Cooley Landing
Cultural Resource Inventory and Assessment

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2415 University Avenue
East Palo Alto, CA 94303

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Introduction

The City of East Palo Alto is proposing to develop a 8.5 acre tract of land into a park and interpretive center. This tract of land is located just south of Dumbarton Bridge, on the western shore of San Francisco Bay, and is popularly known as Cooley Landing. Figure 1 shows the project location, and Figure 2 illustrates the project area. The City contracted Kleinfelder, Inc. to conduct a Phase I and Phase II Environmental Site Assessment (ESA) to determine if the tract is appropriate for its intended use.

Scope of Work

Kleinfelder, Inc. contracted Past Forward, Inc. to perform the historic and archaeological evaluation of Cooley Landing. The scope of work specified that Past Forward, Inc. would:

- Perform an historical and archaeological site survey of the Cooley Landing site. This will be a visual inspection to identify all above-ground resources, as well as identify any indicators of buried archaeological resources.
- Perform background research, including record searches, literature review, and archival research.
- Consult with appropriate agencies via letter inquiries, including Native American tribes or other interested parties.
- Review the geotechnical report for indicators of archaeological findings. In addition to this task requested by the RFP, we will also briefly consult with the geotechnical experts prior to their study to discuss approaches and our informational interest.
- Make a preliminary assessment of the likelihood of presence of buried prehistoric Native American sites in the Cooley Landing site, based on results of the records search and literature review. The coastal San Francisco bay area is well known for the potential for both occupation sites and Native American burial sites. If the assessment is made that there is a likelihood for prehistoric resources, additional study (outside of the current scope) may be required.
- Assess if the Cooley Landing site itself can be evaluated based on visual inspection and background research, and make that evaluation for the National Register of Historic Places if possible.
- Make preliminary preservation recommendations for resources if they are found to be potentially eligible.
- Determine if Past Forward's participation in public outreach efforts is important with regard to cultural resource studies.
Figure 1. Project location.
Figure 2. Project area, aerial view.
Methods and Findings within the Project Area

At the project initiation, Past Forward, Inc. commissioned a records search from the California Historical Resources Information System, Northwest Information Center, Sonoma State University. The purpose of the search was to identify previously known and recorded sites within the project area. Appendix A provides the summary text of this search (Hagel 2006). The records search indicated that there are no previously recorded sites in the project area, or studies conducted within a half-mile of the project area. There were also no listings of historic resources. The records search provided locations of prehistoric sites within one mile, and suggested relevant historic maps. These resources were used to assist in research conducted for the prehistoric and historic background sections.

Past Forward, Inc. wrote a letter to the Native American Heritage Commission requesting information on interested parties and any general background information on the project. The Native American Heritage Commission responded (Pilas-Treadway 2006) with a list of seven names. Letters were written to all seven parties; telephone calls were also made to these individuals. One response was received, which requested additional information. The letter of 19 September 2006 from Rosemary Cambra, Chairwoman of the Muwekma Ohlone Indian tribe, found in Appendix B, contains prehistoric and ethnographic information relevant to the project area. A letter was also written to the East Palo Alto Historical and Agricultural Society; no response was received. Appendix B contains copies of all correspondence to interested parties.

R. Scott Baxter undertook a series of field visits to the site and archival research. As a result, one potential historic property was identified during the visual survey. The dredge was recorded on appropriate DPR 523 forms (Appendix C), and a description and preliminary evaluation of this resource is provided in this report. Archival research was carried out or attempted at the institutions listed below in Table 1. In some instances a telephone conversation with staff revealed that their facilities retained no pertinent information.

<table>
<thead>
<tr>
<th>Table 1. Agencies and institutions contacted.</th>
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<tr>
<td>Amador County District Attorney’s Office</td>
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<tr>
<td>Army Corps of Engineers, San Francisco</td>
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<tr>
<td>Bureau of Reclamation, Fresno and Sacramento</td>
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<tr>
<td>California Department of Water Resources, Sacramento</td>
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<tr>
<td>California Room, California State Library, Sacramento</td>
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<tr>
<td>California State Lands Commission, Sacramento</td>
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<tr>
<td>Cargill Salt, Newark</td>
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<tr>
<td>California Historic Resources Information System (CHRIS), Northwest Information Center, Sonoma State University, Rohnert Park</td>
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<tr>
<td>San Mateo County History Museum Archives, Redwood City</td>
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<tr>
<td>U.S. Coast Guard, Alameda</td>
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Past Forward, Inc. received a copy of the geotechnical report produced by Kleinfelder, Inc. (Khoshkbari and Ellis 2006). Based on this report and the results of the archival research, it was determined that the physical manifestation of the project area in its current condition is attributable to two periods of the site’s history, its use as a dump and later as a boat works. The landform itself is the end product of the location’s use as a dump from 1932-1960. The result is the peninsula now known as Cooley Landing. As described further below in the section on the historic background, refuse was dumped further and further into the bay creating a small finger of land. The refuse was covered with soil to suppress odor and vermin, and to provide a passable route over the older refuse, as the dump extended further and further into the bay. In its nearly three decades of operation, the dump and fill covered over both the land that had been occupied during the prehistoric and historic periods, including the original Cooley Landing.

It is likely that when the land was converted to its later use as a boat works in the 1960s, fill was brought in to level out the land. The geotechnical survey demonstrated that this fill – from both the dump and the boat works – is about 18 feet thick. Groundwater was encountered at eight feet below the ground surface, indicating that before the area was filled, during the early 20th century, this area was approximately 10 feet under water (Khoshkbari and Ellis 2006:6).

It is possible that cultural resources may exist below the 18 ft. of fill within the project. It is our understanding the current proposed project use as a park and interpretive center will not impact the soils below this level. Should such impacts be proposed, further investigations will need to be made to identify potential cultural resources.

**Report Organization**

The report addresses the prehistoric and historic background of the project area. Although any physical manifestations of site occupation, if they exist, are below 18 ft. of fill, it was felt that sufficient background information should be provided to assist with site interpretation, especially with regard to prehistoric resources. The historic background describes the origin of the area known as Cooley Landing, and information on the Cooley family. As there is a potentially historic dredge located on the site, the report includes a short history of dredging in California, as well as a physical description of the dredge at Cooley Landing. A short history of the Palo Alto Boat Works is given. The final section of the report addresses the potential for historic resources, and makes recommendations for future studies.
Background: Prehistory and Ethnography  
(Mark G. Hylkema)

The project location is within very close proximity to numerous prehistoric archaeological sites. Most of these sites are situated along the Bay Shore margin, slightly inland from the current high water tide line. Within the project area, later historic land use included the introduction of approximately 18 ft. of fill (see further discussion in historic background section below, entitled “1932-1960: The Dump”; also see the geotechnical report, Khoshkbari and Ellis 2006). Although prehistoric occupation of the project area is unlikely, one of the project goals is public interpretation. For that reason, this chapter presents an extensive prehistoric and ethnographic background section.

Historically, the terrain of the project area has been altered by agriculture, salt marsh drainage, stream channel modification, waste disposal and massive silting of the tidal marsh from accumulated soils (much of which was generated by hydraulic mining during the historic gold rush years). Over the past several millennia, the natural and cultural landscape of the project area has also undergone significant geomorphic change, not the least of which included the flooding of the Santa Clara Valley and establishment of San Francisco Bay some 6000 years ago.

It is becoming increasingly clear that earlier archaeological deposits lie below layers of accumulated sediments along the Bay Shore margin, and it is difficult to predict where these areas may be given the current landscape. Despite this ongoing siltation process, many significant prehistoric sites were formerly visible as clustered low relief mounds along what once was the mouth of San Francisquito Creek, between what is now Highway 101 and Middlefield Boulevard in East Palo Alto. In order to better understand this situation, a review of regional prehistory has been presented. Figure 3 depicts many of the sites discussed in this section.

Development of San Francisco Bay Cultural Taxonomies

The regional landscape of the San Francisco Bay area has undergone multiple episodes of rapid transformation. Various environmental factors such as massive geologic events, climatic anomalies, changing sea level and erosion have shaped the distribution of flora, fauna and the early human populations who depended on the seasonal cycles of these resources. The landscape of the project area, Bay Shore and valley, achieved a measure of relative environmental equilibrium shortly after the advent of the Late Holocene (circa 3500 RYBP – radio carbon years before present). This era of relative environmental stability promoted dramatic cultural developments among the ancestral Ohlone people. Once the Bay Shore developed into its own distinctive biotic community, early Native American settlements were established around the marshlands. Repetitive use at various locations over long periods of time resulted in the formation of large, mounded archaeological deposits (Nelson 1909).
Figure 3. Distribution of selected archaeological sites (after Hylkema 2002).
Sometime after AD 900, a trend toward more complex social organization began. The latter date heralds a period of cultural transition that involved the replacement of earlier artifact assemblages with new types, many of which served as markers of wealth and specialized societal membership. Archaeological findings indicate that a sort of cultural florescence transpired among the people of the southern San Francisco Bay region (Hylkema 2002). Interestingly, very few of the numerous Bay Shore mound sites continued to be used during the Late Period and there was a shift where large habitation sites develop farther inland, farther away from the Bay Shore edge and most of the mounded sites were abandoned (Leventhal 1993; Lightfoot 1997). Recent synthesis of new archaeological finds, in conjunction with earlier perspectives on the cultural development of the region, is beginning to reveal a prehistory of much greater complexity (Hylkema 2002).

In 1909, when Nels Nelson first published the findings of his survey of Bay area shell mounds, vestiges of early Native California occupancy could still be seen on the landscape. However, of the 425 mound sites that he recorded, many were already suffering from extensive erosion and destruction from urban development. Through the 1930s, the University of California at Berkeley worked to salvage information from Bay Shore mounds (Lightfoot 1997:129-141). These early efforts generated large collections of skeletal remains and artifacts, principally from the more conspicuous, expansive mound sites along the northern San Francisco Bay and San Pablo Bay shore of Alameda and Contra Costa Counties.

Only a few large mound sites similar to those of northern Alameda and Contra Costa Counties were identified for the south Bay. Between 1909 and 1912, Lewellyn Loud from the University of California at Berkeley surveyed the South Bay and plotted the locations of many mound sites including clusters of them within, and adjacent to the project area. In 1912, Loud tested one such mound, SCL-1 (also known as the Ponce and Castro Mound and formerly designated by Nelson as SCL-356 in the City of Mountain View). This site was located within three miles of the current project location (Figure 3). Loud removed 50 burials from a trench excavated through the large mound site. It was noted that the mound was 8 feet high and broader than a football field. In 1931, a Stanford University anatomy professor removed another 100 burials. The artifact assemblages from SCL-1 served to unite the south Bay with north Bay archaeological manifestations, and successive cultural taxonomic schemes subsumed it as such (Bennyhoff 1950; Beardsley 1954).

During the 1930s, excavations conducted in the Central Valley documented stratified sites containing evidence of successive patterns of grave associated artifact types and variations in burial mode. This work led to the construction of a chronological system that was organized into three temporal periods: Early, Middle and Late, which allowed for a formal typology for milling tools, charmstones, Haliotis shell ornaments and Olivella shell beads (Lillard et al. 1939). Distinctive morphological changes and attributes of shell beads allowed for the subdivision of the Late period into Phase 1 and Phase 2. This system was applied to artifact assemblages from throughout central
California and was modified over the years as researchers attempted to make their findings fit the model (Heizer 1949; Beardsley 1948; 1954; Heizer and Baumhoff 1956).

Beardsley (1954:80-101) constructed a chronological scheme for the San Francisco Bay area. His scheme still employed a basic tripartite definition of temporal sequences but seriated contrasting artifact assemblages that were different from the interior Central Valley sequence. At the same time, his Transitional Period evolved into the term "Middle horizon." Beardsley associated the Santa Clara Valley with patterns observed at other east Bay Shore sites of Alameda and Contra Costa Counties and encompassed them under the term "Alameda province." In the Alameda province, Beardsley (1954:2) did not recognize evidence of a cultural assemblage equivalent to the Delta-Central Valley Early horizon, although he believed that a contemporaneous occupation between the two areas was likely. The Middle horizon "Ellis Landing facies" was thought to be similar to contemporary sites of the Delta-Central Valley, except for the absence of cobble mortars in the Delta and the absence of cremations in the San Francisco Bay region. The subsequent Late horizon phase 1 "Emeryville facies" continued to lack the cremations evident in the Delta-Central Valley, and the San Francisco Bay assemblages began to include corner-notched projectile points. Charmstones, absent in the central Delta, were present in the Emeryville facies assemblages. Finally, the Late horizon phase 2 "Fernandez facies" assemblages included cremations coeval with the Delta along with many other traits, but Beardsley believed that Haliotis ornaments did not exhibit the same elaboration of forms or frequency of numbers as in the Delta-Central Valley. Small projectile points with multiple square serrations along the blade margins also suggested an increased affinity between the two regions. Bert Gerow and Roland Force (1968) later popularized this scheme by naming it the Central California Taxonomic System, or CCTS.

In the 1950s, James Bennyhoff attempted to sort out artifact attributes proposed by Beardsley's sequential phases or facies. Bennyhoff intensively examined and seriated temporal relationships of changing shell bead and ornament types and also supplemented his emerging taxonomy through a comparison of fish spear and harpoon attributes. Ultimately, Bennyhoff’s system superseded Beardsley system with a more sophisticated component-oriented phase sequence. In so doing, he began to recognize combinations of artifact traits that implied a Middle period/Late period transition phase. Indeed, the Castro Mound, SCL-1 was instrumental in this new perspective as fish spear types associated with Ellis Landing facies of the Middle horizon co-occurred in the same strata with other artifacts ascribed to the Emeryville facies of phase 1.

Responding to a range of inadequacies with the existing taxonomic sequence, further efforts were made to isolate and seriate other temporally diagnostic artifacts and construct more refined chronological sequences of cultural development (Fredrickson 1974b; Bennyhoff 1978; Bennyhoff and Hughes 1987; Milliken and Bennyhoff 1993; Hughes 1994). Heizer (1958:6) calibrated radiocarbon dates with artifact assemblages from multiple Alameda and Contra Costa County sites, as well as sites from the Delta-Central Valley region. This new application to the issue of seriation facilitated temporal
assignment for three divisions of the Late period that he and Bennyhoff had come to recognize. Changing attributes of rectangular "sequin" *Olivella* shell beads established the basis for the divisions. Bennyhoff also found stylistic changes and shifts in other artifact classes through the three sub-phases that were proposed for the Late period, but he did not publish specifics of his analysis, which was based on burial lots.

Fredrickson (1974b:57-73), in collaboration with Bennyhoff, undertook further definition of cultural traits represented by the developing taxonomic sequences and defined three basic cultural patterns for the San Francisco Bay and interior Delta region: Windmiller, Berkeley and Augustine. The application of the pattern concept was formulated to encompass "an adaptive mode extending across one or more regions, characterized by particular technological skills and devices, particular economic modes, including participating in trade networks and practices surrounding wealth, and by particular mortuary and ceremonial practices (Fredrickson 1974a: 124)."

The taxonomic sequences developed by Bennyhoff and Hughes (1987) and a subsequent revision by Milliken and Bennyhoff (1993:386) provided the necessary temporal framework for the regional overview presented here. These schemes proposed a division of various traits into four general temporal periods (Table 2). The first is the Early period, originating during Middle Holocene times and continuing to approximately 500 BC, followed by the Middle period when populations appear to have expanded their resource base and aggregated into semi-sedentary residential communities. The third temporal sequence of the Milliken and Bennyhoff scheme proposes a transition period ensuing after AD 700, highlighted by intensified socio-economic systems and retention of older Middle period artifact traits. By AD 1200, during the Late period, many Middle period traits gave way to social characteristics consistent with the ethnographic record (Bennyhoff in Hughes 1994:73).

**Early to Mid Holocene Cultural Trends**

General trends in California coastal Holocene environments and archaeological implications have previously been summarized (Fredrickson 1974a; Bickel 1978; Chartkoff and Chartkoff 1984; Moratto 1984; Erlandson and Colten 1991; Erlandson 1997:1-10; Jones and Kennett 1999); however, some antecedents must be presented to give context to this study. Geologic interpretation of sediment profiles from deep borings in the south Bay indicate that between 17,000 and 7,000 years ago, post-Pleistocene warming trends in the global environment caused a rapid rise in sea level as glacial ice melted (Atwater et al. 1977; Atwater et al. 1979). Sometime around 10,000 years ago, during the Early Holocene period (circa 10,000 to 6650 RYBP) the progressively rising sea began to encroach up through the deeper stream channels that meandered through the wide oak woodland and grassland valley plains of what was to become San Francisco Bay. The gentle slope of the valley floors within the future Bay, and the level coastal terrace terrain that once extended considerably farther offshore, facilitated submerging of the landscape until sea level reached its present height by Middle Holocene times, some 6,000 years ago (Bickel 1978).
Table 2. Late Holocene chronology of the San Francisco Bay region.

<table>
<thead>
<tr>
<th>Bennyhoff &amp; Hughes 1987*</th>
<th>Milliken &amp; Bennyhoff 1993</th>
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<tbody>
<tr>
<td>AD 1800</td>
<td>Late Period Phase 2-B</td>
</tr>
<tr>
<td>AD 1700</td>
<td>Late Period Phase 2-A</td>
</tr>
<tr>
<td>AD 1500</td>
<td>Late Period Phase 1-C</td>
</tr>
<tr>
<td>AD 1300</td>
<td>Late Period Phase 1-B</td>
</tr>
<tr>
<td>AD 1100</td>
<td>Late Period Phase 1-A</td>
</tr>
<tr>
<td>AD 900</td>
<td>Middle/Late Period</td>
</tr>
<tr>
<td></td>
<td>Transition</td>
</tr>
<tr>
<td>AD 700</td>
<td>Middle Period Transition</td>
</tr>
<tr>
<td>AD 500</td>
<td>Middle Period Terminal Phase</td>
</tr>
<tr>
<td>AD 300</td>
<td>Middle Period Late Phase</td>
</tr>
<tr>
<td>AD 100</td>
<td>Middle Period Intermediate Phase</td>
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<tr>
<td>200 BC</td>
<td>Early/Middle Period</td>
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<td></td>
<td>Transition</td>
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<tr>
<td>500 BC</td>
<td>Early Period Terminal Windmiller</td>
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<tr>
<td>1100 BC</td>
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<tr>
<td>1600 BC</td>
<td>Early Period Middle Windmiller</td>
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<tr>
<td>2000 BC</td>
<td>Early Period Early Windmiller</td>
</tr>
<tr>
<td>3000 BC</td>
<td>Early Period Early Windmiller</td>
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</tbody>
</table>

* Dating scheme B1.

With the stabilization of sea level, tidal marsh habitats formed around the bay margins creating a diversified regional ecology. Within the delta region, where numerous drainages feed into San Francisco Bay, tidal marshlands became established as early as 6000 RYBP. Conversely, a similar habitat did not develop in the central region of the bay until the Late Holocene when the accumulation of sediments exceeded sea level at about 3000 RYBP, and as recently as 2000 RYBP along the shoreline of southern San Francisco Bay (Bickel 1978).

During the Middle Holocene, stone mortars and pestles appear in the archaeological record, which indicates that acorns had increased in importance as a dietary staple. This addition augmented an earlier, archaic reliance on hard seeds that were milled through the
use of handstones and milling slabs. Access to productive grasslands and oak woodlands necessarily became a crucial factor in the subsistence economy. Evidence of an earlier milling stone tradition and the transition to an acorn dependant economy has been noted at sites CA-SCL-65 and CA-SCL-178 within the Santa Clara Valley (Hildebrandt 1983; Fitzgerald 1993). Greater numbers of milling tools relative to projectile points suggest that there was a greater reliance on vegetal resources than on hunting. In contrast, upland sites within the interior Diablo Range, southeast of the south Bay, contain a greater frequency and diversity of large side-notched, square-stemmed and contracting-stemmed chert projectile points and knives that are morphologically identical to Early period south coast forms (Jones and Hylkema 1988; Hildebrandt and Mikkelsen 1991; Hylkema 1993:99-119; Jones 1993). These robust point forms suggest that there was an emphasis on hunting large game, most probably elk. Coeval point forms from coastal sites of the Monterey Bay and Big Sur coastal region have similarly been attributed to a hunting focus on large game (Jones 1993:44-46). In both regions, these points co-occur with mixed milling tool assemblages that included handstones, milling slabs, mortars and pestles; although for the coastal and bay people the availability of marine mammals expanded the range of prey species (Jones 1993; Gobalet and Jones 1995:813-823).

Along the Bay Shore in close proximity to the project area, three finds stand out as intriguing clues to Middle Holocene times. The first find, from the City of Sunnyvale, consisted of the skeletal remains of a woman dated to 4460 ± 95 BP (Bickel 1978). The second and third finds consist of two burials from the banks of San Francisquito Creek in the City of Palo Alto (SCL-33; Garaventa et al. 1983). These burials are popularly known as Stanford Man II and I. The Stanford Man II burial, dated to 4400 ± 270 and 4350 ± 125 BP (Gerow 1974a: 241), had in association three large side-notched points with distinctive apiculate tips and diamond-shaped bases; all were made from coastal Monterey chert. These point forms probably represent an earlier, as yet undefined cultural tradition.

At the closure of the Middle Holocene, a new age of relative environmental stability was occurring throughout much of northern San Francisco Bay. The tidal marshlands of the southern San Francisco Bay developed into a distinctive delta habitat around 2000 RYBP after accumulations of sediment transported by drainages of the Santa Clara Valley lost velocity before mingling with the waters of the south Bay (Atwater et al. 1979:349). Multiple site locations became established along the Bay Shore, many of which would develop into large shellmounds after long years of repetitive use during the Late Holocene. The percentage of shellmounds that began to form during the Middle Holocene is not yet known, but existing data suggest a correlation between tidal marsh development and increasing reliance on this habitat (Lightfoot 1997).

The Native Landscape

The diverse ecological characteristics of the south Bay and northern Santa Clara Valley region supported large populations of people who established their residential communities among three principal environmental zones. These zones included tidal
marshland, grassland prairie, and oak woodland habitats. Riparian corridors meandered through the various ecological communities and enhanced what was an exceptionally productive environment.

Tidal Marshlands

The protected waters of the San Francisco Bay estuary provided habitat for a variety of fish, birds and sea mammals that the ancestral Ohlone procured through the use of tule balsa boats (Santa Maria [1775] 1971; Vancouver 1798:Vol. 2:23; Harrington 1942; Heizer and Massey 1953:285-312). An extensive network of sloughs and tidal mudflats characterized the southern San Francisco Bay where it intruded into the northern Santa Clara Valley. Freshwater from a multitude of rivers, streams, and rivulets met with saltwater creating what was formerly a vast, brackish tidal marshland. The marshland provided resources such as salt, waterfowl, eggs, meats, and tule reeds. Elk waded among the vast thickets of reeds that ringed the marshlands and interior fresh water marshes, while the reeds themselves were used for building structures, boats, rope, duck decoys, basketry, clothing, and matting (Harrington 1942). Pollen and roots from tule reeds were converted into food (Bocek 1984:240-245). The Ohlone instructed the priests at Mission San Jose how to gather salt from the south Bay marshlands (Sandoval 1988:4-5).

Shore birds including gulls, pelicans, cormorants, rails, egrets, great blue herons, and many others populated the Bay marshlands along with great numbers of migratory ducks and geese (Schoenherr 1992). Waterfowl were obtained through the use of decoys and nets (Crespi in Brown 1974:15).

At low tide, the mud flats were teaming with shorebirds dining on snails, crabs, and other invertebrates. Within the sloughs, leopard sharks (Triakis semifasciata), Pacific herring (Clupea harengus), Pacific sardine (Sardinops sagax), sturgeon (Acipenser sp.) bat rays (Myliobatus californica), and a host of other estuarine fish formed a productive biological zone. Sea otters, sea lions, and harbor seals subsisted on the abundant fish and in turn became prey to the ancestral Ohlone. One historic account in 1877 recalled that the bay shore down to the Guadalupe River “seemed covered with black sheets” because of the dense numbers of sea otters (Brown 2005:12). The California horn snail (Cerithidea californica) was particularly abundant and its presence along with bay mussel (Mytilus edulis), oyster (Ostra lurida), and clams (Macoma nasuta and Tivela stultorum) at local prehistoric sites attests to the importance of this habitat for food (Gerow and Force 1968; Cartier et al. 1993:168-171).

Numerous archaeological sites cluster along the south Bay tidal marsh. Residential use over time has resulted in great accumulations of soil and dietary shell, which created topographic high points, or mounds. One of the earlier dated south bay tidal marsh sites, located in close proximity to the project location, was SMA-77 (also known as the University Village site; see Figure 3). Construction of houses in the late 1950s unearthed numerous human skeletal remains, many of which had in association stone bowl mortars
and pestles, which shows that an acorn economy was established on the southern Bay Shore by 3000 BP (Gerow and Force 1968). Site SMA-77 did not develop into a structured mound like other nearby sites such as the Hiller Mound, SMA-160, Tarlton Mound, SMA-248, or the Castro Mound, SCL-1. Mounded sites in the Project area appear to have developed after the transitional phase between the Early/Middle periods to Phase 2 of the Late period. At the Inigo Mound, SCL-12, located at the southwest corner of Moffett Field, temporally diagnostic artifacts, radiocarbon dates, and obsidian hydration results indicate that it was intermittently occupied over a period of 2,000 years (Kelly 1987; Hylkema 1995). Similarly, the very large Patterson Mound, ALA-328, situated on the east side of the south Bay opposite SCL-1, dated from the Middle Period and shared an overlapping Middle/Late transition period and Late period Phase 1 temporal component with the nearby Ryan Mound, ALA-329 (Coberly 1973; Bickel 1981; Leventhal 1993). The latter site was one of the few intensively used mound sites during the Late period, and both of these mounds contained vast artifact assemblages in association with several hundred human burials.

Valley Grassland and Oak Woodlands

Grassland prairie formerly surrounded the perimeter of the Bay marshland. A range of plant species within this zone provided food for the local inhabitants and browse for the game that they hunted. Large earthen mounds, both natural and anthropogenic (Leventhal 1993; Lightfoot 1997:129-141), provided dry ground during the winter when high tides, stream overflow, and ground saturation created a network of mires and vernal pools (Bolton 1933:353). Dense thickets of willows grew along the margin between the tidal marsh and grasslands where fresh water streams became lost in a maze of sloughs (Mayfield 1978:32; Brown 1974:35). Spanish explorers frequently commented on the seasonal wetlands of Santa Clara Valley and the difficulty they had crossing them (Bolton 1926:3:263; Bolton 1933:353-355; Stanger and Brown 1969:106). The soil was black in color, and grasses were burned in late summer to increase seed productivity (Fages 1937; Mayfield 1978:84-94). Lewis (1973) has noted that aboriginal landscape management techniques utilizing fire enhanced grass seed harvests and improved the browse available for elk, deer, and pronghorn. Large herds of elk and pronghorn once existed on the Santa Clara Valley plains (Fages 1937) and wolves and coyotes were also present (Mayfield 1978:66).

The elevation of the grassland prairie zone rises progressively at greater distances from the Bay and vegetation communities graded into a wooded savanna setting that consisted of widely spaced, tall broad-leaved deciduous oak, laurel, and madrone trees, with an understory of bunch grasses, forbes and shrubs (Kuchler 1977). This community gave way to an extensive thicket of mixed hardwood, greasewood, toyon, chemise, and coyote brush that formed a belt along the lower foothills of Santa Clara Valley (Bolton 1926:3:263; 1930:1:410).

The valley oak woodland zone was particularly suitable for the development of an acorn dependant economy and the majority of sites recorded in the south Bay region occur here.
The use of acorns as a dietary staple and various archaeological implications has been extensively described in the ethnographic literature (Gifford in Heizer and Whipple, 1971:301-305; Basgall 1987:21-52). The valley oak savanna was burned annually after the acorn harvest to prevent the accumulation of excessive wood fuel that would otherwise burn too hot and destroy the acorn producing oaks. Burning had the added benefit of removing the lower shoots from the oaks thereby encouraging the tree to produce more acorns (Lewis 1973:19). European visitors commented on the "park like" appearance of the Santa Clara Valley and the presence of many extraordinarily large oak trees (Bolton 1926:423; Vancouver in Mayfield 1978:132).

Riparian Corridors

In the south Bay, numerous creeks and rivers cross through various ecological zones and have developed distinctive corridors of riparian habitat. Silt deposits from episodic stream overflow along the banks of the meandering streams of Santa Clara Valley created topographic high points that were attractive to prehistoric settlement. Schoenherr (1992:153) has summarized the biological qualities of riparian corridors and noted that they create an ecotonal edge effect in which the density and diversity of species are greater than in any other community in California. The characteristics of a given ecotonal edge changed as drainages cut across various environmental zones.

Larger creeks and rivers supported populations of Pacific pond turtles (Clemmys marmorata), brackish water crabs (Rhithropanopeus harrisi), fresh water clams and mussels (Anodonta nuttallicana and Margaritifera margaritifera) and, during the first seasonal rains, spawning runs of anadromous steelhead, or rainbow trout (Salmo gairdneri) (Bolton 1933:355; Baumhoff 1978). The remains of steelhead and other freshwater fish such as Sacramento sucker (Catostomus occidentalis), splittail, hitch, thicktail chub and other carps and minnows (Cyprinidae) have been identified in archaeological contexts, along with marine fishes from the saltwater estuaries at the Bay Shore end of riparian corridors (Gobalet 1992:72-84).

A cursory examination of site distributions in Santa Clara Valley reveals a pattern of dense clusters along the lengths of major drainages, particularly the Guadalupe River, Coyote Creek and San Francisquito Creek. Bocek (1987) has reviewed site distributions and contents along the San Francisquito Creek drainage, which flows from the east slope of the Santa Cruz Mountains across the peninsular plain and into the south Bay estuary near the project location. Bocek identified 58 sites along this drainage, ranging in age from the Early, Middle and Late periods, and found that the majority occurred in the oak woodland zone. Others clustered at the mouth of San Francisquito creek, and just a few were found along creek forks within the foothills.
Temporal Trends in Subsistence Pursuits

Vegetal resources

A decreasing frequency of handstones and milling slabs used to process hard seeds during the Early, Middle and Late periods suggest that an earlier, archaic reliance on hard seeds eventually gave way to an increased use of acorns after the Middle period (Hildebrandt 1983). Nonetheless, Milliken (1991:132-134) noted that at the time of early Spanish colonization the "meadow lands" between Coyote Creek and the Guadalupe River was an area from which the valley people collected herbs and grass seeds. During the colonization of Santa Clara Valley in the 1770s Spanish explorers frequently noted that they had been provided with gifts of "black-colored tamales" made from grass seeds (Stanger and Brown 1969).

Acorns were an abundant resource within the oak woodland habitats of the south Bay, but their seasonal cycles of availability and capacity for storage constrained group mobility during winter months. Basgall (1987:41) has described the nutritional value of acorns and their relationship to aboriginal societies, and observed that; "Accordingly, once established, such an adaptation would have had important effects on demographic patterns, on mobility strategies, and on the organization of intra-group relations.” In locations like the Santa Clara Valley, where oak groves were well established, acorns were readily gathered during the fall season and stored in granaries (Harrington 1942). Communal acorn storage and redistribution probably involved the organization of social institutions with ranked membership and the delineation of leadership roles (Bean and Lawton 1973:v-xlvi; Bean and Blackburn 1976). The presence of numerous mortars and pestles in Middle and Late period Bay shore/valley sites, often in association with burials, attests to the value of acorns to the people of this region.

While the value of hard seeds and acorns at sites in the Bay shore/valley setting has been discussed, a variety of other plant resources has been identified from archaeological contexts and should be mentioned. Bulbs like soaproot (Chlorogalum pomeridianum) were dietary staples requiring roasting in an earth oven for over thirty-six hours to render them edible (Bolton 1926:423; Heizer 1941:43-44; Harrington 1942). Such ovens used large numbers of fist-sized cobbles to distribute heat within them. Extensive layers of burned rocks have been reported for many Bay area sites, including SCL-178, SCL-690 and SCL-732, and are often in close proximity to cemeteries (Hall et al. 1988:45-47). As late as 1839, one large soaproot roasting oven in Mountain View, not far from the project site was used as a landmark (Brown in Bean 1994:37). It was called horno de los Toroquis (the oven of Soapweed- Toroquis was the native name for the plant).

Dietary shell

Residential sites along the south Bay Shore are characterized by their accumulations of large volumes of shell. Typically, single molluscan species dominated over others in
temporally stratified contexts at variable locations around the bay, although the dominant species differs from one site to the next, or within the strata of an individual site. This has been the subject of considerable academic debate since the early 1900s (Nelson 1909; Greengo 1951; Bickel 1981; Cartier et al. 1993). Gerow (1968:29-32) reviewed the data from a number of shell mounds and summarized observations made about variations in dietary contributions of individual species, concluding that variability was either the result of changing sea level or over exploitation of target species.

Gifford (1916:24) studied the relationship of shell species in Bay Shore mounds and identified the horn snail, oyster, and bay mussel as the principal dietary shellfish found at south Bay sites of Santa Clara County. Sites along the west Bay shore of San Mateo County and east Bay shore of Alameda County record a greater emphasis on bay mussels, oyster and mud clams (*Macoma nasuta, Tivela stultorum*). Several of the large shell mounds from both the west and east Bay Shore margins reveal temporally related changes in target species within the same site (Nelson 1909; Gifford 1916; Schenk 1926; Greengo 1951; Gerow 1968). East Bay sites with stratified components ranging from the Middle period to Middle/Late transitional period typically contain a deeper deposit of oysters that are overlain by layers of clams. In contrast, Early and Middle period sites along the west Bay Shore contain deeper deposits with oysters which are replaced in upper levels dating from the Middle/Late transition to Late period by horn snails (*Cerithidea californica*). Greengo noted that within three shell mounds along the east Bay (ALA-307 West Berkeley, CCO-295 Ellis Landing, and ALA-309 Emeryville) variations of the molluscan fauna "seem to reflect a shift from gravel-bottom species to a mud clam during the accumulation of refuse." He attributed this to progressive silting of the Bay Shore margin.

Strictly from a presence/absence point of view, Cartier et al. (1993:168-171) reviewed the range of shellfish species and volumes from seven south Bay sites (SCL-6W, -6E/447, -68, -128, -137, -300/302, and -690). They found that sites predating the Middle/Late transition period contained greater volumes of bay and ocean mussel. Shortly thereafter, the focus was on horn snails. This is consistent with observations made about the Middle period presence of bay mussel at other regional sites such as SCL-732, a little further south. Sites within the Gilroy area dating from Early to Middle period times are reported to have contained mussel shells, and these shells are also absent in Late period contexts (Hildebrandt 1983:123-131). Despite problems with comparable quantification methods, Cartier et al. (1993) suggested that the distribution of estuarine and marine shells at interior sites of the southern Santa Clara Valley implied a greater reliance on exchange rather than direct procurement. The occurrence of mussels at sites distant from their primary habitats may have also been a result of greater group mobility during the Early and Middle periods.

Horn snails do not exhibit the same distribution pattern as mussels. They are not present at sites farther south than the Santa Teresa Hills but have been reported in upland sites of the easterly Diablo Range. On the other hand, horn snails are not present at upland sites of the Santa Cruz Mountains, where ocean mussels points to an affinity with open coastal
shellfish assemblages throughout the Middle and Late periods. Variation in horn snail
distributions within Santa Clara Valley may be related to seasonal factors that affected
shellfish availability (Schoenherr 1992:678). Horn snails are at their optimum
availability during summer months when mussels are not safe to eat.

Hunting

Simons (1992:73-103) has demonstrated that during the Early and Middle periods, faunal
assemblages from San Francisco Bay shore sites contain a high frequency of canid family
bones (dog, wolf and coyote), elk and deer, mixed with lesser numbers of marine
mammal remains (principally harbor seal and sea otter). Conversely, during the Late
period, there is a substantial decline in canid and elk bones at Bay shore sites, which were
replaced by a major increase in sea otter bones. The contribution of deer relative to elk is
high during the Early period, declining during the Middle period and rising again during
the Late period. This suggested to Simons (1992:88) that shifting of target species was
likely caused by "interannual unpredictability due to short-term climatic events, and
resource depression was resulting from over hunting of other marine (i.e. pinnipeds) and
terrestrial (i.e. artiodactyls) mammal game species." He further proposed that increased
human population pressure during the Late period may account for a greater focus on
estuarine habitats around the Bay that necessitated a co-harvesting strategy emphasizing
predation of sea otters and deer along with waterfowl and fish. Simons concluded that
deer served as a secondary "backup" alternative to sea otters when the latter species
became less available during brief episodes of depletion. However, examinations of the
faunal assemblage from Late period site SCL-38 show that elk and deer continued to
dominate the assemblage (Table 3). Perhaps the Bay Shore communities succumbed to
population pressure and suppression of artiodactyl availability, which accords with
Simon's conclusions, while residents of Santa Clara Valley did not. Table 4 presents a
comparative summary of selected species contributions from sites ALA-328, ALA-329,
SCL-690, and SCL-38.

Assembling South Bay Culture History

In the south Bay area of the Alameda District, variability in artifact assemblages and
changes in morphological attributes within individual classes parallels the seriation
sequences graphically portrayed in charts constructed by Bennyhoff (in Elsasser1978: 37-
57; in Moratto 1984:262-263; in Hughes 1994:68-72). The cultural patterns proposed by
Fredrickson (Windmiller, Berkeley and Augustine) and Gerow (Early Bay) were found to
be applicable to south Bay sites and have been adapted to the discussion below.

Early Bay/Windmiller Pattern (Early period circa 4000 to 2450 RYBP)

Early period Windmiller pattern traits, largely defined by archaeological sites of the
Delta-Central Valley, included the co-occurrence of occasional milling slabs and
handstones with small "paint" mortars, a high frequency of polished stone implements,
perforated charmstones, and a low frequency of polished bone tools. The low frequency
of milling tools implied that there was a greater emphasis on hunting. Large non-obsidian stemmed dart and spear points characterized the hunting equipment, although dart (atlatl) spurs were rare and late in the pattern. Abundant and diverse ideotechnic artifact types accompanied burials, which were typically ventrally extended, sometimes-dorsally extended with a westerly orientation. Within the San Francisco Bay area this pattern was first recognized in the lower component of the West Berkeley mound (ALA-307 [Wallace and Lathrop 1975]) and was proposed to have spanned a period of time ranging from circa 3000 to 500 BC.

Table 3. Faunal assemblage from SCL-38 (number of identified specimens, percentage and weight).

<table>
<thead>
<tr>
<th>Common name</th>
<th>Taxon</th>
<th>NISP</th>
<th>%</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grizzly bear*</td>
<td>Ursus horribilis</td>
<td>4</td>
<td>0.5</td>
<td>222.0</td>
</tr>
<tr>
<td>Black bear</td>
<td>Ursus americanus</td>
<td>2</td>
<td>0.5</td>
<td>45.4</td>
</tr>
<tr>
<td>Tule elk*</td>
<td>Cervus nanoides</td>
<td>105</td>
<td>20.5</td>
<td>3735.7</td>
</tr>
<tr>
<td>Black-tailed deer</td>
<td>Odocoileus hemionus</td>
<td>62</td>
<td>12.0</td>
<td>1941.3</td>
</tr>
<tr>
<td>Pronghorn</td>
<td>Antilocapra americana</td>
<td>7</td>
<td>1.0</td>
<td>201.1</td>
</tr>
<tr>
<td>Large herbivore</td>
<td>Artiodactyla</td>
<td>105</td>
<td>20.5</td>
<td>1781.3</td>
</tr>
<tr>
<td>Mountain Lion</td>
<td>Felis concolor</td>
<td>1</td>
<td>0.5</td>
<td>2.1</td>
</tr>
<tr>
<td>Raccoon</td>
<td>Procyon lotor</td>
<td>2</td>
<td>0.5</td>
<td>9.6</td>
</tr>
<tr>
<td>Gray Fox</td>
<td>Urocyon cinereoargenteus</td>
<td>2</td>
<td>0.5</td>
<td>10.1</td>
</tr>
<tr>
<td>Coyote</td>
<td>Canis latrans</td>
<td>6</td>
<td>1.0</td>
<td>42.7</td>
</tr>
<tr>
<td>Dog/wolf/coyote</td>
<td>Canis sp</td>
<td>18</td>
<td>3.5</td>
<td>108.6</td>
</tr>
<tr>
<td>Rabbit</td>
<td>Sylvilagus bachmanii</td>
<td>6</td>
<td>1.0</td>
<td>7.2</td>
</tr>
<tr>
<td>Jackrabbit</td>
<td>Lepus californicus</td>
<td>37</td>
<td>7.0</td>
<td>79.2</td>
</tr>
<tr>
<td>Bobcat</td>
<td>Lynx rufus</td>
<td>1</td>
<td>0.5</td>
<td>11.3</td>
</tr>
<tr>
<td>Skunk</td>
<td>Mephitus mephitus</td>
<td>2</td>
<td>0.5</td>
<td>7.6</td>
</tr>
<tr>
<td>California sea lion</td>
<td>Zalophus</td>
<td>1</td>
<td>0.5</td>
<td>7.5</td>
</tr>
<tr>
<td>Sea otter</td>
<td>Enhydra lutris</td>
<td>40</td>
<td>7.5</td>
<td>571.2</td>
</tr>
<tr>
<td>Goose</td>
<td>Chen sp.</td>
<td>50</td>
<td>9.5</td>
<td>112.0</td>
</tr>
<tr>
<td>Duck</td>
<td>Anas sp.</td>
<td>9</td>
<td>1.5</td>
<td>19.5</td>
</tr>
<tr>
<td>Geese/Ducks</td>
<td>Anseriformes</td>
<td>1</td>
<td>0.5</td>
<td>5.0</td>
</tr>
<tr>
<td>Crane</td>
<td>Grus sp.</td>
<td>20</td>
<td>4.0</td>
<td>272.4</td>
</tr>
<tr>
<td>Hawk</td>
<td>Buteo sp.</td>
<td>23</td>
<td>4.5</td>
<td>63.0</td>
</tr>
<tr>
<td>Eagle</td>
<td>Aquila sp.</td>
<td>1</td>
<td>0.5</td>
<td>2.2</td>
</tr>
<tr>
<td>Loon</td>
<td>Gavia sp.</td>
<td>3</td>
<td>0.5</td>
<td>5.0</td>
</tr>
<tr>
<td>Pelican</td>
<td>Pelicanus sp.</td>
<td>2</td>
<td>0.5</td>
<td>4.8</td>
</tr>
<tr>
<td>Western Grebe</td>
<td>Aechmorus occidentalis</td>
<td>1</td>
<td>0.5</td>
<td>0.1</td>
</tr>
<tr>
<td>Cormorant</td>
<td>Phalacrocorax</td>
<td>1</td>
<td>0.5</td>
<td>2.2</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>512</td>
<td>100.0</td>
<td>9,222.8</td>
</tr>
</tbody>
</table>

* Other elements from articulated grizzly bear and elk burial features were not included in this summary to avoid bias of the comparative effort. Source: Bellifemine 1997.
Table 4. Comparative percentages of economically significant species from south bay/valley sites.

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Taxon</th>
<th>ALA-328 Middle</th>
<th>ALA-328 Late</th>
<th>SCL-690 Middle/Late</th>
<th>ALA-329 Late</th>
<th>SCL-38 Late</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dog/Wolf/Coyote</td>
<td><em>Canis sp.</em></td>
<td>31.6</td>
<td>11.8</td>
<td>4.2</td>
<td>7.8</td>
<td>4.6</td>
</tr>
<tr>
<td>Elk</td>
<td><em>Cervus nanoides</em></td>
<td>19.8</td>
<td>4.9</td>
<td>3.1</td>
<td>3.0</td>
<td>20.5</td>
</tr>
<tr>
<td>Deer</td>
<td><em>Odocoileus hemionus</em></td>
<td>19.8</td>
<td>10.6</td>
<td>19.5</td>
<td>24.7</td>
<td>12.1</td>
</tr>
<tr>
<td>Pronghorn</td>
<td><em>Anticapra americana</em></td>
<td>1.8</td>
<td>0.7</td>
<td>5.5</td>
<td>2.5</td>
<td>1.3</td>
</tr>
<tr>
<td>Rabbits</td>
<td><em>Lagomorphs</em></td>
<td></td>
<td></td>
<td>43.0</td>
<td>7.0</td>
<td></td>
</tr>
<tr>
<td>Sea Otter</td>
<td><em>Enhydro lutris</em></td>
<td>16.7</td>
<td>58.8</td>
<td></td>
<td>50.1</td>
<td>7.8</td>
</tr>
<tr>
<td>Harbor Seal</td>
<td><em>Phoca vitulina</em></td>
<td>3.7</td>
<td>5.6</td>
<td></td>
<td>3.0</td>
<td></td>
</tr>
<tr>
<td>Misc. other</td>
<td></td>
<td>6.6</td>
<td>7.6</td>
<td>24.7</td>
<td>17.9</td>
<td>46.7*</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>100.0</strong></td>
<td><strong>100.0</strong></td>
<td><strong>100.0</strong></td>
<td><strong>100.0</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

* Includes 21.6% avian and 19.9% unidentified "large herbivore" remains. Sources: Bellifemine (1997); Simons (1992); Hylkema (unpublished notes).

Gerow (1968) observed conflicting patterns between Windmiller assemblages and what he came to call the "Early Bay" culture, which was coined on the basis of his findings at SMA-77, the University Village site on the southern San Francisco Bay Shore. This site contained a mortuary complex with grave associated artifacts that were contemporary with Heizer's Early horizon (Windmiller) of the Central Valley, but the burials were flexed instead of extended. Windmiller sites included a high incidence of drilled shell ornaments and beads, greater numbers of flaked stone points, quartz crystals, and a relatively low incidence of powdered red pigments. In direct contrast, SMA-77 (and the lower component of ALA-307, the West Berkeley site) included flexed burials with no distinctive compass orientations, frequent use of powdered red pigments, and emphasis on both whole *Olivella* shell beads and large, thick rectangular L series beads. In addition, SMA-77 produced large contracting-stemmed chert points, edge-notched stone weights, and a low frequency of obsidian. The assemblage from SMA-77 shows that bone implements such as whistles, serrated scapula saws, and elk antler wedges became popular sometime during this period and continued throughout the Middle period Berkeley pattern.

Comparative anthropometric studies lead Gerow to conclude that the people who occupied the Bay area had different physical characteristics and a different cultural tradition than people from the Delta-Central Valley. He proposed the recognition of an Early Bay pattern within the broadly defined "Early horizon." Further, he observed that his Early Bay pattern was similar to the early cultures of the southern California coast. Gerow (1974b) argued that the two opposing cultural traditions co-existed but became more similar later in time, and eventually converged. In retrospect, Gerow's conclusions about an Early Bay coastal affinity appear to have been correct, although the affinity was not as geographically distant as he had envisioned. Certainly the contracting-stemmed points from SMA-77, made from Monterey chert, are the archetype for Año Nuevo Long-
stemmed points the dominant form at Middle Period coastal sites of San Mateo and Santa Cruz Counties (Hylkema 1991).

In the study area, Early period assemblages from SCL-354 in the foothills of Los Altos also yielded Monterey chert long-stemmed points like those from SMA-77. Other similarities included flexed burials, numerous whole *Olivella* beads, mortars/pestles, handstones/milling slabs, perforate charmstones, quartz crystals, red pigment, and small paint mortars. At SMA-77, powdered red pigment was especially abundant in association with many badger bones. This pigment was probably cinnabar, which was available from the Almaden Hills near San Jose (Heizer and Treganza 1944:311). On the other hand, some artifact traits found at SCL-354 differ from SMA-77 (for example, SCL-354 had polished stone wedges, *Olivella* G3b large ring beads, perforated grizzly bear fibula pendants), but the two sites have produced coeval radiocarbon dates and are within ten miles of each other. Both of these sites show that by the terminal phase of the Early period, burials on the Bay side of the peninsula were clustered together and placed within residential deposits.

Most of the burials from both SCL-354 and SMA-77 lacked grave associated artifacts but those that did appeared to retain ideotechnic kinds of objects. Individual wealth was not a trait at either of these two sites. For example, at SCL-354, one individual had in association 3 perforated grizzly bear fibula, while another had 12 identically made perforated charmstones (phallic type V after Beardsley 1954:114) and still another had over 100 *Olivella* G3b beads. At this site, differential treatment of some individuals indicated that markers special to their roles in society (such as shamans, headmen, or other distinguished positions) were transmitted to the grave, but the accrual of wealth and emblems reflecting special societal membership among the larger group were not evident. Unfortunately, this site was severely disturbed by housing construction in the early 1970s, and at least 60 burials were unearthed (field notes in author’s possession). Of these, most were flexed but some were identified as "straight" which probably meant extended. The presence of extended burials along with polished stone wedges, or chisels, implies that some Windmiller Pattern traits were indeed present on the peninsula.

This is in stark contrast to SMA-77, where 43 burials were recovered (all flexed with no polished chisels) and *Olivella* thick rectangle L series beads were present in lieu of the G3b type. Both SCL-354 and SMA-77 had mixed milling tool assemblages that included mortars, pestles, handstones, and milling slabs. Both sites produced perforated charmstones; however, those from SMA-77 (symmetric spindle type IIB after Beardsley 1954:114) were stylistically different from those at SCL-354. These latter charmstones had knobbed distal and proximal ends while those from SMA-77 did not. Perhaps the differences in the assemblages from these two coeval sites are an indication that a succession of cultural traits had occurred during the Early period. Ultimately, these developments were either replaced by, or incorporated into, cultural traits of the Berkeley pattern.
Berkeley Pattern (Middle Period circa 2450 to 1250 RYBP)

The Berkeley pattern was proposed on the basis of observed trends at north Bay sites where a larger population, implied by an extensive distribution of sites frequently containing large volumes of human skeletal remains, began an intensive tidal marsh economy. The earliest manifestations are contemporaneous with Early Bay/Windmiller, but traits defining the earlier pattern faded as many Bay Shore sites developed into large mounded accumulations of shell and earth. Large and small cobble mortars and various pestle types are commonly found in Middle Period assemblages, which is an indication that there was a significant reliance on acorns. Bennyhoff and Fredrickson (in Hughes 1994:22) considered handstones and millingslabs to be rare; nonetheless, they are often present in both Middle and Late period archaeological assemblages from the south Bay. Evidently, the milling of hard seeds continued to supplement the acorn diet.

Berkeley pattern sites exhibit a decrease in chipped stone projectile points, with contracting-stemmed and large expanding-stemmed forms characterizing the few. Hunting appears to have been less significant than at Windmiller sites, although there was a greater emphasis on bone implements. Double pronged fish spears appeared and are useful as temporally diagnostic artifacts (Bennyhoff 1950). Serrated bone scapulas and innominates increased in numbers compared to Early period sites, as do beveled elk antler wedges. Flexed burials with no patterned orientation, randomly interred in residential middens accompanied by fewer artifacts (with little emphasis on wealth), and occasional expressions of cosmological beliefs in the form of animal burials, charnstones, quartz crystals, and bone whistles, characterize this pattern.

Within the study area, the locations of Middle period Berkeley pattern sites reveal a preference for tidal marsh resources in tandem with oak woodland resources. It is not yet known if this dichotomous pattern of site distributions was a reflection of seasonal residential relocation, or if there were two kinds of adaptive modes that co-existed. Some researchers have suggested that this dichotomous subsistence/settlement pattern reflected alternating exploitation of fresh water marshes and brackish water tidal marshes (Cartier et al. 1993).

Cultural taxonomists have distinguished two sub phases within the Middle period with certain artifact types distinguishing the older lower phase from a younger upper phase at approximately 1650 BP (Milliken and Bennyhoff 1993). During the upper Middle period there was a greater emphasis on shell bead wealth in mortuary contexts, which corresponds with a transformation of some *Olivella* bead types and other artifact forms. For example, teardrop shaped (piled) charnstones with drilled perforations from lower Middle period assemblages evolved into non-perforated forms of the upper Middle period.

Upper Middle period sites along the south Bay Shore appear to be considerably more affluent in terms of artifact density than interior riparian and oak woodland sites away from the Bay margin. An example of this can be seen through a comparison of
assemblages from Bay shore site ALA-328 and its two Middle period components (Coberly 1973; Bickel 1981) with Middle period oak woodland sites SCL-131, SCL-137 and SCL-732. Unfortunately, the components at ALA-328 are difficult to separate because of the great volumes of burials, artifacts, and dietary debris in mixed contexts. Nonetheless, even with the large numbers of burials contained in this Bay Shore mound, relatively few exhibited qualities that might indicate an emphasis on wealth and greater social differentiation beyond the occasional shaman or head man. A comparison of the frequency of grave associated shell beads and pendants from a series of selected Berkeley pattern sites reveals very low numbers of these artifacts, with a major increase occurring during the subsequent Augustine pattern (Table 5).

**Increased violence during the Middle period**

In the south Bay, many Middle period sites have recovered burials that exhibited signs of violent trauma (Jurmain 1991; Cartier et al. 1993:65-67). Examples of this were found at ALA-328, ALA-343, ALA-453, SCL-137, SCL-732 and SCL-302, and the trend continued to the Middle Late/Transition period, as noted for sites ALA-329, SCL-6 and SCL-690. This condition parallels observations made at other Middle period sites throughout Central California (Pastron 1973; Chartkoff and Chartkoff 1984:236). It has been proposed that increased violence was probably attributable to greater population stress on natural resources, and subsequent expressions of territoriality. Perhaps the massive quantities of dietary shell manifest at Bay Shore Berkeley pattern sites resulted from an inability to maintain a larger hunting territory within the interior away from tidal marsh resources.

**Table 5. Comparative volumes of Late Holocene grave associated shell beads and ornaments from southern San Francisco Bay sites.**

<table>
<thead>
<tr>
<th>Period</th>
<th>Site</th>
<th>No. of Burials</th>
<th>% with <em>Olivella</em> Beads (N)</th>
<th>% with <em>Haliotis</em> Pendants (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Late Phase 1 &amp; 2</td>
<td>ALA-329</td>
<td>284*</td>
<td>42 (43,179)</td>
<td>19 (288)</td>
</tr>
<tr>
<td>Late Phase 1 &amp; 2</td>
<td>SCL-38</td>
<td>244</td>
<td>37 (30,247)</td>
<td>25 (575)</td>
</tr>
<tr>
<td>Middle/Late</td>
<td>SCL-690</td>
<td>125</td>
<td>76 (32,875)</td>
<td>22 (165)</td>
</tr>
<tr>
<td>Upper Middle</td>
<td>ALA-343</td>
<td>75</td>
<td>45 (3,123)</td>
<td>29 (139)</td>
</tr>
<tr>
<td>Upper Middle</td>
<td>SCL-755</td>
<td>25</td>
<td>48 (385)</td>
<td>20 (18)</td>
</tr>
<tr>
<td>Upper Middle</td>
<td>SCL-131</td>
<td>64</td>
<td>0 (0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Lower Middle</td>
<td>SCL-137</td>
<td>88</td>
<td>17 (1,516)</td>
<td>1 (1)</td>
</tr>
<tr>
<td>Lower Middle</td>
<td>SCL-732</td>
<td>102</td>
<td>9 (1,035)</td>
<td>5 (24)</td>
</tr>
<tr>
<td>Early</td>
<td>SMA-77</td>
<td>44</td>
<td>38 (2,726)</td>
<td>34 (63)</td>
</tr>
</tbody>
</table>

* Sample based on collection from San Jose State University; does not include Stanford University collection.
Meganos tradition

Sometime during the Middle period, an influx of people with their own distinctive cultural traits defined as the Meganos tradition emerged along the southeast margin of the Bay, establishing themselves between the tidal marsh people of the south Bay and those to the north. The roots of what appears to have been a population movement can be seen at sites around the sloughs and mouth of the San Joaquin River in the Stockton District where many cultural traits of the earlier Windmiller pattern appeared south of their earlier origin in the lower Sacramento Valley. Concurrently, sites within what was formerly Windmiller country have been found to exhibit characteristics of the Berkeley pattern. Site ALA-413 in Livermore Valley provided evidence that the Meganos tradition had spread into the interior valleys of the northern Diablo Range by the early phase of the Middle period (Wiberg 1984; Bennyhoff in Hughes 1994:81-89).

During the upper Middle period, the Meganos tradition extended into the Fremont Plain of the southeast Bay and mixed with the populations of Santa Clara Valley. The amalgamation of some "Bay" traits with the new arrivals developed into a cultural tradition that was defined by Bennyhoff as the Meganos Aspect (Bennyhoff in Hughes 1994:7-13). According to Bennyhoff, Meganos Aspect traits included ventrally and dorsally extended burials without specific compass orientation, a co-occurrence of flexed burials, and very few grave associated artifacts. Bennyhoff viewed the Meganos culture as "a hybrid of a Windmiller population intermarrying with Berkeley neighbors" (Bennyhoff in Hughes 1994:82). The Meganos culture appeared to have been at a border with Berkeley pattern cultural groups of the southeast Bay. Bennyhoff proposed that by the time of the terminal years of the Middle period the Meganos people eventually withdrew progressively back towards the San Joaquin River delta and the Stockton District became their cultural center (see distribution maps drawn by Bennyhoff in Hughes 1994:84-87).

Several sites in the south Bay exhibit traits of what has come to be called the Meganos intrusion. Of principal note are sites ALA-453 in Union City, ALA-343 in Fremont (Hall et al. 1988:321-334), and SCL-327 in San Jose (Cartier 1988:355-366). At ALA-343, 75 burials were identified, of which 20% of the aged individuals were estimated to have been less than 16 years of age. Nearly 39% of the burials were either tightly or semi-flexed and the rest were dorsally or ventrally extended. Burial associated artifacts from ALA-343 (illustrated in Hylkema 2002) included Haliotis pendants, Olivella beads (F3b, F3a, G1, G2a, A1 and C2 types), phylite and mica pendants, and very long and polished elk tibia bone spatulates with perforated ends (some of which had remnants of asphaltum with imprints of Olivella shell bead appliqué). The assemblage also included two-pronged bone fish spears, bird bone whistles, red pigment, charmstone manufacturing stages (piled types), mortars, pestles, and other oddly unique artifact forms. Expressions of special status were not restricted to the adults; a child of between four and six years of age (Burial 26) was covered in a shroud of perforate mica pendants, Haliotis shield and other smaller pendants, Haliotis ring beads, Olivella beads (types F3b, G1 and G2a), and red paint pigment. Large, "shield-like" Haliotis pendants described by Bennyhoff (in Hughes 1994:88) for the nearby Patterson Mound, site ALA328, along with other similar artifacts suggest that the Berkeley pattern and Meganos people coexisted along the southeast Bay margins. Some burials from both sites exhibit evidence of violent trauma.
Temporally diagnostic *Olivella* beads have served to establish the chronology of ALA-343. Types F3a and F3b square saddles have been ascribed to a time frame of 500-700 AD (Bennyhoff and Hughes 1987:106). Many bead specimens exhibited qualities resembling the sharply rectangular M1a type, which is a hallmark of the subsequent Middle/Late transition period, but the diagnostic corners were still slightly rounded. This peculiar bead type led Milliken (Milliken and Bennyhoff 1993) to propose a new type, designated as M/F3. The M/F3 bead type has been identified in grave lots at Middle/Late transition period site SCL-690 (Hylkema 2004) along with the classic M1a, which suggests that M/F3 *Olivella* beads occurred as late as 800 AD. Given the absence of the M1a type at ALA-343 it is likely that the site was abandoned with the advent of traits that characterize the Augustine pattern, dating the terminus of the Meganos tradition on the south Bay to sometime between AD 600 and 800.

*Augustine Pattern (Middle/Late transition and Late periods circa 1250 to 150 RYBP)*

The Augustine pattern of the Late period is composed of three temporal phases: Middle/Late transition, Late period Phase 1, and Phase 2. Together these phases delineate a progressive intensification of localized economic systems and greater distinctions in social ranking. Very few Bay Shore mound sites seem to have Late Period components. Site ALA-329, on the opposite side of the bay from the project site is one that has a strong Late Period component that overlay an earlier Middle Period component. Bennyhoff (in Leventhal 1993:298-356) summarized grave associated artifacts from 284 burials at ALA-329 recovered by San Jose State University. These, along with 139 burials in the possession of Stanford University, produced a remarkably rich assemblage that has facilitated seriation of Augustine pattern artifact forms. Although many objects such as feathers, cordage, and fancy basketry described in the ethnographic record are known to have been associated with wealth and status, they have not been preserved in the archaeological record. Interpretations of accrued wealth based solely upon artifacts made of shell, bone and stone is likely to lead to some erroneous interpretations. Nonetheless, despite the absence of perishable wealth items, the increased use of shaped shell beads, an accepted marker of wealth, clearly blossomed during the Late period to a degree not previously seen at south Bay sites of earlier antiquity (Milliken and Bennyhoff 1993). Sites ALA-329, SCL-38 and SCL-690 produced large volumes of *Olivella* beads in mortuary contexts and after looking at the ratio of beads per burial the general impression is that wealth during the Middle/Late transition period involved the larger community. At SCL-38 large Late period Phase 1 and Phase 2 bead lots were ascribed to fewer members. This trend suggests a refinement of social organization where an elite social class may have controlled the bead wealth. Many Late period sites within the study area report burials with bundles of whistles in association. SMA-125 produced 164 whistles from among 46 burials: one individual had 127 of them (Morejohn and Galloway 1983). Incidentally, this site, along with SMA-204, SCL-690, SCL-6, SCL-38, SCL-128, ALA-329, produced large numbers of circular *Haliotis* CA3 and CA5 type pendants, a form that frequently occurs at sites that also contained *Haliotis* banjo pendants. The extensive geographic distribution of such
distinctive artifact types strongly suggests a shared system of cultural values. These traits and their association within mortuary contexts appear to be associated with an emerging differentiation of societal membership institutions like those described for ethnographic groups throughout Central California (Kroeber 1932; Loeb 1933).

**Middle/Late transition period**

With the beginning of the Middle/Late transition period artifact assemblages and burial arrangements from south Bay sites show that this was a time when significant social changes were occurring. The early years of this period included a transitional time that consisted of a coalescence of earlier Berkeley pattern traits with a singular emphasis on grave wealth. *Olivella* shell beads gained greater significance and mixed assemblages of rectangular M1a series sequin, F3a square saddle, and D1 split-punched beads were popularized during the Middle/Late transition period. Long tubular stone tobacco pipes appeared (with collared mouthpieces as opposed to later flanged forms). Double pronged, bone fish spears (type 003) were coeval with newly introduced bone and elk antler serrated harpoons, but were gradually replaced during the subsequent Late Phase 1 by the serrated harpoons. Edge incised *Haliotis* pendants became quite popular, particularly circular CA3 and CA5 forms, and the first banjo pendant forms began to appear.

At SCL-690 where 125 burials were recovered, an explosion in funerary artifacts is evident, principally in the number of shell beads per individual. Radiocarbon dates show that the site has a strong affinity to the Middle/Late transition period, which accounts for the large number of *Olivella* M1a beads, but also has temporal affiliation with Phase 1. The absence of end-perforated rectangular M2a beads suggests that the Phase 1 component was brief. Females composed 47% of the burial population, males 53%, and 16% of the total represented individuals less than 16 years of age. More than 76% of the burials had *Olivella* beads in association and 22 percent had *Haliotis* pendants. As a general statistic, Milliken and Bennyhoff (1993:383) calculated that each burial averaged 263 beads, and eight burials from this site were among the 29 richest burial associated bead lots they had tallied in their inventory of multiple sites from Central California. The distribution of beads was not gender or age specific; females and males received them, as did several of the juvenile burials. Evidence of ascribed ranking in the distribution of individuals within the cemetery was lacking and bead wealth was shared among the many. One adolescent (burial number 24) retained nearly 2,000 beads (types A1, C7, D1, G1, M1a and M/F3) together in a single lot along with six *Haliotis* pendants (five types BB8a and one WLj). *Haliotis* pendants were widely distributed within the cemetery, particularly the circular CA3 and CA5 type. Only one individual had three *Haliotis* banjo pendants in association, and these were of an early form (type N4 after Gifford 1947).

In addition to shell beads and ornaments, many burials from SCL-690 had grave associated artifacts that included mortars, pestles, handstones, pipes, charmstones, scapula saws, elk antler wedges and long, polished bone awls or hairpins. A total of 18 whistles were found with five burials, one of which had at least seven of them. Obsidian
projectile points from north coast range sources included thick, lanceolate forms with multiple small serrations along the blade margins. Several Stockton serrated obsidian points were also recovered which date to the transition into Late period Phase 1.

**Late period Phases 1 and 2**

An increased elaboration of grave associated ceremonial regalia mark this period as a time of significant social transformation. Fredrickson and Bennyhoff (in Hughes 1994:23) defined Augustine pattern traits as including well-shaped mortars and pestles, many of which were very large in size. Sites ALA-329 and SCL-38 produced many “flower pot” shaped mortars exhibiting fine workmanship, and some of these exhibited *Olivella* G1 bead appliqué on the rims. Tubular, polished stone tobacco pipes changed from collared to flanged mouthpieces, (some with bone stem inserts), and charmstones included some older piled forms with the addition of new forms with long, tapered proximal ends. Other traits included greater numbers of small obsidian Stockton serrated projectile points, which marks the introduction of a bow and arrow technology. Newly introduced artifact types appeared including northern California style bone and antler harpoons, along with more elaborate *Haliotis* banjo pendant forms (N series after the Gifford [1947:21-23] nomenclature). These traits lead Bennyhoff to envision an influx of populations from north of San Francisco Bay (see Bennyhoff in Hughes 1994:65-74 for a serious discussion of this matter). It was proposed that this occurred rapidly after the withdrawal of Meganos cultural traits from the Bay area.

Bennyhoff observed that at several Bay area sites combinations of *Olivella* M1a beads and M2a beads within individual burial lots, and greater elaboration of banjo pendant forms took place during Phase 1. At ALA-329, burial number 95 had combinations of M1a and M2a beads along with 11 banjo pendants. *Haliotis* ornaments with V-shaped surface edge incisions also became more popular as evidenced by numerous specimens from ALA-329 and SCL-38. By Phase 2, M2a *Olivella* beads replaced the M1a sequin type, and some bird bone whistles began to exhibit elaborate geometric designs incised into their surfaces. Smaller serrated obsidian points with expanding stems may represent the development of sinew-backed bows.

Multivariate cluster analysis of burials and their artifacts from SCL-38 indicated that this cemetery was highly organized with gender, age and wealth distinctions (Bellifemine 1997). Although SCL-38 also contained an older, Middle period component, most of the 244 burials from this site were clustered into groups exhibiting what has been interpreted as "high status artifact sets." Artifacts associated with these burials were clearly of Late period vintage, while others, peripheral to these high status individuals had little in association. These latter burials may reflect an older Berkeley pattern component, or perhaps they represent lower status individuals. In either case, SCL-38 provided evidence that by Phase 1 and 2 times, a system of social ranking and hierarchy was in place.
**Kuksu - the catalyst to cultural complexity**

The introduction and increased proliferation of *Haliotis* banjo pendants, which first appeared in the south Bay at SCL-690 during the Middle/Late transition period, has provided insight into the mechanism of social change that differentiates the earlier Berkeley pattern from the Augustine pattern. Banjo pendants derived their familiar name from their likeness to the silhouette of a stringed musical instrument. Gifford (1947:21) commented that they bore a resemblance to a human form, with projections conforming to a stylized image of feet, hands, and an enormous head. He credited this observation to R. F. Heizer, who suggested that these pendants might have represented the deity impersonated in ethnographic “big-head” performances of the *Kuksu* God-impersonating cult and membership society of Central California. Gifford wrote: “In this performance the dancer wears a tule head-piece from which radiate sticks with feathers attached at distal ends. These project 2 to 3 feet from the head of the wearer (Gifford 1947:21).” Unfortunately, no direct ethnographic account has yet been found to prove that these pendants do indeed represent *Kuksu* “Big-Head dancers. Further, it is difficult to determine the anthropomorphic image portrayed by those pendants exhibiting fishtailed or clawed distal ends.

The *Kuksu* initiation and membership cycle has been described in the ethnographic literature from much of Central California (Kroeber 1932:401-402; Loeb 1933:139-232; Gifford 1947; Goldschmidt 1951; Fredrickson 1974b: 64-65; Baumhoff 1980:181; Leventhal 1993:183-195). The ethnographic Pomo, Miwok, Patwin, and Nomlaki peoples north of the Carquinez Straits practiced *Kuksu*, but the Yokuts of the lower San Joaquin Valley did not, and its distribution among the Ohlone (or Costanoan) was not known (Kroeber 1923:306-309). Mason (1912) recorded that *Kuksu* was practiced by the Salinan on the southern California coast; however, his informant told him that a person from the southern San Francisco Bay Mission of San Jose had recently introduced it. Similarly, statements from the Marin Miwok indicated that they too had learned it from Ohlone people near Mission San Jose (Collier and Thalman 1996:232). The distribution of Banjo pendants from archaeological contexts coincides with ethnographic accounts of *Kuksu* membership. Furthermore, the accrual of beads coincident with sites that had banjo pendants accords with ethnographic descriptions ascribing wealth acquisition with *Kuksu* membership (Goldschmidt 1951:339-340). Fredrickson (1974b: 64) suggested that it is possible that the accrual of bead wealth associated with the *Kuksu* tradition may in fact relate to ideotechnic functions rather than sociotechnic ones (membership emblems rather than wealth).

**Conclusion**

Archaeological assemblages from archaic sites in Central California have shown a steady progression to a specialized, collector adaptive mode that emphasized reliance upon storable vegetal food resources, acorns in particular. This trait is often cited as the principal criterion accounting for demographic patterns associated with the cultural development of the region (Baumhoff 1963:155-236; Mayer 1976:30; Basgall 1987:21-
52). For the early cultures of the San Francisco Bay area, additional benefits in terms of staples to their diet became increasingly available with the progressive maturation of the South Bay Shore estuarine habitat. Ultimately, as the landscape stabilized, repetitive accumulations of dietary debris and the deposition of anthropogenic soils facilitated the formation of numerous mounded sites along the bay margin. Many of these became cemeteries as well as habitation sites.

By the terminal phase of the Early period, mortuary sites around San Francisco Bay and the interior Delta-Central Valley region began to exhibit greater social organization in tandem with increased use of mortars and pestles. Hildebrandt (in Elsasser 1986: 97) has demonstrated that an increased reliance on an acorn economy emerged in the Santa Clara Valley as early as 2500 BC. Deceased members of the various communities began to be interred as groups within their residential deposits and social distinctions appeared in the form of unique grave associated artifacts distributed among a few individuals. This pattern continued throughout the subsequent Middle period. However, towards the terminal phase of the Middle period, social systems among divergent cultural regions intensified, and many localities were transformed into an inter-related economic network with an extensive geographic range (Fredrickson 1974b: 57-73). Still other cultural traditions of the Bay area (e.g. Meganos) became more isolated, progressively retreating as the Berkeley pattern sites transformed into traits characteristic of the Augustine pattern.

Within the south Bay, archaeological sites dating to the Middle/Late transition period (circa AD 700 to 1200) have produced artifact types in mortuary contexts that identify this time as a period of socio-economic transformation. By the Late period (circa AD 1200 to the 1770s) an elaborate social hierarchy had emerged. Certain ideotechnic artifact types found in mortuary contexts (particularly Haliotis banjo pendants, tobacco pipes, and incised bird bone whistles) coincide with an elaboration and refinement of wealth, status, and institutional organization (Goldschmidt 1951:339-340; Fredrickson 1974b: 57-73; Gerow 1974a; Baumhoff 1981; Bickel 1981; Bocek 1987; Simons 1992:73-104; Jones and Hildebrantd 1992:360-401; Cartier et al. 1993; Leventhal 1993; Milliken and Bennyhoff 1993:381-395; Bellifemine 1997; Hylkema 2002). Although it is convenient to associate this development to the productivity of localized environments, the resource base was already well established before the florescence of the Ohlone culture that began during the Middle/Late transition period.

A very large population of Native Americans occupied the vicinity of the project area at the time of first European contact in the fall of 1769 the vicinity. Historic records from Mission Santa Clara and Mission Dolores have led to the identification of the local tribal community as the Puichon. Milliken (1991:457) states that they controlled the bay margin from the mouth of Stevens Creek to lower San Francisquito Creek, up to the western foothills of the Santa Cruz Mountain range. This politically autonomous community was one of nearly 50 that collectively composed the Ohlone cultural sphere of the San Francisco and Monterey Bay region. During the Mission period (1769-1834), the vast majority of these Native American communities relocated to mission sites.
Background: Historic Period

During the late 1700s and early 1800s, Native Americans occupied the vicinity of the project area, as noted above. The historic European American occupation of the project vicinity began in 1848, with the development of a wharf and residential area.

1848-1867: Ravenswood

The current project area was once adjacent to the Pulgas Rancho. As a marsh, though, the area likely saw little use during the Mexican era. In 1848, Adams & Co., a San Francisco Bank, acquired 3673.76 acres of the rancho in trade for an unpaid loan. Isaiah Woods, one of the partners at the bank, convinced his partners to invest further in the land. The Pacific & Atlantic Railroad Company had laid out a proposed route directly through their new land, and Woods had visions of building a “new San Francisco” there. In 1849, they built an elaborate wharf at the end of Bay Road that extended 75 feet out into 18 foot deep water. The partners had surveyed five subdivisions on either side of Bay Road and named their new community Ravenswood. Woods built himself a home here that he called “Woodside Mansion.” The Pacific & Atlantic line was never built and Woods’ partners soured on the endeavor. Two years later the Central Pacific Railroad began considering the same route. Interest renewed and soon houses, hotels, saloons, and a store were erected on the subdivision. The Central Pacific plan never became reality and Adams & Co. lost heavily. In 1853, only an average of two ships a week visited Ravenswood Landing (Foss 1942:5, 69).

In 1854, financial panic struck San Francisco, when the well respected banking institution Page Bacon suddenly closed its doors. A run on all of the banks ensued, resulting in the failure of more than 200 banks and businesses, among them Adams & Co. Thousands of San Franciscans were left without their savings. Woods reportedly embezzled what money he could and retired to Woodside Mansion. Naively, Woods had not counted on anyone tracking him down. He was caught unaware when Morris Dooley appeared at Woodside Mansion with gun in hand. At gun point, Woods dug up over $300,000 in gold coin he had buried at Woodside. Dooley took the $81,000 he had deposited at Adam & Co. and departed. Woods, realizing others would be soon to follow, gathered up his remaining coin and shipped out with his daughter. Some said he went to Guatemala, others said to Australia, some reported seeing him in Hawaii. (Surprisingly, at the end of his life, Woods later returned to California, and died at Mare Island in 1880 [Svanevik and Burgett 1992:D3].)

In 1856, the bank’s and Woods’ holdings at Ravenswood were sold at a Sheriff’s sale to compensate those who lost their savings at Adam & Co. (Foss 1942:5-6; Svanevik and Burgett 1992:D3). What followed was a rapid series of changes in ownership. In 1854, John H. Hackett and Charles D. Judah, members of the failed Adams & Co., received a franchise for Ravenswood Landing from the California State Legislature. Shortly thereafter, Judah sold his share to Hackett and moved home to New York. In 1856,
Hackett sold half interest in the landing to Joseph Tuers for $4000, including interest in the franchise and marsh lands outside Rancho Pulgas for an additional $4000. Later that year Hackett left for the east, leaving John T. Doyle in charge of his interests at the landing and surrounding lands. In 1859, Tuers sold his interest in the property to Fox and O’Conner, who the following year sold it to Joshua Leavitt (Foss 1942:69-70; Anonymous 1946).

In 1860, Fox and O’Conner sold 402.76 acres to Joshua Leavitt. Leavitt was already a successful dairy farmer and soon erected barns for his herd. His son, Joshua Leavitt Jr., ventured into poultry farming on the land and did not fare so well. The losses they accrued from this failed venture forced their sale of the land in 1867.

1867-1930: Cooley Landing

Lester Phillip Cooley came to California in 1859 (Figure 4). Some sources note that he arrived via an overland route, while others note his arrival via the ocean (Frisbie 1918; Foss 1942:32-33). With only $2 in his pocket he quickly searched for a job, and for a while settled for cutting cord wood on the peninsula. He later moved on to the mines in the Sierras where he worked as a carpenter at one of the mines. After witnessing a terrible mine accident he gave up on the mines and moved on to San Francisco. There he located a good well, and purchased a water selling route. This seemingly innocuous profession proved quite lucrative in a city with a scarcity of good drinking water. Cooley raised enough money to buy a share of a dairy farm that included 250 head of cattle.

In 1867, he decided to move his operation, and his family, down the peninsula. He sold his share in the dairy farm and purchased the 402.72 acre ranch (Ravenswood) from Joshua Leavitt for $32,273.60. This purchase included one-half of the rights to the old Ravenswood landing, which was located at the ranch. Cooley remodeled the house, built new barns, drilled a well, and made many improvements to the land. With his acquisition the landing became known as Cooley Landing. Leavitt had been overtaxed by the duties of the farm and had let the landing fall into a state of disrepair. Cooley rebuilt it in a V-shape to provide more shelter to vessels from the Bay’s rip tides, and better allow year round shipments of his farm’s products. In 1874, Cooley purchased the remaining interest in the landing and the franchise from John Doyle and John Hackett for $150, making Cooley the sole owner.

Simultaneously, a large new brick manufacturing plant, Hunter and Schakleford, open in Ravenswood. They wanted to ship their bricks to San Francisco, and Cooley’s new landing provided the perfect point of departure. Cooley granted Hunter and Schakleford a 10-year lease, and agreed to keep up the facility (Frisbie 1918; Foss 1942:32-33, 70-1; Hynding 1982:133-136).

Cooley’s operation flourished (Figure 5). He made continual improvements to his property including a 60 foot by 200 foot barn, used by local farmers to store grain. In 1874, he was elected Mayor of Menlo Park, a post he held until the town was un-
incorporated. Lester and his wife Geraldine had six children, although only three, all boys, survived to adulthood.

By 1876, more than 21,500,000 bricks had been shipped out of the port, but the landing itself was in a poor state of repair. Cooley rebuilt the landing at that time, while Hunter and Schakleford temporarily used their own smaller landing to ship their products. Cooley had experienced several bouts of cancer, and he finally succumbed to the disease in 1882. (Foss 1942:32-33, 70-1; Hynding 1982:133-136; Anonymous n.d.1:23).

Figure 4. Undated photo of Lester Phillip Cooley (Courtesy of San Mateo County History Museum Archives).
In 1883, it was noted that the old Ravenswood landing was gone, but a new smaller landing had been erected there, presumably the one built by Cooley (Alley 1883:229). That year Lester’s widow, Geraldine Cooley, married William Frisbie, a family friend who ran a pair of drug stores in Redwood City. Their marriage was a short one, as William died a year-and-a-half later. Although Geraldine would later marry again, for a time she and her children ran the ranch holdings and Cooley Landing. She devoted most of her time to heading charitable organizations throughout the state and the nation (Foss 1942:32-34).

In 1884, Hunter and Schakleford let their lease on Cooley Landing go, by which time they had shipped out more than 40 million bricks. With the lapse of this lease, business at Cooley Landing dropped off dramatically. Occasional timber schooners stopped there to pick up lumber from Page’s Mill, but the landing was primarily only used by the Cooley family after 1884 (Foss 1942: 70-1).

Figure 5. View of Cooley Landing and Ranch as it appeared circa 1878 (Moore & Depue 1878).
When Geraldine Cooley’s second husband William Frisbie died in 1885, the eldest of Lester and Geraldine’s sons, William, took charge of the ranch. Although only 19, he had already built his own boat in which he traveled around San Francisco Bay. He helped to run the ranch but the sea was his first love, and he spent much of his time at Cooley Landing. He built several sloops and barges, and was soon piloting boats between Cooley Landing and San Francisco (Figure 6). He eventually upgraded an old steam yacht, the Old Ravenswood, into a capital steam launch. He later built a steamer at Cooley Landing called the Gerald C, which he used to make runs all over San Francisco Bay and up the Sacramento River. This vessel was later used to lay the first submarine cable between San Francisco and Hawaii. By 1900, usage of Cooley Landing had ceased almost completely. William had went to work for William P. Fuller Paint Company, piloting their steamer, the W.P. Fuller, around San Francisco Bay, as well as another called the Tiajuana. In 1907, William sold his share in the ranch to his younger bother Charles. In 1911, William purchased a 10-acre ranch near his parent’s ranch, and moved there with his wife and children.

![Figure 6. Undated view of Cooley Landing. The vessel is misidentified as the Gerald C. Written descriptions identify the Gerald C. as a steamer, the vessel shown here is a scow schooner, possibly one of William Lester Cooley’s earlier vessels (Courtesy of the California Room, California State Library).](image)
According to one source he later went on to be appointed “Chief of Docks” for the California Transportation Company of San Francisco, a position he held until the 1940s (Frisbie 1918; Foss 1942:35-36, 72; Anonymous n.d. 2:65). Apparently as part of the role he captained the famous sternwheel-steamer Delta Queen. This vessel ran passengers between Sacramento and San Francisco. His most famous exploit as captain of this vessel was a race between the Delta Queen, which ran between Sacramento and San Francisco, and the Delta King, which ran between Stockton and San Francisco, and the Golden Eagle, which ran on the Mississippi River. This nationwide event was broadcast live via radio across the country. Although Captain Cooley came in last, the captains of the three vessels gained national recognition for their exploit (Figure 7) (Garvey 2004:85-87). William retired from this position in 1941, and went to live with his son Harry in Sacramento. He died in 1956 (Sacramento Bee July 7).

Figure 7. Captain William Lester Cooley (on left) with the captain of the Delta King (Courtesy of the California Room, California State Library).
While William followed his own path, his younger brother Frank took over the lead for caring for the family ranch. Although Frank helped his brother with his boat building ventures, including the Gerald C, his primary occupation was farming. He later moved to the San Joaquin Valley where he farmed 7000 acres. In 1922, Frank moved to San Carlos where he first opened a woodworking and machine shop, and later an airport. During this time he used the old Cooley Landing to build a handful of small vessels. Frank later went back to farming, buying a 75-acre ranch on the Peninsula. By this time Cooley Landing was little more than a few old pilings (Frisbie 1918; Foss 1942:35-36, 72).

Charles Cooley, the third brother, also helped on the family ranch. In addition to his duties at the ranch, he attended his mother at her many social functions around the country. In 1907, William sold his share of the ranch to Charles, and at the same time their mother sold 100 acres of the ranch to I. Butler. In 1910, Mrs. Geraldine Cooley Frisbie sold an additional 180.5 acres to E.F. Turel and the balance of her portion of the ranch to the Spring Valley Water Company. Charles sold his portion of the ranch to Charles Weeks, after which he moved to Palo Alto. Thus ended the era of Cooley Landing (Foss 1942:36-37).

**Other Boat Landings Contemporary with Cooley Landing**

The following section was largely borrowed from a report by Baxter and Allen (2001) that evaluated a series of small boat landings (now designated as Eden Landing) that were contemporaneous with Cooley Landing. These landings were situated the opposite side of the Bay from Cooley Landing near Hayward, California.

Previous research on landing sites is somewhat limited. As Hope et al. (1996:11) point out, “few archaeological studies of historic shipping facilities have taken place in the United States.” They list research efforts that have primarily focused on the eastern part of the United States (Geismar 1983; Heintzelman-Muego 1983; Norman 1987). Geographically more pertinent is the work done in San Francisco by Olmstead et al. (1977), Pastron et al. (1981), Olmstead and Olmstead (1980; 1994), and Olmstead (1993). The latter work in the San Francisco area has presented several pertinent thoughts on the issue.

Olmstead 1993:363 suggests:

… that the primary research value of wharves is related to the technology involved in their construction. She identified the following questions that have potential relevance for evaluation of … [landing complexes] …: 1) How was the wharf constructed (Cobb, crib, or pile)?, 2) Are the techniques used in the construction typical of this type, or are they unusual, considering the property’s location and date?, 3) Is there evidence of local innovation in the construction of this wharf?
The remote Cooley Landing is, perhaps, more similar to some other small scale landing sites rather than the larger San Francisco version. These sites often served not only as shipping points, but as civic centers, residences, storage centers, and dry docks. Such sites include locations like North Ferry Point, Maryland. This 19th century landing was constructed along the banks of the Magothy River to service an alum works operated adjacent to the site. Testing revealed a stone U-shaped wharf that was once covered with wooden planks. Artifacts descriptions are not yet available (Bilicki 1999).

Shifting focus back to California, San Nicolas Island provides an example of a comprehensive, if diffuse landing. A formalized stone wharf, housing, and corrals for sheep were constructed on the island in the early part of the 20th century. The sheep ranching activities have been the focus of an intense historical study by Swanson (1993). Similar constructions have been found on San Clemente Island (Allen, personal observation and site recordation, 1995).

Cartago, in Owens Valley, California was also home to a small wharf. John Baptiste Daneri founded Cartago Landing in 1872. He built a warehouse and general store along the road from Lone Pine to Los Angeles. His new establishment served as the southern terminus for the Bessie Brady, the new ferry used to ship silver from the Cerro Gordo Mines across Owens Lake. A rock landing on the shore of the lake was constructed to accommodate the steamer. At this little port, silver bullion was offloaded from the Bessie Brady, and transferred to wagons that took the silver to Los Angeles, and later Bakersfield (Chalfant 1933:50; Likes and Day 1975:35; Michael 1987:1). By 1879, the Cerro Gordo mines had played-out. The Bessie Brady was beached and stripped, and the bullion wagons ceased their departure from Cartago (Likes and Day 1975:50). Baxter and Allen (2003) recorded the archaeological manifestation of the Cartago Boat Landing during a project for the California Department of Transportation. The E. Clampus Vitus group had noted the likely place of the landing, and nominated it as a Point of Historical Interest in 1979, it was not until 2003 that the actual site was located. Baxter and Allen (2003) suggested the site was eligible for the National Register of Historic Places based on its association with the Cerro Gordo Mining district, but the site was determined to be outside the project APE and was not formally evaluated.

In closer proximity is Esser’s (1999) discussion of Montezuma Slough in the California Delta. She highlights the importance of small sloughs in California’s marshlands. These sloughs were often the focal point of life in these areas where “front doors of houses faced the water [and] barn doors opened directly onto the water so that grain and livestock could be easily loaded and unloaded.” Farms had individual landings that could be as simple as brush pilings or more formal wooden structures or piers. Esser (1999:19-20) highlights four main topics of importance associated with these sloughs: 1) The Waterway and its navigation; 2) Landings; 3) Land Features; 4) Modification of Waterways.

The San Francisco Bay spawned the development of several new vessel types adapted to the local environment. Perhaps most well-known among these is the scow schooner that
was heavily used by the salt industry and agriculture for cross bay commerce. A permanent exhibit display at the San Francisco Maritime Museum discusses the evolution of such vessels. Esser (1999:19) also notes the importance of “vernacular watercraft [that] were designed and built specifically for this region [sloughs], so boat design often reflects local variations.” Oyster barges were also a common vessel along the marshes of the East Bay (Sandoval 1988:45-46). Associated with these landings may be abandoned or scuttled vessels that frequented these landings. Maritime archaeology has a strong tradition in California with many abandoned or wrecked vessels identified in California. Among these is the Schooner Neptune, a timber boat that once plied the coast of California and found its resting place in nearby San Francisco Bay (Delgado 1986).

1932-1960: The Dump

From 1932 through 1960, Cooley Landing was used as the county dump (Figure 8). Much of the material was burned, first in open fires and later in an incinerator. The refuse brought here actually forms most of the landmass that can be seen today. As more and more refuse was brought to the site, it was dumped further and further into the bay, resulting in the small finger of land that is now (inaccurately) known as Cooley Landing. Clean fill was periodically applied to cover the refuse, in order to keep down both odors and vermin.

Figure 8. Undated view of Cooley Landing during its use as a dump site (Courtesy of San Mateo County History Museum Archives).

The study of refuse disposal goes right to the heart of traditional archaeology. It is these material remains that are generally the focus of archaeologists. By studying these materials archaeologists can address research questions as diverse as disposal patterns, diet, health, consumer patterns, trade networks, ethnicity, status, and the like. To address these questions, these remains need to have two key elements, association and integrity.
Artifactual remains need to be definitively associated with individual persons or groups of people. Because the archaeological remains in community dumps cannot be associated with particular people, they are generally considered to be lacking in association. The focus in recent years has been directed more and more at discrete refuse deposits such as refuse filled privies and wells associated with particular households. By focusing on these features, archaeologists can directly link the material with particular individuals or families and make statements about those persons.

There have been exceptions to this trend, where community dumps have been successfully analyzed in a way that provided data relevant to important research questions. Examples include the dumps at the Woolen Mills Chinatown in San Jose, California at the town dump at Cartago, California. These refuse deposits were considered important based upon the fact that they could be associated with distinct groups of people. In the case of Woolen Mills, the dump was directly associated with a relatively small immigrant Chinese population that inhabited the site for a distinct period of time (1887-1902). At Cartago, discrete portions of the dump could be directly linked the workers housed in a company town erected there to house workers at an adjacent potash plant. In both cases the dumps were associated with distinct groups circumscribed by ethnicity in the first case, and type of employment in the second (Allen et al. 2002; Baxter and Allen 2003).

Given the county-wide association of the Cooley Landing dump, while individual artifacts may be encountered that are useful for public interpretation, as a whole the associated community is too large to assume that the dump could hold archaeological value. This is further complicated by the fact that the contents of the dump were regularly burned, re-spread, and intermittently covered with fill. Contents of the dump warrant no further study or analysis.

**1960-1998: Palo Alto Boat Works**

In 1960, Carl H. Schoof purchased the property, and opened the Palo Alto Boat Works. He specialized in repairing wooden boats and even built a few himself. Early on, Schoof worked on some large vessels, but in later years he primarily worked on smaller craft, that could be towed there, such as old Criscrafts.

Carl Schoof constructed the structures that are currently situated on the peninsula, for the Palo Alto Boat Works in the early 1960s (Schoof 2006). The main building is a wood-framed, T-shaped structure that is 95 feet long, 38 feet wide at one end, and 32 feet wide at the other (Figure 9). The 1780 square foot main structure was built in the early 1960s. In 1965, a 2220 square foot addition was added, giving the overall building a total of 4000 square feet. (Khoshkbari and Ellis 2006:2). Several prefabricated metal storage sheds are situated at the edge of an adjacent parking lot that are also of relatively recent construction.
Figure 9. Carl Schoof’s Palo Alto Boat Works, facing northeast. The primary structure was built in the early 1960s, and an addition completed in 1965.

Mr. Schoof also constructed a wharf for the Palo Alto Boat Works, and portions of the wharf can still be seen today. The wharf includes a pair of short sea walls of small boulders and earth and a metal docking facility set on wooden pilings. The docking facility has mostly rusted away. Its physical integrity is poor.

These structures – the main building, the storage sheds, and the wharf – are all less than 50 years old. As such, these constructions do not meet the age requirement of the National Register of Historic Places. They warrant no further analysis.

At some point – the exact date is unknown – Carl acquired a dredge which he planned on using to clear out local harbors. The dredge was reportedly built during WWII, although no information beyond that has been located. Certain references indicate it was used to clear the Palo Alto Yacht Harbor, but Shirley Schoof, Carl’s wife, claims they never really used it. Ultimately, the dredge was converted for use as a residence, where Carl and Shirley Schoof lived for several years (Schoof 2006). The dredge is an object of interest, and is further described in the next section.

In 1998, Mr. Schoof sold 6.75 acres to the Peninsula Open Space Trust (POST). This property included a center strip of land extending to the tip of the former dump site now known as Cooley Landing. The Midpeninsula Regional Open Space District owns the adjacent lands touching the Bay on either side. Carl Schoof passed away, and is survived by his wife Shirley Schoof, who now lives in Tucson, Arizona.
The Dredge at Cooley Landing

One of the most prominent cultural features within the project area is a very large vessel known as a clamshell dredge (Figure 10). Despite extended attempts to discern the exact origin of the dredge, only an estimated date can be made. According to Shirley Schoof, it was built during WWII, and her husband purchased it to clear local harbors around San Francisco Bay. Apparently his efforts came to naught. Carl Schoof eventually “parked” the dredge at Cooley Landing, built a small levee around the vessel to protect it from rough seas, and converted the vessel into what became essentially a house boat.

![Image of the dredge at Cooley Landing, facing southeast, later converted to living quarters. The exact origin and date of construction of the vessel are unknown at this time.](image)

The dredge is a wooden-hulled vessel measuring 28 feet wide and 79 feet long. The hull is flooded, and no detail could be given concerning its contents or type of construction, other than it is bluff-bowed rather than raked. Two hatches at the bow and one at the stern provide access into the hull. There are two decks above the hull. The lower deck is a single, large open “engine room,” containing the equipment used to operate the dredge (Figures 11 and 12).
Figure 11. Buda diesel engine in dredge engine room. Ingersoll Rand compressor in background.

Figure 12. Winch system in dredge engine room.
The most eye-catching feature in the engine room is a Buda Model 6D1G468, six-cylinder diesel engine (Figure 11). Buda was an industrial engine manufacturer located in Harvey, Illinois. The engines were re-branded in 1953 when Buda was bought out by Allis-Chalmers (Bowes 2007).

Also found in the engine room are a series of winches that were used to control the boom, buckets, spuds, and other equipment. The winch systems on this dredge are made up of a series of components built by various manufacturers including: Orr & Sembower, Inc. of Reading, Pennsylvania, Murray & Bros. Machine Works S.F., M&C Co. S.F., and SKF. Orr & Sembower were a Chicago-based manufacturing firm established in 1893. They had a number of manufacturing facilities including one in Reading, Pennsylvania. They were well known for their steam locomotives, and horizontal and vertical steam engines that were used in a number of farm and industrial processes. The company fell on hard times after WWII, and moved to Middleton, Pennsylvania. They ultimately shut down in 1977 (Mae 1982). SKF is a bearing company founded in Sweden in 1907 by Sven Wingquist. In 1909, SKF opened a subsidiary in New York, and in 1947 opened two factories in the U.S. SKF is still one of the largest producers of bearings in the world (SKF 2007). An Ingersoll-Rand Type 30 compressor was also powered by the Buda engine. Ingersoll dates back to 1871 and the production of pneumatic rock drills. Through a series of mergers Ingersoll-Rand was formed in 1905, and continues in operation toady (Ingersoll Rand 2007). Not original to this vessel is a kerosene heater, apparently installed to heat the living quarters positioned on the upper deck. Critical to discerning the potential date of the dredge are the remains of knob and tube wiring, a technology considered obsolete by the end of the 1930s.

Two pairs of doors are located at the fore and aft of the engine room to allow access from the outside. There is no direct access from one deck to another from the interior of the vessel. There are four windows on the port and starboard sides of the vessel, and single windows both fore and aft. All windows and all but one door to the aft of the vessel have been boarded over with plywood. The engine room is surprisingly clean and unmodified for such a word-a-day vessel. It is painted a drab grey color on the interior, with no distinguishing marks other than the equipment. A causeway surrounds the engine room, providing access to all sides of the vessel.

The upper deck is accessed by stairs on the port and starboard sides. It has been modified into living quarters, and includes a kitchen, bathroom, bedroom, and large living room (Figure 13). Many dredges had such accommodations, as the crews operating the vessels lived on board. This portion of the vessel, however, has been greatly remodeled. Based on the shag carpet and acoustic ceiling, this portion of the vessel was probably remodeled in the 1970s. The stern, or rear, portion of this deck is an addition, not original to the vessel, probably added on during the remodel. The living quarters are accessed via a single door on the starboard side of the vessel. A series of irregular windows flank the second deck, and all have been covered with plywood.
Figure 13. Living quarters on upper deck of dredge.

The lever house is toward the front, or bow, of the vessel (Figure 14). It has a unique faceted front and curved roof line. Most of the levers and hydraulic controls appear to be intact. A pair of spuds flank the vessel, roughly parallel to the lever house, and a single spud is situated at the center of the stern. The boom is approximately 60 to 80 feet long, and is supported by a substantial A-shaped head-frame and guy wires. The only major component missing from the dredge is the bucket.

Figure 14. Interior of lever house, showing hoist control levers, and hydraulic brakes.
The dredge present at Cooley Landing remains something of an enigma. To date, the exact date or place of origin for the vessel has not been yet been discovered, nor has a vessel name or number been located. Based on the equipment in the engine room, the approximate date of the dredge is sometime during the late 1930s, but earlier than the WWII period that Shirley Schoof had estimated.

The dredge is quite unique. It appears to be the most complete wooden-hulled, clamshell dredge in the San Francisco Bay area, and probably all of California. There is limited information available on historic dredges in California, but a preliminary search has not found any relevant resources. There is a Dutra Dredge Museum located in Rio Vista, California. The Dutra family, involved in dredging activities in California for many years, runs this private museum. The museum is said to house historic photographs and scale models of various dredges. To date, attempts to contact the museum have been unsuccessful, and it is unknown if the museum has access to, or information about, existing dredges and their locations.

There is still one operating wooden-hulled, clamshell dredge, the Mallard II, currently owned by Cargill Salt. However, it has been greatly modified and updated over the years, with modern steel A-frame, and boom, and modern power plant. No other vessels of this type, and vintage, have been located at this time. It appears that the dredge at Cooley Landing is the most complete, and largely unmodified wooden-hulled, clamshell dredge in existence in California, and possibly in the U.S.

Part of what makes the vessel at Cooley Landing unique is the history of the clamshell dredge itself. In California, this type of dredge was critical to the development of central and coastal lands. Clamshell dredges helped to reclaim thousands of acres of land, keeping shipping channels open to the ports of Sacramento and Stockton, as well as deepening ports around San Francisco and other areas of coastal California in order to provide access to increasingly larger sea-going vessels.

A Short History of Dredging in California

Reclamation

In 1850, Congress passed the Swamp Land Reclamation Act, which allowed for the reclamation of government-owned swamp and tidal lands by private parties. People quickly went to work building levees to hold back the waters of California’s bays and inland waterways. This was initially done by hand, or with animal power where possible. Development of these levee systems was so vigorous that in 1861 the state assembled the Board of Swamp and Overflowed Land Commission to regulate the building of levees. By 1871, virtually all of the designated swamp and overflow lands in the state had been sold. The early levees were relatively small, only three to six feet high, and most were soon inundated. To rebuild them to a suitable size required massive amounts of labor and so mechanical means were soon employed. The Tide Land Reclamation Company was among the first to experiment with “ditchers,” at their Roberts and Twitchell Island
projects. Other early mechanized reclamation projects included Bacon Island, Bethel Island, Jersey Island, and Staten Island (Thompson and Dutra 1983).

As the projects became more involved, the dredges became larger and more technologically refined. With this came added cost. Rather than purchase a dredge that would sit idle once a reclamation project was done, most landowners did not maintain their own dredges. Instead, dredge companies were formed to maintain fleets of dredges that could be hired as needed by various landholders. Some early dredge companies included: The Argyle Dredging Company, Caledonia Dredge Company, E.A. Dutra Dredging Company, Olympian Dredge Company, San Joaquin Ditching Company, Thor Dredging Company, Union Dredge Company, and many others. Reclamation districts also developed, which pooled the resources of several different land owners. Many of these reclamation districts acquired dredges of their own (Thompson and Dutra 1983).

**Navigational Assistance**

Aside from their major role in reclamation projects, many dredges were employed in clearing California’s waterways for shipping. When the interior of California was first being settled in the 1850s, steamers and schooners were able to travel from San Francisco Bay as far north as Redding and as far south as Tulare Lake. With the advent of hydraulic mining that soon changed, as the rivers were filled with the silt and debris of this destructive mining practice. The bottom of the Sacramento River alone was raised 12 feet. The first attempt to remedy the situation came in 1870, when it was proposed to dredge a 14-mile stretch of river out of Stockton, although no actual dredging was ever accomplished. The idea came up again in 1887 and 1890, but it would be several more years before it came to fruition (Thompson and Dutra 1983:29).

Although the proposed dredging of the rivers was long in coming, dredges were employed early on at the Ports of San Francisco and Oakland. As early as the 1850s, they were busily deepening the harbors to allow better access to the deep draft ocean-going vessels that were bringing people and materials to a rapidly developing California. By 1874, the Board of State Harbor Commissioners had formed their own dredging operation to keep the ports clear (Thompson and Dutra 1983:28).

**Technology**

In the early days there were as many different types of dredges as there were builders. After a time several of the more successful designs proved themselves and builders settled on a handful of variations. These are described below.

One of the earliest types of dredge was the “dipper dredge” (Figure 15). This type of dredge looked essentially like a steam shovel mounted on a barge. The shovel was mounted well forward of the hull on a long timber, with the engine and boiler set well aft to balance the vessel. The shovel was rotated on a turn table to allow dumping of material where necessary. The best of these could move up to 200 cubic yards of soil an
They had two spuds near the front and one to the rear. By raising all but one spud, they could push themselves along with the shovel in a walking motion. The inherent short reach of these vessels limited them primarily to harbor clearing (Thompson and Dutra 1983:36-45).

Figure 15. A typical “dipper dredge”. The Atlas at Work circa 1905. Note the laundry drying aft of the lever-house (Thompson and Dutra 1983).

Another popular type of dredge was the hydraulic or suction pipeline dredge (Figure 16). This type of dredge used pumps to suck up material from the water’s bottom. This dredge generally had a nozzle and hose mounted on a heavy wooden structure, called a ladder, that was mounted off the bow of the vessel. They first tried rotating the nozzle from side to side, but found the whole boat listed with it, resulting in an uneven cut. To rectify this, they left the nozzle pointing directly off the bow and rotated the whole vessel on a single spud, pulling the boat from side to side with guy wires. A variety of cutting heads was used to loosen the soil from the bottom so it could be sucked up onto the dredge. Some of these heads had rotating cutting devices, while others used high pressure streams of water to blast the bottom loose. These types of dredges were popular because the spoil could be dumped directly on land via a floating pipeline, instead of in barge to be later dumped elsewhere. They saw extensive use at infilling projects around the Bay Area where they were used to raise the grades of both San Francisco and Oakland (Thompson and Dutra 1983:48-55).
Yet another type of dredge was the bucket-ladder dredge (Figure 17). These dredges used a series of buckets linked together via a chain or belt in a continuous circle. This whole system was driven in a circular fashion to excavated the soil from the below the dredge and dump in onboard. It was then discharged off the vessel via a long pipe. Although this type of dredge had been used in such widely scattered areas as England, the Suez Canal, and the Panama Canal, the bucket ladder dredges used in California were unique. Those used elsewhere were relatively low, but in order to deliver the soil to the tops of the levies in California the ladders had to be up to 40 feet high (Thompson and Dutra 1983:66-86).

Figure 16. Cross section of a typical suction pipeline dredge, the Atlas, as built in 1883 (Thompson and Dutra 1983)

Figure 17. The Thor, a typical bucket-ladder dredge.
Clamshell dredges were ultimately the most successful and numerous dredges used in California. They were among the most simple machines, less prone to the frequent and often costly mechanical problems that plagued other types of dredges. They were also quite versatile as they were able to excavate at virtually any depth, deposit soil up to 300 feet away from the point of excavation, and, due to its height, could deposit soil atop virtually any levee.

The clamshell dredge is composed of a few simple components. The rectangular hull was often bluff bowed, although some were raked. Atop the hull sits the cabin holding the power-plant, hoists, galley, bunks, and lever-house. Protruding from the front of the vessel is a long boom from which is suspended a clamshell bucket. The boom is supported by a network of guy wires, and a sturdy A-frame built over the cabin. There have been a variety of technologies used over the years as designs improved. Steam engines were replaced with gas and diesel engines, wooden vessels have given way to steel, and hydraulics taken the places of mechanically driven components. Despite this the basic working of the clamshell dredge remains unchanged.

Life on a Dredge

Dredge crews varied in size from as few as two men to as many as a dozen, depending on the type and size of the dredge. In the early days of steam power a dredge would require, at a minimum, at least one engine man to maintain the engine(s) and an operator or lever man to operate the excavator. The crews were generally larger than this with other crewmen conducting other tasks, such as maintaining pumps, directing the dumping of spoil, staking out required grades, etc. Clamshell dredges required fewer crew than other types of dredges, as the lever-man controlled both the excavation and dumping of spoil. Other types of dredges, such as hydraulic suction dredges, required one man to conduct the excavation, and another (or others) to coordinate the dumping of the spoil. Modern clamshell dredges with diesel power can operate with as few as two men.

Despite not generally moving far from their home port, many dredge crews lived on their vessels. They were constructed with bunks and a galley for the men who would stay onboard for extended periods of time. Even though some dredges could operate with as few as two men, many dredges were operated 24 hours a day, requiring multiple teams to keep things running. Off duty crew members could rest in the bunks while others continued to operate the dredge.

Following is an excerpt from the hand written log of what is apparently a suction dredge clearing the harbor in San Francisco in 1927. It provides a small window into the lives of the dredge crews during that time.

Saturday January 1, 1927
Not operating
Holiday
Watchmen on dredge
G. Robertson 12-8 am  
A. Hausen 8-4 pm  
J. Coelough 4-12 pm

Sunday January 2, 1927  
Watchmen on dredge  
12-8 am Wm. Clements  
8-4 pm Chas. Gamble  
4-12 pm L. Peters  
Power cable blew up this am. I came down and repaired it so as to be ready to operate tonight.

Monday, January 3, 1927  
Dredging SW [southwest] of tarr [sic] oil wharf  
Not operating from 12-8 am  
Repaired main pump  
Power cable all out-Moved dredge back and out from oil wharf-changed part swing wire put in new wire  
Cleared main pump put in ring of packing  
Stbd [Starboard] swing wire broke  
Tightening bolts on main pump  
Pump shaking very bad  
Operating time only 3 hrs 45 min.  
Weather unsettled  
Heavey [sic] fog in all (Anonymous 1927:1-3)

A later account describes maintaining levees at salt facilities around the Bay:

In the beginning [1953] it was a 24-hour operation, six days a week; we would go out on the Bay for a week at a time. We had a cook aboard and we’d camp out there. The clamshell dredge had a two-man crew to operate it: one in the pilot house, one man on the deck. Later on, we’d just go out for a few days at a time…I was the lever man. Two levers operated the boom; you had one in your hand all the time, like a steering wheel. Then you had the other lever to pull up the spuds—those are like legs; they go into the mud; they hold the dredge in place like an anchor. You stand there with those two levers—it’s the same principle as operating a car; you’d better hold on to them, otherwise
something might happen. It’s physically demanding—there’s no power steering. After eight hours standing up and working those levers, that’s about all you cared to do...The deckhand does anything from going ashore and picking up supplies to putting out stakes to show where we had to work, and then doing minor maintenance, scraping rust and painting, things like that (Owens-Viani 2004).

Even today dredge crews stay aboard for extended periods of time. During a recent interview, the head lever man of the Mallard II (Figure 18) described his job as follows:

The 200 miles of levees I’m responsible for run, starting in the East Bay from the San Mateo Bridge, all the way around the South Bay and back up to Redwood City...My shift starts Tuesday morning and goes through Friday night (St. Luke’s Hospital 2007).

Figure 18. The Mallard II working just south of Dumbarton Bridge. Owned by Cargill Salt, the Mallard II was built in 1936 and is probably the oldest operating dredge in California, although it has been significantly altered. Note the modern steel boom and A-frame which replaced the older wooden structure.
Research and Interpretive Themes Associated with Dredging

The primary research concept behind dredging is technology, perhaps more precisely changes in technology. As noted above, dredges were used to build levees, clear or deepen harbors and river channels, and to raise the grade of water-side land holdings. Each type of land improvement project required different technologies, and these technologies changed over time. The dredges developed in California were built during a time of rapid industrialization and technological change. As a result the dredges employed expressed a wide variety of approaches to dredging, and reflected the continual changes in technology. Often, dredges were drastically rebuilt to accommodate improved technologies.

Potential research questions associated with dredge technology could include: Is the dredge typical or atypical of a certain type of dredge technology? Is this technology typical or atypical for the period of construction? Has it been modified over time? What purpose did the dredge serve? Were the projects the dredge was involved in of any significance? Were the builders or owners of the dredge anyone of significance? Answers to these questions could frame themes for the proposed interpretive center.
Cultural Resource Evaluation and Recommendations

The National Register of Historic Places lists properties that are important to our nation’s past. To be eligible for the listing, a property normally must be 50 years of age or older; it must possess historic significance; and it must possess integrity of location, design, setting, materials, workmanship, feeling, and association. Significance is the importance of a property to the history, architecture, archaeology, engineering, or cultural aspects of a community. To qualify for the National Register, a property must have significance in American history at the local, state, or national level. This importance can be present in districts, sites, buildings, structures, and objects that possess integrity and meet one or more of the following criteria (National Park Service 1991):

a) association with events that have made a significant contribution to the broad patterns of history;

b) association with the lives of persons significant to our past;

c) embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

d) have yielded, or may be likely to yield, information important in prehistory or history.

Prehistoric/Native American Components

As noted above, the landform on which the project is proposed is a man-made landform created during the 1930s to 1960. Prior to the development of this landform, the project area would have been approximately 10 feet underwater. Although water levels in the Bay have fluctuated over time, the project area probably remained inundated during most of the human occupation of North America. Chances are slim for encountering Native American archaeological materials, which, if present, would be approximately 18 feet below the current grade. The proposed project does not include substantial subsurface grading, and would not impact any Native American related materials, should they be present. If a project is later proposed that would impact the area below 18 ft., then the potential for prehistoric resources will have to be reassessed.

Ravenswood and Cooley Landing

There does not appear to be any physical remains of Cooley Landing within the project area. Both the original Ravenswood Landing and the later Cooley Landing were both wooden structures, both of which were reported to have substantially decayed by the 1940s. There may be the potential for buried remains of the wharf, such as pilings,
although this seems unlikely, and would most likely be indistinguishable from the refuse that was later deposited here. The actual town site of Ravenswood, and Cooley’s Ranch were situated further inland. Based on this information, there are no cultural resources associated with Ravenswood or Cooley Landing present at the site. As with the prehistoric resources, though, if a project is later proposed that would impact the area below 18 ft., then the potential will have to be reassessed.

The Dump and the Palo Alto Boat Works

As noted above, for refuse deposits to be eligible for the National Register they need to have clear historical association. Since the material deposited here was accumulated over a 30-year period, and was deposited by numerous unknown persons from across San Mateo County, deposits associated with the dump lack this correlation. This lack of association makes the dump deposits ineligible for the National Register.

The structures associated with the Palo Alto Boat Works do not meet the 50 years of age requirement for consideration.

The Dredge

In order to recognize the importance of maritime-related vessels important to our nation’s past, and to encourage preservation of these vessels, in 1966 Congress expanded the definition of the National Register of Historic Places (Delgado 1992). As a result of this expansion, National Register properties now include not only vessels, but also buildings and structures, such as canals, drydocks, shipyards, and lighthouses. The dredge at Cooley Landing, due to its role in reclamation of maritime properties to dry land, qualifies as a vessel that could be used to interpret California maritime history. It is a floating vessel by definition and historic use.

Due to its unique nature, the dredge at Cooley Landing may be eligible for the National Register under criteria a and c, as it is associated with important reclamation activities that have shaped the history of California, and it may be a unique vessel of its kind, and embody engineering knowledge. If the date and origin of construction were determined, as well as a life history of the vessel, it may also be eligible under criterion d, in that it may yield information pertinent to the technological development of dredges in California.

The National Register Bulletin No. 20 (Delgado 1992) that defines the study of maritime vessels makes the following recommendations for evaluation:

Determining the significance of a historic vessel depends on establishing whether the vessel is 1) the sole, best, or a good representative of a specific vessel type; 2) is associated with a significant designer or builder; or 3) was involved in important maritime trade, naval, recreational, government, or commercial activities. The significance of a historic vessel can only be determined through a
A typical investigation for a historic vessel nomination should include:

1. Identification of the specific type of vessel and documentation based on a physical inspection of the vessel and a documentation of her history.

2. Identification of the historic context(s) associated with the vessel based on a documentation of her history.

3. Determination that the characteristics of the vessel make her either the best, or, a good representative of her type.

4. Evaluation of the significance of the vessel based on the National Register criteria.

5. Evaluation of the vessel's integrity and a listing of features that the vessel should retain to continue to possess integrity.

6. Evaluation of a vessel's special characteristics that might qualify her for National Register listing even though she might be less than 50 years old or some aspect of her present condition generally would not qualify her for listing.

Further archival research is needed to fulfill the requirements noted in the *National Register Bulletin* No. 20, and to determine the exact date of construction, origin, and life history of this particular dredge.

In order to be eligible for the National Register, a vessel must also retain physical integrity. The dredge at Cooley Landing retains remarkable physical integrity, including integrity of design, materials, and workmanship, although its living quarters have been modified. The vessel is, though, currently in a critical stage of decay. It retains structural integrity, but has not been maintained in recent years, and the exterior is rapidly decaying. The hull is flooded, although it seems structurally sound, and as a result the deck is rapidly approaching a poor condition. The vessel is actively being vandalized, with visible signs of intentional destruction occurring during the course of this project. If not stabilized and secured soon, it may reach a stage of decay from which it can not be feasibly recovered.

According to the *National Register Bulletin* No. 20 (Delgado 1992), a vessel retains integrity of setting if it is maintained in the water. The dredge at Cooley Landing is currently in a marsh area adjacent to the waterfront. According to the *Bulletin*, as an exception, “Integrity of setting will be maintained if the craft is associated with the water by means of a waterfront location. This setting must not detract from appreciating the vessel as a waterborne craft or present her as a museum object.” The dredge’s current setting appears to meet this requirement.
Recommendations

The only cultural resource of concern within the project area appears to be the dredge, which may be eligible for the National Register. In order to make a formal determination, more archival research and careful application of the criteria set forth in National Register Bulletin No. 20 is necessary. This research is outside the scope of the current project.

Until such a determination occurs, the dredge should be treated as if it were eligible for the National Register. Any plans to develop the site should not impact the dredge in any way. At the same, if stabilization efforts can occur, it would greatly assist in maintaining the physical integrity of the vessel. Care should be taken, though, to not affect the dredge’s historic materials and workmanship.

The dredge is of a type that was critical to the development of Central and Coastal California, and is also representative of a unique form of engineering and technological innovation. As such, it would make an ideal historical display, as it perhaps be one of the last examples of its kind, at least in California. Any plans for development of the dredge as an interpretive display should include recommendations for further study and a determination of eligibility.
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**Review Comments:** Mitch Postel, Director, San Mateo County History Museum, has reviewed the Cooley Landing Cultural Resource Inventory and Assessment, prepared by R. Scott Baxter, Rebecca Allen, and Mark G. Hylkema under contract with Kleinfelder, Inc., August, 2007. His detailed comments are attached.

Dr. Postel’s main comment concerns the legends about Isaiah Woods. He cites a biography by Albert Shumate that disputes the legends that this report includes. This biography also available at the East Palo Alto Public Library reference section along with the other materials about Cooley Landing. In addition, the excerpts from this biography that are most relevant to this report are attached here. Here is the citation for this book: Shumate, Albert. *The Notorious I.C. Woods of the Adams Express*. Glendale, California: The Arthur H. Clark Company, 1986.

In addition, Dr. Postel provided the attached excerpt from a student paper “The Ideal Cement Plant at Redwood City,” Tim Orazem, report for the History of San Mateo County (History 21) course, June, 1979. Pages 10-12 describe typical Marine Operation (dredging) in Redwood City.

**Note about private portions of the report:** The original full report contains two pieces of information that are not in the public version. Standard practice is to keep this information private to protect the sites from unauthorized entry and to respect the sovereignty of Tribal governments. The content of these private portions of the report does not substantially change the conclusions in the public portions of thereport.

1. State of California Department of Parks and Recreation Site Record #523, which includes Primary Record, Archeological Site Record, Building Structure, and Object Record, Sketch Map, and Location Map (5 pages).
2. Consultation with Native American entities

According to standard procedure, the City will forward this report to the Northwest Information Center, where it will be available to qualified persons. Contact information: Northwest Information Center, Sonoma State University, 1303 Maurice Ave., Rohnert Park, CA 94928, [http://www.sonoma.edu/nwic/](http://www.sonoma.edu/nwic/), Tel: 707.664.0880, Fax: 707.664.0890, [jordanl@sonoma.edu](mailto:jordanl@sonoma.edu)

If you have any questions, please contact Lily Lee, Cooley Landing Project Manager, City of East Palo Alto, 2415 University Ave., 2nd Floor, East Palo Alto, CA 94301, Tel: 650-853-3166, Fax: 650-853-3115. This report is also available online at this website: [http://www.ci.east-palo-alto.ca.us/economicdev/planandinfrast.html#Cooley](http://www.ci.east-palo-alto.ca.us/economicdev/planandinfrast.html#Cooley)

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