicated by black dots, and the numbers correspond to the localities listed in Appendix 1 and mapped in Appendix 2 (with the exception of University of California Museum of Paleontology locality V-6888).



Geologic Map Units

Holocene

af	artificial fill (unmapped)
Qya	young alluvial flood plain deposits
Qyc	young colluvial deposits
Qls	landslide deposits

Pleistocene

Qoa	old alluvial flood plain deposits
Qvop9a	very old paralic deposits, unit 9a
Qvop9	very old paralic deposits, unit 9
Qvop8a	very old paralic deposits, unit 8a
Qvop8	very old paralic deposits, unit 8
Qvop7	very old paralic deposits, unit 7

approximately equivalent to the Lindavista Formation

Pliocene-Pleistocene

Tsd	San Diego Formation

Eocene

Tmv	Mission Valley Formation
Tst	Stadium Conglomerate
Tf	Friars Formation
Tsc	Scripps Formation

Geologic Map Symbols

- contact, certain
- contact, approx. located
- fault, certain
- fault, inferred
- fault, concealed
- Kearny Mesa CPA
- other specific and master plan areas
- 1-mile radius buffer
- SDSNH fossil localities

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FIGURE 4

Overview Geologic Map
Kearny Mesa Community Plan Update
City of San Diego, San Diego County, California

0 1.8
scale in miles

N

Sources:
Geology from Kennedy and Tan, 2008;
Terrain Hillshade, ESRI et al., 2018;
Bing Maps Aerial, Microsoft et al., 2018

4.0 Results

4.1 Results of the Paleontological Records & Literature Searches

A records search of paleontological collections data at the SDNHM indicates there are 52 known fossil collection localities that lie within the boundaries of the Kearny Mesa Community Plan Area, and an additional 32 localities that lie within a 1-mile radius of the Project Area. These 84 localities are from the Pleistocene-age Lindavista Formation and the Eocene-age Mission Valley Formation, Stadium Conglomerate, Friars Formation, and Scripps Formation, and are described in greater detail below. A list of the fossil collection localities is provided in Appendix 1, and the localities are shown on the geologic map in Appendix 2.

In addition, a summary of the geology and paleontology for each geologic unit that occurs within the Project Area is provided below. A detailed map of the geologic units underlying the Project Area is presented in Appendix 2.

4.1.1 Artificial fill (af)

Description: Though not formally mapped by Kennedy and Tan (2008), previously developed portions of the Project Area (e.g., along existing roadways, underlying building footprints) are most likely underlain by significant volumes of documented and/or undocumented artificial fill. The Project-specific geotechnical report (The Bodhi Group, 2018) indicates that uncompacted artificial fill is located south of SR-52 between Convoy Street and Magnatron Boulevard (associated with the Miramar Landfill), and south and west of Murphy Canyon Road (associated with the abandoned Fenton Quarry). Artificial fill consists of previously disturbed deposits associated with human activities and is often composed of sedimentary materials mined in close vicinity to a project site (e.g., adjacent hillslopes), but artificial fill is also occasionally imported to a project site and may be from a distant location. Artificial fill is typically placed in order to change the topography of a location, such as during the creation of flat pads for new housing developments or to maintain level streets.

Paleontology: Because artificial fill has been previously disturbed and may have been imported to its current location, any fossils these deposits may contain have lost their original stratigraphic and geographic context, and are thus not considered to be scientifically significant.

4.1.2 Young alluvial flood plain deposits (Qya)

Description: Young alluvial deposits occur along the floors of modern drainages, including Murphy Canyon (within the eastern margin of the Project Area, along the west side of I-15), San Clemente Canyon (in the northwestern corner of the Project Area, at the I-805/SR-52 interchange), and along smaller drainages that feed into these major canyons and Mission Valley to the south. As described by Kennedy and Tan (2008), these deposits consist of poorly consolidated, poorly sorted sand, silt, and gravels in modern stream beds. Locally derived colluvium from adjacent hillslopes are likely also included in the young alluvial deposits mapped by Kennedy and Tan (2008). The bulk of these deposits are primarily Holocene in age (less than about 11,000 years old), but may contain deposits of late Pleistocene age at greater depth.

Many of the areas where Holocene alluvial deposits are mapped have been previously graded. A single exposure of young canyon colluvial slope wash was viewed in an open utility trench along Murphy

Canyon Road, where these deposits consist of loose clast-supported cobble conglomerate in coarse-grained sand.

Paleontology: No fossils are currently known from young alluvial deposits in the vicinity of the Project Area. The lack of recorded fossil collection localities is primarily due to the relatively young geologic age of these deposits (less than about ~11,000 years old).

4.1.3 Old alluvial flood plain deposits (Qoa)

Description: Older river terrace deposits are mapped above the active floodplain within Mission Valley, and only crop out in a small portion of the southernmost Project Area, along Friars Road west of I-15. Pleistocene-age alluvial flood plain deposits are found along the margins of many of the larger coastal and mountain valleys in San Diego County. These fluvial deposits generally occur at levels above the active stream channels and represent the sediments of ancient river courses. In the Project Area, the older terrace deposits accumulated along the margins of the ancient San Diego River. The exact age of these deposits is presently uncertain, and varies geographically, but they are clearly related to late Pleistocene (500,000 to 11,000 years old) climatic events, which caused dramatic changes in sea level.

The mapped exposure of old alluvial flood plain deposits in the Project Area was inaccessible due to the presence of fencing. These deposits were not observed elsewhere during the pedestrian survey. In San Diego County, Pleistocene alluvial flood plain deposits generally consist of moderately indurated pebble and cobble conglomerates, gravelly sandstones, silty sandstones, and claystones.

Paleontology: The SDNHM does not have any recorded fossil collection localities from Pleistocene alluvial flood plain deposits within a 1-mile radius of the Project Area. However, recent fossil discoveries of Pleistocene land mammals (e.g., rodents, rabbits, horse, camel, deer, and ground sloth) were made in old alluvial floodplain deposits exposed during development of the Quarry Falls (Civita) project site, located along the north side of Mission Valley, approximately two miles southwest of the Project Area.

Elsewhere in coastal San Diego County, Pleistocene terrestrial vertebrates have been recovered from similar old alluvial floodplain deposits, and include skeletal remains of reptiles and birds (e.g., pond turtle, lizard, passenger pigeon, and hawk), small bodied mammals (e.g., mole, shrew, mice, and squirrel), and large-bodied Pleistocene mammals (e.g., ground sloth, wolf, bear, tapir, horse, camel, deer, giant bison, mastodon, and mammoth) (Chandler, 1982; Deméré and Walsh, 1993; Deméré et al., 2013; Jefferson, 1991; Majors, 1993).

4.1.4 Lindavista Formation (Qvop8, Qvop8a, Qvop9)

Description: The Lindavista Formation is mapped across most of the Project Area, and forms the flat-lying mesa surface that has already been heavily developed. The Lindavista Formation consists of marine and/or non-marine terrace deposits of early to middle Pleistocene age (approximately 1.5 to 0.5 million years old) that accumulated in fluvial, aeolian, and shallow nearshore marine paleoenvironments (Kennedy, 1975). The deposits rest directly on an elevated marine abrasion platform (sea floor) that was eroded directly into older Eocene-age geologic units. More specifically, these deposits rest on the Tierra Santa Terrace platform (approximately 930,000 years old) and the Linda Vista Terrace platform (approximately 855,000 years old) of Kern and Rockwell (1992), and are broadly equivalent to Quaternary very old paralic deposits, units 8 and 9, respectively, of Kennedy and Tan (2008). The geologic unit mapped as Qvop8a by Kennedy and Tan (2008) represents back beach dune sands laid down in a shoreline setting on top of the Tierra Santa Terrace.

During the pedestrian survey, the Lindavista Formation was observed in road cuts along Kearny Villa Road and Aero Drive west and south of Montgomery-Gibbs Executive Airport, respectively, as well as in cliff exposures along Murphy Canyon where this geologic unit unconformably overlies Eocene strata. These deposits generally consist of reddish brown, very poorly sorted, moderately to well indurated, massive to bedded, angular to subrounded, fine- to coarse-grained cobbly sandstone with scattered boulders. In addition, the change in elevation marking the eastern extent of the younger Linda Vista Terrace platform (Qvop9; at approximately 390 feet above sea level) and the western edge of the older Tierra Santa Terrace platform (Qvop8), where it is overlain by back beach dune sands (at approximately 430 feet above sea level), was observed in the northwest portion of the Project Area along Convoy Court between Shawline Street and Ruffner Street.

Paleontology: Paleontological mitigation programs conducted at several previous construction project sites within the Project Area produced fossils from the Lindavista Formation. Specific earthwork activities that were successfully monitored for fossil remains include: mass grading for the Waxie Business Center project (north of Clairemont Mesa Boulevard and east of SR-163), trenching and excavation for underground utilities and a detention basin for the San Diego Spectrum project (along Ruffin Road, south of Clairemont Mesa Boulevard), trenching and excavation for basement footings for the San Diego County Medical Examiner and Forensics Center project (along Overland Avenue, north of Clairemont Mesa Boulevard), mass grading for the Sunrise Centrum Apartments project (southeast of the SR-163/Clairemont Mesa Boulevard interchange), mass grading for the Kaiser Central Hospital project (south of Clairemont Mesa Boulevard and east of Ruffin Road), and excavation for a parking garage at the Parkview at Aero Court project (just east of the SR-163/I-805 interchange).

In total, the SDNHM has 12 recorded fossil collection localities from the Lindavista Formation within a 1-mile radius of the Project Area, which produced trace fossils (e.g., burrows and pholad clam borings), fossilized impressions of vascular plants, internal and external molds or shells of marine invertebrates (e.g., snails, mussels, clams, and sand dollars), and an impression of a ray tooth plate (SDNHM unpublished paleontological collections data).

Fossil collection localities are typically rare within the Lindavista Formation, although exposures in the Mira Mesa and Tierrasanta areas of the City of San Diego are more likely to produce fossils. The fossils that have been collected from the formation include nearshore marine invertebrates such as clams, scallops, snails, and sand dollars (Kennedy, 1973), as well as the occasional remains of sharks and baleen whales (Deméré and Walsh, 1993).

4.1.5 Mission Valley Formation (Tmv)

Description: The Mission Valley Formation is exposed in the southern portion of the Project Area, in the vicinity of the I-805/SR-163 interchange, south of Aero Drive, and along Murphy Canyon just north of Friars Road, and appears to pinch out beneath the Lindavista Formation to the south of Balboa Avenue (see Figure 3). The Mission Valley Formation is a middle Eocene-age geologic unit that contains strata deposited in both marine and terrestrial paleoenvironments. Strata of the Mission Valley Formation have been dated to 42.83 million years using Ar-Ar radiometric dating methods, placing the formation within the middle Eocene Epoch (Walsh, 1996). In its type area along SR-163 on the south side of Mission Valley, deposits are typically very fine- to fine-grained marine sandstones, while in more eastern and southern exposures, fine- to medium-grained fluvial sandstones, as well as green and brown nonmarine siltstones and mudstones are common. The maximum thickness of the formation is 200 feet near its type location in Mission Valley, although it only reaches a thickness of 60 feet at Scripps Ranch and 45 feet in Tierrasanta (Deméré and Walsh, 1993).

Exposures of the Mission Valley Formation were difficult to access during the pedestrian survey, but strata were observed in an embankment behind a commercial development on the north side of Aero Drive, west of Ruffin Road. Here, the Mission Valley Formation was identified based on its stratigraphic position relative to the underlying cobble conglomerate of the Stadium Conglomerate, which overlies Friars Formation sandstone. The Mission Valley Formation in this area consists of light tan to light olive gray sandstones, and erodes into gentle slopes.

Paleontology: Paleontological mitigation programs conducted at several previous construction project sites within the Project Area produced fossils from the Mission Valley Formation. Specific earthwork activities that were successfully monitored for fossil remains include: mass grading for the Daley Stonecrest industrial park (south of Aero Drive in the eastern portion of the Project Area) and excavation for a parking garage at the Parkview at Aero Court project (just east of the SR-163/I-805 interchange). Fossils were also collected within the Project Area from an exposed cut slope located just south of the Aero Drive/Ruffin Road intersection.

In total, the SDNHM has 15 recorded fossil collection localities from the Mission Valley Formation within a 1-mile radius of the Project Area, which produced trace fossils (e.g., worm borings, sponge borings, shipworm borings, and burrows) and fossilized impressions or remains of plants (e.g., horsetails, almond, and other vascular plants), marine invertebrates (e.g., foraminifers, bryozoans, corals, snails, mussels, oysters, clams, tusk shells, barnacles, crabs, ostracods, pencil sea urchins, and heart urchins), marine vertebrates (e.g., sharks, skates, rays, and bony fish), and terrestrial vertebrates (e.g., turtles and insectivorous mammals). An additional fossil collection locality is from undifferentiated deposits of the Stadium Conglomerate and overlying Mission Valley Formation, and yielded trace fossils (e.g., sponge borings) and fossilized impressions or remains of plants (e.g., wood fragments of vascular plants) and marine invertebrates (e.g., snails, oysters, mussels, and clams) (SDNHM unpublished paleontological collections data).

The fluvial deposits of the Mission Valley Formation have yielded a diverse assemblage of terrestrial mammals, including opossums, insectivores, bats, rodents, primates, artiodactyls, and perissodactyls (Golz and Lillegraven, 1977; Walsh, 1996). Fossilized wood is also known from these deposits (SDNHM unpublished paleontological collections data). The marine deposits of the Mission Valley Formation have yielded a diverse fossil assemblage consisting of marine microfossils (e.g., foraminifers), invertebrates (e.g., clams, snails, crustaceans, sand dollars, sea urchins), and vertebrates (e.g., sharks, rays, bony fishes). Importantly, the Mission Valley Formation is one of only a few examples in North America where marine and terrestrial fossils of the same age can be directly correlated (Flynn, 1986; Golz and Lillegraven, 1977; Walsh, 1996).

4.1.6 Stadium Conglomerate (Tst)

Description: The Stadium Conglomerate (Kennedy and Moore, 1971) is middle Eocene in age (approximately 44 to 42 million years old) and contains a lower member and an upper member (Milow and Ennis, 1961; Walsh et al., 1996). The lower member is composed of light gray and pale greenish-gray, poorly sorted cobble conglomerate in a muddy to sandy matrix with lenses of greenish and bluish-gray siltstone and mudstone, while the upper member generally consists of reddish tan to brown, moderately-sorted to well-sorted cobble to boulder conglomerate with occasional lenses of reddish tan cross-bedded sandstone.

As discussed in Section 3.1, the stratigraphy and mapping of Eocene conglomeratic strata in the northern portion of the Project Area is complicated, and requires further study. Strata are correctly mapped by Kennedy and Tan (2008) as the Stadium Conglomerate to the south of Clairemont Mesa Boulevard, but strata further north may actually represent the conglomerate tongue of the Friars Formation on the basis of the older early Uintan age of the terrestrial mammal fauna recovered from conglomerate deposits in this area (discussed below in Section 4.1.7).

The most prominent exposure of the Stadium Conglomerate identified on the pedestrian survey was observed in an embankment behind a commercial development on the north side of Aero Drive, west of Ruffin Road. The Stadium Conglomerate in this area consisted of light yellowish gray, matrix-supported cobble conglomerate in a coarse-grained sandstone matrix. Here, the Stadium Conglomerate was overlain by sandstone deposits of the Mission Valley Formation and underlain by Friars Formation sandstone.

Paleontology: Paleontological mitigation programs conducted at several previous construction project sites within the Project Area produced fossils from the Stadium Conglomerate. Specific earthwork activities that were successfully monitored for fossil remains include: mass grading for the Daley Stonecrest industrial park (within the Stonecrest Specific Plan Area), mass grading for the Stonecrest Development project (within the Stonecrest Specific Plan Area), excavation of a pad for the Aero Drive Self Storage project (south and west of the Aero Drive/Ruffin Road intersection), and excavation for a parking garage at the Parkview at Aero Court project (just east of the SR-163/I-805 interchange).

In total, the SDNHM has 14 recorded fossil collection localities from the Stadium Conglomerate within a 1-mile radius of the Project Area. Six localities are from the lower member, seven are from the upper member, and one is from undifferentiated deposits of the Stadium Conglomerate. Taken as a whole, the localities produced trace fossils (e.g., burrows) and fossilized impressions or remains of terrestrial and freshwater invertebrates (e.g., land snails and freshwater mussels), marine invertebrates (e.g., foraminifers, snails, oysters, clams, and sea urchins), and terrestrial vertebrates (e.g., reptiles, marsupials, apatotheres, dermopterans, assorted insectivorous mammals, bats, primates, carnivorous mammals, rodents, oreodonts and other artiodactyls, and perissodactyls). An additional fossil collection locality is from undifferentiated deposits of the Stadium Conglomerate and overlying Mission Valley Formation, and yielded trace fossils (e.g., sponge borings) and fossilized impressions or remains of plants (e.g., wood fragments of vascular plants) and marine invertebrates (e.g., snails, oysters, mussels, and clams) (SDNHM unpublished paleontological collections data).

Both members of the Stadium Conglomerate have produced limited but significant assemblages of fossils from a number of localities in the metropolitan San Diego area. Collected fossils include marine foraminiferans and mollusks (Dusenbury, 1932; Givens and Kennedy, 1979; Steineck et al., 1972), and sparse but well-preserved remains of terrestrial mammals including opossums, insectivores, primates, rodents, carnivores, rhinoceros, and artiodactyls (SDNHM unpublished paleontological records; Walsh, 1996, 1997; Walsh et al., 1996).

4.1.7 Friars Formation (Tf)

Description: The middle Eocene-age (approximately 47 to 46 million years old) Friars Formation is a primarily terrestrial rock unit that consists mainly of light gray, medium-grained sandstones; greenish, reddish, and brown siltstones and mudstones; and common lenses of cobble conglomerate (Kennedy, 1975; Givens and Kennedy, 1979; Squires and Deméré, 1991). Walsh et al. (1996) divided the Friars into an informally named lower sandstone-mudstone tongue, a middle conglomerate tongue, and an upper sandstone-mudstone tongue. The lower tongue of the Friars Formation generally consists of light gray fine- to medium-grained sandstones with horizons of greenish to reddish siltstones and mudstones; the conglomerate tongue consists mainly of light rusty brown and light gray cobble and boulder conglomerate with common thin beds and rip-up clasts of multicolored siltstone and mudstone; and the upper tongue generally consists of light gray, fine- to medium-grained sandstones and reddish siltstones and mudstones. All three tongues are primarily fluvial in origin, with lagoonal and marine facies to the west (Givens and Kennedy 1979; Kennedy, 1975; Squires and Deméré, 1991; Walsh et al., 1996).

The Friars Formation crops out extensively along Murphy Canyon in the eastern portion of the Project Area, as well as in the northwest corner of the Project Area, where it is exposed along San Clemente Canyon. As depicted by Walsh et al. (1996), the upper tongue of the Friars Formation is primarily exposed along the upper margins of Murphy Canyon, while the conglomerate tongue of the Friars Formation may partially occur within conglomeratic strata north of Clairemont Mesa Boulevard referred to as the Stadium Conglomerate (see Section 3.1 and Section 4.1.6, above). The lower tongue underlies the conglomerate tongue in approximately the northern half of Murphy Canyon.

During the pedestrian survey, the Friars Formation was observed in cut slopes along Murphy Canyon Road and Aero Drive, in road cuts along I-15 and SR-52, and in an open utility trench along Murphy Canyon Road north of Aero Drive, where excavation activities for construction of the San Diego Gas & Electric (SDG&E) TL 663 Mission-Kearny Conversion/Reconductor project are being monitoring for paleontological resources. Outcrops consist of light yellowish gray, silty sandstone. While the conglomerate tongue of the Friars Formation was not documented during the pedestrian survey, it has been previously identified within the Project Area during paleontological mitigation of construction projects.

Paleontology: Paleontological mitigation programs conducted at a number of previous construction project sites within the Project Area produced fossils from the Friars Formation. Specific earthwork activities that were successfully monitored for fossil remains include: mass grading for the Waxie Business Center project (north of Clairemont Mesa Boulevard and east of SR-163), mass grading and slope excavations for the Kaiser Central Hospital project (south of Clairemont Mesa Boulevard and east of Ruffin Road), mass grading for the Murphy Canyon Gateway development (southwest of the I-15/Balboa Avenue interchange), and mass grading for the Stonecrest Square and the Stonecrest Village projects (both within the Stonecrest Specific Plan Area). Fossils were also collected within the Project Area from several sites not undergoing active development: a vertical exposure and a cut slope located northwest of the I-15/Friars Road interchange, a cut slope west of Murphy Canyon Road along the south side of Clairemont Mesa Boulevard, and a cut slope behind the City of San Diego Waste Management Department along Murphy Canyon Road south of Clairemont Mesa Boulevard.

In total, the SDNHM has 35 recorded fossil collection localities from the Friars Formation within a 1-mile radius of the Project Area. Of these localities, one was recovered from the lower tongue, four from the conglomerate tongue, seven from the upper tongue, and the remaining 23 were unassigned to a specific subunit. Taken as a whole, the localities produced trace fossils (e.g., coprolites) and fossilized impressions or remains of plants (e.g., silicified wood and leaf impressions of vascular plants, including ferns, waterlilies, willows, and horsetails), terrestrial invertebrates (e.g., land snails), marine invertebrates (e.g., snails and clams), and terrestrial vertebrates (e.g., amphibians, turtles, crocodiles, lizards, snakes, birds, and a mammalian assemblage of marsupials, apatotheres, dermopterans, insectivores, bats, primates, carnivorans, rodents, condylarths, oreodonts and other artiodactyls, rhinoceroses, and brontotheres) (SDNHM unpublished paleontological collections data).

The Friars Formation is rich in vertebrate fossils, especially terrestrial mammals (e.g., Colbert, 2006; Golz and Lillegraven, 1977; Stock, 1934; Tomiya, 2011, 2013; Walsh, 1996, 1997, 2010; Wilson, 1940a, 1940b). The composite fossil mammal assemblage from the Friars Formation, referred to as the Poway Fauna, consists of about 53 genera of fossil mammals containing at least 61 species (Novacek and Lillegraven, 1979; Walsh, 1991, 1996). Fossils from the Friars Formation are entirely early Uintan in age (Walsh, 1996, 2010). The Poway Fauna represents the largest and most diverse middle Eocene mammalian assemblage known from California and serves as the regional standard for making informed comparisons with time equivalent assemblages from other regions in North America. Well-preserved remains of marine microfossils and macroinvertebrates, as well as impressions of fossil leaves, have also been reported from western exposures of the Friars Formation (Givens and Kennedy, 1979; Squires and Deméré, 1991).

4.1.8 Scripps Formation (Tsc)

Description: The Scripps Formation is composed of interbedded layers of claystones, siltstones, sandstones, and cobble conglomerate (Kennedy and Moore, 1971; Kennedy, 1975). These sediments were deposited in a marine continental shelf environment during the early middle Eocene, approximately 47 million years ago. The Scripps Formation underlies and intertongues with the Friars Formation.

While the Scripps Formation is only exposed at the surface in the far northwest corner of the Project Area along the lower slopes of San Clemente Canyon (Kennedy and Tan, 2008), strata referable to this geologic unit have been encountered during paleontological mitigation of construction activities (i.e., trenching for utilities and mass grading for building pads) within the Project Area, specifically in the northern portion of Murphy Canyon where the Scripps Formation underlies and intertongues with the Friars Formation (Walsh et al., 1996).

The Scripps Formation was observed during the pedestrian survey in an open utility trench along Murphy Canyon Road north of Aero Drive, where excavation activities for construction of the SDG&E TL 663 Mission-Kearny Conversion/Reconductor project are being monitoring for paleontological resources. Here the formation consists of yellowish tan, well-sorted, well-indurated, massive, fine-grained micaceous marine sandstones interfingering with light gray fluvial sandstones of the Friars Formation.

Paleontology: Paleontological mitigation work at a previous construction project site within the Project Area produced fossils from the Scripps Formation. The fossil remains were recovered during monitoring of excavations for a retaining wall for the Computer Media Site project (located along Murphy Canyon Road, northwest of the I-15/Balboa Avenue interchange). In addition, a new fossil collection locality from deposits tentatively assigned to the Scripps Formation was discovered in May

2018 during paleontological monitoring of the SDG&E TL 663 Mission-Kearny Conversion/Reconductor project. The fossils were recovered from trenching spoils, and consist of marine mollusks preserved as internal molds with white shell fragments.

In total, the SDNHM has 7 recorded fossil collection localities from the Scripps Formation within a 1-mile radius of the Project Area (in addition to the above mentioned newly discovered locality), which produced trace fossils (e.g., burrows and sponge borings) and fossilized impressions or remains of plants (e.g., green algae, and leaves and woody debris of vascular plants), marine invertebrates (e.g., coral, bryozoans, snails, oysters, mussels, clams, nautiloids, and tusk shells), and marine vertebrates (e.g., sharks, rays, bony fish, and crocodiles) (SDNHM unpublished paleontological collections data).

The Scripps Formation is known to preserve rich and diverse fossil assemblages of marine organisms almost wherever it is exposed. Significant paleontological resources that have been recovered from the Scripps Formation include fossils of benthic and neritic marine organisms such as clams, snails, crabs, sea urchins, sharks, rays, and bony fishes (Givens and Kennedy, 1976, 1979), as well as significant remains of crocodilians, turtles, and land mammals (Golz and Lillegraven, 1977; Walsh, 1991). In addition, well-preserved remains of fossil wood and leaves have been found (Deméré and Walsh, 1993).

4.2 Results of the Pedestrian Survey

As observed during the pedestrian survey, the Project Area occupies the top of an approximately flat-lying mesa that is dissected by Murphy Canyon and its tributary drainages to the east, San Clemente Canyon and its tributaries in the northwest, and tributaries to Mission Valley in the south. The broad, flat mesa surface has been heavily developed over the years, and continues to be developed today. It is bordered by I-805, SR-52, and I-15 to the west, north, and east, respectively, while SR-163 transects the Project Area from southwest to northeast, and SR-274 crosses the Project Area from east to west. The pedestrian survey primarily focused on portions of the Project Area that were expected to contain vertical exposures of native geologic units, including natural slopes along Murphy and San Clemente canyons and their tributary drainages, manmade cut slopes related to previous development along Murphy Canyon, and road cuts for major roadways. The vast majority of the Project Area is covered by existing development, vegetation, or topsoil.

The geology of the Project Area as mapped by Kennedy and Tan (2008) and presented in the Project-specific geotechnical report (The Bodhi Group, 2018) was generally confirmed during the pedestrian survey. A sequence of Eocene-age geologic rock units was observed that includes (in order from stratigraphically lowest to highest) yellowish tan sandstones of the Scripps Formation (Figure 5), light yellowish gray sandstones of the Friars Formation (Figures 5–7), cobble conglomerates of the Stadium Conglomerate (Figure 7), and light tan sandstones of the Mission Valley Formation (Figures 7–8). Most of these exposures could not be accessed to obtain detailed lithologic descriptions due to their proximity to high-speed roadways or the presence of manmade barriers (e.g., fencing and retaining walls), and were primarily identified based on their general appearance in outcrop and stratigraphic and topographic position. Capping many of the exposures were the distinctive reddish brown, resistant, cobbly sandstone deposits of the Lindavista Formation (Figures 6, 8–10). In addition, an approximately 40 foot change in elevation was identified between the younger Linda Vista Terrace platform (Qvop9; at approximately 390 feet above sea level) and the western edge of the older Tierra Santa Terrace platform (Qvop8) where it is overlain by back beach dune sands (at approximately 430 feet above sea level)

(Figure 11). The Lindavista Formation and underlying Eocene rocks were observed to be heavily dissected by modern erosion along Murphy Canyon in the eastern portion of the Project Area, and to a lesser extent along San Clemente Canyon in the northwest. Finally, Pleistocene and Holocene alluvial flood plain deposits were not observed during the pedestrian survey due to the limited access to mapped exposures and the presence of vegetation obscuring low-lying areas.

Figure 5. Interfingering deposits of the Friars Formation (light gray) and Scripps Formation (yellowish tan) as exposed during paleontological mitigation of trenching along Murphy Canyon Road. Artificial fill underlying the existing pavement is visible in the uppermost ~1 foot of the trench. Fossilized internal molds of marine mollusks were recently collected in this area from a yellowish gray, fine-grained micaceous sandstone of the Scripps Formation. Photo taken by Bradford O. Riney, 8 May 2018.

Figure 6. Contact between cavernously weathering light yellowish gray sandstone of the Friars Formation (Tf) and more resistant reddish brown cobbly sandstone of the overlying Lindavista Formation (Qvop8) as exposed along the north side of SR-52, just west of I-15. Loose cobbles cover the slopes below the Friars Formation, but it is unclear if the clasts are derived from the Lindavista Formation or conglomeratic strata underlying the Friars Formation sandstone. Photo taken by Bradford O. Riney, 8 May 2018.

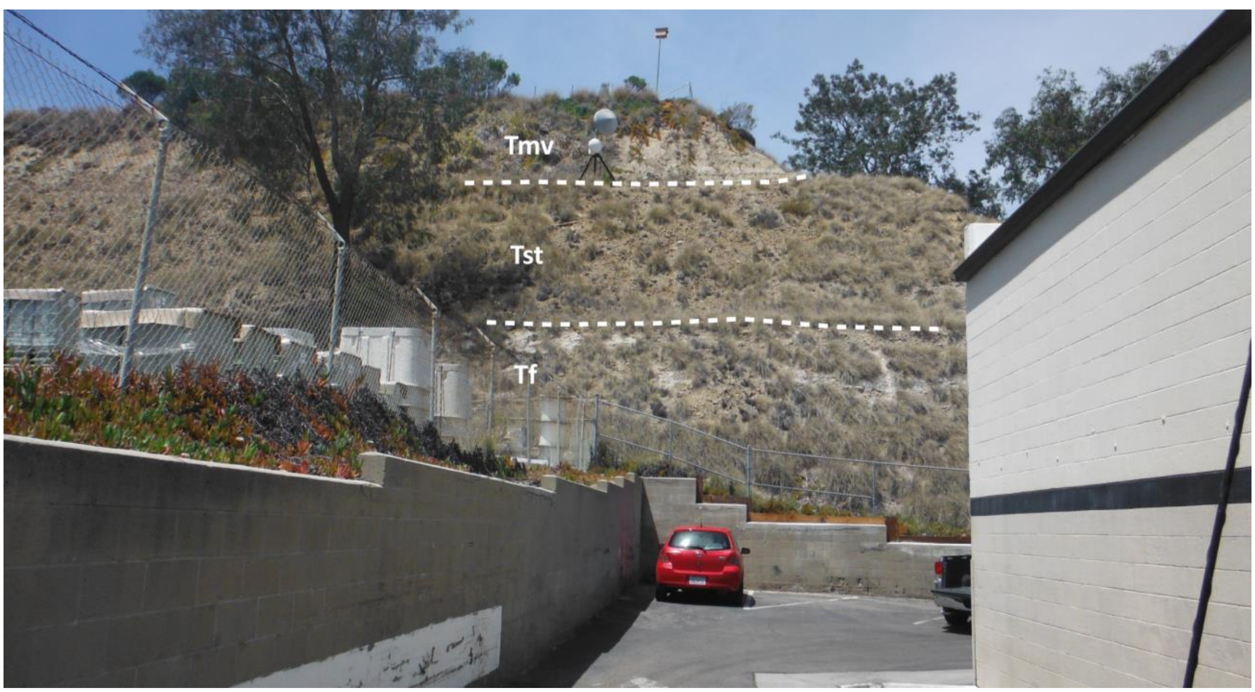

Figure 7. Moderately overgrown cut slope exposed behind 4665 Aero Drive, looking north. Here, light gray sandstones of the Friars Formation (Tf) are overlain by cobble conglomerates of the Stadium Conglomerate (Tst), which are overlain by marine sandstones of the Mission Valley Formation (Tmv). Photo taken by Bradford O. Riney, 8 May 2018.

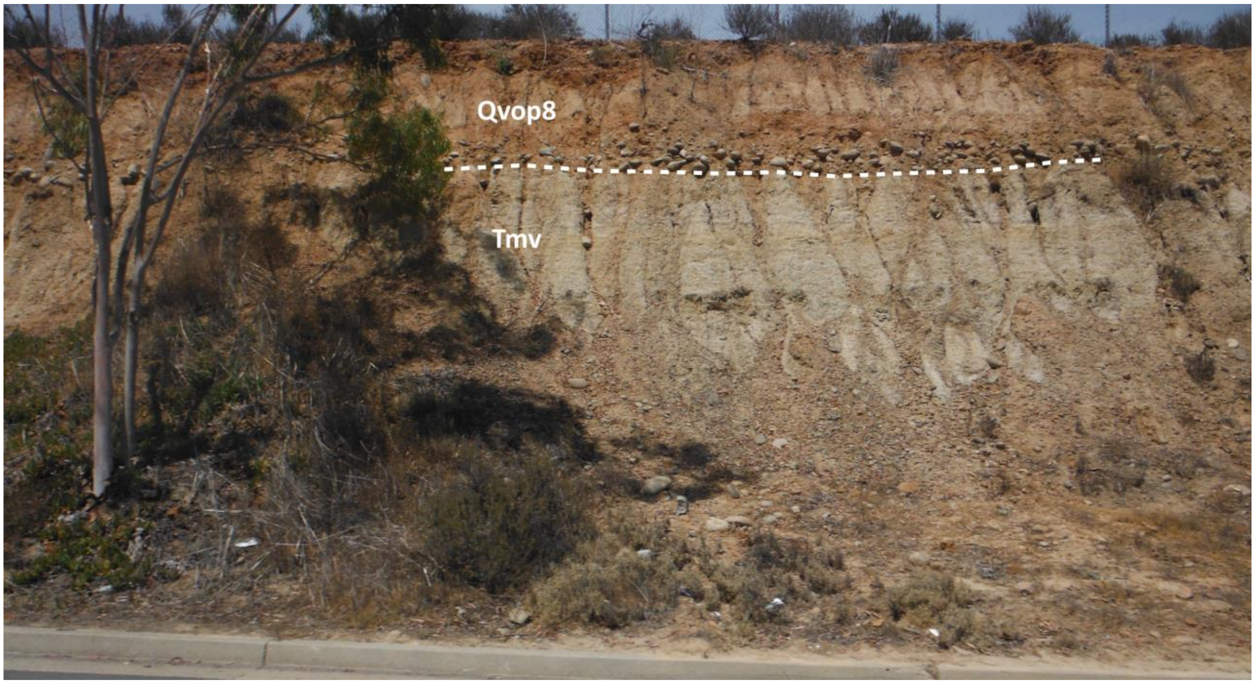

Figure 8. Outcrop of light gray sandstones of the Mission Valley Formation (Tmv) overlain by cobbly reddish brown sandstones of the Lindavista Formation (Qvop8) exposed along Aero Drive. View looking north toward Montgomery-Gibbs Executive Airport. Photo taken by Bradford O. Riney, 8 May 2018.

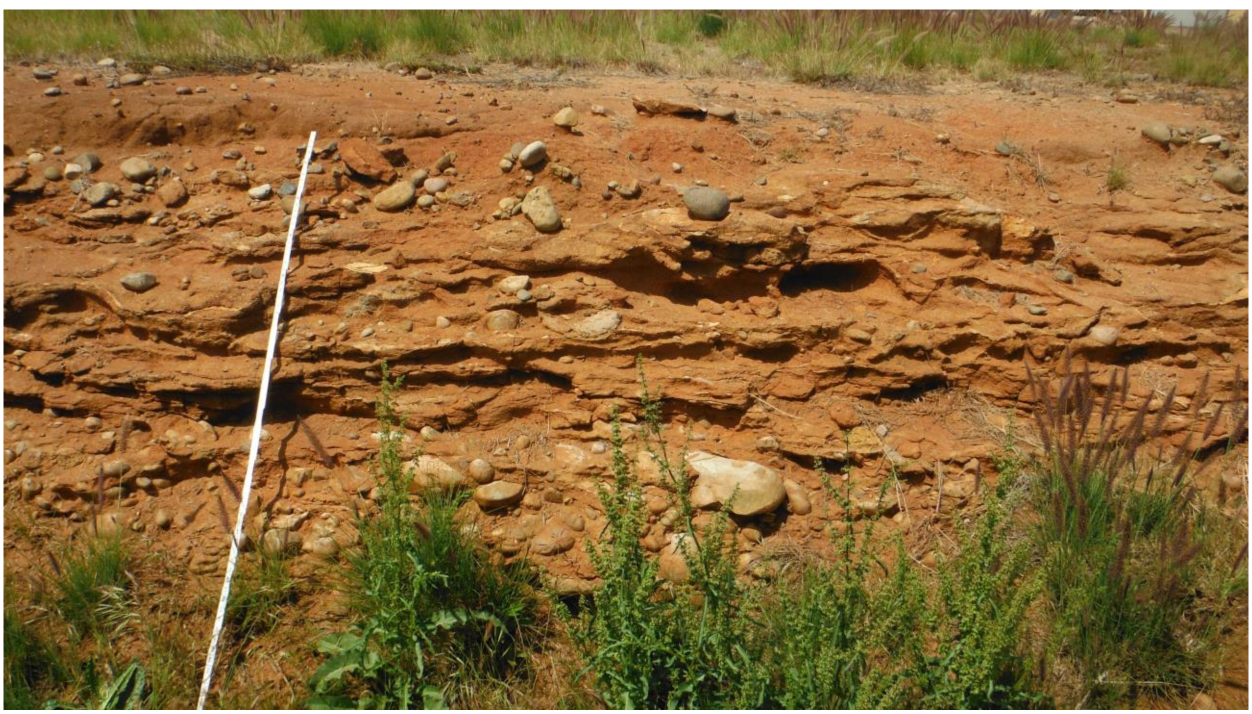

Figure 9. Outcrop of reddish brown, very poorly sorted, moderately to well indurated, massive to bedded, cobbly sandstone with scattered boulders of the Lindavista Formation. This exposure is located in a drainage along Kearny Villa Road, west of Montgomery-Gibbs Executive Airport. Photo taken by Bradford O. Riney, 8 May 2018.

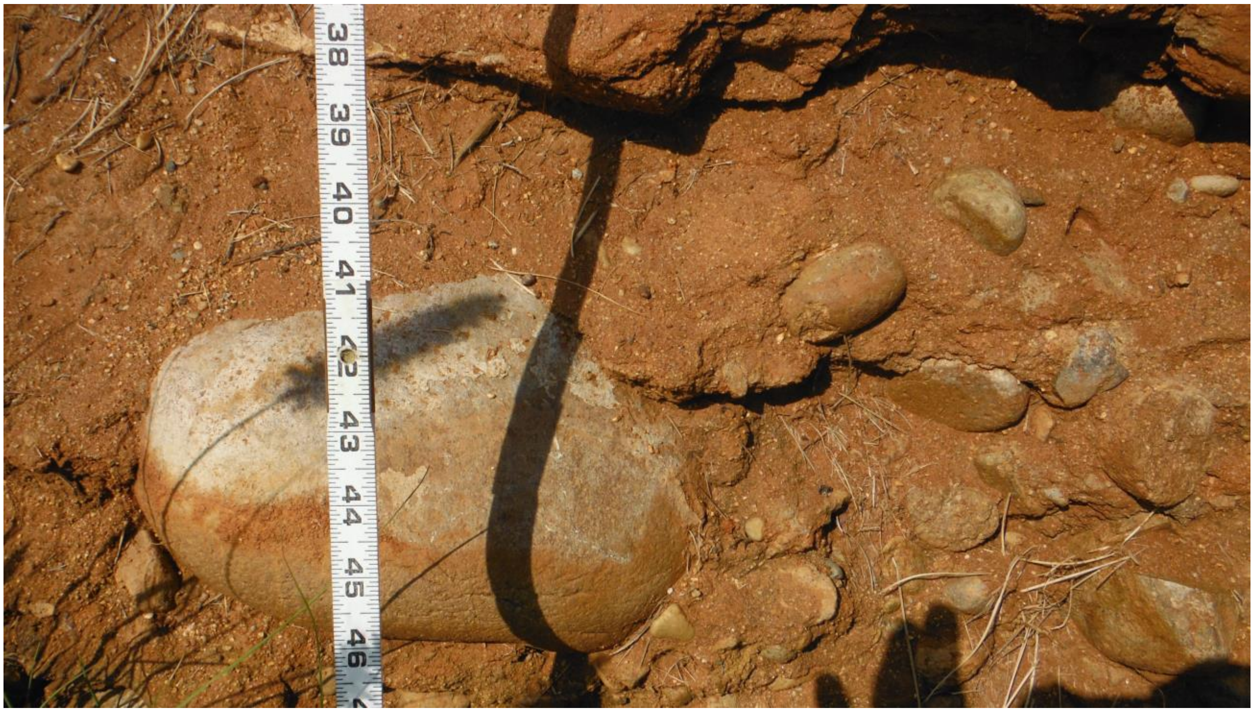

Figure 10. Close up of the outcrop pictured in Figure 5, showing poorly sorted nature of the Lindavista Formation, which contains fine- to coarse-grained sandstone, pebbles, cobbles, and scattered boulders. Photo taken by Bradford O. Riney, 8 May 2018.

Figure 11. View looking east along Convoy Court between Shawline Street and Ruffner Street. In the foreground is the lower elevation Linda Vista Terrace (Qvop9; at approximately 390 feet above sea level), with the western edge of the older Tierra Santa Terrace (Qvop8) visible in the distance, where it is overlain by back beach dune sands (at approximately 430 feet above sea level). Photo taken by Bradford O. Riney, 8 May 2018.

4.3 Results of Paleontological Resource Potential Analysis

The paleontological resource potential of each geologic unit present within the Project Area is assessed below, summarized in Table 1, and depicted in the paleontological potential maps in Appendix 3.

Table 1. Summary of paleontological potential ratings of geologic units within the Project Area.

Geologic Unit	Age	Paleontological Potential
artificial fill (af)	Recent	None
young alluvial flood plain deposits (Qya)	Holocene	Low
old alluvial flood plain deposits (Qoa)	Pleistocene	Moderate
Lindavista Formation (Qvop8, Qvop8a, Qvop9)	Pleistocene	Moderate
Mission Valley Formation (Tmv)	Eocene	High
Stadium Conglomerate (Tst)	Eocene	High
Friars Formation (Tf)	Eocene	High
Scripps Formation (Tsc)	Eocene	High

4.3.1 Artificial fill

Artificial fill is unmapped within the Project Area, but will likely be encountered in most previously developed areas. It was observed to underlie the road surfaces traversed during the pedestrian survey. The project-specific geotechnical report (Bodhi Group, 2018) specifically notes the presence of uncompacted artificial fill south of SR-52 between Convoy Street and Magnatron Boulevard (associated with the Miramar Landfill), and south and west of Murphy Canyon Road (associated with the abandoned Fenton Quarry).

Artificial fill has no paleontological potential because of the disturbed nature of these sediments and any contained fossils.

4.3.2 Young alluvial flood plain deposits

Holocene alluvial flood plain deposits lie along active drainages within the Project Area (e.g., Murphy Canyon and tributaries in the east, San Clemente Canyon and tributaries in the north, and tributaries of the San Diego River in the south). The largest volume of these deposits underlies I-15 in Murphy Canyon.

Holocene alluvial flood plain deposits within the Project Area are assigned a low paleontological potential based on the high energy depositional environment of these strata and their relatively young geologic age (generally less than 11,000 years old). Within the Project Area, however, these surficial deposits appear to overlie Eocene strata with high paleontological potential ratings, which could be impacted where the depth of excavation activities exceeds the thickness of the mapped surficial sediments.

4.3.3 Old alluvial flood plain deposits

A small outcrop of Pleistocene alluvial flood plain deposits is mapped within the Project Area just north of Friars Road. The occurrence of these deposits could not be confirmed during the pedestrian survey owing to the presence of fencing.

Due to the sparse but scientifically significant fossils discovered in Pleistocene alluvial flood plain deposits elsewhere in southwestern San Diego County, these deposits are assigned a moderate paleontological potential.

4.3.4 Lindavista Formation

The Lindavista Formation occurs extensively throughout the Project Area, and is the primary geologic unit underlying areas that have already been developed. These deposits cap most of the natural and manmade outcrops observed on the pedestrian survey.

While fossils are sparsely distributed in the Lindavista Formation, the frequency of recorded fossil collection localities within the Project Area supports a moderate paleontological potential rating.

4.3.5 Mission Valley Formation

The Mission Valley Formation underlies the Lindavista Formation in the southern portion of the Project Area, primarily in the vicinity of Aero Drive (as documented during the pedestrian survey) and southward, as well as near the I-805/SR-163 interchange. As noted in the project-specific geotechnical report (Bodhi Group, 2018), the Mission Valley Formation appears to pinch out below the Lindavista Formation in the central and northern portions of the Project Area.

The presence of SDSNH fossil collection localities within the Project Area, as well as the diversity of fossils recovered from the Mission Valley Formation elsewhere in southwestern San Diego County, demonstrate the high paleontological potential of this geologic unit.

4.3.6 Stadium Conglomerate

The Stadium Conglomerate is exposed in the eastern portion of the Project Area to the south of Clairemont Mesa Boulevard, where it overlies the Friars Formation and underlies the Mission Valley Formation, and was identified during the pedestrian survey in manmade cut slopes adjacent to previous developments. As discussed in Sections 3.1 and 4.1.6, conglomeratic strata mapped by Kennedy and Tan (2008) as the Stadium Conglomerate northward of Clairemont Mesa Boulevard may instead represent the conglomerate tongue of the Friars Formation. While the fine-grained lithologies that typically yield fossil remains were not specifically observed during the pedestrian survey, previous paleontological mitigation of earthwork within the Project Area resulted in the recovery of fossils from rip-up clasts within the Stadium Conglomerate, indicating that these lithologies are present in the Project Area.

The Stadium Conglomerate is assigned a high paleontological resource potential based on the recovery of scientifically significant fossils, particularly land mammals, in southwestern San Diego County and the presence of documented fossil localities from the Stadium Conglomerate within the Project Area.

4.3.7 Friars Formation

The Friars Formation is extensively exposed along the west wall of Murphy Canyon, as well as in the northwestern corner of the Project Area along the south wall of San Clemente Canyon. According to the project-specific geotechnical report (Bodhi Group, 2018), and as observed on the pedestrian survey, the Friars Formation consists primarily of sandstone in the Project Area. Previous paleontological mitigation of earthwork within the Project Area has also confirmed the presence of conglomeratic beds within the Friars Formation, which has the potential to contain fossil remains in claystone and siltstone rip-up clasts.

The Friars Formation is assigned a high paleontological resource potential based on the diverse and scientifically important terrestrial mammalian fossils recovered from this geologic unit in southwestern San Diego County. The presence of abundant fossil localities from the Friars Formation within the Project Area further supports the high paleontological potential of these deposits.

4.3.8 Scripps Formation

While the Scripps Formation is only mapped at the surface in the northwestern corner of the Project Area, the formation was observed to interfinger with deposits of the Friars Formation in trench exposures for underground utilities along Murphy Canyon Road, and therefore could be present in the subsurface in areas where the Friars Formation is mapped.

The Scripps Formation is assigned a high paleontological potential due to the co-occurrence of marine invertebrate fossils and terrestrial vertebrates in these deposits, as well as the presence of fossil localities within the Project Area.

4.4 Results of Paleontological Impact Analysis

4.4.1 Areas Potentially Containing Paleontological Resources

Nearly the entire Project Area is underlain by paleontologically sensitive strata, with the exception of the floors of modern drainages (e.g., Murphy Canyon, San Clemente Canyon, tributaries, and minor unmapped streambeds). However, unmapped artificial fill is likely present in most areas that have been previously developed, and may vary from shallow veneers of fill underlying road surfaces to extensive volumes of fill that were emplaced to create level building pads along steep slopes (e.g., developments along Murphy Canyon). Therefore, the history of development within the Project Area also partially determines whether paleontological resources are present in a given location.

As outlined in Section 4.3 and Table 1, earthwork activities will only impact paleontological resources if they disturb paleontologically sensitive strata (i.e., deposits of high or moderate paleontological potential). Thus, paleontological resources may be impacted by earthwork that will disturb deposits of Pleistocene alluvial flood plain deposits, the Lindavista Formation, the Mission Valley Formation, the Stadium Conglomerate, the Friars Formation, or the Scripps Formation. Earthwork within artificial fill or Holocene alluvial flood plain deposits will not impact paleontological resources.

4.4.2 Future Development with Potential to Impact Paleontological Resources

Types of deep earthwork that may occur during future construction activities within the Project Area that can be monitored for paleontological resources include, but are not limited to, mass grading for the creation of level building pads or roadways, trenching for underground electrical lines or other utilities, large-diameter drilling (greater than about 18 inches in diameter) for utility poles or foundation supports, and other miscellaneous excavations (e.g., footing excavations, slope excavations for road widening).

Mass grading has the potential to create temporary exposures (e.g., cut slopes and/or graded surfaces) of geologic units containing fossil remains and traces, which, during paleontological monitoring, can be recovered as they are unearthed. Trenching typically creates elongate vertical exposures of sedimentary strata, and spoils derived from trenching can be successfully monitored for unearthed paleontological resources. Likewise, drilling operations that utilize a helical auger with a diameter greater than about 18 inches (e.g., for electrical service poles, equipment foundations) typically will bring up spoils of intact blocks of sedimentary rocks that may contain unbroken fossil remains, and thus monitoring of such activities can lead to the discovery and salvage of significant fossils.

5.0 Recommended Mitigation Strategies

As discussed above, paleontologically sensitive strata are expected to be impacted by future development within the Kearny Mesa Community Plan Area. Therefore, paleontological mitigation is recommended for those future construction projects within the Project Area that will impact the specific paleontologically sensitive geologic units described in Section 4.3. Paleontological mitigation may be accomplished through avoidance or paleontological monitoring, as summarized below.

5.1 General Strategies for Paleontological Mitigation

5.1.1 Avoidance/Establishment of an ESA

Avoidance of project impacts to paleontological resources can, in some instances, be achieved by project redesign so that paleontological resources are left completely outside of the project's impact area (e.g., moving project components away from the resource, or developing a construction approach that does not involve excavations into potentially fossil-bearing strata).

Establishment of environmentally sensitive areas (ESAs) may be employed in conjunction with avoidance in order to protect resources within or immediately adjacent to certain parts of a project while concurrently allowing the project to proceed. Generally, ESAs involve some combination of avoidance, exclusionary fencing (or other physical protective barrier), and administrative protection measures as an alternative to excavation.

5.1.2 Paleontological Monitoring

Development and implementation of mitigation measures centered on paleontological monitoring can minimize impacts through recovery and conservation of fossils unearthed during construction, and is the most commonly employed paleontological mitigation strategy. Mitigation measures typically address pre-construction, during-construction, and post-construction activities. Pre-construction measures generally address professional qualifications, fossil repository selection, meeting attendance, and worker environmental awareness training (if applicable). During-construction measures generally address construction monitoring, data recovery, safety considerations, and fossil discovery and recovery. Post-construction measures generally address fossil preparation, fossil curation, fossil storage, and final reporting.

5.2 Recommendations for the Project Area

Within the Project Area, paleontological monitoring is recommended as the most reasonable paleontological mitigation strategy to reduce the impacts to a level below significant. As discussed above, such monitoring should be restricted to areas and projects where earthwork is expected to directly impact geologic units with high or moderate paleontological potential.

Recommended mitigation measures for implementing a paleontological monitoring program are outlined below.

1. **Pre-Construction (personnel and repository):** Prior to the commencement of construction, a qualified Project Paleontologist shall be retained to oversee the mitigation program (a Project Paleontologist is a person with a Ph.D. or Master's Degree in Paleontology or related field, and who has knowledge of San Diego County paleontology and documented experience in

professional paleontological procedures and techniques). In addition, a regional fossil repository shall be designated to receive any discovered fossils (because the Project Area lies within San Diego County, the recommended repository is the San Diego Natural History Museum).

2. **Pre-Construction (meeting):** The Project Paleontologist should attend the pre-construction meeting to consult with the grading and excavation contractors concerning excavation schedules, paleontological field techniques, and safety issues.
3. **During-Construction (monitoring):** A paleontological monitor (working under the direction of the Project Paleontologist) should be on-site on a full-time basis during all original cutting of previously undisturbed deposits of Pleistocene alluvial flood plain deposits (moderate paleontological potential), the Lindavista Formation (moderate paleontological potential), the Mission Valley Formation (high paleontological potential), the Stadium Conglomerate (high paleontological potential), the Friars Formation (high paleontological potential), and the Scripps Formation (high paleontological potential) to inspect temporary exposures for unearthed fossils.
4. **During-Construction (fossil recovery):** If fossils are discovered, the Project Paleontologist (or paleontological monitor) should recover them. In most cases, fossil salvage can be completed in a short period of time. However, some fossil specimens (e.g., a bone bed or a complete large mammal skeleton) may require an extended salvage period. In these instances, the Project Paleontologist (or paleontological monitor) has the authority to temporarily direct, divert, or halt grading to allow recovery of fossil remains in a timely manner.
5. **Post-Construction (treatment):** Fossil remains collected during monitoring and salvage should be cleaned, repaired, sorted, and cataloged as part of the mitigation program.
6. **Post-Construction (curation):** Prepared fossils, along with copies of all pertinent field notes, photos, and maps, should be deposited (as a donation) in the designated fossil repository. Donation of the fossils shall be accompanied by financial support for initial specimen storage.
7. **Post-Construction (final report):** A final summary paleontological mitigation report should be completed that outlines the results of the mitigation program. This report should include discussions of the methods used, stratigraphic section(s) exposed, fossils collected, inventory lists of catalogued fossils, and significance of recovered fossils.

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Appendices

Appendix 1: List of SDSNH Fossil Localities within a 1-mile Radius of the Project Area

Appendix 2: Geologic Map of the Project Area

Appendix 3: Paleontological Potential Map of the Project Area

Appendix 1: List of Localities within a 1-mile Radius of the Project Area
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Locality Number	Locality Name	Location	Elevation (feet)	Geologic Unit	Era	Period	Epoch
3826	Waxie Business Park	City of San Diego, San Diego County, CA	412	Lindavista Formation	Cenozoic	Quaternary	Pleistocene
3827	Waxie Business Park	City of San Diego, San Diego County, CA	409	Lindavista Formation	Cenozoic	Quaternary	Pleistocene
3878	Fiesta Island Replacement Project (FIRP)	City of San Diego, San Diego County, CA	396	Lindavista Formation	Cenozoic	Quaternary	Pleistocene
3880	Fiesta Island Replacement Project (FIRP)	City of San Diego, San Diego County, CA	398	Lindavista Formation	Cenozoic	Quaternary	Pleistocene
4430	San Diego Spectrum	City of San Diego, San Diego County, CA	413	Lindavista Formation	Cenozoic	Quaternary	early Pleistocene
4431	San Diego Spectrum	City of San Diego, San Diego County, CA	0	Lindavista Formation	Cenozoic	Quaternary	early Pleistocene
6115	S.D. County Medical Examiner & Forensics Cent	City of San Diego, San Diego County, CA	415	Lindavista Formation	Cenozoic	Quaternary	Pleistocene
6118	Parkview at Aero Court-pholad bed	City of San Diego, San Diego County, CA	389	Lindavista Formation	Cenozoic	Quaternary	Pleistocene
6698	Sunroad Centrum Apartments, Phase 2 & 3	City of San Diego, San Diego County, CA	399	Lindavista Formation	Cenozoic	Quaternary	early Pleistocene
6787	Kaiser Central Hospital	City of San Diego, San Diego County, CA	412	Lindavista Formation	Cenozoic	Quaternary	Pleistocene
4348	San Diego Spectrum	City of San Diego, San Diego County, CA	412	Lindavista Formation, Tierra Santa Terrace	Cenozoic	Quaternary	early Pleistocene
4349	San Diego Spectrum	City of San Diego, San Diego County, CA	408	Lindavista Formation, Tierra Santa Terrace	Cenozoic	Quaternary	early Pleistocene
5898	Children's Hospital Parking Garage	City of San Diego, San Diego County, CA	361	Mission Valley Formation, Reworked into Lindavista Fm	Cenozoic	Paleogene	Eocene
5901	Children's Hospital Parking Garage	City of San Diego, San Diego County, CA	359	Mission Valley Formation, Reworked into Lindavista Fm	Cenozoic	Paleogene	middle Eocene
3275	Murphy Canyon	City of San Diego, San Diego County, CA	360	Mission Valley Formation	Cenozoic	Paleogene	Eocene
3417	I-8 and I-15	City of San Diego, San Diego County, CA	250	Mission Valley Formation	Cenozoic	Paleogene	middle Eocene
3529	Daley StoneCrest Site 11	City of San Diego, San Diego County, CA	367	Mission Valley Formation	Cenozoic	Paleogene	Eocene
3531	Daley StoneCrest Site 14	City of San Diego, San Diego County, CA	372	Mission Valley Formation	Cenozoic	Paleogene	Eocene
3532	Daley StoneCrest Site 15	City of San Diego, San Diego County, CA	373	Mission Valley Formation	Cenozoic	Paleogene	middle Eocene
3533	Daley StoneCrest Site 17	City of San Diego, San Diego County, CA	380	Mission Valley Formation	Cenozoic	Paleogene	middle Eocene
3535	Daley StoneCrest Site 23	City of San Diego, San Diego County, CA	371	Mission Valley Formation	Cenozoic	Paleogene	middle Eocene
3537	Daley StoneCrest Site 28	City of San Diego, San Diego County, CA	369	Mission Valley Formation	Cenozoic	Paleogene	middle Eocene
4331	I-15 & 40th Street	City of San Diego, San Diego County, CA	225	Mission Valley Formation	Cenozoic	Paleogene	middle Eocene
5423	Serra Mesa Library	City of San Diego, San Diego County, CA	392	Mission Valley Formation	Cenozoic	Paleogene	middle Eocene
6010	Cabrillo Medical Center	City of San Diego, San Diego County, CA	340	Mission Valley Formation	Cenozoic	Paleogene	middle Eocene
6112	Parkview at Aero Court-Tmv southern fauna	City of San Diego, San Diego County, CA	379	Mission Valley Formation	Cenozoic	Paleogene	middle Eocene
6113	Parkview at Aero Court-Tmv northern fauna	City of San Diego, San Diego County, CA	377	Mission Valley Formation	Cenozoic	Paleogene	middle Eocene
6111	Parkview at Aero Court-undif Tst/Tmv fauna	City of San Diego, San Diego County, CA	375	Stadium Conglomerate/Mission Valley Formation	Cenozoic	Paleogene	middle Eocene
6110	Parkview at Aero Court-Stadium fauna	City of San Diego, San Diego County, CA	375	Stadium Conglomerate	Cenozoic	Paleogene	middle Eocene
3526	Daley-StoneCrest	City of San Diego, San Diego County, CA	349	Stadium Conglomerate, upper member	Cenozoic	Paleogene	middle Eocene
3527	Daley-StoneCrest	City of San Diego, San Diego County, CA	340	Stadium Conglomerate, upper member	Cenozoic	Paleogene	middle Eocene
3528	Daley StoneCrest	City of San Diego, San Diego County, CA	340	Stadium Conglomerate, upper member	Cenozoic	Paleogene	middle Eocene
3530	Daley StoneCrest Site 13	City of San Diego, San Diego County, CA	347	Stadium Conglomerate, upper member	Cenozoic	Paleogene	middle Eocene
3534	Daley StoneCrest Site 22	City of San Diego, San Diego County, CA	341	Stadium Conglomerate, upper member	Cenozoic	Paleogene	middle Eocene
3536	Daley StoneCrest Site 27	City of San Diego, San Diego County, CA	325	Stadium Conglomerate, upper member	Cenozoic	Paleogene	middle Eocene

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Locality Number	Locality Name	Location	Elevation (feet)	Geologic Unit	Era	Period	Epoch
3538	Daley StoneCrest Site 29	City of San Diego, San Diego County, CA	340	Stadium Conglomerate, upper member	Cenozoic	Paleogene	middle Eocene
3731	H.G. Fenton Quarry	City of San Diego, San Diego County, CA	200	Stadium Conglomerate, lower member	Cenozoic	Paleogene	middle Eocene
3852	Stonecrest Square site 12	City of San Diego, San Diego County, CA	255	Stadium Conglomerate, lower member	Cenozoic	Paleogene	middle Eocene
4943	Mission City North Site 3	City of San Diego, San Diego County, CA	200	Stadium Conglomerate, lower member	Cenozoic	Paleogene	middle Eocene
4945	Mission City North Site 3-E	City of San Diego, San Diego County, CA	200	Stadium Conglomerate, lower member	Cenozoic	Paleogene	middle Eocene
4954	Mission City North Site 1A+1B	City of San Diego, San Diego County, CA	193	Stadium Conglomerate, lower member	Cenozoic	Paleogene	middle Eocene
7357	Aero Drive Self Storage	City of San Diego, San Diego County, CA	308	Stadium Conglomerate, lower member	Cenozoic	Paleogene	middle Eocene
3145	Murphy Canyon	City of San Diego, San Diego County, CA	120	Friars Formation	Cenozoic	Paleogene	middle Eocene
3343	Hooberman Site	City of San Diego, San Diego County, CA	200	Friars Formation	Cenozoic	Paleogene	middle Eocene
3488	Unocal Cut Slope	City of San Diego, San Diego County, CA	100	Friars Formation	Cenozoic	Paleogene	middle Eocene
3649	San Diego Mission 1	City of San Diego, San Diego County, CA	90	Friars Formation	Cenozoic	Paleogene	middle Eocene
3669	San Diego Mission 2	City of San Diego, San Diego County, CA	9	Friars Formation	Cenozoic	Paleogene	middle Eocene
3781	Stonecrest Square site 1	City of San Diego, San Diego County, CA	243	Friars Formation	Cenozoic	Paleogene	middle Eocene
3784	Stonecrest Square site 4	City of San Diego, San Diego County, CA	217	Friars Formation	Cenozoic	Paleogene	middle Eocene
3785	Stonecrest Square site 5	City of San Diego, San Diego County, CA	220	Friars Formation	Cenozoic	Paleogene	middle Eocene
3786	Stonecrest Square site 6	City of San Diego, San Diego County, CA	240	Friars Formation	Cenozoic	Paleogene	middle Eocene
3787	Stonecrest Square site 7	City of San Diego, San Diego County, CA	190	Friars Formation	Cenozoic	Paleogene	middle Eocene
3788	Stonecrest Square site 8	City of San Diego, San Diego County, CA	170	Friars Formation	Cenozoic	Paleogene	middle Eocene
3789	Stonecrest Square site 9	City of San Diego, San Diego County, CA	230	Friars Formation	Cenozoic	Paleogene	middle Eocene
3790	Stonecrest Square site 10	City of San Diego, San Diego County, CA	234	Friars Formation	Cenozoic	Paleogene	middle Eocene
3831	Mission Terrace	City of San Diego, San Diego County, CA	89	Friars Formation	Cenozoic	Paleogene	middle Eocene
3832	Mission Terrace	City of San Diego, San Diego County, CA	93	Friars Formation	Cenozoic	Paleogene	middle Eocene
3833	Mission Terrace	City of San Diego, San Diego County, CA	77	Friars Formation	Cenozoic	Paleogene	middle Eocene
3851	Stonecrest Square site 11	City of San Diego, San Diego County, CA	170	Friars Formation	Cenozoic	Paleogene	middle Eocene
4018	Fiesta Island Replacement Project - Phase 2	City of San Diego, San Diego County, CA	342	Friars Formation	Cenozoic	Paleogene	middle Eocene
4343	Stonecrest Village, Phase II	City of San Diego, San Diego County, CA	200	Friars Formation	Cenozoic	Paleogene	middle Eocene
4344	Stonecrest Village, Phase 2	City of San Diego, San Diego County, CA	150	Friars Formation	Cenozoic	Paleogene	middle Eocene
4944	Mission City North Site 4	City of San Diego, San Diego County, CA	114	Friars Formation	Cenozoic	Paleogene	middle Eocene
6182	University City Village Apartments, Phase C	City of San Diego, San Diego County, CA	363	Friars Formation	Cenozoic	Paleogene	middle Eocene
6183	University City Village Apartments, Phase E	City of San Diego, San Diego County, CA	342	Friars Formation	Cenozoic	Paleogene	middle Eocene
3777	Clairemont Mesa Blvd. & Murphy Canyon Road	City of San Diego, San Diego County, CA	340	Friars Formation, upper tongue	Cenozoic	Paleogene	middle Eocene
3825	Waxie Business Park	City of San Diego, San Diego County, CA	385	Friars Formation, upper tongue	Cenozoic	Paleogene	middle Eocene
3883	Fiesta Island Replacement Project (FIRP)	City of San Diego, San Diego County, CA	382	Friars Formation, upper tongue	Cenozoic	Paleogene	middle Eocene
6783	Kaiser Central Hospital	City of San Diego, San Diego County, CA	375	Friars Formation, upper tongue	Cenozoic	Paleogene	middle Eocene
6784	Kaiser Central Hospital	City of San Diego, San Diego County, CA	376	Friars Formation, upper tongue	Cenozoic	Paleogene	middle Eocene

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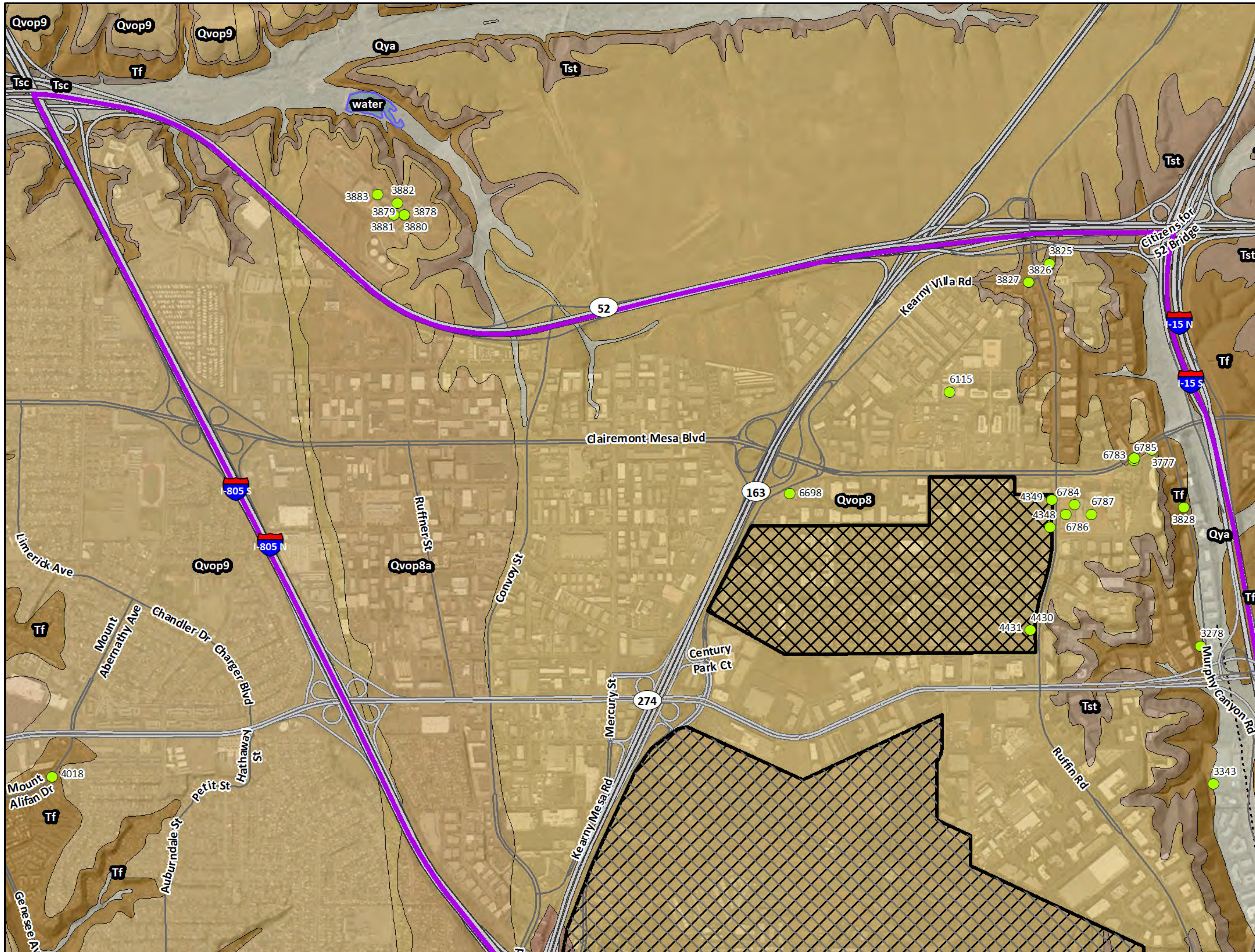
Locality Number	Locality Name	Location	Elevation (feet)	Geologic Unit	Era	Period	Epoch
6785	Kaiser Central Hospital	City of San Diego, San Diego County, CA	387	Friars Formation, upper tongue	Cenozoic	Paleogene	middle Eocene
6786	Kaiser Central Hospital	City of San Diego, San Diego County, CA	393	Friars Formation, upper tongue	Cenozoic	Paleogene	middle Eocene
3730	Clairemont Mesa Boulevard	City of San Diego, San Diego County, CA	340	Friars Formation, conglomerate tongue	Cenozoic	Paleogene	middle Eocene
3881	Fiesta Island Replacement Project (FIRP)	City of San Diego, San Diego County, CA	382	Friars Formation, conglomerate tongue	Cenozoic	Paleogene	middle Eocene
3882	Fiesta Island Replacement Project (FIRP)	City of San Diego, San Diego County, CA	393	Friars Formation, conglomerate tongue	Cenozoic	Paleogene	middle Eocene
3879	Fiesta Island Replacement Project (FIRP)	City of San Diego, San Diego County, CA	396	Friars Formation, conglomerate tongue(?)	Cenozoic	Paleogene	middle Eocene
3828	4950 Murphy Canyon Road	City of San Diego, San Diego County, CA	240	Friars Formation, lower tongue	Cenozoic	Paleogene	middle Eocene
3278	Computer Media Site, Murphy Canyon	City of San Diego, San Diego County, CA	236	Scripps Formation	Cenozoic	Paleogene	middle Eocene
6330	University City Village, Phase Y, Building 11	City of San Diego, San Diego County, CA	328	Scripps Formation	Cenozoic	Paleogene	middle Eocene
6331	University City Village, Y Storm drain trench	City of San Diego, San Diego County, CA	322	Scripps Formation	Cenozoic	Paleogene	Eocene
7205	La Jolla Del Rey, Phase 2	City of San Diego, San Diego County, CA	365	Scripps Formation	Cenozoic	Paleogene	middle Eocene
7206	La Jolla Del Rey, Phase 2	City of San Diego, San Diego County, CA	365	Scripps Formation	Cenozoic	Paleogene	middle Eocene
7207	La Jolla Del Rey, Phase 2	City of San Diego, San Diego County, CA	365	Scripps Formation	Cenozoic	Paleogene	middle Eocene
7208	La Jolla Del Rey, Phase 2	City of San Diego, San Diego County, CA	365	Scripps Formation	Cenozoic	Paleogene	middle Eocene



Geologic Map Units

Holocene

- af — artificial fill (unmapped)
- Qya — young alluvial flood plain deposits
- Qyc — young colluvial deposits
- Qls — landslide deposits

Pleistocene

- Qoa — old alluvial flood plain deposits
- Qvop9a — very old paralic deposits, unit 9a
- Qvop9 — very old paralic deposits, unit 9
- Qvop8a — very old paralic deposits, unit 8a
- Qvop8 — very old paralic deposits, unit 8
- Qvop7 — very old paralic deposits, unit 7

(Qvop9a–Qvop7: approximately equivalent to the Lindavista Formation)

Pliocene-Pleistocene

- Tsd — San Diego Formation

Eocene

- Tmv — Mission Valley Formation
- Tst — Stadium Conglomerate
- Tf — Friars Formation
- Tsc — Scripps Formation

Geologic Map Symbols

- contact, certain
- contact, approx. located
- fault, certain
- fault, inferred
- fault, concealed
- Kearny Mesa CPA
- other specific and master plan areas
- SDSNH fossil localities

PALEOSERVICES
SAN DIEGO NATURAL HISTORY MUSEUM

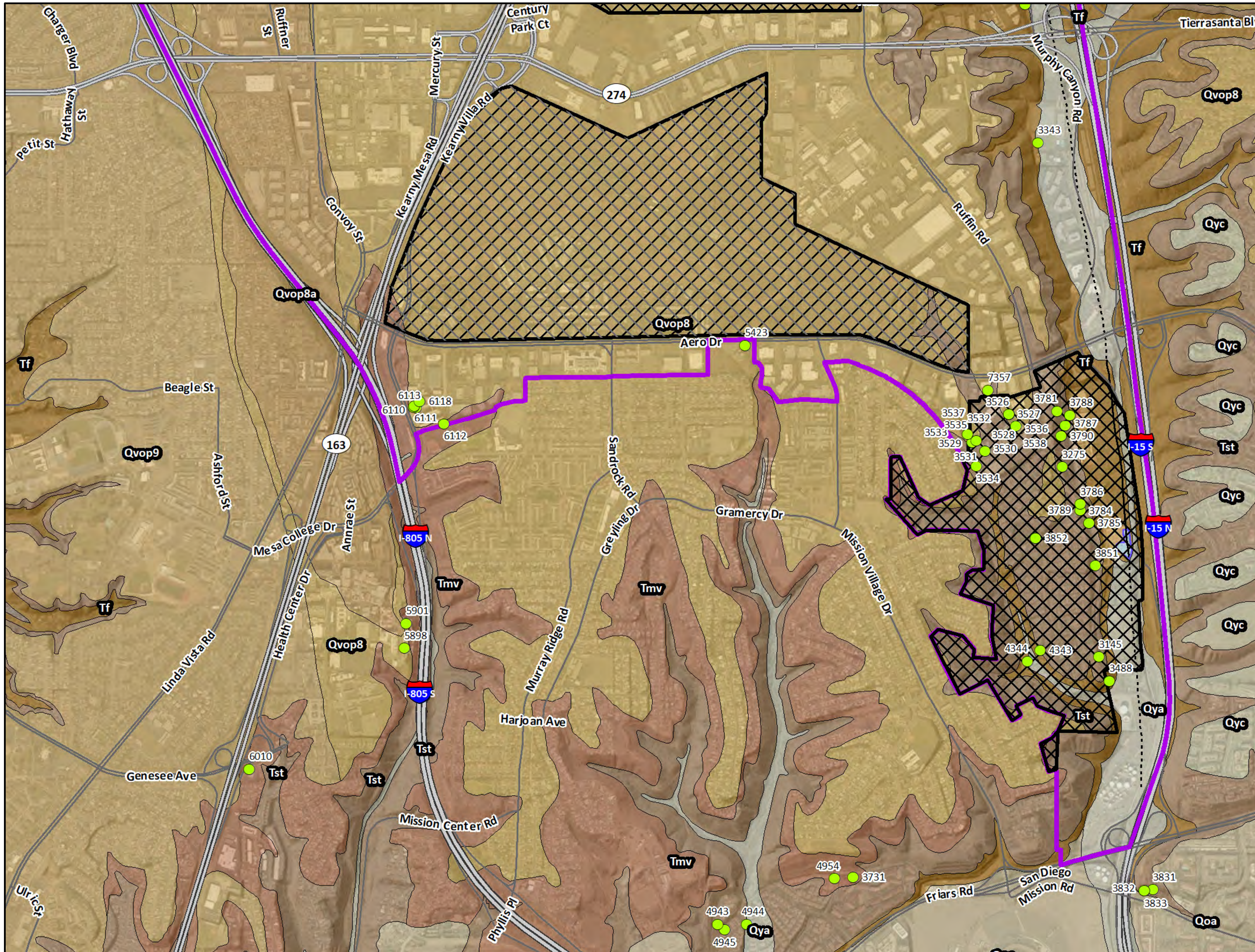
APPENDIX
2

Geologic Map: North
Kearny Mesa Community Plan Update
City of San Diego, San Diego County, California

0 — 0.6
scale in miles

N

Sources:
Geology from Kennedy and Tan, 2008;
USA Major Roads and
Terrain Hillshade, ESRI et al., 2018;
Bing Maps Aerial, Microsoft et al., 2018



Geologic Map Units

Holocene

af	artificial fill (unmapped)
Qya	young alluvial flood plain deposits
Qyc	young colluvial deposits
Qls	landslide deposits

Pleistocene

Qoa	old alluvial flood plain deposits
Qvop9a	very old paralic deposits, unit 9a
Qvop9	very old paralic deposits, unit 9
Qvop8a	very old paralic deposits, unit 8a
Qvop8	very old paralic deposits, unit 8
Qvop7	very old paralic deposits, unit 7

(Qvop9a–Qvop7: approximately equivalent to the Lindavista Formation)

Pliocene-Pleistocene

Tsd	San Diego Formation

Eocene

Tmv	Mission Valley Formation
Tst	Stadium Conglomerate
Tf	Friars Formation
Tsc	Scripps Formation

Geologic Map Symbols

- contact, certain
- contact, approx. located
- fault, certain
- fault, inferred
- fault, concealed
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- SDSNH fossil localities

PaleoServices
San Diego Natural History Museum

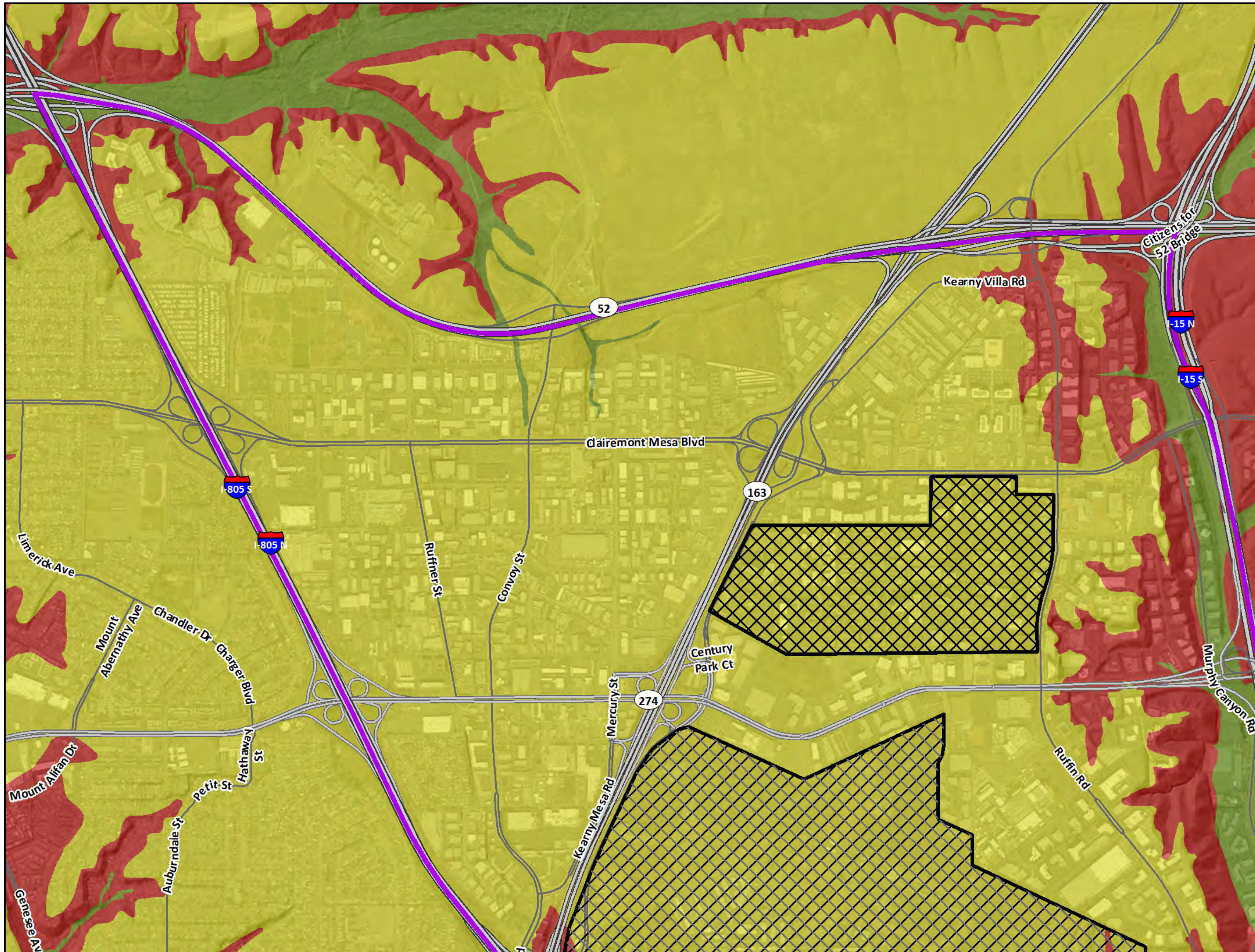
APPENDIX 2

Geologic Map: South
Kearny Mesa Community Plan Update
City of San Diego, San Diego County, California

0 0.6
scale in miles

N

Sources:
Geology from Kennedy and Tan, 2008;
USA Major Roads and Terrain Hillshade, ESRI et al., 2018;
Bing Maps Aerial, Microsoft et al., 2018



Paleontological Potential Rating

- High potential
- Moderate potential
- Low potential
- No potential (unmapped)

- Kearny Mesa Community Plan Area
- other specific and master plan areas

PALEOSERVICES
SAN DIEGO NATURAL HISTORY MUSEUM

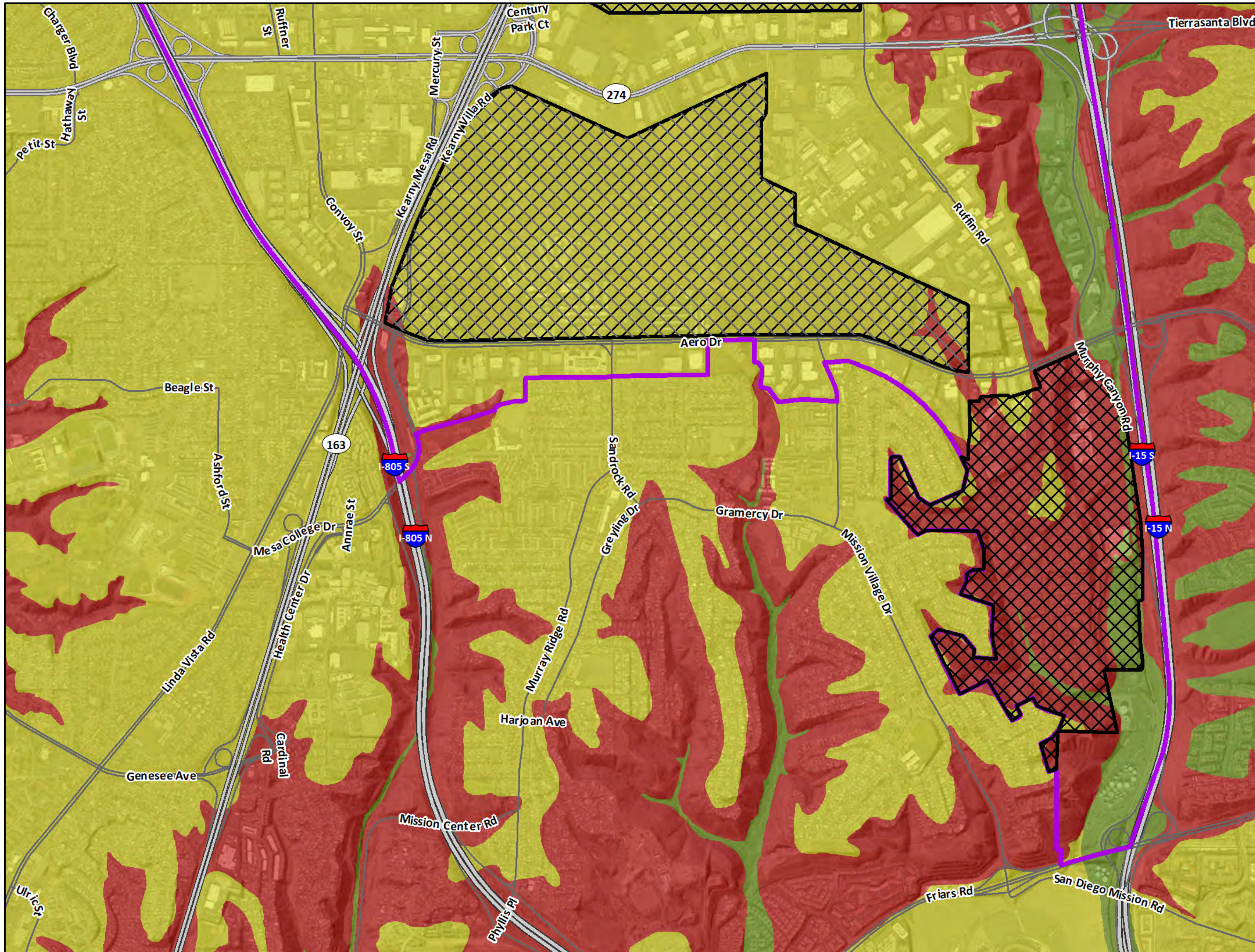
APPENDIX
3

Paleontological Potential Map: North
Kearny Mesa Community Plan Update
City of San Diego, San Diego County, California

0 0.6
scale in miles

N

Sources:
Geology from Kennedy and Tan, 2008;
USA Major Roads and
Terrain Hillshade, ESRI et al., 2018;
Bing Maps Aerial, Microsoft et al., 2018



Paleontological Potential Rating

- High potential
- Moderate potential
- Low potential
- No potential (unmapped)

- Kearny Mesa Community Plan Area
- other specific and master plan areas

PALEOSERVICES
SAN DIEGO NATURAL HISTORY MUSEUM

APPENDIX 3

Paleontological Potential Map: South
Kearny Mesa Community Plan Update
City of San Diego, San Diego County, California

0 0.6
scale in miles

N

Sources:
Geology from Kennedy and Tan, 2008;
USA Major Roads and
Terrain Hillshade, ESRI et al., 2018;
Bing Maps Aerial, Microsoft et al., 2018