GEOARCHAEOLOGICAL ASSESSMENT

CITY OF SAN DIEGO SEWER GROUP 827
CITY OF SAN DIEGO
SAN DIEGO COUNTY, CALIFORNIA

Prepared for:

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LSA Project No. SGC1501

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Updated Sites: None
Key Words: City of San Diego Sewer Group 827, Mission Bay Golf Course, geoarchaeological testing report, La Jolla 7.5-minute quadrangle, CA-SDI-5017

LSA

June 2015

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ABSTRACT

Geoarchaeological investigations were conducted to determine if buried cultural deposits of the La Rinconada de Jamo Site (CA-SDI-5017) or any other archaeological sites are present within the project area. Core drilling occurred on May 26, 2015. Analysis of the soil cores was conducted June 1, 2015. No archaeological resources were discovered during coring within the project area. Based on the absence of any archaeological resources within the project area to a depth of 28 feet, the proposed project should not affect Site CA-SDI-5017 or any other archaeological sites. Archaeological monitoring is recommended during the excavation of the northern and central access pits. All field notes, photographs, and other project-related materials are available at the Carlsbad office of LSA Associates, Inc. (LSA). Many portions of this report utilize data and research conducted by LSA and their subconsultant Statistical Research, Inc. (SRI) during analysis of the proposed improvements to the Mission Bay Golf Course (Homburg, et al. 2013).

INTRODUCTION

The City of San Diego plans to install a new 24-inch diameter sewer line 24 feet beneath the existing Mission Bay Golf Course. The project includes the excavation of three bore access pits to facilitate trench-less installation (micro tunneling) of the new sewer line.

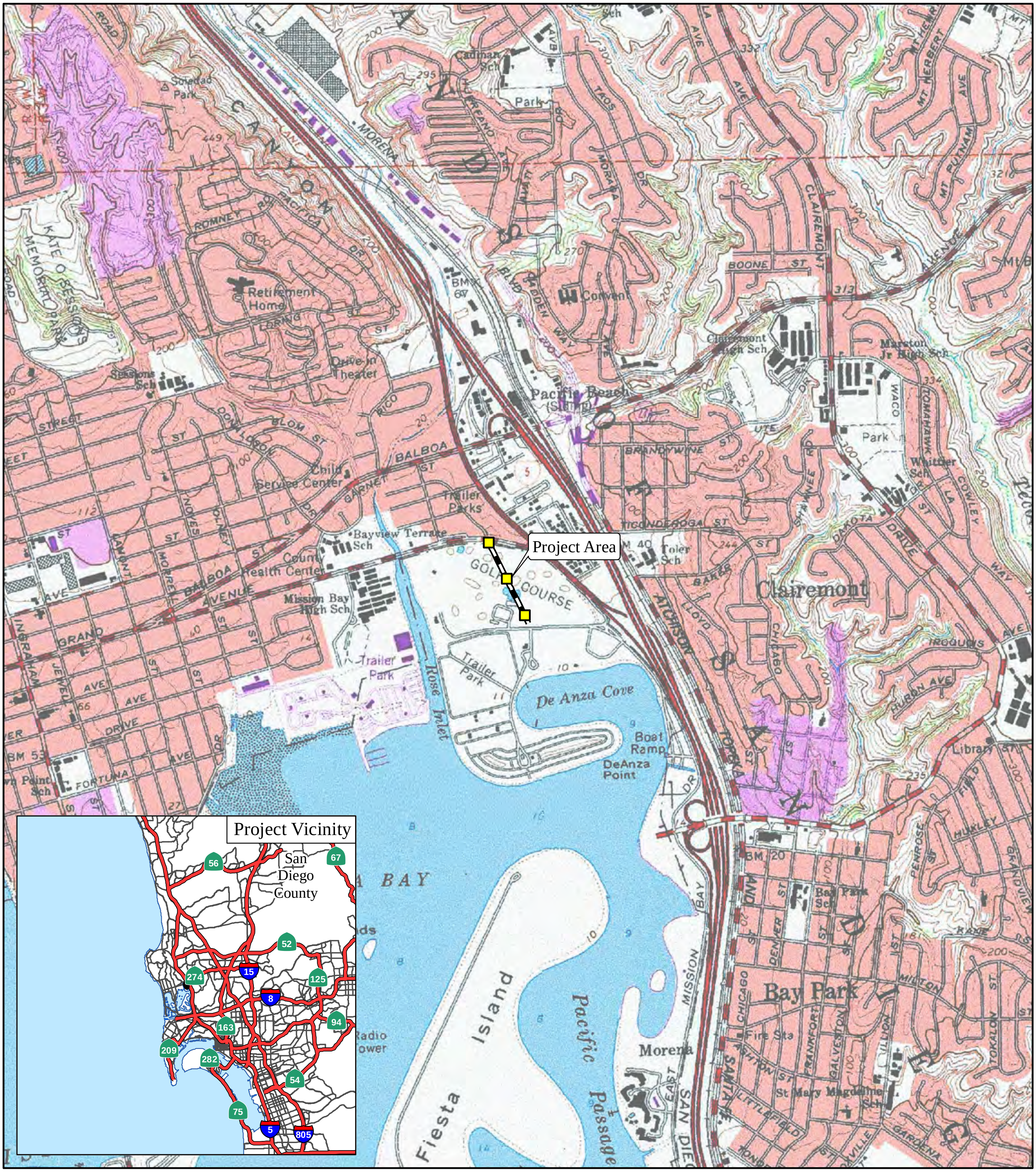
Project

LSA is tasked to assess the City of San Diego Sewer Group 824 Project for the presence of archaeological resources. In order to accomplish this task, six sediment cores were collected at intervals in along the proposed path of the sewer line avoiding the putting greens and other active golf course facilities. Samples were collected using a hydraulic drill rig that pushed a narrow tube into the ground and collected sediment individual samples that were up to 4 feet long. Ground disturbance was limited to the 1⅛ inch diameter of the sample tube. All core sample locations were backfilled with bentonite at the conclusion of the sampling. The project area is located on the northeast side of Mission Bay in the City of San Diego, in the communities of Pacific Beach and Mission Bay Park (Figure 1).

LSA completed all items per the City's Historical and Paleontological Resources Guidelines, and Section 01560 – Environmental Protection of the Contract Documents. The Project Archaeologist assigned to this project will fulfill the professional qualifications required by the City. All work was be conducted within City-owned land in accordance with California Environmental Quality Act (CEQA) guidelines and the City of San Diego Land Development Code, Historical Resources Guidelines (2001). The City will serve as the Lead Agency for CEQA compliance for the project. The project will be submitted to Development Services Department (DSD) for CEQA and permit review.

PERSONNEL

The testing program was completed by LSA cultural resources staff who meets the State and local requirement qualifications (Appendix A).



L S A

LEGEND

Access Pit (not to scale)

Proposed Sewer Alignment

N

0 1000 2000

FEET

SOURCE: USGS 7.5' Quad. (La Jolla, 1975)

FIGURE 1

Georchaeological Assessment

City of San Diego Sewer Group 827 Project

Project Location

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Mr. Roderic McLean was the Project Manager. Mr. McLean is a member of the Register of Professional Archaeologists (RPA), is a San Diego County certified consultant, and meets the Secretary of Interior standards for a qualified archaeologist. Mr. McLean has an M.A. in Anthropology from California State University Fullerton and has over 30 years of experience in local archaeology.

Brooks Smith assisted with the preparation of this report and examined the core samples that were collected. Mr. Smith listed on the City of San Diego approved consultants list and has over 23 years' experience in southern California geology and paleontology. Mr. Smith has a B.S. degree in Earth Science from the University of California, Santa Cruz.

Jacqueline Hall, B.A. monitored and mapped the core sampling.

All excavation and soil core analysis was observed by a Native American monitor from LJS Cultural Monitoring, LLC.

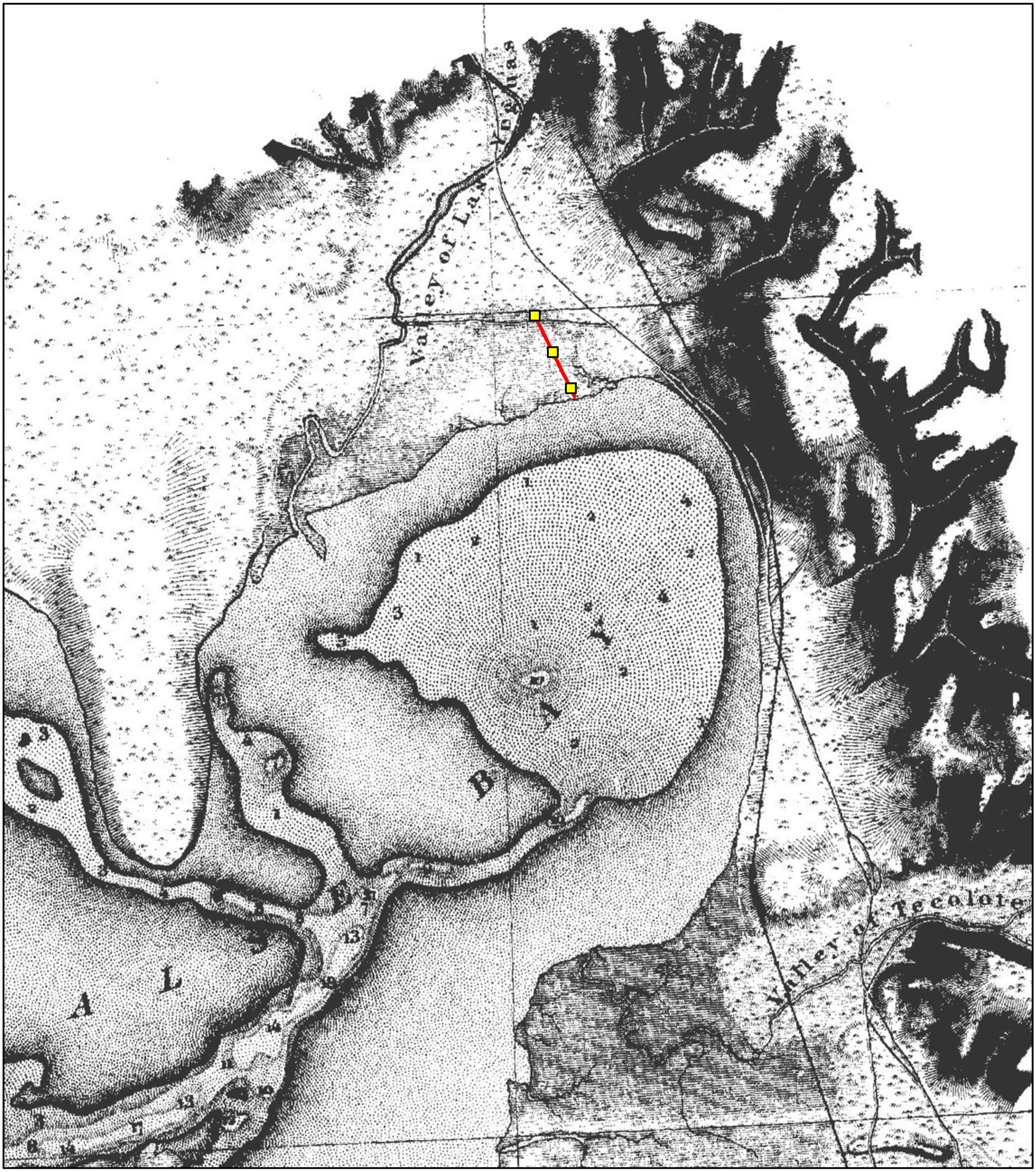
SETTING

The proposed project (City of San Diego Sewer Group 827) is adjacent to the recorded boundaries of the prehistoric village of *La Rinconada de Jamo* (CA-SDI-5017), a large site according to Malcolm Rogers, "second to only SDM-W-1" in terms of size (Rogers n.d.). This site is one of the locations listed in the 1769 Portolá Expedition record as a large, peaceful village just north of Mission Bay. During the Mission Period, only a few of the inhabitants from Rinconada were given baptismal rites, and none was associated with the 1775 attack on Mission San Diego de Alcalá. Figure 2 shows the project location on an 1857 Coastal Survey map and in relation to the Mission Bay Shoreline. By the early 1930s, the community of Pacific Beach had become heavily populated (Figure 3). The golf course across which the project crosses was constructed circa 1960. The project area is located in a culturally sensitive area in the City of San Diego. The recorded boundaries of Site CA-SDI-5017 encompass a portion of the Mission Bay Golf Course as well as a portion of the current sewer project. This cultural resource is discussed in detail below.

Site CA-SDI-5017

The northern portion of the City of San Diego Sewer Group 827 Project is within the recorded southern boundaries of the prehistoric/ethnohistoric village of *La Rinconada de Jamo* (CA-SDI-5017) (Figure 4). This Native American village site was first encountered by the Spanish in 1769 by Don Gaspár de Portolá on a trip from San Diego to Monterey (Carrico 1977). Initially the contact was peaceful, but relations between the Native Americans and the rogue Spanish soldiers had soured by 1772. The village name of "Rinconada" is listed in mission records, but also under Rincon and by the Kumeyaay names Jamio, Japmo, and Jamo (Carrico 1977:33).

Site CA-SDI-5017 was originally recorded by Malcolm Rogers of the San Diego Museum of Man in the 1920s–1930s as SDM-W-150 (Rose Canyon Site) and SDM-W-152 (Rogers n.d.). SDM-W-150 was located at the mouth of Rose Canyon and trenching at this site and SDM-W-152 to the east yielded "many cobble hearths … and … we found four Y-III house pits all with cobbles and fire broken rock ruins." Additional cultural material included ceramics, groundstone, charcoal, shell midden, and obsidian. Rogers also remarked that SDM-W-150 was "a rich site and has been collected



LSA

FIGURE 2

LEGEND

Access Pit (not to scale)

Proposed Sewer Alignment

N

0 1000 2000

FEET

SOURCE: San Diego Bay Coastal Survey Map (1857)

Geoarchaeological Assessment
City of San Diego Sewer Group 827 Project

Project Location on 1857 Coastal Survey Map

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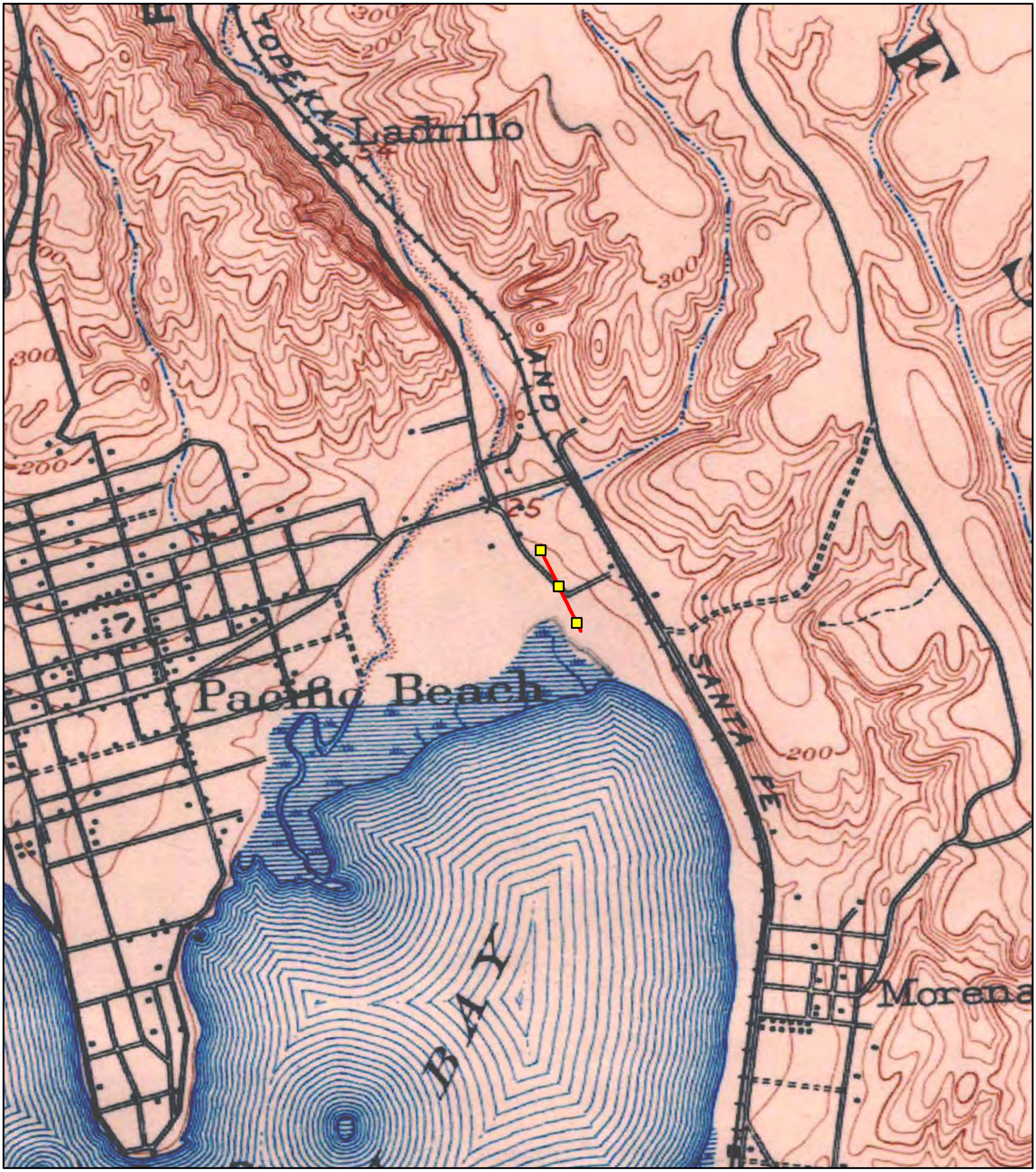

LSA

LEGEND

Access Pit (not to scale)

Proposed Sewer Alignment

FIGURE 3

0 1000 2000
FEET

SOURCE: USGS 7.5' Quad. (La Jolla, 1930)

Georchaeological Assessment
City of San Diego Sewer Group 827 Project

Project Location on 1930 USGS Topographic Map

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Figure 4: Project Area and Site CA-SDI-5017 (Confidential Figure located in Appendix D)

on for years. Thousands of manos have been taken from this site and hundreds of metates." Even in Rogers' original account, it was clear the site had been severely disturbed by "deep plowing, erosion and rodents." The area to the immediate east of SDM-W-150, called SDM-W-152, included midden soil and cobble hearth features representative of intermittent camping (Rogers n.d.).

In 1979, Richard Norwood recorded a portion of Site CA-SDI-5017 at the location of the Bluffside Townhomes Project along Pacifica Drive (Norwood 1979). Artifacts included "5 hammerstones, 2 core fragments, ± 20 flakes/debitage, 1 projectile point, 100 metate fragments, 1,000+ manos, thermal fractured rock, 3 potsherds, and charcoal." Norwood also described the site as a "well-developed shell midden." The deposit had been disturbed by clearing, planting of ornamental trees, other landscaping, and the construction of the existing residence in 1958. One historic-age feature was observed, consisting of a cement birdbath "made from a whole metate with the base laden with over 300 manos. The date in the cement is November 1, 1918." Norwood also noted that manos and metates have been incorporated into retaining walls throughout the property (1979).

An indexing program for the preservation of Site CA-SDI-5017 was completed in 1986 as part of the Bella Pacific Park Planned residential unit by Winterrowd and Cardenas, resulting in the interpretation that the site is a "rich and varied intact village midden deposit." In addition to background research on the site, Winterrowd and Cardenas excavated three 2-meter × 2-meter units and recovered thousands of artifacts including "groundstone tools, flaked stone tools, debitage, ceramics, bone artifacts, shell artifacts, historic artifacts, shell ecofacts, animal bones, fish bone, macrobotanical remains, thermally-affected stone, and charcoal." It was determined that the site had likely been occupied for at least 2,500 years based on the artifact assemblage, and that it could have been used for ceremonial purposes based on the recovery of a ceramic pipe fragment and red-tailed hawk remains (Winterrowd and Cardenas 1986).

A monitoring and excavation program at the intersection of Balboa Avenue and Pico Street in 1992 resulted in the recovery of hundreds of artifacts including groundstone tools, chipped lithic tools, flakes, debitage, bone tools, shell tools, shell decorations, a charmstone fragment, shell, terrestrial and marine mammal remains, charcoal, and fire-affected rock (Bissell 1992). One feature, described as a "rock pile—may be the remains of an earth oven" contained three granitic metate fragments, two granitic mano fragments, two sandstone mano fragments, and a quartzite chopper. Bissell also notes that much of the midden was likely removed during urbanization of the area and that the upper part of the midden has probably been destroyed (1992).

Additional monitoring and excavation occurred at a portion of Site CA-SDI-5017 in 2008 as part of the Admiral Hartman Family Housing project (Garcia-Herbst 2008). Artifacts recovered during the monitoring and excavation included lithic tools, groundstone tools, flakes/debitage, animal bone, and shell. It was noted that intact deposits of midden still exist in the site area and the potential for encountering additional archaeological material is high (Garcia-Herbst 2008).

Geologic Context

Portions of this context utilize data and research conducted by SRI and LSA during analysis of the proposed improvements to the Mission Bay Golf Course (Homburg, et al. 2013).

The project area is in the coastal portion of the Peninsular Ranges Geomorphic Province, a region characterized by northwest-trending structural blocks and intervening fault zones. The Province extends over more than 900 miles from the Los Angeles Basin to the southern tip of Baja California, and it varies in width from about 30 to 100 miles. Bedrock units in the Peninsular Ranges Province include Jurassic (~144–206 million years old, or mya) metavolcanic and metasedimentary rocks, and Cretaceous (~65–144 mya) igneous rocks of the Southern California Batholith, a large intrusive igneous body). The coastal portion of the Province in San Diego County typically has a sequence of upper Cretaceous, Tertiary (~2–65 mya), and Quaternary (less than ~2 mya) marine and non-marine sedimentary strata that form a dissected coastal plain.

The project is located on a late Holocene stream terrace, east of Rose Inlet at the lower reach of the Rose Canyon drainage system and about 400 meters north of Mission Bay (a portion of the bay now called Fiesta Bay). About 1 kilometer north of the northern end of the project, the Rose Canyon drainage has entrenched a narrow canyon along the Rose Canyon Fault. This canyon cuts into a Quaternary marine terrace known as the Nestor terrace, a prominent wave-cut platform that rises 20 to 23 meters (65 to 75 feet) above sea level just inland from the modern coast (Kennedy and Peterson 1975). The Nestor terrace surface is directly underlain by poorly consolidated fossiliferous sandstones of the late to middle Pleistocene Bay Point Formation (Kennedy and Peterson 1975). The Bay Point Formation is a near-shore marine and non-marine (talus and slopewash) sedimentary deposit composed of poorly cemented, light brown sandstone that was deposited on currently-raised wave-cut platforms. The lithology consists mainly of fine- to medium-grained, silty and clayey sand that is occasionally interbedded with of sandy clay. It has a maximum thickness of 100 feet or more and it dates to ~0.13–0.08 mya (Kennedy and Peterson 1975; Kennedy et al. 1977; Tan and Kennedy 1996). The Bay Point Formation is exposed along the northern shore of Mission Bay, along the San Diego waterfront, the mouths of major river valleys (e.g., San Diego River, Soledad Valley, Penasquitos Canyon, Carmel Valley, and San Dieguito Valley), and throughout the city of Coronado.

Studies of late Pleistocene and Holocene landscape evolution for coastal drainages in southern California indicate three major geologic events have taken place over the last 24,000 years (Waters et al. 1999; Shlemon 1992; Masters 1994). The first involved the deep entrenchment of coastal drainages between 24 and 18 thousand years ago (ka) in response to a global drop in sea level of at least 120 meters (393 feet) below present levels (Fairbanks 1989; Masters 1988; Muhs et al. 2003). Most coastal drainages adjusted to this lowered base level by deeply incising their valleys and prograding onto the exposed continental shelf. The second event began after 18 ka when the formerly incised valleys began to fill in with sediment that aggraded in response to late-glacial sea level rise. By approximately 8 ka, sea level had risen to within 16 meters of its modern position. Sea level continued to steadily rise through the middle to late Holocene until approximately 5 ka. Between 5 and 3 ka, sea levels rose more rapidly and the rate of sediment deposition increased along coastal streams. After 3 ka, sea level rise slowed dramatically until it reached its present position.

The final major geologic event occurred approximately 500 years ago when coastal streams incised their floodplains, thereby creating a low terrace (Waters et al. 1999). Formation of this low terrace was followed by a brief period of aggradation (deposition) and then a second pulse of stream incision took place to form a second low terrace. Beneath the artificial fill, most of the Mission Bay Golf Course, across which the City of San Diego Sewer Group 827 project crosses, sits on these two late Holocene terraces. The episodes of channel incision were most likely caused by increased precipitation associated with El Nino-Southern Oscillation events over the last 500 years. A period of major flooding has been recorded in others areas of California around this time (Schimmelmann et al. 1998; Malamud-Roam et al. 2006).

Soils Map Data

Portions of this section utilize data and research conducted by SRI and LSA during analysis of the proposed improvements to the Mission Bay Golf Course (Homburg, et al. 2013).

As shown in Figure 5, soils mapped by the Natural Resources Conservation Service (formerly the Soil Conservation Service) indicate that the City of San Diego Sewer Group 827 Project is *covered* by made land (unit Md in Figure 5), which is artificial fill. The artificial fill is shown as extending to the west on the opposite side of Rose Inlet and south of Mission Bay Road to De Anza Point and the lagoon, as well as being present within a majority of the Mission Bay Golf Course. A tidal flat area (unit Tl in Figure 5) is located to the southwest on the west side of Rose Inlet. Two units of natural soil were mapped north of Grand Avenue and partially within the Mission Bay Golf Course (units CsB and HuC in Figure 5). Unit CsB refers to the Corralitos loamy sand, 0 to 5 percent slopes, which is north of the northwest part of the golf course. Unit HuC refers to the Huerhuero-Urban land complex, 2 to 9 percent slopes, a broader soil map unit located north of the north-central and northeast parts of the golf course; the soils of the Huerhuero series in this complex are now subsumed under the Antioch series. It is likely that portions of units CsB and HuC extended onto the golf course prior to fill being placed on it, with tidal flats extending across much of the southern part of the golf course. Within the City of San Diego Sewer Group 827, it is likely that only the CsB and Tl are present beneath the artificial fill. All of these soil map units are described in much more detail in Appendix B and the soils of units CsB and HuC are summarized below.

Corralitos soils are moderately extensive in small coastal valleys from central California southward. They are classified as Mixed, thermic Typic Xeropsamments; these are soils with mixed mineralogy and a thermic soil temperature regime that are weakly developed and dominated by quartz sand. They are in the Entisols soil order, soils defined by the presence of A and C horizons and absence of B soil horizon development (that is, they lack soil structure and there is no accumulation of illuvial, or vertically translocated, clay). The weak development of these soils is an indicator that they are young soils. Corralitos soils typically occur on alluvial fans and in small valleys at elevations of 25 to 1,000 feet, at slopes of 0 to 15 percent. The soils formed in recent sandy alluvium derived from acid sandstone and related sources, under dry subhumid mesothermal climates with dry somewhat foggy summers and cool moist winters. They are somewhat excessively drained and have slow runoff and rapid permeability. Some areas are subject to localized flooding and deposition. Rock fragments are mostly of gravel size and make up less than 15 percent of the soil and in most pedons less than 5 percent of soil. Textures are sand, loamy sand, fine sand or loamy fine sand to a depth of 40 inches (~1 meter). Dominant sand sizes are medium and fine sand. Coarse and very coarse sand combined is less than 35 percent. The profile is stratified, but strata finer than loamy fine sand are lacking to a depth of more than 40 inches (~1 meter). The soil is dominantly slightly to strongly acid, but some strata in some pedons are neutral.

LSA

FIGURE 5

LEGEND

- Access Pit (not to scale)
- Core Testing Location
- Proposed Sewer Alignment
- Approximate Existing Sewer Alignment

Geologic Unit

- CsB-Corralitos Loamy Sand
- HuC-Huerhuero-Urban (Antioch Series)
- HuE-Huerhuero Series
- Md-Made Land
- Tl-Tidal Flat

0 300 600

FEET

SOURCE: Aerial (2007); USDA (2012)

Geoarchaeological Assessment
City of San Diego Sewer Group 827 Project

Project Area and Geologic Units

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As previously, noted, the Huerhuero series are now included with the Antioch series. Antioch soils have light brownish gray and brown, medium acid, loam Ap and Al horizons, light gray A2 horizons, light yellowish brown yellowish brown, medium acid and moderately alkaline clay and clay loam B2t horizons. They are classified as Fine, smectitic, thermic Typic Natrixeralfs; these are soils dominated by smectite clay that have a thermic soil temperature regime, a xeric soil moisture regime, and that have a Bt horizon (a subsurface horizon characterized by the accumulation of illuvial clay). They are in the Alfisols soil order, which is defined by the presence of significant alluvial clay and a high base saturation (which indicates that they are not strongly leached). This level of soil development indicates that they are significantly older than the Corralitos soils. Antioch soils are on nearly level to strongly sloping alluvial fans and terraces at elevations below 1,100 feet, with slopes that are usually less than 3 percent, and they occur along the central and southern Coast Range valleys of California.

They form in areas with subhumid, mesothermal climates, with warm to hot dry summers and cool moist winters. They are moderately well to somewhat poorly drained, have slow to medium runoff, and very slow permeability.

History of Dredging in Mission Bay

Portions of this history utilize data and research conducted by SRI and LSA during analysis of the proposed improvements to the Mission Bay Golf Course (Homburg, et al. 2013).

Mission Bay was a tidal marsh prior to dredging that began in 1946 and continued to 1962 (Friends of Mission Bay Marshes, n.d.). During its pre-dredging history, it likely shifted between a lagoon, estuary, or tidal marsh due to natural shifts in the San Diego River terminus between San Diego Bay and Mission Bay. It is interesting to note that the European explorer Juan Rodriguez Cabrillo named the area that is now Mission Bay “False Bay,” presumably because he and other explorers thought it was the entrance into San Diego Bay. Mission Bay was one of two original natural outlets of the San Diego River, the other being San Diego Bay. The U.S. Army Corps of Engineers (USACE) constructed a levee in 1855 to divert the San Diego River to permanently discharge into Mission Bay (then called False Bay) (Herron 1986; Wiegel 1994) in order to prevent sediment from accumulating in San Diego Bay. This levee was rebuilt in 1875 and again in 1885 after it was washed out by flooding (Wiegel 1994). The mouth of the San Diego River is often closed by littoral drift during extreme rainfall and runoff events. A lowered weir was constructed into the middle jetty to allow potential floodwaters to discharge through both the river channel and the entrance to the bay (Griggs et al. 2005). The San Diego River, with a watershed of about 435 square miles, is the major source of sand in Mission Bay (Minan 2004). Historically, the San Diego River contributed an average of 71,900 cubic yards per year (yd^3/yr) of sand to the bay, but dams built upstream on the river have reduced the sediment yield to 6,600 yd^3/yr of sand (Willis et al. 2002).

In all, 25 million cubic yards of sand and silt were dredged to create the land that forms the Mission Bay Aquatic Park. The land portion of this park is almost entirely built from artificial fill (United States History n.d.). The engineering history of dredging activity Mission Bay was recently reviewed by Ford (2011). A photograph of a large boat, the HR Morris (a Manson Construction Cutter Suction Dredge), used for dredging in Mission Bay in 2010 is available at http://en.wikipedia.org/wiki/

File:HR-Morris-Pipeline-Dredge.jpg. Sediment was dredged from the bottom of the bay by suction and then redeposited hydraulically.

During the last few decades, most material dredged from Mission Bay has been redeposited along the Pacific Beach and Ocean Beach, but a significant amount has also been placed along Mission Beach (Patsch and Griggs 2007). Maintenance dredging is required in the entrance channel to Mission Bay because of the small tidal prism relative to the navigational depths required and the width of the entrance channel (O'Brien 1931; Wiegel 1994). Similar fill deposits from historic and modern construction activities have also been identified in large areas along the eastern part of San Diego Bay and along the Interstate 5 corridor (Stroh 2012), and in other places around Mission Bay (e.g., Fordham 2008). Such fill deposits include compacted engineered, non-compacted non-engineered, and hydraulic and mechanical non-engineered fill.

The review by Gabrielson (2004) is especially pertinent to the history of dredging and redeposition of fill on and near the Mission Bay Golf course and City of San Diego Sewer Group 827 Project:

> The City's first dredging operation commenced early in 1946, and created the area then known as Gleason Point, now Bahia Point. Between 1946 and 1956, the City completed dredging in the West Bay, west of Ingraham Street, at the same time creating some new land areas with dredged material. In addition, a narrow channel was dredged in the east bay to De Anza Cove, the point of which was created by dredged material.
>
> In 1956–57, the City Engineering and Planning Department prepared preliminary drawings of a master plan for the area, showing that millions of yards of undesirable soils and unsatisfactory materials would be disposed of in the ocean. Public hearings were held, and it was evident from the vigorous public protest that disposal of the undesirable material at sea would not be acceptable, so it was decided to add an island in the bay (Fiesta Island), and make this a disposal area. The island would have, as margins, 200-foot-wide sand levees, and would be covered with a minimum of three feet of sand. After the hearings and the addition of Fiesta Island in 1958, the author, Ed Gabrielson, and his staff, proceeded to prepare the contract drawings for the completion of dredging of Mission Bay and the creation of subsequent infrastructure.
>
> The original material that had been pumped onto De Anza Point was a mucky silt, which would not hold up equipment of any type. Although this material set for approximately three years, it never gave up its water content, and nothing could be built on it. As a remedial action, it was decided to pump good sand over this area, three feet deep. After a few months, tests showed the area to be fairly stable. Shortly thereafter, contracts were let for sewers, water mains, and a trailer court. Trouble had been expected in the construction of sewer mains, but, fortunately, the work went very well, and construction was completed. Later on, the lessee desired some higher ground on the undeveloped portion. In 1963–64, the lessee, with permission of the City, let a contract for additional dredging to place another three feet of fill on the remaining portion. The sand was pumped by dredging from the west side of Fiesta Island.
>
> Upon completion of the Federal work, the City decided to advertise for bids for completion of all remaining dredging and creation of all needed land areas. The first contract drawing directed the contractor to complete the bay dredging to a depth of minus eight feet mean lower low water, to cover all proposed beach areas with three feet of sand and to provide at

least three feet of sand to underfoot at a water depth of minus six feet mean lower low water. It also directed the preparation of a disposal area for the undesirable fine silts. This disposal area became Fiesta Island.

This paper by Gabrielson (2004) clearly indicates that De Anza Point, which is immediately south of the Mission Bay Golf Course and the City of San Diego Sewer Group 827 Project, was built from artificial fill. It also notes the problems for developing this area that were caused by the high water content, texture, and organic matter of the mucky silt. These problems were solved by waiting for three years, then placing 3 feet of sand over the mucky silt and then another 3 feet of sand in 1963–64. The Mission Bay Golf Course, which opened on May 27, 1955, was constructed upon the fill deposits in the 46-acre parcel north of De Anza Point.

REGULATORY CONTEXT

Cultural resources investigations are required to comply with local, State, and Federal laws, regulations, and ordinances. Most of these laws overlap and complement each other providing protection of cultural resources at various jurisdictional levels. The evaluation criteria used by the City of San Diego to determine the significance of a site are defined in Section 15064.5 of the *CEQA Guidelines*. Historical resources, as defined by CEQA, include:

1. A resource listed in, or determined to be eligible by the State Historical Resources Commission, for listing in the California Register of Historical Resources.
2. A resource included in a local register of historical resources, as defined in Section 5020.1(k) of the Public Resources Code or identified as significant in a historical resource survey meeting the requirements of Section 5024.1 of the Public Resources Code, shall be presumed to be historically or culturally significant. Public agencies must treat any such resource as significant unless the preponderance of evidence demonstrates that it is not historically or culturally significant.
3. Any object, building, structure, site, area, place, record or manuscript which a lead agency determines to be historically significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California may be considered to be a historical resource, provided the lead agency's determination is supported by substantial evidence in light of the whole record. Generally, a resource shall be considered by the lead agency to be "historically significant" if the resource meets the criteria for listing in the California Register (Pub. Res. Code SS5024.1, Title 14 CCR, Section 4852) including the following:
   - A. It is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage;
   - B. It is associated with the lives of persons important in our past;
   - C. It embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values; and/or
   - D. It has yielded, or may be likely to yield, information important in prehistory or history.

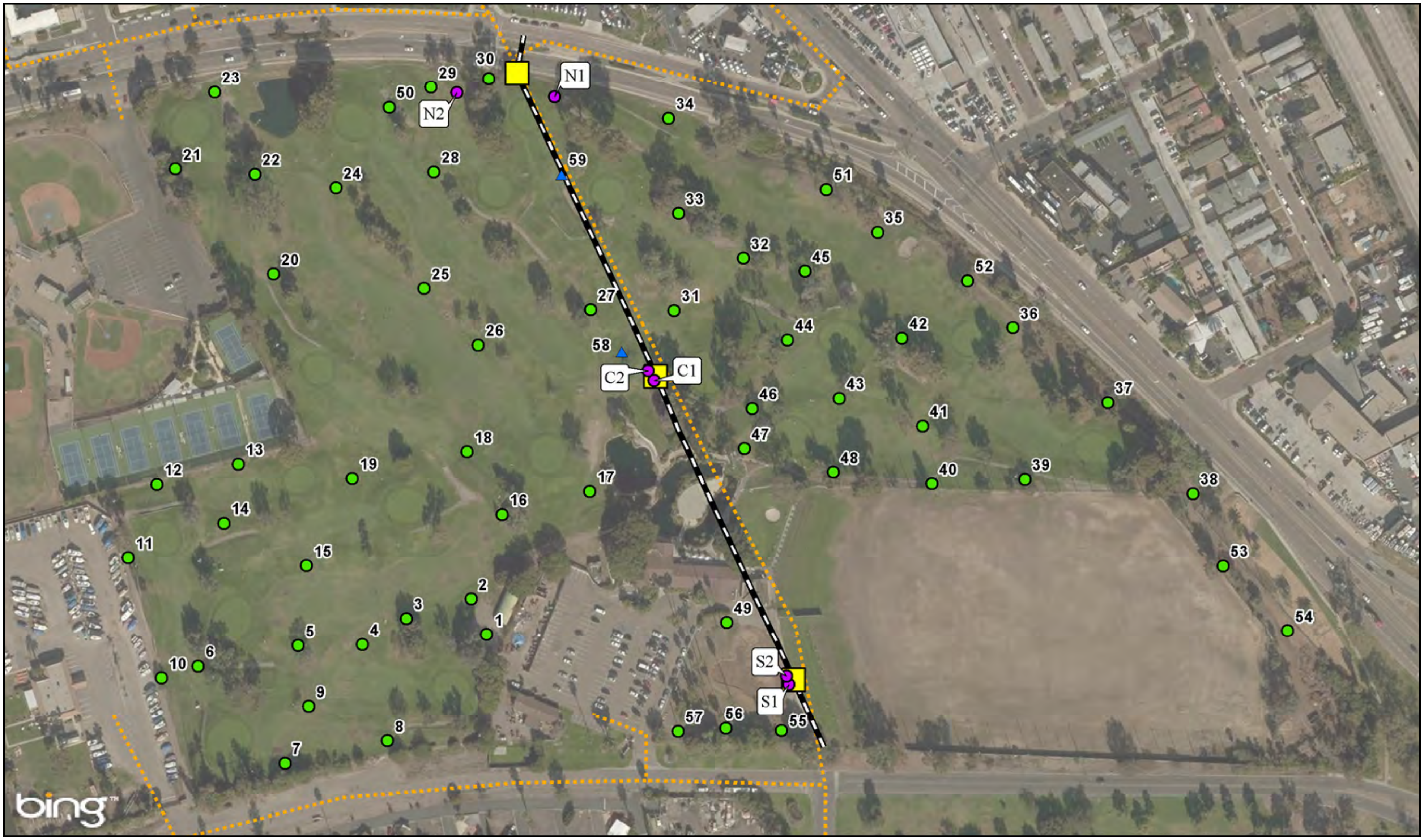
4. If a resource is not listed in, or determined to be eligible for listing in the California Register of Historical Resources, not included in a local register of historical resources (pursuant to section 5020.1(k) of the Public Resources Code), or identified in an historical resources survey (meeting the criteria in section 5024.1(g) of the Public Resource Code) does not preclude a lead agency from determining that the resource may be an historical resource as defined in Public Resource Code Sections 5020.1(j) or 5024.1.

METHODS

Portions of the methods discussion utilize data and research conducted by SRI and LSA during analysis of the proposed improvements to the Mission Bay Golf Course (Homburg, et al. 2013).

Prior to fieldwork, background research was conducted to compile information on the soils and geology of the project area. Additional research was completed to seek information history of re-deposition of fill materials in and around Mission Bay.

Cores were collected on May 26, 2015 A hydraulic drilling rig was used to extract 1⅛-inch-wide (2.86 centimeter) 4-foot long cores. Samples were obtained by pushing the sample tube into the ground, and then pulling the tube out. In all, six cores were collected (see Figure 6); two cores placed in the northern area, two in the central area, and two in the southern area locations were selected in a way that avoided the tee, greens, and fairways of the golf course. Cores were taken in 4-foot (122-centimeter) sections to a maximum depth of 28 feet (8.5 meters), with each section collected in clear acrylic sleeves. Because of very sandy, very wet, or very muddy subsurface conditions, many of the 4-foot samples were incomplete as the sediment fell out of the tube while it was being pulled out of the ground. Better recovery usually occurred with increasing depth. However, in some cases there was no recovery.



LSA

FIGURE 6

LEGEND

Access Pit (not to scale)

Proposed Sewer Alignment

Approximate Existing Sewer Alignment

Core Testing Location (2015)

2013 Core Testing

Deep Core Sample Location (12 foot depth)

Core Sample Location (8 foot depth)

0 125 250

FEET

SOURCE: LSA (2013; 2015)

Georchaeological Assessment
City of San Diego Sewer Group 827 Project

Core Sampling Locations

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The core sections were taken to LSA's lab in Carlsbad. The tubes were cleaned of mud and dirt to allow the sediment within them to be clearly seen. Areas with potentially unique features or characteristics such as organic material or shell were flagged for closer examination through opening up the core sample to directly examine it. Brooks Smith and Jacqueline Hall described the cores on June 4, 2015, with the assistance of the Native American monitor, Annette Osuna. Core descriptions followed standard soil survey methods as outlined in Schoenberger et al. (2002) and Soil Survey Division Staff (1993). The sediment properties recorded focused on the most informative of the stratigraphic integrity of the deposits. Soil descriptions for each core included the following properties: master horizon/ stratigraphic depths, Munsell color (moist only because almost all samples were moist), textural estimates by the ribbon method, or examination, gravel content, redoximorphic features, and inclusions of shell and organics. The results are recorded in Appendix B. Additionally, the core samples were screened through 1/8 and 1/16 inch meshes to observe the potential presence of artifacts and ecofacts.

Drill rig collecting samples.

REPORT OF FINDINGS

Portions of this discussion utilize data and research conducted by SRI and LSA during analysis of the proposed improvements to the Mission Bay Golf Course (Homburg, et al. 2013).

Although each core sample was 4 feet long, during the removal, some of the sediment fell out while the tube was being removed, especially in the upper horizons; this was likely due to a combination of factors such as water content and sediment type (e.g., loose unconsolidated sediments). Many tubes had a "sediment catcher" added to the end of the tube in an attempt to limit the loss, but sediment loss still occurred. In the upper 16 feet, recovery averaged around 24 inches; however, below a depth of 16 feet, recovery was better and several of the columns between 20 and 28 feet had a full 4-foot recovery. Core C1 had no recovery between 16 to 24 feet, and Core S2 had no recovery between 20 and 28 feet. Although Core S1 was sampled, it was not described in detail as part of this study. S1 was examined briefly for the presence of shells, charcoal, potential cultural deposits, or paleosols; however, none was observed.

Complete descriptions of the cores (N1, N2, C1, C2, and S2) are provided in Appendix C. The overall stratigraphy and the properties of individual strata indicate that the upper 5 to 10 feet of sediment in the cores consists predominantly of artificial fill that was emplaced on the property (Figure 7). The artificial fill is composed of layers of brown to reddish brown silty sand and gray fine-grained sand with fragments of shells consisting primarily of species found in a bay environment such as Venus clam (*Chione* sp.), oyster (*Ostrea* sp.), jackknife clam (*Tagelus* sp.), scallop (*Argopecten* sp.), turret snail (*Turritella* sp.), and whelk snails (Ranellidae). The gray fine-grained sand and the shell fragments are likely dredge material from the bay, while the brown to red brown horizons may be terrestrial in origin that was mixed in to the dredge material as artificial fill.

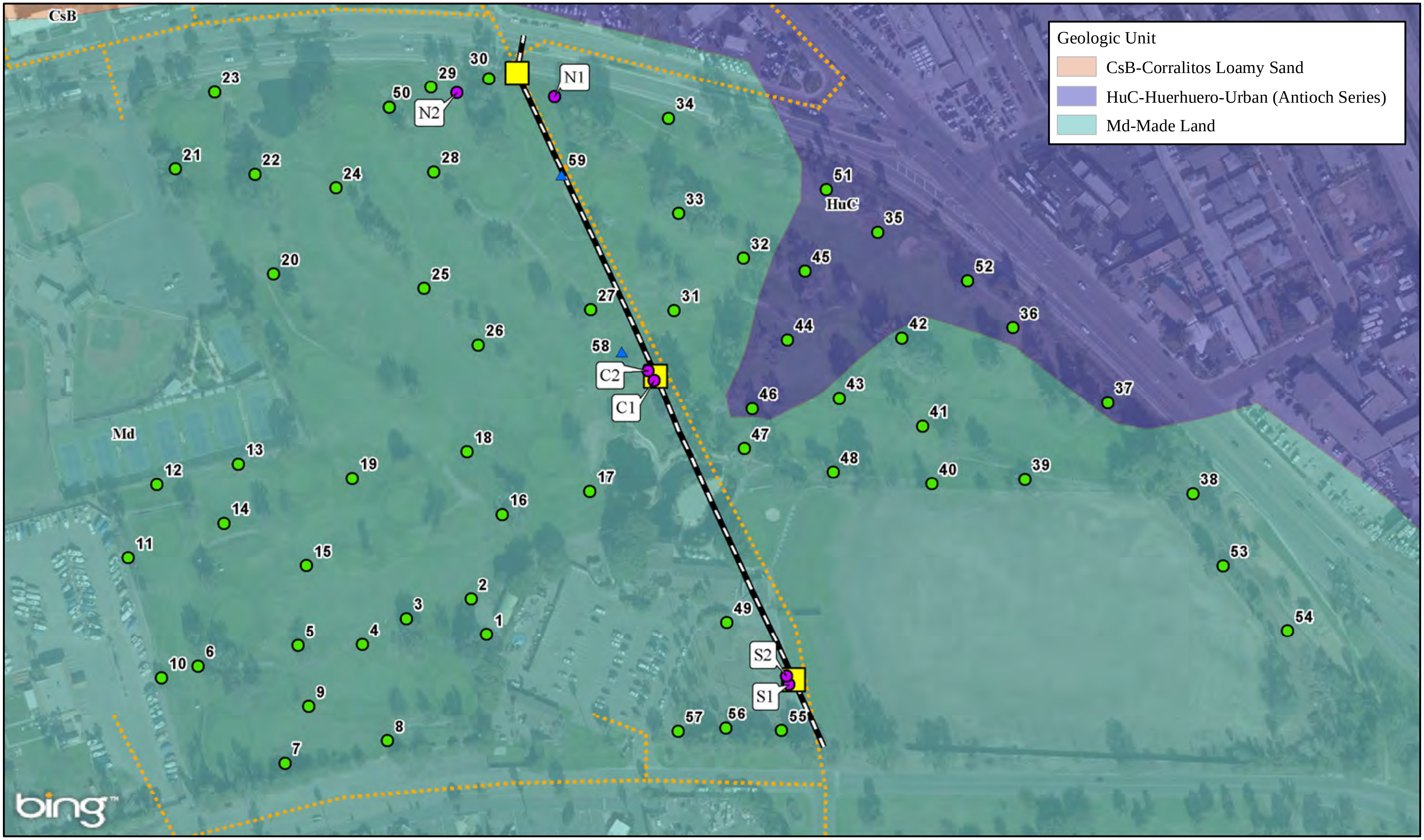
Below the artificial fill are horizons consistent with deposition in alternating terrestrial aquatic conditions, likely reflecting changing climatic conditions or changes in sea level. This interpretation corroborates the findings indicated by the published soil map data (see previously referenced Figure 5) and historical and geological data (Figure 8) on the Mission Bay area presented above. The rationale for this interpretation of the core data is reviewed below.

The redeposited sediment is dominated by dark gray, gray, and very dark gray colors that indicate reduction of iron caused by the sediment being saturated for significant periods of time in the bay before being dredged and emplaced as artificial fill. Some horizons also contain layers of brown silty sand, interspersed with the dredged material likely caused by dumping or mixing of sediment from other areas. In addition, some of the dredge material contains sea shells from mollusks that would be expected in a bay/estuary environment. Sediment type is primarily slightly silty to silty fine-grained sand.

Within the subsurface below the artificial fill, dark grayish brown, very dark grayish brown, gray, dark gray, and shades of greenish and bluish gray colors are common, and soils with redoximorphic features (reddish or grayish soil features caused by oxidation or reduction of iron associated with alternating wet and dry conditions), which occur on occasion; these colors and redoximorphic features indicate that these sediments originated from places that alternated between saturated and drier conditions, such as the edges of tidal flats or at the top of a fluctuating water table in the wetlands.

Dark brown, reddish brown and dark reddish brown, colors are also common, and these mainly originate from terrestrial soil material due to the oxidation of iron present in the soil. The dark brown, reddish brown, and dark reddish brown colors were observed at depth in all the core samples, and these appear to be from the Antioch soils that were buried *under* artificial fill and other sediments (previously referenced Figure 7). Another indicator of sediment that is probably intact is the presence of laminated deposits that result from sedimentation in slow-moving water, such as that deposited by small streams or as sheet flow in flood deposits, or in a quiet bay/estuary. The presence of soil that uniform over long depths suggests stable deposition over a long period of time. In all, intact soils and sediments were observed below a depth that varied from approximately 5 to 6 feet in the north to 7 feet in the central area to 10 feet in the southern area. On average, intact sediment accounts for approximately 76 percent of all cores that were examined (that is the total length of all five cores examined—N1, N2, C1, C2, and S2—or 100 feet of the 135 feet of cores examined; Appendix B).

Textures for the core samples vary from fine-grained loamy sand, to sandy silt, clayey silt, silty clay to almost pure clay; the more silty and clayey sediment is more common with depth. Some samples, especially the ones with shades of gray have abundant mica present, which is common in shallow



LSA

FIGURE 7

LEGEND

- Core Testing Location (2015)
- Access Pit (not to scale)
- Proposed Sewer Alignment
- Approximate Existing Sewer Alignment

2013 Core Testing

- Deep Core Sample Location (12 foot depth)
- Core Sample Location (8 foot depth)

N

0 125 250

FEET

Geoarchaeological Assessment
City of San Diego Sewer Group 827 Project

Core Sampling Locations and Geologic Units

SOURCE: LSA (2013, 2015); Aerial (2007); USDA (2012)

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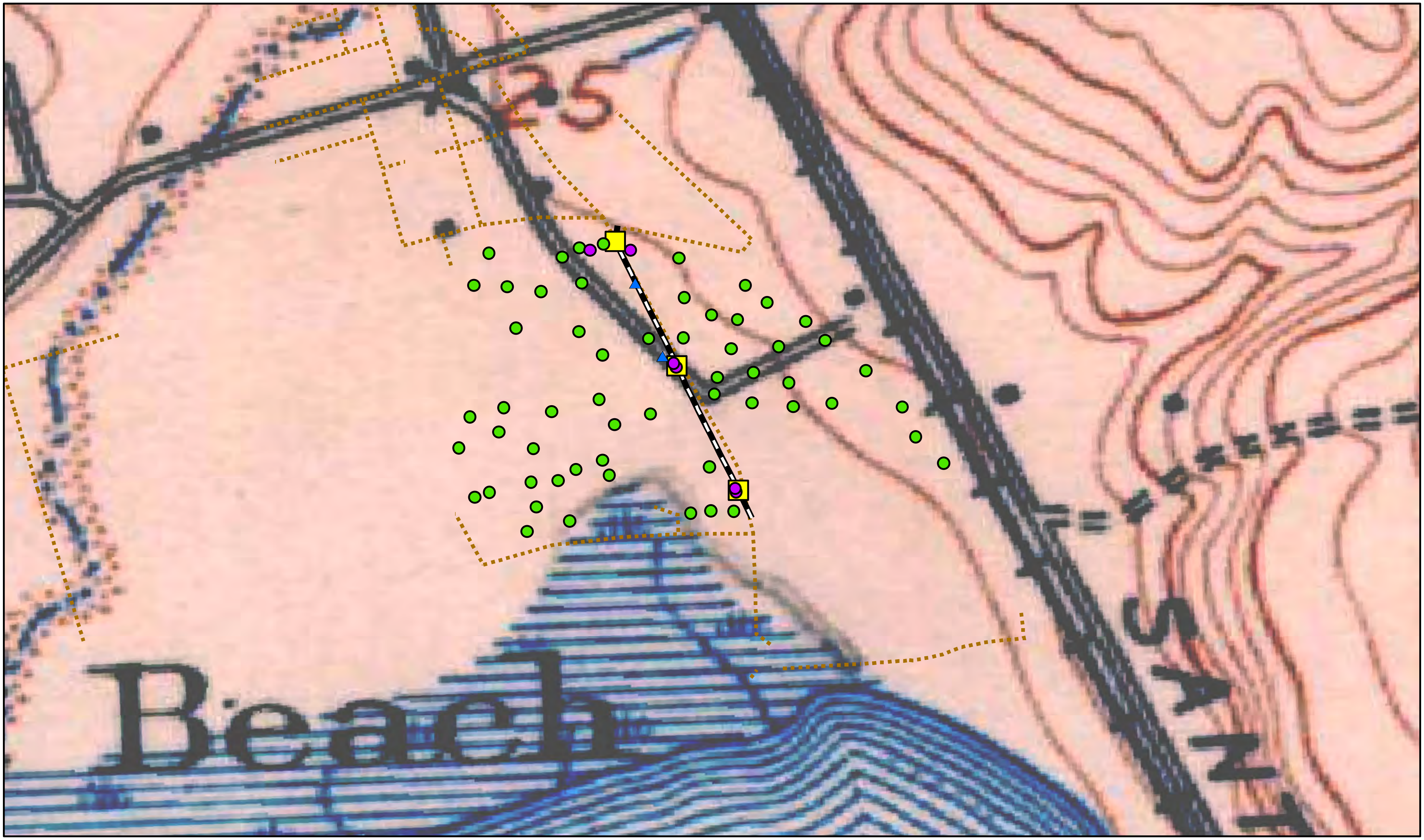


LSA

FIGURE 8

LEGEND

- Access Pit (not to scale)
- Proposed Sewer Alignment
- Approximate Existing Sewer Alignment
- Core Testing Location (2015)

2013 Core Testing

- Deep Core Sample Location (12 foot depth)
- Core Sample Location (8 foot depth)

N

0 300 600

FEET

SOURCE: LSA (2013; 2015); USGS 7.5' Quad. (La Jolla, 1930)

Geoarchaeological Assessment
City of San Diego Sewer Group 827 Project

Core Sampling Locations, USGS Topographic Map, 1930

I:\SGC1501\GIS\GeoArch1930_SamplingLoc_2015.mxd (6/19/2015) bays and estuaries. Horizons that contained shell tended to be shades of gray and were composed of silty fine-grained sand, silty fine to medium-grained sand and fine-grained sand. Gravel was only seen in S2 in the upper areas that appear to be artificial fill.

More detailed descriptions of observed sediments in each area of the project are provided below:

Within one of the northern cores (N2) a thinly laminated gray, greasy, clayey silt horizon with abundant mica was noted in the upper area of the core from the 4 to 8-foot level, likely indicating that there is a transition to a natural deposit in a marshy environment in this northern area in the upper 5 to 8-foot area. Although not laminated, in Core N1, sediment with gradational transition from slightly silty fine-grained sand to silty fine-grained sand may indicate natural conditions rather than dredge material. Similar marsh-like conditions were noted in the lower portions of the 4 to 8-foot sections of Cores C1 and C2 that included dark gray to blue gray silt and fine-grained sand with abundant mica. In Core S2, fill soils extended deeper to around 10 feet below the surface, at which point bay/estuary sediments were observed composed of black silty fine-grained sand with shell fragments and mica and a very sulfurous aroma.

Within the northern portion of the project in the cores (N1 and N2) between 8 and 16 feet, alternating horizons of sediment consisting of gray sandy silt to silty and clayey sand and brown clayey silt were observed. The gray layers are interpreted as marine and the brown layers as terrestrial. From 16 to 28 feet in the northern area (Cores N1 and N2), the sediments were primarily composed of brown to dark red brown sandy silt, clayey silt, silty clay, and clay. These are likely terrestrial deposits based on their color. Occasional specks of black organic material were observed that resembles charcoal, but they appear to be natural, based on their distribution.

Within the central portion of the project (Cores C1 and C2), the similar alternating horizons of gray, blue gray, greenish gray sandy silt to silty clay, and clay, and brown clayey silt that were seen in Cores N1 and N2 at a depth of 8 to 16 feet were observed; although they extended to a depth of around 18 feet in Core C1. Like the northern portion, this is interpreted to represent alternating conditions from terrestrial to marine. From 18 to 25 feet in the central area (Core C2), the sediments were primarily composed of brown to dark red brown silty fine-grained sand, clayey silt, and silty clay. These brown sediments extended down to 28 feet in Core C2, but there was no recovery between 16 and 24 feet; therefore, the accuracy of this deep sample may not be exact. Like the northern area, these brown to red brown sediments are interpreted as representing terrestrial sediments. In Core C2, between 25 and 26.5 feet, the sediment is a very dark greenish gray fine to medium-grained sandy clay grading up to silty clay. This is likely another marshy deposit. The very bottom of Core C2 is between 26.5 and 27 feet is composed of dark brown fine to medium-grained sand, and is likely terrestrial in origin.

Within the southern portion of the project, only Core S2 was examined in detail. The upper 10 feet of sediment appear to be artificial fill consisting of dredge material composed of gray to dark gray fine to medium-grained sand with shells, dark gray silty fine-grained sand with small shells, and some mixed horizons of brown silty fine grains sand, and a few pieces of gravel. The brown sediment is likely sediment of terrestrial origin, mixed into the dredge material. Below the artificial fill, between 10 and 15.5 feet, are sediments composed almost entirely of marshy deposits consisting of black very silty fine-grained sand and clayey silt with a sulfurous smell indicating very anoxic conditions; some of the sediment has a very greasy texture. Between 15.5 to 18 feet are sediments composed of dark reddish gray to brown slightly clayey silt that likely represents a transition back to terrestrial based on the color. Between 18 to 20 feet is a greenish-black clayey silt with a sulfurous aroma and some flecks of organic material (that resembles charcoal) and increasing fine to medium-grained sand content with depth. There was no recovery below a depth of 20 feet at Core S2.

The only real soil development noted was in the upper several inches and is related to the development of the golf course. All of this soil development occurs on sediment identified as artificial fill and was generally no more than 4 to 6 inches thick.

Shellfish remains were observed in all but the northern Core N2, with most present in the upper 5 to 10 feet in sediment identified as dredging material placed as artificial fill. Core N1 contained small fragments of shell at depths of around 14 feet and these appear to be natural in-situ bay/estuary deposits based on composition. Shells observed included Venus clam, oyster, jackknife clam, scallop, turret snail, and whelk snails. These are all species that are common in protected bays and lagoons in southern California. Most of these shells are all highly fragmented due to physical damage caused by being dredged and redeposited and possibly due to their collection in the 1⅛-inch sample tube.

DISCUSSION AND EVALUATION

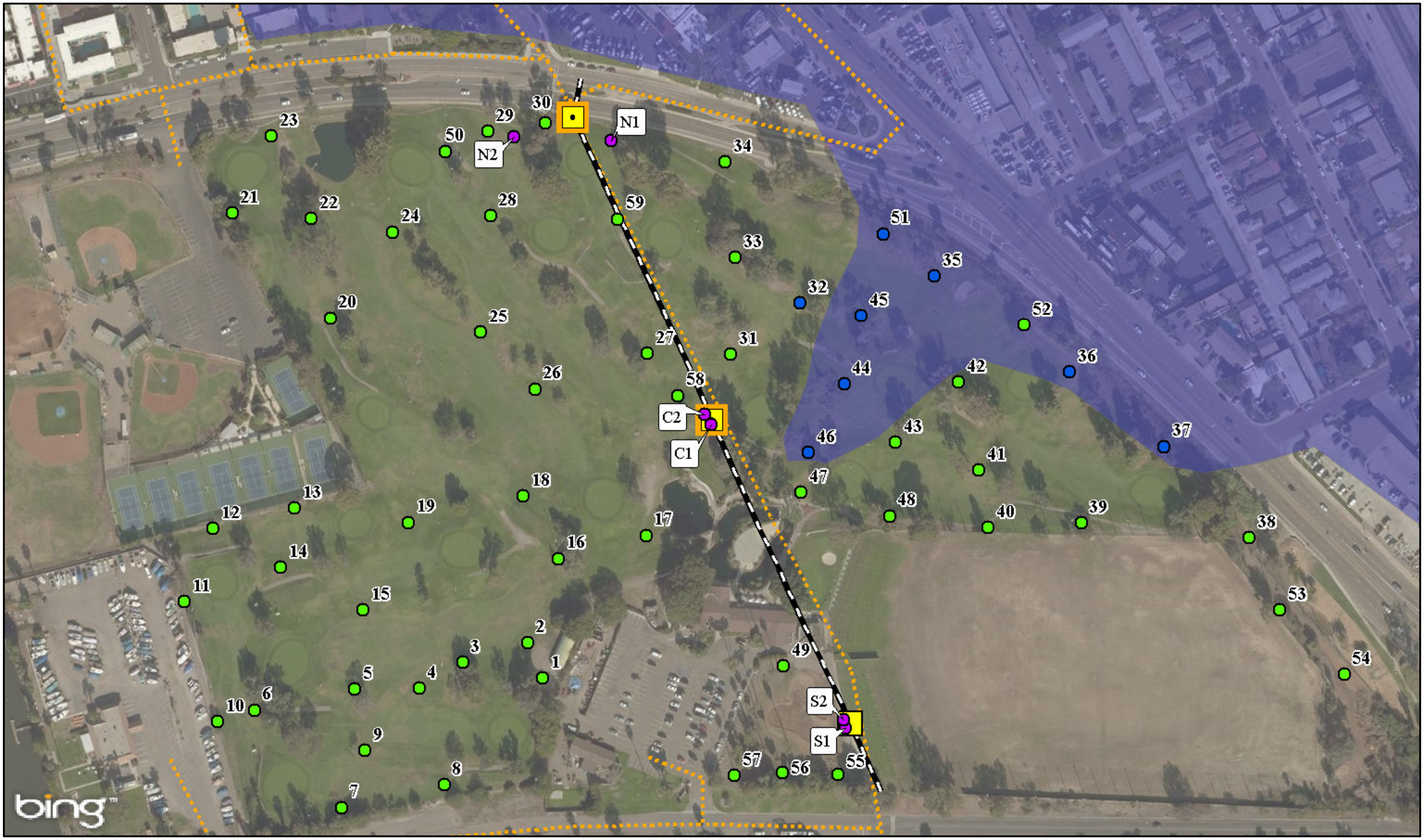
Portions of this discussion and evaluation utilize data and research conducted by SRI during analysis of the proposed improvements to the Mission Bay Golf Course (Homburg, et al. 2013).

Overall, this study revealed the effectiveness of coring for examining, documenting, and interpreting the vertical distribution of sediment horizons and determining the presence/absence of cultural deposits with minimal impact. Coring is cost-effective, relatively non-destructive, and it provides archaeologists and geoscientists with important archaeological and stratigraphic information that would be too costly to obtain by other methods (Stein 1986; Schuldenrein 1991). Coring is less effective at documenting the horizontal distribution and variability of cultural deposits, however. Caution must therefore be taken with such a limited sample when the researcher has such a narrow view of the subsurface in a 1⅛-inch core; especially when only a partial recovery of the 4-foot sample occurs. However, based on the description of Archaeological Site CA-SDI-5017 being an extensive site with the potential of thousands of years of occupation (Winterrowd and Cardenas 1986), if this site were present in the subsurface, some evidence for it likely would have been seen in the core samples through the presence of abundant charcoal, midden soil, burned shell, and bone.

No demonstrable artifacts or subsistence remains indicative of Site CA-SDI-5017 or any other site were found in the cores. The uppermost portions of the project area were covered by fill to depths of around 10 feet in the south and between 5 and 8 feet in the north and central areas. Immediately below the artificial fill, native sediments were observed that are consistent with the Antioch soil series as well as Tidal flats. The Antioch soils predate the maximum age of archaeological sites in the region, and Tidal flats have no potential to contain cultural resources. Exact depths could not be determined because of the incomplete recovery of the core samples. With increasing depth, transitions between terrestrial and marshy/estuary were observed, which is consistent with the project's location on the margins of the current coastline. Although no definitive evidence for cultural resources was observed in the northern portion of the project, it is possible that portions of CA-SDI-5017 may still exist below the artificial fill, as recovery was incomplete and evidence for the site may have been missed. Therefore, any excavation below a depth or 5 feet should initially be monitored to confirm or deny the presence of cultural resources in this area. Sediment in the central portion of the project appears to be composed of artificial fill in the upper 7 feet with terrestrial deposits and marshy deposits below that; it is unlikely that cultural deposits are present at this location. Sediment in the southern portion of the project appears to be composed of artificial fill in the upper 10 feet and then marsh deposits down to approximately 16 feet; as such, the potential for cultural resources at this location is very low and monitoring is not warranted. Deeper excavations throughout the project associated with the micro tunneling that may extend to depths as deep as 24 feet below the surface are unlikely to encounter cultural resources as the sediments are associated with either marsh conditions or terrestrial sediments that predate human habitation based on the age of the Antioch soil series in other areas.

CONCLUSIONS AND RECOMMENDATIONS

In conclusion, no cultural deposits were discovered during the geoarchaeological assessment of City of San Diego Sewer Group 827 Project on the Mission Bay Golf Course. There is a slight possibility for cultural deposits below the artificial fill in the northern area based on the area's location within the mapped boundaries of the site and the incomplete recovery of the core sample. It is therefore recommended that sediments be monitored in this area (Figure 9). The central areas of the project are less likely to contain cultural resources despite being on the boundary of the mapped location for Site CA-SDI-5017; however, monitoring of the excavation of the central access pit is recommended as well. The central area exhibits up to 7 feet of artificial fill and layers of marshy sediment and terrestrial sediment that likely predate human occupation of the area below the artificial fill. Areas in the south are outside the mapped location of Site CA-SDI-5017 and contain up to 10 feet of artificial fill over marshy deposits and then terrestrial deposits that likely predate the human occupation of the area; as such monitoring is not recommended in the southern area. Deep excavation associated with the micro-tunneling that will extend up to 24 feet below the surface are also unlikely to encounter cultural resources based on the apparent native sediments present at this depth that have no evidence for cultural resources; in addition, excavation techniques associated with micro-tunneling general preclude the direct observation of sediment removal. These deep excavations will also not require cultural resources monitoring. If, in the unlikely event that artifacts or midden soils are discovered in areas where monitoring is not occurring, work in the immediate area should be redirected until an archaeologist can come out to examine the find, assess its nature, and make recommendations.



LSA

LEGEND

Access Pit - no monitoring recommended (not to scale)

Access Pit- monitoring recommended (not to scale)

Proposed Sewer Alignment

Approximate Existing Sewer Alignment

Core Testing Location (2015)

2013 Core Testing

Core Sample Location-Dredge Sediment

Core Sample Location-Native Soil

HuC-Huerhuero-Urban Complex (Antioch Series)

N

0 125 250

FEET

FIGURE 9

Geoarchaeological Assessment
City of San Diego Sewer Group 827 Project

Recommended Monitoring Location

SOURCE: LSA (2013; 2015); USDA (2012)

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APPENDIX A:

RÉSUMÉS

RODERIC NOEL MCLEAN, RPA

ASSOCIATE/ARCHAEOLOGIST

EXPERTISE

Cultural Resources Project Management

Archaeology

Cartography

Forensic Archaeology

EDUCATION

California State University, Fullerton, M.A., Anthropology/Archaeology, 2003. Thesis title: *The Material Culture of Fort Whipple*.

University of California at Los Angeles, B.A., Anthropology/Archaeology, 1978.

West Los Angeles Community College, A.A., Anthropology, 1976.

PROFESSIONAL ORGANIZATIONS/ MEMBERSHIPS

Society for American Archaeology

Association of Environmental Professionals

Pacific Coast Archaeological Society

San Diego County Archaeological Society

PROFESSIONAL EXPERIENCE AND RESPONSIBILITIES

Mr. McLean has over 35 years of experience as a professional archaeologist, including almost 13 years as a staff archaeologist with the United States Army Corps of Engineers, and extensive experience throughout California and in Nevada and Arizona. Mr. McLean is a Registered Professional Archaeologist and exceeds the Secretary of the Interior's *Qualification Standards for Archaeology and History*. Mr. McLean is also certified by the County of San Diego as qualified to direct archaeological studies for California Environmental Quality Act (CEQA) projects and has worked extensively in San Diego County. His area of expertise lies in both prehistoric and historic archaeology, and compliance with Section 106 of the National Historic Preservation Act (NHPA). Mr. McLean is responsible for directing studies and writing cultural resource assessment reports to meet the compliance requirements of the NHPA and CEQA; consulting with the Office of Historic Preservation; conducting Native American consultation; assessing resource significance and project effects; mitigation planning and execution; directing archaeological surveys and excavations; and preparing Historic American Building Survey/Historic American Engineering Record documentation. Additionally, he performs peer and third-party review of draft cultural resources documents, including in support of federal agency compliance with 36 Code of Federal Regulations (CFR) Part 800. Mr. McLean directed a Missing-in-Action (MIA) recovery mission in Vietnam as a Team Anthropologist with the Central Identification Laboratory, Hawaii (now Joint Prisoner of War [POW]/MIA Accounting Command). He is an advisory board member for the Master of Arts Degree Program in Applied Archaeology at California State University, San Bernardino.

PROJECT EXPERIENCE

City of San Diego On-Call Cultural Resources Services for Citywide Engineering Programs and Projects

Under a current contract with the City of San Diego, Mr. McLean has directed and managed tasks involving subsurface exploration, test excavation, data recovery, and construction monitoring. Tasks include, but are not limited to, the following:

- La Jolla Shores Drive Water Main Replacement monitoring
- Villa Montezuma Project test excavation
- Otay Pipeline Phase II monitoring
- Group 698 Sewer Project data recovery
- Sunset Cliffs monitoring
- Torrey Pines Road Improvements constraints analysis

PROFESSIONAL EXPERIENCE

Associate, LSA Associates, Inc., Carlsbad, California, 2004–Present.

Staff Archaeologist (GS-11), United States Army Corps of Engineers, Los Angeles District (southern half of California and entire state of Arizona), 1991–2004.

Forest Service Program oversight, United States Forest Service, 1998 and 2000.

Team Anthropologist, United States Army Central Identification Laboratory, Hawaii, 1997.

Senior Archaeologist (GS-12), United States Army Corps of Engineers, Los Angeles District, September 1–October 31, 1996.

Co-Principal Investigator, INFOTEC Research, 1991.

Field Director, Chambers Group, Inc., Santa Ana, California, 1989–1991.

Field Director, Keith Companies, Costa Mesa, California, 1989.

Field Director, Scientific Resource Surveys, Huntington Beach, California, 1988–1989.

Field Director, Tetra-Tech, Inc., San Bernardino, California, 1988.

Archaeologist/Cartographer, Chambers Group Inc., Santa Ana, California 1987–1988.

Archaeologist, Archaeological Associates, Sun City, California, 1985–1988.

Crew Chief, Harmsworth Associates, Laguna Hills, California, 1987.

Archaeologist, Westec Services, San Diego, California, 1986.

Archaeologist, W & S Consultants, Los Angeles, California, 1985.

Archaeologist, Peak and Associates, Sacramento, California, 1985.

PROJECT EXPERIENCE (CONTINUED)

- Del Cerro, Sherman Heights, and Mission Hills Street lights monitoring
- Mission Bay Tee testing and geoarchaeology

Imperial Solar Energy Center West
Imperial County, California
Under contract with Tenaska, Inc., Mr. McLean is serving as the Project Manager performing compliance monitoring in support of the Bureau of Land Management (BLM). On behalf of the BLM, Mr. McLean is in charge of reviewing monitoring documentation, providing monitoring oversight, and performing project field visit support project compliance with the Mitigation Monitoring and Reporting Plan, the construction measures from the Final Environmental Impact Report/Environmental Assessment, and BLM-specific conditions.

Coastal Rail Trail Project
San Diego County, California
Under contract with the City of Carlsbad, Mr. McLean directed the cultural resources studies in support of Section 106 and National Environmental Policy Act compliance regarding a planned recreational trail.

Del Mar Fairgrounds
Del Mar, California
Mr. McLean was the Principal Investigator for several ongoing studies within and adjacent to the Fairgrounds.

Southern California Edison, Archaeological On-call, Various Locations, California
As Cultural Resources Task Manager and Lead Principal Investigator, Mr. McLean is responding to all requests for services and provides the Consultant Work Assignments and cost estimate spreadsheets for approval regarding each project (task). LSA has successfully completed over 600 tasks involving survey, test excavation, and monitoring. He reviews the draft reports in the role of Principal Investigator prior to submittal to Southern California Edison.

Solar One Project
San Bernardino County, California
As part of as needed services to Stirling Energy Systems, Inc., Mr. McLean (Project Manager and Principal Investigator) assembled a team who reviewed the draft cultural technical documents on behalf of the Bureau of Land Management (BLM). Additionally, he produced a Plan of Development matrix to facilitate the BLM's review of the Application of Certification submitted to the California Energy Commission and the BLM.

PROFESSIONAL EXPERIENCE (CONTINUED)

Archaeologist, Louis Berger and Associates, San Bernardino, California, 1985.

Unit Leader/Excavator, Scientific Resource Surveys, Inc., Huntington Beach, California, 1984–1985.

Excavator/Mapping, Archaeological Associates, Sun City, California, 1984–1985.

Archaeologist/Cartographer, California State University, Fullerton, 1984.

Photographer, Department of Anthropology, California State University, Long Beach, 1983.

Research Assistant, New Mexico Archaeological Services, Inc., Carlsbad, New Mexico, 1981–1982.

Site Director, Center for American Archeology, Kampsville, Illinois, 1979–1981.

Survey Leader/Archaeologist, Illinois State Museum, Springfield, Illinois, 1979.

Archaeologist, Social Process Research Institute, University of California at Santa Barbara, 1978–1979.

GS-5/Archaeologist, National Forest Service, United States Department of Agriculture, Modoc National Forest, 1978.

Archaeologist, University of California at Los Angeles, 1978.

PROFESSIONAL CERTIFICATIONS

Register of Professional Archaeologists (RPA)

County of San Diego Certified Consultant

Hazardous Waste Operations/Emergency Response –

40 Hour Course per 29 CFR 1910.120 and GISO 5192

PROJECT EXPERIENCE (CONTINUED)

Solar Two Project
Imperial County, California
Mr. McLean assembled a team who reviewed the draft cultural technical documents on behalf of the Bureau of Land Management (BLM) and the California Energy Commission (CEC) as part of as needed services to Stirling Energy Systems. He acted as Project Manager and Principal Investigator on this project and is also providing Section 106 expertise to the BLM and is managing a team of LSA archaeologists who provided Native American government-to-government consultation support to the BLM.

Sunrise Powerlink Project
San Diego and Imperial Counties, California
Mr. McLean was the Project Manager and Principal Investigator under contract with San Diego Gas & Electric Company, who provided third-party review of draft cultural resources documents to the Bureau of Land Management (BLM). He also provided Section 106 expertise to the BLM including preparation of a Programmatic Agreement for the project. Mr. McLean assembled a team supporting the BLM in government-to-government consultation with Tribes, including organizing meetings and making multiple telephone calls to interested tribes on behalf of the BLM.

El Casco (Oak Valley) System Substation Project
Riverside and San Bernardino Counties, California
Mr. McLean was the Project Manager and Lead Principal Investigator for contract with Southern California Edison regarding identification and evaluation of cultural resources for a proposed substation and reconductor line project.

Los Coches Creek Middle School
Alpine, San Diego County, California
LSA performed an archaeological survey and evaluation of identified archaeological sites at the location of a proposed school. Mr. McLean reviewed and edited the final report.

Sports Arena Arco Station
San Diego, California
LSA performed construction monitoring at the CA-SDI-10530/H West Point Loma Dump site. Mr. McLean reviewed and edited the final report.

South Orange County Transportation Infrastructure Improvement Project
Orange and San Diego Counties, California
Mr. McLean served as the Principal Investigator regarding the identification and evaluation of cultural resources within the project's area of potential effects.

SPECIAL TRAINING

University of Alabama, Huntsville: Environmental Impact Assessment of Projects

University of Nevada, Reno: Geomorphology in Archaeological Analysis, Native American Grave Protection and Repatriation Act (NAGPRA): Implications and Practical Application

United States Department of the Interior: Remote Sensing/Geophysical Techniques for Cultural Resource Management

United States General Services Administration: Federal Projects and Historic Preservation Laws

Advisory Council on Historic Preservation: Agreement Documents Preparation

United States Army Corps of Engineers:

Cultural Resources

Environmental Laws and Regulations

Global Positioning Systems

Hazardous Waste Operations/Emergency Response (40 Hour Course)

Historic Structures, Maintenance and Repair

Geographic Information Systems (GIS)

Remote Sensing Techniques

TEACHING

Invited instructor of survey and mapping, California State University, Los Angeles (since 1995) for annual field school on San Nicolas Island.

Annual instruction in forensic archaeology at El Toro High School.

ACADEMIC APPOINTMENT

Advisory Board Member, Master of Arts Degree Program in Applied Archaeology at California State University, San Bernardino.

PROJECT EXPERIENCE (CONTINUED)

Fagan Ranch
Ventura County, California
Mr. McLean served as the Project Manager for the identification of cultural resources within proposed housing development.

Oak Valley, Champions Golf Course
Riverside County, California
Mr. McLean served as the Principal Investigator for the identification, evaluation, and treatment of cultural resources within proposed housing development.

Truckee Meadows
Washoe County, Nevada
Mr. McLean served as the Consultant to the United States Army Corps of Engineers in the identification, evaluation, and treatment of cultural resources within proposed flood control project.

Southern California Edison Power Pole Upgrades
Santa Catalina Island, California
Mr. McLean served as the Co-Principal Investigator for contract with Southern California Edison regarding identification for cultural resources for planned power pole upgrades.

Laguna Canyon Excavations
Orange County, California
Mr. McLean served as the Project Manager and field director for a contract with the California Department of Transportation (Caltrans) regarding the data recovery (mitigation) excavations of prehistoric village site CA-ORA-1055.

Olinda Alpha Landfill Expansion
Orange County, California
Mr. McLean served as the Principal Investigator for surface surveys of proposed landfill expansion.

Diablo Canyon Power Plant
San Luis Obispo County, California
Mr. McLean performed cultural resources inventory of emergency sirens proposed for relocation for the client, Pacific Gas & Electric Company. The study included monitoring of excavation in sensitive areas. Impacts to resources were successfully avoided.

BROOKS SMITH
ASSOCIATE/PALEONTOLOGIST

LSA

EXPERTISE

Paleontological Assessment Reports and Paleontological Resources Impact Mitigation Programs

Archaeological and Paleontological Mitigation Monitoring Reports

Paleontological and Archaeological Resource Monitoring

Archaeological Excavation

Fossil Collection, Salvage, Identification, and Curation

GPS Data Collection and Analysis

Geologic Data Collection and Interpretation

EDUCATION

University of California, Santa Cruz, B.S., Earth Science (Geology), 1989.

California State University, Fullerton, Archaeological field methods course on San Nicolas Island, June–July 1993.

PROFESSIONAL RESPONSIBILITIES

Mr. Smith is a project manager at LSA with 22 years of experience in paleontology. He is responsible for scheduling paleontological and archaeological monitors on both large- and small-scale projects, as well as acting as an intermediary between clients and agencies such as the United States Department of Interior, Bureau of Land Management (BLM), and the United States Department of Agriculture, Forest Service (Forest Service). Mr. Smith also prepares paleontological assessment reports, paleontological resources impact mitigation programs (PRIMPs), and monitoring reports following the completion of both cultural and paleontological mitigation monitoring.

While in the field, Mr. Smith acts as a Field Coordinator or Co-Field Coordinator during field surveys for paleontological and archaeological resources prior to construction/development activities. Mr. Smith also monitors for and collects cultural and scientific resources during grading activities; documents and tests archaeological sites; assists with the salvage of large fossil remains with the use of plaster casts; assists with large-scale wet and dry screening of sediments for fossils; collects and analyzes data from handheld global positioning system (GPS) units; and collects and analyzes geologic and geomorphic data for use in reports.

PROJECT EXPERIENCE

Coyote Canyon Landfill
Newport Beach, California
Mr. Smith provided paleontological mitigation monitoring during the time the Coyote Canyon Landfill was active. Mr. Smith collected resources, prepared resources to the point of identification, identified collected resources, and input the resources into the fossil catalog.

Frank R. Bowerman Landfill
Orange County, California
Mr. Smith has provided paleontological resources monitoring on this project and assisted in the salvage of large-scale paleontological resources. Mr. Smith has prepared several year-end summary reports as well as 3-year summary reports documenting monitoring activities in addition to finds. Mr. Smith also prepared a paleontological resources assessment for the landfill.

Prima Deshecha Landfill
San Juan Capistrano, California
Mr. Smith provided paleontological mitigation monitoring during excavation associated with landfill operations and collected paleontological resources as they were uncovered by the grading operations. Mr. Smith also assisted with cultural resources testing of several prehistoric sites that were within proposed expansion areas.

PROFESSIONAL EXPERIENCE

Archaeological and Paleontological Surveyor, Monitor, Excavator, Report Preparer, and Paleontological Field Coordinator, LSA Associates, Inc., Irvine, California, July 1992–Present.

Geologist, Mission Geoscience, Newport Beach, California, November 1993–February 1994.

Paleontologist, John Minch and Associates, San Juan Capistrano, California, February–June 1992.

Geologist, Soil and Testing Engineers, Inc., Placentia, California, September 1989–February 1992.

CERTIFICATIONS

40-Hour Hazardous Materials Handling and Response, current through January 2015

County of Orange, Certified Paleontologist

City of San Diego Qualified Paleontologist

PROFESSIONAL ORGANIZATIONS/ MEMBERSHIPS

San Diego Association of Geologists

UCSC Alumni Association

Society of Vertebrate Paleontology

PROJECT EXPERIENCE (CONTINUED)

California Department of Transportation
Orange, Riverside, and San Bernardino Counties, California
Mr. Smith has prepared numerous Paleontological Investigation Reports (PIRs) and Paleontological Evaluation Reports (PERs) for the California Department of Transportation (Caltrans) following the guidelines in the Caltrans Standard Environmental Reference, Environmental Handbook, Volume 1, Chapter 8 – Paleontology. These reports are usually combined into a single document and involve geological formation studies, paleontological research at local museums, and field surveys to help determine whether proposed Caltrans projects will encounter paleontological resources during project development, and if so, whether those paleontological resources are significant. Mr. Smith has also prepared Paleontological Mitigation Plans (PMPs) for Caltrans that include developed paleontological mitigation procedures that must be in place during Caltrans road widening projects in order to protect the significant paleontological resources that have the potential to be encountered during grading.

The Bluffs Retail Center
Newport Beach, California
LSA was retained by the Irvine Company to provide cultural and paleontological resource mitigation monitoring during grading associated with the Bluffs Retail Center located in Newport Beach. Mr. Smith provided archaeological and paleontological monitoring for this project. Mr. Smith also assisted with the salvage of several fossil localities that contained significant fossil shark teeth. Mr. Smith was also the lead author for the final paleontological mitigation monitoring report.

Orchard at Saddleback, Phase I
Lake Forest, California
LSA was retained by W.A.L.F. LLC to provide cultural and paleontological resource mitigation monitoring during grading associated with the Phase I portion of the Orchard at Saddleback, located within the City of Lake Forest. Mr. Smith provided archaeological and paleontological monitoring during grading and was the lead author for the final paleontological mitigation monitoring report.

Orchard at Saddleback, Phase II
Lake Forest, California
LSA was retained by Wetrust America to provide cultural and paleontological resource mitigation monitoring during grading associated with the Phase II portion of the Orchard at Saddleback, located within the City of Lake Forest. Mr. Smith provided archaeological and paleontological monitoring during grading and was the lead author for the final paleontological mitigation monitoring report, as well as co-author for the cultural resources monitoring report.

PROJECT EXPERIENCE (CONTINUED)

Del Mar Fairgrounds
Del Mar, California
LSA was retained by the 22nd District Agricultural Association to provide technical studies needed to assist the 22nd District Agricultural Association during future expansion plans at the Fairgrounds. Mr. Smith authored the paleontological resources assessment report.

Laguna Canyon Road (State Route 133) Widening
Orange County, California
LSA was retained by Caltrans to provide cultural and paleontological resource mitigation monitoring along Laguna Canyon Road during its widening and realignment between State Route 73 (SR-73) and Old Laguna Canyon Road. Mr. Smith provided archaeological and paleontological monitoring for this project, as well as preparation of stratigraphic sections and identification of paleontological specimens. Mr. Smith also assisted on the excavation of archaeological site CA-ORA-1055 and was the lead author for the final paleontological mitigation monitoring report, as well as a contributing author for the final archaeological mitigation monitoring report.

Los Coches Creek Area Middle School
El Cajon, California
Mr. Smith performed a cultural resources survey of an 80-acre parcel as part of an assessment report prior to the construction of the school. During the survey, Mr. Smith recorded numerous undiscovered prehistoric and historic cultural resources.

Marine Corps Base Camp Pendleton
San Diego, California
LSA was contracted to conduct extensive testing of an ethnographically recorded village site. Mr. Smith provided cultural resource testing of Site CA-SDI-10156/H. LSA was contracted to provide cultural resource monitoring during removal of potentially hazardous soil in the Stewart Mesa area of the base. Mr. Smith delineated known cultural resource sites and provided monitoring during excavation.

Southern California Edison On-Call
Los Angeles, Orange, Riverside, San Bernardino, and San Diego Counties, California
LSA performs archaeological resource assessments for Southern California Edison's (SCE) pole replacement program. Assessments include record searches for previously recorded resources and studies; field surveys around poles; recordation of observed resources, if any; and recommendations. To date, over 1,000 poles have been assessed. Mr. Smith performed field surveys, recorded resources, and synthesized data.

State Route 73 Widening
Costa Mesa, California
LSA was contracted to provide paleontological monitoring during the widening of SR-73 between stations 74+00 and 82+00. The project area is located in the median of SR-73 within an approximately 0.5-mile stretch between the Birch Street overcrossing on the south and the northbound Bristol Street overcrossing on the north. Mr. Smith provided paleontological monitoring and fossil identification, and wrote the mitigation monitoring report.

PROJECT EXPERIENCE (CONTINUED)

San Joaquin Hills Transportation Corridor (State Route 73)
Orange County, California
LSA was contracted to provide paleontological mitigation monitoring for the San Joaquin Hills Transportation Corridor between El Toro Road in the south and Newport Coast Drive in the north. Mr. Smith provided paleontological resource monitoring (scheduling up to five monitors), fossil identification and curation, and assisted with writing the final mitigation monitoring report.

State Route 71 Widening
Chino, California
LSA was contracted to provide paleontological and cultural resource monitoring during the widening of State Route 71 (SR-71). Mr. Smith provided paleontological and cultural resource monitoring, fossil identification, and curation of collected paleontological remains.

El Camino Real Widening North of Cougar Drive
Carlsbad, California
LSA provided paleontological resources mitigation monitoring during the widening of a portion of El Camino Real north of Cougar Drive in the City of Carlsbad from two lanes to three. The project involved removing a section of hill measuring approximately 100 feet long, 30 feet wide, and up to 15 feet high in the Cretaceous Point Loma Formation. LSA collected several fossil localities containing clams, snails, crabs, and plant material. Mr. Smith provided some of the monitoring for this project, and was the lead author for the mitigation monitoring report.

San Diego Gas & Electric On-Call Environmental Services
California
LSA provides support documentation to San Diego Gas & Electric (SDG&E) to satisfy Natural Communities Conservation Plan (NCCP), California Environmental Quality Act, California Public Utility Commission (CPUC), California Coastal Commission, United States Army Corps of Engineers (Corps), California Department of Fish and Wildlife (CDFW), and Regional Water Quality Control Board requirements. Mr. Smith mainly works on SDG&E projects that require cultural resource studies. Representative projects include the following:

- **Shadowridge-Meadowlark Tap: Rebuild TL 13811:** LSA provided a cultural resource assessment for an approximately 4-mile transmission line located in San Diego. The assessment included a cultural resources search through the South Coastal Information Center, and an intensive pedestrian survey for all proposed new pole locations and staging areas. Finally, LSA made recommendations for each separate pole location. Mr. Smith was involved in all aspects of the cultural resource assessment.
- **Firestorm 2007 Environmental and Biological Monitoring:** LSA provided on-call support for monitoring services immediately following the October 2007 wildfires in San Diego, including documentation of access road regrading and erosion control consultation; data compilation, analysis, and interpretation; and data form entry for compliance with Corps Regional General Permit 63. Mr. Smith provided both cultural and biological surveys along several of the burned pole alignments.

APPENDIX B:

SOIL PEDON DESCRIPTIONS FOR THE MISSION BAY GOLF COURSE AND ADJACENT AREAS

CORRALITOS SERIES

Location: Corralitos, California
Established Series
Rev. GWH-RCH-TDC
4/93

The Corralitos series consists of deep, somewhat excessively drained soils that formed in recent sandy alluvium derived from acid sandstone and related rocks. Corralitos soils are on alluvial fans and in small valleys and have slopes of 0 to 15 percent. The mean annual precipitation is about 20 inches, and mean annual air temperature is about 58 degrees Fahrenheit (F).

Taxonomic Class: Mixed, thermic Typic Xeropsamments

Typical Pedon: Corralitos loamy sand - rangeland. (Colors are for dry soil unless otherwise noted.)

A11 0 to 8 inches; brown (10YR 5/3) loamy sand, dark brown (10YR 4/3) moist; single-grained; loose; many very fine, common fine and few medium and coarse roots; many very fine and fine interstitial pores; medium acid (pH 6.0); abrupt wavy boundary (3 to 10 inches thick).

A12 8 to 20 inches; grayish brown (10YR 5/2) loamy sand, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, nonsticky and nonplastic; common very fine and fine roots, and few medium and coarse roots; many very fine and fine interstitial pores and many very fine, fine, and medium tubular pores; medium acid (pH 6.0); gradual irregular boundary (6 to 13 inches thick).

A13 20 to 32 inches; grayish brown (10YR 5/2) loamy sand, dark brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine, fine, medium, and coarse roots; many very fine and fine interstitial and many fine and common medium tubular pores; medium acid (pH 6.0); gradual irregular boundary (7 to 12 inches thick).

C1 32 to 49 inches; light brownish gray (10YR 6/2) light loamy sand, dark yellowish brown (10YR 4/4) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine, fine, medium, and coarse roots; many very fine and fine interstitial pores and many very fine, fine, and medium tubular pores; medium acid (pH 6.0); abrupt wavy boundary (10 to 18 inches thick).

C2 49 to 72 inches; pale brown (10YR 6/3) loamy sand, yellowish brown (10YR 5/4) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine and fine and few medium roots; many very fine and fine interstitial and few very fine and fine tubular pores; medium acid (pH 6.0) (10 to 14 inches thick).

Type Location: Santa Barbara, California; 3¼ miles east along the north edge of San Antonio Valley from the Lompos-Casmalia Road intersection and 1.8 miles north on side road, east of road fork.

Range in Characteristics: The mean annual soil temperature is about 60 to 65 degrees F and the soil temperature usually is not below 47 degrees F at any time. The mean winter soil temperature is about 54 to 58 degrees F and the mean summer soil temperature is about 65 to 70 degrees F. The soil between depths of about 12 and 35 inches is usually dry all of the time from late April or May until November or early December and is moist in some or all parts all the rest of the year.

Rock fragments are mostly of gravel size and make up less than 15 percent of the soil and in most pedons less than 5 percent of soil. Textures are sand, loamy sand, fine sand or loamy fine sand to a depth of 40 inches or more. Dominant sand sizes are medium and fine sand. Coarse and very coarse sand combined is less than 35 percent. The profile is stratified, but strata finer than loamy fine sand are lacking to a depth of more than 40 inches. The soil is dominantly slightly to strongly acid but some strata in some pedons are neutral.

The A horizon is brown to pale brown (10YR 5/3, 5/2, 6/2, 6/3). Organic matter is less than 1 percent in most parts.

The C horizon is light gray to light yellowish brown (10YR 7/2, 7/1, 7/3, 6/2, 6/3, 6/4). Weakly expressed buried A horizons are present in a few pedons. Buried horizons of contrasting texture and color are present below a depth of 40 inches in some pedons.

Competing Series: These are the Arnold, Briones, Calhi, Delhi and Tujunga series in the same family and the Baywood and Oceano series. Arnold soils have a paralithic contact 40 to 60 inches below the surface and lack stratification (see Remarks). Baywood soils have a mollic epipedon. Briones soils have a paralithic contact 20 to 40 inches below the surface. Calhi soils are moderately to very strongly alkaline below a depth of 10 inches. Delhi soils lack rock fragments and stratification, and the mean summer and mean winter soil temperatures differ by about 25 to 35 degrees F. Oceano soils have lamellae and lack stratification. Tujunga soils have more than 35 percent coarse and very coarse sand and mean summer and mean winter soil temperatures differ by more than 15 degrees F. Also, Tujunga soils are slightly acid to mildly alkaline and have 5 to 35 percent rock fragments.

Geographic Setting: The Corralitos soils are on alluvial fans and in small valleys at elevations of 25 to 1,000 feet. Slopes are 0 to 15 percent. The soils formed in recent sandy alluvium derived from acid sandstone and related sources. The climate is dry subhumid mesothermal with dry somewhat foggy summers and cool moist winters. Mean annual precipitation is 12 to 30 inches. Average January temperature is 50 to 52 degrees F, average July temperature is 62 to 66 F, and mean annual temperature is 57 to 60 degrees F. The frost-free season is 250 to 330 days.

Geographically Associated Soils: These are the Antioch, Cortina, Elder, Las Flores, Metz, and Pico soils and the competing Arnold soils. Antioch and Las Flores soils have a fine-textured argillic horizon. Cortina soils are loamy and have more than 35 percent rock fragments. Elder and Pico soils are sandy loam and have a mollic epipedon. Metz soils are stratified with strata finer than loamy fine sand.

Drainage and Permeability: Somewhat excessively drained; slow runoff; rapid permeability. Some areas are subject to localized flooding and deposition. Channels and other flood control measures now protect some areas.

Use and Vegetation: Used for range, dryland crops, urban development, and for growing truck crops, alfalfa, citrus, and other fruits under irrigation. Uncultivated areas have a cover of annual grasses, forbs, coyotebush, other shrubs, and a few live oak trees.

Distribution and Extent: Small coastal valleys from central California southward. The soils are moderately extensive.

MLRA Soil Survey Regional Office (MO) Responsible: Davis, California

Series Established: Santa Cruz County (Pajaro Valley Area), California, 1908.

Remarks: This description represents a change in the type location, which was formerly in Santa Cruz County. Corralitos was not mapped in Santa Cruz County during the soil survey completed in 1976. This does not change the concept of the series. Soils of the Laguna series are now dominantly included in the Corralitos series. Continued study is needed to establish acceptable differentia between the Corralitos and Arnold series. Arnold soils are underlain by soft sandstone at depths of 40 inches or more.

Last revised by the State in November, 1977.

CsB—Corralitos loamy sand, 0 to 5 percent slopes

- **Map Unit Setting**
  - Landscape: Valleys
  - Elevation: 30 to 1,000 feet
  - Mean annual precipitation: 12 to 30 inches
  - Mean annual air temperature: 57 to 61 degrees F
- **Map Unit Composition**
  - Corralitos and similar soils: 85 percent
  - Minor components: 15 percent
- **Description of Corralitos**
  - ***Setting***
    - Landform: Alluvial fans
    - Landform position (two-dimensional): Toeslope
    - Landform position (three-dimensional): Base slope, rise
    - Down-slope shape: Linear
    - Across-slope shape: Convex
    - Parent material: Alluvium derived from calcareous sandstone
  - ***Properties and qualities***
    - Slope: 0 to 5 percent
    - Depth to restrictive feature: More than 80 inches
    - Drainage class: Somewhat excessively drained
    - Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
    - Depth to water table: More than 80 inches
    - Frequency of flooding: None
    - Frequency of ponding: None
    - Available water capacity: Moderate (about 8.3 inches)

- ***Interpretive groups***
  - Farmland classification: Prime farmland if irrigated
  - Land capability classification (irrigated): 3s
  - Land capability (non-irrigated): 4s
  - Hydrologic Soil Group: A
- ***Typical profile***
  - 0 to 12 inches: Loamy sand
  - 12 to 43 inches: Loamy fine sand, loamy sand
  - 43 to 72 inches: Sand, fine sand

- **Minor Components**
  - ***Tujunga***
    - Percent of map unit: 10 percent
  - ***Huerhuero***
    - Percent of map unit: 2 percent
  - ***Unnamed***
    - Percent of map unit: 1 percent
    - Landform: Alluvial fans
    - Landform position (two-dimensional): Toeslope
    - Landform position (three-dimensional): Base slope, rise
    - Down-slope shape: Linear
    - Across-slope shape: Convex
  - ***Unnamed ponded***
    - Percent of map unit: 1 percent
    - Landform: Depressions
  - ***Las flores***
    - Percent of map unit: 1 percent

ANTIOCH SERIES

Location: Antioch, California
Established Series
Rev. LAB-GMK-LCL
3/97

Note: Soils of the Huerhuero series are now included with the Antioch series.

The Antioch series has light brownish gray and brown, medium acid, loam Ap and Al horizons, light gray A2 horizons, light yellowish brown yellowish brown, medium acid and moderately alkaline clay and clay loam B2t horizons.

Taxonomic Class: Fine, smectitic, thermic Typic Natrixeralfs

Typical Pedon: Antioch loam/plowed field (Colors are for dry soil unless otherwise noted.)

Ap 0 to 5 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; common fine yellowish brown (10YR 5/6) mottles, strong brown (7.5YR 5/6) moist; massive; hard, friable, slightly sticky, slightly plastic; many very fine roots; many very fine roots; many very fine and medium tubular pores; medium acid (pH 5.6); clear smooth boundary (5 to 10 inches thick).

A1 5 to 14 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; few fine yellowish brown (10YR 5/6) mottles, strong brown (7.5YR 5/6) moist massive; hard, friable, slightly sticky, slightly plastic; few very fine roots; many fine and medium acid (pH 6.0); clear wavy boundary (8 to 15 inches thick).

A2 14 to 19 inches; light gray (10YR 7/2) loam, dark grayish brown (10YR 4/2) moist; common fine yellowish sticky, slightly sticky; slightly plastic; few very fine roots; many fine pores; Mn stains; slightly acid (pH 6.5); abrupt smooth boundary (¼ to 5 inches thick).

Bt1 19 to 34 inches; light yellowish brown (10YR 6/4) clay, dark yellowish brown (10YR 3/3) moist; moderate very coarse prismatic structure; extremely hard, very firm, sticky, very plastic; few very fine roots; common very fine tubular pores; many moderately thick clay films on faces of peds and lining pores; few dark stains; medium acid (pH 6.0); clear wavy boundary (9 to 16 inches thick).

Bt2 34 to 37 inches; yellowish brown (10YR 5/4) heavy clay loam, dark brown (10YR 4/3) moist; weak medium angular blocky structure; extremely hard, very firm, sticky, plastic; common very fine tubular pores; many moderately thick clay films on faces of peds and lining pores; many dark stains; moderately alkaline (pH 8.0); clear wavy boundary (8 to 14 inches thick).

Bt3 37 to 46 inches; pale brown (10YR 6/3) clay loam, dark yellowish brown (10YR 4/4) moist, dark brown (7.5YR 3/2) and dark grayish brown (2.5Y 4/2) ped faces moist; weak medium angular blocky structure; hard, firm, sticky, plastic; common very fine tubular pores; continuous moderately thick clay films on faces of peds and lining pores; common dark stains; moderately alkaline (pH 8.0); diffuse boundary (0 to 10 inches thick).

Bt4 46 to 60 inches; pale brown (10YR 6/3) silty clay loam, olive brown (2.5Y 4/2) and dusky red (2.5YR 3/2) faces of peds moist; weak medium angular blocky structure; hard, firm, sticky, plastic; common very fine tubular pores; continuous moderately thick clay films on faces of peds and lining pores; common dark stains; moderately alkaline (pH 8.0); clear wavy boundary (0 to 14 inches thick).

C1 60 to 76 inches; pale brown (10YR 6/3) loam, dark yellowish brown (10YR 4/4) moist; weak medium angular blocky structure; slightly hard, friable, slightly sticky, plastic; many very fine tubular pores; common thin clay films on faces of peds and lining pores; common dark stains; moderately alkaline (pH 8.0); clear wavy boundary (10 to 20 inches thick).

C2 76 to 81; Dark yellowish brown (10YR 4/4) moist fine sandy loam; weak medium angular blocky structure; slightly hard, friable, many very fine tubular pores; few thin clay films on faces of peds and lining pores; moderately alkaline (pH 8.0); common Fe and Mn stains.

Type Location: Solano County, California; 1½ miles east of Suisun City; Southwest ¼ Southeast ¼ Southwest ¼ Section 29, Township 5 North, Range 1 West, MDB&M 38 degrees North latitude 14 minutes, 40 seconds, 122 degrees West longitude 00 minutes, 5 seconds.

Range in Characteristics: The mean annual soil temperature 59 to 64 F. The soils become moist in some or all parts between depths of 4 to 12 inches about late November and usually remain moist all the time until late May or early June. The soils remain dry all rest of the time. Few pebbles are present throughout the some pedons. Coarse and very coarse sand is less than 5 percent.

The A1 horizon is dark grayish brown, dark brown, brown, grayish brown, or light brownish gray. It contains more than 1 percent organic matter in the upper 10 inches, but is hard and massive when dry. This horizon is neutral to strongly acid, though neutral saturation in some pedons.

The A2 horizon is gray, light brownish, light brownish gray or light gray and is slightly to strongly acid. The A2-Bt horizon boundary is abrupt or very abrupt. The Bt horizon is dark brown, yellowish brown, light yellowish brown and pale brown 10YR hue and light olive brown and light yellowish brown in 2.5Y hue. It is medium acid to moderately alkaline, becoming more alkaline with increasing depth. All of the Bt horizon has more than 15 percent exchangeable sodium. It is clay or heavy clay loam and has approximately 35 to 45 percent clay. It has weak or moderate columnar moderate to strong prismatic structure in the upper part. Usually there are transitional horizons to the C horizon. The lower Bt horizons or B3 or C horizons are calcareous in some or all parts.

The C horizon is pale brown, light yellowish brown, yellowish brown or dark yellowish brown, it is somewhat stratified and is usually clay loam or loam in texture. This horizon is mildly or moderately alkaline.

Competing Series: These are the Bonsall, Las Flores, Lethent, Milipitas, Placentia, Riz, San Miguel, Solano, Stockpen, Tierra, and Waukena series. Bonsall and Stockpen soils lack an albic horizon. Las Flores, Milipitas, and Tierra soils lack natric horizons. Lethent soils have an aridic moisture regime. Placentia soils have about 15 to 20 percent coarse and very coarse sand in the B2t horizon. Riz soils lack an abrupt A-B horizon boundary with more than 15 percent absolute clay difference. San Miguel soils have a lithic contact at depth of 20 to 34 inches. Solano and Waukena soils have less than 35 percent clay in the natric horizon.

Geographic Setting: Antioch soils are on nearly level to strongly sloping alluvial fans and terraces at elevations of less than 1,100 feet. Slopes are usually less than 3 percent. The climate is subhumid mesothermal with warm to hot dry summers and cool moist winter. Mean annual precipitation is 12 to 20 inches. Average January temperature is about 46 degrees F, average July temperature about 68 degrees F, mean annual temperature about 58 degrees F, and the freeze-free season is about 260 days.

Geographically Associated Soils: These are the Altamont, Los Osos, Pleasanton, Rincon, and San Ysidro soils and the competing Solano soils. Altamont soils are of fine texture throughout and have cracks. Los Osos soils have mollic epipedons. Pleasanton, Rincon, and San Ysidro soils lack natric horizons.

Drainage and Permeability: Moderately well to somewhat poorly drained; slow to medium runoff; very slow permeability.

Use of Vegetation: Used for production of annual pasture, dryfarmed grain and some irrigated row crops. Vegetation in untilled areas is annual grasses, forbs and weeds with scattered oaks.

Distribution and Extent: Along the central and southern Coast Range valleys in California. They are of moderate extent in MLRA 14 and 17.

MLRA Soil Survey Regional Office (MO) Responsible: Davis, California

Series Established: Reconnaissance of Sacramento Valley, California, 1913.

Remarks: The soils were formerly classified in the solodized-Solonetz group. Soils of the Huerhuero series are now included with the Antioch series.

Last revised by the State in May 1972.

Additional Data: NSSL pedon S64CA-095-008 (type location) and S78CA-000-000 (range in characteristics).

HuC—Huerhuero-Urban land complex, 2 to 9 percent slopes

- **Map Unit Setting**
  - Landscape: Valleys
  - Elevation: 1,100 feet
  - Mean annual precipitation: 12 to 20 inches
  - Mean annual air temperature: 57 degrees F
  - Frost-free period: 260 days
- **Map Unit Composition**
  - Huerhuero and similar soils: 50 percent
  - Urban land: 30 percent
  - Minor components: 15 percent
- **Description of Huerhuero**
  - ***Setting***
    - Landform: Marine terraces
    - Down-slope shape: Linear
    - Across-slope shape: Linear
    - Parent material: Calcareous alluvium derived from sedimentary rock

- ***Properties and qualities***
  - Slope: 2 to 9 percent
  - Depth to restrictive feature: More than 80 inches
  - Drainage class: Moderately well drained
  - Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
  - Depth to water table: More than 80 inches
  - Frequency of flooding: None
  - Frequency of ponding: None
  - Maximum salinity: Non-saline (0.0 to 2.0 mmhos/cm)
  - Sodium adsorption ratio, maximum: 25.0
  - Available water capacity: Moderate (about 6.6 inches)
- ***Interpretive groups***
  - Farmland classification: Not prime farmland
  - Land capability classification (irrigated): 4e
  - Land capability (non-irrigated): 4e
  - Hydrologic Soil Group: D
- ***Typical profile***
  - 0 to 12 inches: Loam
  - 12 to 55 inches: Clay loam, clay
  - 55 to 72 inches: Stratified sand to sandy loam

- **Description of Urban Land**
  - ***Interpretive groups***
    - Farmland classification: Not prime farmland
    - Land capability (non-irrigated): 8
  - ***Typical profile***
    - 0 to 6 inches: Variable
- **Minor Components**
  - ***Las flores***
    - Percent of map unit: 10 percent
  - ***Oliventain***
    - Percent of map unit: 5 percent

HuE—Huerhuero-Urban land complex, 9 to 30 percent slopes

- **Map Unit Setting**
  - Landscape: Valleys
  - Elevation: 1,100 feet
  - Mean annual precipitation: 12 to 20 inches
  - Mean annual air temperature: 57 degrees F
  - Frost-free period: 260 days
- **Map Unit Composition**
  - Huerhuero and similar soils: 50 percent
  - Urban land: 30 percent
- **Description of Huerhuero**
  - ***Setting***
    - Landform: Marine terraces
    - Down-slope shape: Concave
    - Across-slope shape: Linear
    - Parent material: Calcareous alluvium derived from sedimentary rock
  - ***Properties and qualities***
    - Slope: 15 to 30 percent
    - Depth to restrictive feature: More than 80 inches
    - Drainage class: Moderately well drained
    - Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
    - Depth to water table: More than 80 inches
    - Frequency of flooding: None
    - Frequency of ponding: None
    - Maximum salinity: Non-saline (0.0 to 2.0 mmhos/cm)
    - Sodium adsorption ratio, maximum: 25.0
    - Available water capacity: Moderate (about 6.5 inches)
  - ***Interpretive groups***
    - Farmland classification: Not prime farmland
    - Land capability classification (irrigated): 6e
    - Land capability (non-irrigated): 6e
    - Hydrologic Soil Group: D

- ***Typical profile***
  - 0 to 10 inches: Loam
  - 10 to 50 inches: Clay loam, clay
  - 50 to 60 inches: Stratified sand to sandy loam

- **Description of Urban Land**
  - ***Interpretive groups***
    - Farmland classification: Not prime farmland
    - Land capability (non-irrigated): 8
  - ***Typical profile***
    - 0 to 6 inches: Variable

Md—Made land

- **Map Unit Composition**
  - Made land: 100 percent
- **Description of Made Land**
  - ***Interpretive groups***
    - Farmland classification: Not prime farmland
    - Land capability (nonirrigated): 8
  - ***Typical profile***
    - 0 to 6 inches: Variable

Tl—Tidal flats

- **Map Unit Composition**
  - Tidal flats: 100 percent
- **Description of Tidal Flats**
  - ***Setting***
    - Landform: Tidal flats
  - ***Properties and qualities***
    - Slope: 0 to 2 percent
    - Drainage class: Very poorly drained
    - Depth to water table: About 0 inches
    - Frequency of flooding: Frequent

- ***Interpretive groups***
  - Farmland classification: Not prime farmland
  - Land capability (non-irrigated): 8
  - Hydrologic Soil Group: D
- ***Typical profile***
  - 0 to 60 inches: Variable

APPENDIX C:

CORE DESCRIPTIONS TABLE

CORE C1

0-4 feet (27” recovery)

0-7 inches	5YR 3/2 (dark reddish brown) fine grained sandy silt, lots of organic material (humus)
7-10 inches	7.5YR 6/1 (gray) very fine grained sand with shell fragments: *Chione* and *Tagelus* (Dredge material)
10-18 inches	5YR 3/2 (dark reddish brown) silty clay, some caliche nodules, small amount of fine grained sand.
18-27 inches	7.5YR 5/1 (gray) fine grained sand

4-8 feet (22” recovery)

0-11 inches	7.5YR 5/1 (gray) slightly silty fine grained sand, some mica
11-22 inches	GLEY-2 3/10B (very dark bluish gray) silty fine grained sand, abundant mica, greasy, very small shell fragments – sand grained sized (*Tagelus*)

8-12 feet (18” recovery)

0-5 inches	GLEY-2 3/10B (very dark bluish gray) silty fine grained sand, abundant mica, greasy, very small shell fragments – sand grained sized (*Tagelus*). Very wet.
5-11 inches	5YR 3/2 (dark reddish brown) fine grained sandy silt (?Native)
11-18 inches	7.5YR 3/3 (dark brown) fine grained sandy clayey silt

12-16 feet (30” recovery)

0-4 inches	7.5YR 3/1 (very dark gray) almost pure silt with trace mica
4-16 inches	7.5YR 4/2 (brown) silt, somewhat greasy texture, lots of charcoal (organics) – some up to 1/2 inch.
16-28 inches	7.5YR 3/1 (very dark gray) mostly silt, greasy texture, small charcoal (organics) flakes.
28-30 inches	7.5YR 3/1 (very dark gray fine to medium grained sandy silt

16-20 feet (no recovery)

20-24 feet (no recovery)

24-28 feet (39” recovery)

0-6 inches	7.5YR 3/2 (dark brown) silty fine to medium grained sand
6-39 inches	7.5TR 4/2 (brown) silty clay with trace amount of mica.

CORE C2

0-4 feet (28” recovery)

0-3 inches	7.5YR 3/1 (very dark gray) silty fine grained sand, highly organic
3-11 inches	5YR 2.5/2 (dark reddish brown silty fine to medium grained sand
11-20 inches	7.5YR 6/1 (gray) silty fine grained sand with abundant small shell fragments: *Chione*, *Tagelus*, *Argopecten*, and *Ostrea* (dredge material)
	20 to 28 inches 10YR 4/2 (dark grayish brown) very silty fine grained sand, no shell

4-8 feet (28” recovery)

0-8 inches	10YR 3/3 (dark brown) very silty fine grained sand
8-28 inches	10YR 3/1 (very dark gray) silty fine grained sand with mica. Sandy silt between 16-22 inches, more abundant mica beginning at 20 inches

8-12 feet (22” recovery)

0-10 inches	10YR 3/1 (very dark gray) fine grained sandy silt with abundant mica. 0-5 inches is very wet
10-22 inches	10YR 3/3 (dark brown) clayey silt. Not as wet as upper levels, just moist. 10YR 4/3 (brown) at bottom

12-16 feet (29” recovery)

0-13 inches	10YR 4/3 (brown) clayey silt, no mica
13-24 inches	10YR 3/1(very dark gray) clayey silt
24-29 inches	GLEY-2 3/5BG (very dark greenish gray) silty clay

16-20 feet (43” recovery)

0-3 inches	GLEY-2 3/5BG (very dark greenish gray) clayey silt
3-23 inches	GLEY-2 2.5/5BG (greenish black) clayey silt
23-43 inches	5YR 3/3 (dark reddish brown) silty fine grained sand

20-24 feet (48” recovery)

0-4 inches	5YR 3/3 dark reddish brown silty fine grained sand
4-48 inches	Color varies 5YR 3/3 (dark reddish brown), 5YR 3/1 (very dark gray), 5YR 3/2 (dark reddish brown) and 5YR 4/3 (reddish brown) silty clay, some areas of clayey silt. Broad variations. Moisture content is moist.

24-27 feet (30” recovery)

0-9 inches	7.5YR 4/2 (brown) clayey silt, trace amount of fine grained sand
9-18 inches	GLEY-1 3/5GY (very dark greenish gray) silty clay. Mottling of 5YR 4/6 (yellowish red) colors.
18-23 inches	GLEY-1 3/5GY (very dark greenish gray) slowly increasing fine to medium grained sand content.
23-26 inches	7.5YR 4/1 (dark gray) silty fine to medium grained sand
26-30 inches	7.5 TR 4/3 (dark brown) fine to medium grained sand

CORE N1

0-4 feet (28" recovery)

0-4 inches	10YR 2/2 (very dark brown highly organic silty sand with grass and roots
4-16 inches	7.5YR 4/2 (brown) silty fine grained sand with small fragments of shell:Ostrea, Chione, Tagelus, and Argopecten. (dredge material).
16-19 inches	7.5YR 4/2 (brown) fine grained sandy silt, with shell fragments.
19-22 inches	7.5YR 3/2 (dark brown fine grained sandy silt with trace clay, no shells. (?terrestrial origin)
22-28 inches	GLEY-2 5/5B (blueish gray) silty fine grained sand with abundant mica. Tiny fragments / small flecks of shell highly fragmented Tagelus, and Chione.

4-8 feet (30" recovery)

0-30 inches	7.5YR 4/1 (dark gray) slightly silty fine grained sand some mica, some tine shell fragments (sand grained sized). With depth grades to silty fine grained sand. Sample is fairly uniform aside from the increasing silt content.

8-12 feet (19" recovery)

0-15 inches	7.5YR 3/1 (very dark gray) fine grained sandy silt, abundant mica, no organics.
15-19 inches	7.5YR 2.5YR 5/3 (very dark brown) clayey silt with mica, no organics.

12-16 feet (32" recovery)

0-27 inches	7.5YR 2.5/3 (very dark brown) clayey silt, some mica. Very wet 19-27 inches. Increasing charcoal at 20 inches
27-32inches	7.5YR 4/1 (dark gray) mottled with 7.5YR 4/5 (brown) silt. Lots of caliche nodules, some charcoal? (orgnacis).

16-20 feet (28" recovery)

0-18 inches	7.5YR 4/3 (brown) sandy silt, very wet
18-28 inches	7.5YR 3/3(dark brown) silty clay or clay silt (~50/50 mix). Very small charcoal ? (organics) flecks present.

20-24 feet (48" recovery)

0-12 inches	7.5YR 4/3 (brown) clayey silt to silty clay (~50/50 mix). Moist, some trace amounts of charcoal? (organics)
12-19 inches	7.5YR 4/3 (brown) clayey silt.
19-48 inches	7.5YR 4/3 (brown) clayey silt to silty clay (~50/50 mix). Moist, some trace amounts of charcoal? (organics)

24-28 feet (48" recovery)

0-22 inches	7.5YR 3/3(dark brown) silty clay
22-34 inches	7.5YR 4/3 (brown) silty clay to clayey silt with trace of sand
34-48 inches	7.5YR 2.5/2 (very dark brown silty clay

CORE N2

0-4 feet (25" recovery)

0-2.5 inches	5YR 2.5/1 (black) silty fine grained sand with organics
2.5-8 inches	7.5YR 6/1 (gray) fine grained sand.
8-10 inches	5YR 4/3(reddish brown) slightly silty fine grained sand
10-12 inches	6/1 (gray) fin grained sand
12 to 25 inches	5YR 4/1 (dark gray) fine grained sand, increasing silt content with depth.

4-8 feet (26" recovery)

0-2 inches	10YR 4/1 (dark gray) slightly silty fine grained sand with some caliche nodules
2-13 inches	10YR 4/1 (dark gray) very silty fine grained sand, abundant mica at 5-10 inches
13-15 inches	10YR 3/1 (very dark gray) same as above, increasing clay content, ~30% mica.
15-18inches	10YR 2/1 (black) clayey silt, very greasy texture, no sand, thinly laminated
18-26 inches	10YR2/1 (black) clayey silt, very greasy texture, not laminated.

8-12 feet (27" recovery)

0-14 inches	10YR 3/1 (very dark gray) and 10YR4/2 (dark grayish brown) mottled clayey silty fine grained sand (~50% sand, 30 % silt and 20% clay).
14 to 27 inches	7.7YR 4/2 (brown) silty clayey fine grained sand, approx. 50% sand.

12-16 feet (32" recovery)

0-10 inches	7.5YR 5/2 (brown) silty clayey fin grained sand, fairly wet
10-11 inches	10YR 2.5/1 (very dark gray) thinly laminated clayey silt, greasy
11-18 inches	10YR5/3 (brown) silt with a little bit of clay, some soft caliche veins, clay increases with depth
18-22 inches	7.5YR 3/1 (very dark gray) clayey silt, laminated. Some mottling, 10YR 5/3 (brown) some charcoal/organics at 20 inches
22-26 inches	GLEY-2 4/5BG (dark greenish gray) fine grained sandy clayey silt, mottled with 10YR5/3 (brown)
26-32 inches	GLEY-2 5/10G – 4/10G (greenish gray to dark greenish gray) fine grained sandy silt, occasional pieces of mica

16-20 feet (34" recovery)

0-10 inches	7.5YR 5/2 (brown) fine grained sandy silt with some clay
10-34 inches	5YR3/2 (dark reddish brown) silty clay

20-24 feet (48" recovery)

0-12 inches	2.5YR 3/2 (dark reddish brown) moist silty clay very dense
12-16 inches	2.5YR 3/2 (dark reddish brown) pure clay
16-32 inches	2.5YR 3/2 (dark reddish brown) silty clay
32-48 inches	2.5YR 3/2 (dark reddish brown) pure clay

24-28 feet (48" recovery)

0-16 inches	5YR3/3 to 2.5YR 3/3(dark reddish brown) pure clay
16-48 inches	5YR 3/3 (dark reddish brown) clayey silt with a small amount of fine grained sand

CORE S2

0-4 feet (24” recovery)

0-5 inches	7.5YR 6/1 (gray) fine to medium grained sand
5-7 inches	7.5YR 2.5/1 (black) silt
7-20 inches	7.5YR 4/1 (dark gray) silty fine to medium grained sand with abundant shell fragments: *Turritella*; *Ostrea*; unidentified clams. Also mix of other sediment types: sandy clay, clayey silt, clay balls. Definitely fill/reworked
20-24 inches	7.5YR 4/3 (brown) silty fine grained sand

4-8 feet (27” recovery)

0-10 inches	7.5YR 4/3 (brown) silty fine grained sand to silty fine to medium grained sand. Some gravel, or a broken cobble.
10-27 inches	5YR 4/1 (dark gray) silty fine to medium grained sand lots of *Tagelus* fragments, some *Chione*; *Argopecten* (with shell color intact); barnacle, whelk. All shells are highly fragmented; shells are 15-20% of matrix.

8-12 feet (31” recovery)

0-4 inches	5YR 4/1 (dark gray) silty fine to medium grained sand lots of *Tagelus* fragments, some *Chione*; *Argopecten* (with shell color intact); barnacle, whelk. All shells are highly fragmented; shells are 15-20% of matrix.
4-27 inches	5YR 4/1 (dark gray) silty fine grained sand, abundant mica, a few unidentifiable sand grained sized shell fragments
27-31 inches	7.5YR 2.5/1 (black) very silty fine grained sand

12-16 feet (48” recovery)

0-24 inches	7.5YR 2.5/1 (black) very silty fine grained sand, some mica, very wet 0-24 inches
20-24 inches	(gradational contact)
24-42 inches	GLEY-1 2.5/N (black) clayey silt. Very greasy, lots of charcoal/organic material, sulfur aroma. Likely very anoxic environment.
42-48 inches	5YR 4/2 (dark reddish brown) slightly clayey silt (?terrestrial)

16-20 feet (48” recovery)

0-36 inches	7.5YR 3/2 (dark brown slightly clayey silt, a little bit of mica, no organics.
36-48 inches	GLEY-1 2.5/10Y (greenish black) clayey silt with some charcoal/organics slightly sandy as depth increases and then up to 40% sand at 48 inches. Sulphur aroma

20-24 feet (no recovery)

24-28 feet (no recovery)

APPENDIX D:

CONFIDENTIAL FIGURE