DRAFT ENVIRONMENTAL IMPACT REPORT FOR THE PROPOSED OAK COUNTRY ESTATES

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Technical Appendices, Volume II (Appendix E, Part 1)

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January 2005

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DEPARTMENT OF PLANNING AND LAND USE

CULTURAL RESOURCES REPORT OF THE SURVEY AND TESTING PROGRAMS FOR THE OAK COUNTRY ESTATES DEVELOPMENT IN RAMONA, SAN DIEGO COUNTY, CALIFORNIA

VOLUME I

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NATIONAL ARCHAEOLOGICAL DATA BASE INFORMATION

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Report Title:	Cultural Resources Report of Survey and Testing Programs for the Oak Country Estates Development in Ramona, San Diego County, California
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Submitted to:	County of San Diego Department of Planning and Land Use 5201 Ruffin Road San Diego, CA 92123-1666
Contract No.:	BMA 0005-175
USGS Quadrangle:	San Pasqual 7.5'
Acreage:	769 Acres
Keywords:	Positive survey (discovery of 10 new sites, relocation of 30 previously recorded sites), Late Prehistoric period sites, testing 427 STP excavations and 35 1 m^2 units, 350 bedrock milling features, village of Pa'mu, milling tools, pottery, modified bone, faunal remains (bone and shell), bifaces/arrow points, obsidian studies (Coso, Casa Diablo, and Obsidian Butte), Piedra de Lumbre chert, radiocarbon dating, pollen studies, column sampling, flotation/macroflora analysis

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MANAGEMENT SUMMARY AND ABSTRACT

This document presents the results of a Phase I archaeological survey and cultural resources inventory, an Extended Phase I boundary definition program, and a Phase II site significance evaluation program for a proposed 769-acre housing development project located near Ramona, San Diego County, California. The Phase I and Phase II programs were conducted as part of an Environmental Impact Report (EIR) in compliance with the California Environmental Quality Act (CEQA) and County of San Diego environmental guidelines. The Phase I Inventory was performed prior to the beginning of the Extended Phase I testing program, and involved site records searches, literature reviews, historic map checks and field survey. The Extended Phase I program was conducted for site subsurface boundary definition and the Phase II program to evaluate sites for significance under CEQA and the County of San Diego environmental guidelines, including the County Resource Protection Ordinance (RPO).

The Oak Country Estates project is located in central San Diego County, approximately 1.5 miles north of Highway 67, extending northwesterly from the intersection of Highland Valley Road and Rangeland Road, approximately two miles west of the community of Ramona. Santa Maria Creek flows north through the lower central portion and along the northeastern edge of the property. The project consists of the development of portions of the 769-acre property for which two development alternatives are addressed; the Proposed Project Plan and the Reduced Intensity/Reduced Impact Alternative (Alternative 1) . Each of the plans develops a portion of the property with the remainder in larger Open Space lots with potential also for additional open space easement protection within each individual development lot. The larger Open Space lots encompass the Santa Maria Creek bed and portions of two tributaries present on the property. Expected impacts to existing cultural resources may derive from the construction of several new streets for ingress and egress to the development, from the grading of pads for dwellings and their ancillary structures, and from earthmoving activities necessary to construct individual septic facilities and driveways of various lengths for access to dwellings.

The Proposed Project Plan consists of 57; 52 in the Specific Planning Area, each with a minimum of two gross acres, and five in the area designated as General Agriculture, each with a minimum of either ten or forty gross acres. Fifty-two lots are located on the western half of the project site and are accessed from Highland Valley Road. Six Open Space lots, totaling approximately 461 acres, are located along the Santa Maria Creek and the middle portion of the property.

The Reduced Impact Alternative (Alternative 1) resembles the Proposed Project Plan in the number and locations of lots. It consists of 55 residential with 52 in the Specific Planning Area, each having a minimum of two gross acres, and three in the area designated as General Agricultural, each with a minimum of two gross acres. Fifty-two lots are located on the western half of the project site and are accessed from Highland Valley Road. Alternative 1 maintains six Open Space lots, similar to the Proposed Project. Total acreage of Open Space in Alternative 1 is greater than that in the Proposed Project, as Lots 56 and 57 of the Proposed Project would be included within Open Space Lot F in Alternative 1. The Open Space Easement over Lots 53, 54, and 55 of the Proposed Project are reduced in Alternative 1. Overall, Alternative 1 includes approximately 542 acres within designated Open Space lots, which is approximately 81 acres more than in the Proposed Project. The severity of impacts to cultural resources associated with Alternative 1 is much less than under the Proposed Project Plan, and, consequently, the levels of mitigation are also reduced. Under Alternative 1, the placement of roads would not directly impact any significant archaeological resources and eleven rather than fourteen lots could potentially affect archaeological resources. Also with this alternative, within the eleven lots, the planned locations for house pads, driveways, and leach fields are designed to avoid the potentially affected significant sites.

A records and literature search was conducted to identify any previously recorded archaeological or historical resources, and to document all previous archaeological investigations conducted within a 0.5 mile radius of the study area. The records search indicated that thirty-two prehistoric archaeological sites had been previously recorded on the property as a result of two previous surveys on the property. The current study was conducted to assess the previous cultural resources work and to update the current conditions and locations of the previously recorded sites on the property, and to determine if additional sites exist that were missed due to vegetation or other constraints during the earlier work. During the field survey, the thirty-two previously recorded cultural resource sites were re-identified and ten additional sites were discovered and recorded. Site forms were submitted to the South Coastal Information Center at San Diego State University for assignment of permanent site trinomials and primary numbers. Of the forty cultural sites on the property, thirty-nine are exclusively prehistoric and one is principally prehistoric with a historic element. No items of a temporal and/or culturally diagnostic nature were collected from the surface of the sites during the survey. Some of the sites have been disturbed by agricultural activities. The only historic element of a site observed consists of the remnants of a cattle corral.

An Extended Phase I site assessment and boundary delineation program was then conducted consisting of the excavation of 427 STPs containing 27.5 m^3 of soil. To better resolve actual site subsurface deposit extent, an interval of five or more items of cultural material per STP, rather than simple presence or absence, was used to better focus the boundaries of midden deposits within site areas. As a result of the Extended Phase 1 program, 12 of the previously recorded 30 sites were combined to form four sites, resulting in a revised total (including the 10 new sites) of 32 sites within the 769-acre project property. Together, these sites contained 350 bedrock features including 1,317 slicks, 243 basins, and 58 mortars, and produced 172 flaked stone tools and cores with 9,115 pieces of debitage, 255 ground stone tools, 16 pieces of modified bone, 256 prehistoric ceramic artifacts, and 14,846 pieces of faunal bone and 18 pieces of shellfish shell in the testing programs. Also noted were six rock rooms and four other surface rock features. The Extended Phase I testing program also determined that 15 of the 32 sites did not have a subsurface deposit present consisting only of surface artifacts and/or bedrock milling features. A Phase II evaluation for site significance was subsequently proposed and conducted for the remaining seventeen sites. At these seventeen sites, thirty-five 1 by 1 m, Phase II units were excavated to evaluate the content, depth, and significance of these deposits. These thirty-five units represent 26.2 m^3 of excavated soil.

Results from the Extended Phase I and Phase II testing programs indicated that the artifact assemblages at the thirty-two sites were primarily Late Prehistoric in age. Their distribution on the property resembled an hypothesized settlement pattern of a dispersed village settlement with several sites forming the central habitation area of the village and other less extensive sites comprising dispersed loci of activity and/or temporary habitation away from the main village area. Phase II testing at the seventeen sites with subsurface deposits appeared to indicate that these sites consisted either of main habitation locations with associated milling features, or of milling stations with temporary campsites or smaller habitation areas associated with them. The fifteen sites without deposits represent milling stations without habitation areas associated with them.

Based on the results of the Phase I archaeological survey and boundary testing program, and on the results of the Phase II, site significance testing program, twenty sites were found not to be significant cultural resources and, therefore, impacts will not be significant. For these twenty resources, no further consideration is warranted. Based on the results of the Phase II site significance testing program, twelve sites were found to be significant cultural resources under CEQA and, therefore, project impacts to these resources will be significant. Of these twelve sites, ten have also been found to be significant under criteria stipulated in the County of San Diego Resource Protection Ordinance (RPO). For all twelve resources, avoidance (preservation) is the preferred mitigation measure.

For ten of the twelve significant sites, a final phase of data recovery should be completed through accurate mapping and recordation of the bedrock milling features present at each of these sites. This recordation coupled with preservation in open space will achieve mitigation of potential adverse effects. Under the current development plans, the twelve significant sites can be preserved in dedicated open space easements. Establishment of the open space easements with fencing as needed and restrictions on access/use of the easements will mitigate potential adverse impacts to a level of non-significant effects. A qualified archaeological monitor shall be present on-site, during project construction, to observe any grading, clearing, or other earth moving activities to ensure impacts to sensitive resources are avoided. Complete descriptions of the specific measures to ensure adequate mitigation of impacts are provided in Section XV of this report.

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I. INTRODUCTION AND PROJECT DESCRIPTION

A. Introduction

This document presents the results of a Phase I archaeological survey and cultural resources inventory, an Extended Phase I boundary definition program, and a Phase II site significance evaluation program for a proposed 769-acre housing development project located near Ramona, San Diego County, California. These Phase I and Phase II programs were conducted as part of an Environmental Impact Report (EIR) in compliance with the California Environmental Quality Act (CEQA) and County of San Diego environmental guidelines.

The Phase I Inventory was performed prior to the beginning of the Extended Phase I testing program, and involved site records searches, literature reviews, historic map checks and field survey. The Extended Phase I program was conducted for site subsurface boundary definition and the Phase II program to evaluate sites for significance under CEQA and the County of San Diego environmental guidelines, including the County Resource Protection Ordinance (RPO).

This document contains description and discussion of the cultural resource sites, environmental and cultural background, field and laboratory methods, and recommendations for mitigation measures where appropriate. The content of this report is consistent with, and includes information recommended in, *Archaeological Resource Management Reports (ARMR); Recommended Contents and Format* (Office of Historic Preservation 1989).

Project personnel included: Richard L. Carrico (M.A.), Project Manager and Principal Investigator for Phase I, and Co-Principal Investigator for the Extended Phase I and Phase II testing programs; Theodore G. Cooley (M.A., RPA), Extended Phase I and Phase II Project Archaeologist, and Co-Principal Investigator; Stacey Jordan (Ph.D., RPA), Historical Archaeologist; Carol Serr (B.A.), Laboratory Director; Josh Smallwood (B.A.), Phase I survey field crew chief; Laura Barrie, (B.A.), Extended Phase I and Phase II field crew chief; and Kristen Walker (B.A.), Christopher Beach (B.A.), David Caterino (B.A.), Chrissy Mittendorff, Cristela Cuellar, Laura McElvana, Patrick McGinnis, Kimberly Lauko, Jennale Peacock, and K. Ross Way, laboratory and/or Phase I or Extended Phase I or Phase II field crew members. Resumes for key personnel are included in Appendix A.

B. Project Location And Description

Map I-1 shows the general location of the project in central San Diego County. The project is approximately 1.5 miles north of Highway 67, extending northwesterly from the intersection of Highland Valley Road and Rangeland Road, approximately two miles west of the community of Ramona. Santa Maria Creek flows north through the lower central portion and along the northeastern edge of the property. Woodson Mountain is approximately 1.5 miles to the southwest and the San Pasqual Valley approximately 2.3 miles to the northwest. On the San Pasqual U.S.G.S 7.5 minute Quadrangle, the project property lies in an unsectioned portion of the northeast corner of Township 13 South, Range 1 West (Map I-2).

The project consists of the development of portions of the 769-acre property into one of the two development plans. Each of these plans develops a portion of the property with the remainder in larger Open Space lots with potential also for additional open space easement protection within each individual development lot. The larger Open Space lots encompass the Santa Maria Creek bed as well portions of two tributaries present on the property. Impacts to existing cultural resources may derive from the construction of several new streets for ingress and egress to the development, from the grading of pads for dwellings and their ancillary

structures, and from earthmoving activities necessary to construct individual septic facilities and driveways of various lengths for access to dwellings.

The Proposed Project Plan consists of 57; 52 in the Specific Planning Area, each with a minimum of two gross acres, and five in the area designated as General Agriculture, each with a minimum of either ten or forty gross acres. Fifty-two lots are located on the western half of the project site and are accessed from Highland Valley Road. Six Open Space lots, totaling approximately 461 acres, are located along the Santa Maria Creek and the middle portion of the property.

The Reduced Impact Alternative (Alternative 1) resembles the Proposed Project Plan in the number and locations of lots. It consists of 55 residential with 52 in the Specific Planning Area, each having a minimum of two gross acres, and three in the area designated as General Agricultural, each with a minimum of two gross acres. Fifty-two lots are located on the western half of the project site and are accessed from Highland Valley Road. Alternative 1 maintains six Open Space lots, similar to the Proposed Project. Total acreage of Open Space in Alternative 1 is greater than that in the Proposed Project, as Lots 56 and 57 of the Proposed Project would be included within Open Space Lot F in Alternative 1. The Open Space Easement over Lots 53, 54, and 55 of the Proposed Project are reduced in Alternative 1. Overall, Alternative 1 includes approximately 542 acres within designated Open Space lots, which is approximately 81 acres more than in the Proposed Project. The severity of impacts to cultural resources associated with Alternative 1 is much less than under the Proposed Project Plan, and, consequently, the levels of mitigation are also reduced. Under Alternative 1, the placement of roads would not directly impact any significant archaeological resources and eleven rather than fourteen lots could potentially affect archaeological resources. Also with this alternative, within the eleven lots, the planned locations for house pads, driveways, and leach fields are designed to avoid the potentially affected significant sites.

Mooney & Associates

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Oak Country Estates
Regional Location Map

Map I-1

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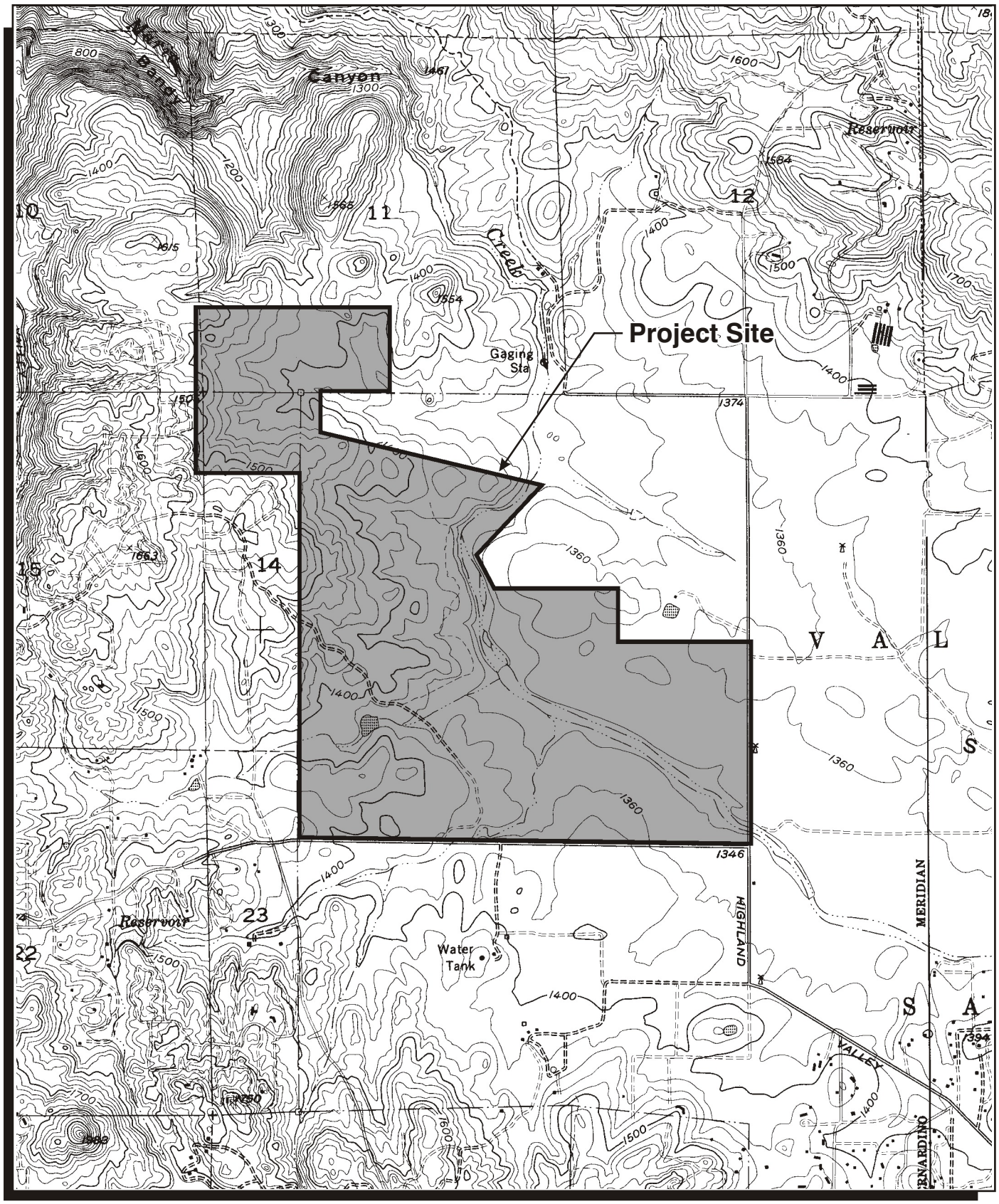

SOURCE: USGS 7.5' Quad Map (San Pasqual)

Mooney & Associates

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Oak Country Estates
Vicinity Map

Map I-2

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II. SETTING

A. Introduction

To provide a natural and a cultural context for the site testing and research program that follows, a brief review of the region's natural setting and culture history is presented. The cultural history includes a discussion of the prehistoric and protohistoric period, the local ethnohistoric life style, and the historic development of the project area.

B. Environmental Setting

The project property lies within the Santa Maria Valley (sometimes also referred to as the Ramona Valley) along the western foothills of the Laguna Mountains of the western peninsular ranges of San Diego County. Locally, these foothills reach an elevation of 882 m (2,894 ft.) at Mount Woodson approximately 2.5 kilometers (1.6 miles) to southwest of the project property (Plate II-1A). Elevation on the property ranges from 401 m (1,315 ft.) along Santa Maria Creek at the northeastern corner to 477 m (1,565 ft.) at the west central edge of the property. To the east, beyond the Santa Maria Valley, the terrain consists of steep ridges and valleys that gradate into the higher elevations Laguna Mountains. Santa Maria Creek, that flows through the property (Plate II-1B), originates in these mountains and combines with Santa Ysabel Creek in San Pasqual Valley 3.2 kilometers (2 miles) to the northwest of the property to form the San Dieguito River.

Natural vegetation on the property consists principally of dense coast live oak woodland, open coast live oak woodland, disturbed coast live oak woodland, southern willow scrub, buckwheat scrub, southern mixed chaparral (Plate II-2A), mule fat scrub, freshwater seeps, non-native grassland (Plate II-2B) , and San Diego clay pan vernal pools (Nordby and Robbins 2001). The descriptions of these plant communities provided below are excerpted from Nordby and Robbins (2001).

> Coast live oak woodland consists of a closed canopy woodland dominated by coast live oak (*Quercus agrifolia*). The coast live oak is an evergreen that may grow from 10 to 25 meters in height. Coast live oak woodland is the dominant oak woodland community for southern California and will often integrate with Engelmann oak woodland. The underlayer of shrubs is often poorly developed but may include toyon (*Heteromeles arbutifolia*), currants (*Ribes* sp.), and laurel sumac (*Malosma laurina*). The understory is often dominated by non-native grasses (Holland, 1986). On-site both open and dense forms of this woodland occur. Open coast live oak woodland varies from dense coast live oak woodland by the coverage of the mature tree canopy. The coast live oak woodland located on-site is scattered throughout the western portion of the project site.
>
> Southern willow scrub is described by Holland as a dense, broadleafed, winter deciduous riparian thicket dominated by several willow species. Site factors include loose, sandy or fine gravelly alluvium deposited near stream channels during flood flows. According to Holland, southern willow scrub requires repeated flooding to prevent succession to southern cottonwood-sycamore riparian forest. Dominant plants observed on-site included red willow (*Salix laevegata)* and arroyo willow (*Salix lasiolepis).* Other plants observed included western ragweed (*Ambrosia psilostachya*), carex (*Carex* sp.), eleocharis (*Eleocharis* sp.), and salt heliotrope (*Heliotopum curvasscium*). The southern willow scrub on-site is located near the pond which is situated near the southwestern corner of the property.

Buckwheat scrub consists of open areas dominated by California buckwheat (*Eriogonum fasciculatum)*. California buckwheat is a low growing shrub found in many different vegetation communities; however, on-site California buckwheat creates large homogenous landscapes. Other plants observed included rip-gut, soft chess (*Bromus hordeaceus*), vinegar weed (*Trichostema lanceolatum*), filaree (*Erodium botrys*), and slender wild oat (*Avena barbata*). The buckwheat scrub on-site is scattered throughout the western portion of the project site and is surrounded by non-native grassland, southern mixed chaparral, and oak woodland communities.

Southern mixed chaparral consists of broad-leaved sclerophyll shrubs, 1.5-3 meters tall, forming dense often nearly impenetrable vegetation dominated by scrub oak (*Quercus berbidifolia),* chamise (*Adenostoma fasciculatum)*, manzanita species (*Arctostaphylos sp.),* white stemmed lilac (*Ceanothus leucodermis*), and mission manzanita (*Xylococcus bicolor*). Other plants observed on-site include golden yarrow (*Eriophyllum confertiflorum*), blue dicks (*Dichelostema capitatum*), checkerbloom (*Sidalcea malvaeflora*), white sage (*Salvia apiana*), California buckwheat, and laurel sumac (*Malosma laurina).* The southern mixed chaparral on-site is located throughout the majority of the western portion of the project site.

Mule fat scrub is described as a depauperate, tall, herbaceous riparian scrub strongly dominated by mule fat (*Baccharis salicifolia*) (Holland 1986). Other species associated with this habitat type commonly include slender willow (*Salix exigua*) and stinging nettle (*Urtica holosericea*). Mule fat scrub generally occurs within stream channels with a fairly coarse substrate and moderately deep water table. It is usually an early successional community and is maintained as such by regular, frequent flooding (Holland 1986). On-site mule fat scrub dominates most of the channelized areas of the Santa Maria Creek.

Freshwater seeps consist mostly of perennial herbs, especially sedges and grasses, which usually form a complete cover (Holland 1986). Site factors include permanently moist or wet soil around freshwater seeps, often associated with grasslands or meadows. This habitat is associated with the tributaries and meadows surrounding the Santa Maria Creek. Dominant plants include yellow carex (*Carex* sp.), carex (*Carex pregocilus*), elocharis (*Elocharis marginata*), and Mexican rush (*Juncus mexicanus*). Other plants observed include saltgrass (*Distichlis spicata*), foxtail (*Bromus madritensis*), wild rye (*Leymus triticoides*), slender wild oat (*Avena barbata*), and rip-gut (*Bromus diandrus*).

Non-native grassland consists of a dense to sparse cover of annual grasses with flowering culms measuring approximately one meter high. Native wild flowers are often associated with this community, especially in years of favorable rainfall. Plants observed on-site include: wild barely (*Hordeum murinum*), rip-gut, slender wild oat, foxtail, slender tar weed (*Holocarpha virgata*), southern tar weed (*Centromadia parryi ssp. australis*), common tar weed (*Deinandra fasciculata*), Parry's tarplant (*Centromasia paryii*), Orcutt's brodiaea (*Brodiaea orcuttii*), buttercup (*Ranunculus californica*), goldfields (*Lathenia californica*), mariposa lilly (*Calochortus splendens*), purple needlegrass (*Nassella pulchra*), and blue dicks. The non-native grassland on-site is located throughout the majority of the eastern portion of the project site.

San Diego mesa claypan vernal pools consist of a low, amphibious, herbaceous community dominated by annual herbs and grasses. Germination and growth begin with winter rains, often continuing even when inundated. Site factors include fine textured grey soils that are lacking in iron cemented hardpan. Species observed on-site include wooly marbles

A.) Mount Woodson, Sites CA-SDI-7759 and 7758 in Foreground

B.) Santa Maria Creek, Bedrock Milling at Site CA-SDI-7322 in Foreground

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A.) Dense Chaparral and Oak Woodland Vegetation

B.) Grassland and Sage Scrub

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(*Psilocarphus brevissimus*), grass poly (*Lythrum hyssopifolium*), water-starwart (*Callitriche marginata*), water pygmy weed (*Crassula aquatica*), annual hair grass (*Deschampsia danthonioides*), quillwort (*Isoetes orcuttii*), flowering quill wort (*Lilea scilloides*), toad rush (*Juncus bufonius*), plantain (*Plantago elongata*), adobe allocarya (*Plagiobothrys acanthocarphus*), curly docks (*Rumex crispis*), wild barely (*Hordeum murianum*), rush (*Juncus dubius*), spike rush (*Eleocharis macrostachya*), and purselane speedwell (*Veronica perigrina*). The vernal pools on-site are scattered throughout the non-native grassland in the eastern portion of the property.

Prehistorically, the various oak woodland, scrub, and chaparral communities covered most of the hillsides, ridges, and canyons in these foothill areas with interspersed areas of native grasslands. Prior to historic and modern activities, major drainages such as Santa Maria Creek possibly contained more extensive stands of the riparian community with plants such as sycamore (*Platanus racemosa*), Fremont cottonwood (*Populus fremontii*), coast live oak (*Quercus agrifolia*) and willow (*Salix* sp.). It also appears that the low lying seep areas described above by Nordby and Robbins, along Santa Maria Creek in the southern portion of property, may have once contained marshlands. Additional plants present in freshwater marsh might include cattail (*Typha*), and bulrush (*Scirpus* sp.). As indicated above, however, over the last 200 years these natural communities have been disturbed by historic development, agriculture, and cattle grazing, and today introduced grasses and other plants (i.e., non-native grassland) are now present in many native grassland areas and in areas where sage scrub was formerly present (Munz 1974; Beauchamp 1986).

Animal life, prehistorically, around the project area undoubtedly included large to medium size mammal species such as grizzly bear (*Ursus horribilis*) and black bear (*Ursus americanus*), mountain lion (*Felis concolor*), bobcat (*Lynx rufus*), mule deer (*Odocoileus hemionus*), coyote (*Canis latrans*), gray fox (*Urocyon cinereoargenteus*), badger (*Taxidea taxus*), ringtail (*Bassariscus asutus*), raccoon (*Procyon lotor*), and striped skunk (*Mephitis mephitis*). Numerous species of smaller size mammals were also present including jack rabbit (*Lepus californicus*), brush rabbit (*Sylvilagus bachmani*), cottontail rabbit (*Sylvilagus audubonii*), ground squirrel (*Spermophilus beecheyi*), pocket gopher (*Thomomys bottae*), and several species of mice and rats (Burt and Grossenheider 1976). Other animals included numerous predatory bird species such as red-tailed hawks (*Buteo jamaicencis*) and golden eagles (*Aquila chrysaetos*) (Peterson 1961); and various amphibian and reptile species including a large variety of lizards and snakes as well as pond turtles (*Clemmys marmorata*) in the Santa Maria Creek drainage (Stebbins 1966).

Geologically, the property is underlain, principally, by granitic rocks of the Southern California Batholith of Cretaceous age. These granitic rocks are exposed at the surface as boulders over most of the project property (Plates II-3A and B). Granitic bedrock formations in the project area include the Woodson Mountain Granodiorite and the San Marcos Gabbro. Also present in the area (Santa Maria Valley), but apparently not on the property, are limited outcrops of pre-Cretaceous age meta-sedimentary rocks, designated the Bedford Canyon Formation. The southeastern area of the property contains shallow sediments of recent geologic (Quaternary) age, deposited on the granitic bedrock. These sediments are alluvium of the Santa Maria Creek flood plain consisting of sandy clay, with minor amounts of gravel, and cobbles (Weber 1963; Rogers 1965).

Specific soil types within the project property consist of: the Bonsall sandy loam (thick surface, 2-9% slopes), Bonsall-Fallbrook sandy loams (2-5% slopes), Bosanko clay (2-9% slopes), and the Las Posas fine sandy loam (5-9% slopes and 5-9% slopes eroded) in the non-drainage areas of the southeastern quadrant of the property; the Fallbrook sandy loam (9-15% slopes, eroded, 15-30% slopes, eroded) and the Fallbrook rocky sandy loam (9-30% slopes and 9-30% slopes eroded) in the non-drainage areas of the western half and north central portion of the property; the Cieneba-Fallbrook rocky sandy loams (9 to 30%, eroded) in a small area of the northwest corner of the property; the Placentia sandy loam (5-9% slopes, eroded) in two small areas pf the west central area of the property; the Tujunga sand (0-5% slopes) within the Santa Maria Creek bed; the Visalia sandy loam (0-2% and 2-5% slopes) along the outer margins of the Tujunga sand and within and

along the adjacent tributary drainages to the west; the Vista sandy loam (5-9% slopes) in a small area of the northeast corner of the property, and 2-5% slopes in a small area of the northwest corner of the property; and the Ramona sandy loam, 5-9% slopes, in an area of the northwest corner of the property, and 5-9% slopes, eroded, in a small area of the southwest corner of the property (USDA 1973).

C. Cultural Setting

1. Prehistory

The following culture history outlines and briefly describes the known prehistoric cultural traditions. The approximately 9,000 years of documented prehistory has been divided into three periods: Early Prehistoric period (Paleoindian, San Dieguito tradition/complex), Middle Prehistoric period (Archaic, Milling Stone Horizon, Encinitas tradition, La Jolla and Pauma complexes, Intermediate Horizon, Campbell tradition), and Late Prehistoric period (Yuman and Shoshonean traditions, Cuyamaca and San Luis Rey complexes). Prehistory changes to history in the San Diego area at the end of the Late Prehistoric Period, beginning with initial contact between the extant prehistoric culture and Europeans (Spaniards), circa 1542 A.D., followed by more substantial contact in 1769 A.D.

a. Early Prehistoric Period

The "San Dieguito complex"is the earliest reliably dated occupation of the region and is the only complex associated with this period in the San Diego area. This assemblage of artifacts, first identified by Rogers (1945, 1966), has been studied and elaborated upon by Warren and True (1961) and Warren (1967). The complex correlates with Wallace's (1955) "Early Man Horizon, “and Warren subsequently defined a San Dieguito tradition (1968). In the western United States, radiocarbon dates for the San Dieguito complex range from sometime before 9,030 ± 350 years before present (B.P.) to between 8,490 ± 400 and 7,620 ± 380 and years B.P. (Warren 1967, 1968). Some researchers see a San Dieguito complex with a primarily, but not exclusively, hunting subsistence orientation, as distinct from the more gathering oriented complexes of traits that were to follow (Warren 1967, 1968; Wallace 1978). Others see a more diversified San Dieguito subsistence system as possibly ancestral or a developmental stage for the subsequent predominantly gathering oriented complex denoted as the "La Jolla/Pauma complex" (cf. Ezell 1987; Gallegos 1985, 1987, 1991; Koerper et al. 1991).

b. Middle Prehistoric (Archaic) Period Complexes

In the San Diego area, and possibly extending as far north as Orange County, the Encinitas tradition/La Jolla/Pauma complexes (Milling Stone Horizon) are identified by Warren (1968:4) as beginning circa 8,600 B.P. and extending until circa 1,300 years ago (Warren 1968). During this period, north of San Diego to Santa Barbara, beginning circa 4,800 years ago and continuing to as late as 1,300 years ago, shifts in subsistence patterns are seen to occur involving the use of the acorn as a major vegetal foodstuff and a new emphasis on hunting (Warren 1968). These changes in subsistence practices are reflected in the archaeological record by the presence of some new tool types not previously seen. Principal among these changes are the presence in significant numbers of spear points (dart and atlatl) and the introduction of the mortar and pestle, a tool necessary to process acorns. Based on these perceived shifts, the Intermediate Horizon (Wallace 1955) and Campbell tradition (Warren 1968), were delineated for this period along the coastal area.

A.) Granite Bedrock Outcrop at Site CA-SDI-7759

B.) Granite Outcrops and Oak Woodland at Site CA-SDI-7756

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While evidence for the use of hunting for subsistence does gradually increase through time in the south coastal San Diego area, the subsistence practices and, consequently, the artifact assemblage of the Encinitas tradition/La Jolla/Pauma complexes (Milling Stone Horizon) are seen as, otherwise, continuing largely unchanged up to the beginning of the Late Period (circa 1,300 years ago) with no intervening period reflecting substantial subsistence shifts (Warren 1968:4). It is characterized in the archaeological record by: manos and metates, shell middens, terrestrial and marine mammal remains, burials, rock features, cobble-based tools at coastal sites (La Jolla complex), and increased hunting equipment and quarry-based tools at inland sites (Pauma complex). This artifact assemblage can also include bone tools, doughnut stones, discoidals, stone balls, plummets, biface knives, large side-notched and eared dart points, and beads made of stone, bone, and shell. The inland or "Pauma complex," aspect of this culture, as defined by True (1958), lacks shellfish remains but is otherwise similar to the La Jolla complex and may, therefore, simply represent a non-coastal expression of the La Jolla complex (True 1980; True and Beemer 1982).

Until recently, a general paucity of archaeological sites has been noted in north-central San Diego County, after 3,000 years B.P. to approximately 1,500 years B.P. This reduction in the number of archaeological sites has been attributed to siltation of coastal lagoons and a consequent reduction and depletion of shellfish and other lagoon resources (Warren et al. 1961; Warren and Pavesic 1963; Gallegos 1985). Recently, however, work on Camp Pendleton, north of the central county coastal lagoons, has suggested that areas to the north may have been increasingly exploited after 3,000 years B.P. due to the creation, by sea level rise, of extensive new sandy beaches in these areas and the exploitation of the shellfish resource *Donax gouldii* (Byrd 1998). In the southern coastal area, as predicted by Warren (1964), archaeological sites dated to the period after 3,000 years B.P. to circa 1,300 B.P. sites are found closer to, and around, San Diego Bay, where shellfish were still abundant (cf. Gallegos 1995; Cooley 1998). As such, these sites may represent what can be considered the climax of the La Jolla/Pauma complex.

In a recent revision of his chronology, based on some of the new data that has been generated, Warren et al. (1998) have redefined Warrens's 1968 sequence for the San Diego area. The period from circa 10,500 B.P. to 8,200 B.P. is termed the Initial Period and represents Paleoindian assemblages or, principally in San Diego, the San Dieguito pattern as well as possibly the earliest occurrences of the La Jolla pattern assemblage. This period is followed by the Transitional Period, from 8,200 B.P. to 7,200 B.P., during which the La Jolla artifact assemblage replaces the San Dieguito assemblage in the archaeological record. The next period is termed the Middle Archaic Period, which extends from 7,200 B.P. to 4,000 B.P. This period, and the following one, the Final Archaic Period (from 4,000 B.P. to 1,300 B.P.), represent a redefining of the La Jolla pattern (and Encinitas tradition) into, basically, an early phase and a late phase. During the Middle Archaic, the La Jolla cultural pattern reached its greatest expression and populations were most substantial along the central areas of San Diego coast. During the Final Archaic, populations in this central coastal area decline and migrate, adapting to the loss of the lagoons in that area. Also, during this latter period, Campbell tradition and desert influences also begin to manifest themselves in the La Jolla artifact assemblage, principally in the form of hunting equipment such as large side-notched dart points initially, and then, possibly, by arrow-size projectile points at the very end of the period. Subsequent to 1,300 B.P. the Late Prehistoric Period Yuman and Shoshonean complexes supplant the La Jolla pattern in the area.

c. Late Prehistoric Period Complexes

The end of Warrens's Final Archaic Period, including the Encinitas tradition/La Jolla/Pauma complexes, and the beginning of the Late Prehistoric Period in this area is seen as marked by a number of rather abrupt changes. The magnitude of these changes and the short period of time within which these changes took place seem to indicate a significant change in subsistence practices in San Diego County (circa 1,300 years B.P.); a shift was made from atlatl and dart to the bow and arrow, shellfish gathering was de-emphasized in some areas (possibly due to silting of the lagoons), and storage of crops, such as acorns, by Yuman and Shoshonean

peoples was institutionalized. In addition, new traits such as the production of pottery and cremation of the dead were introduced during the Late Prehistoric Period.

By 2,000 to 1,500 years ago, Yuman-speaking people occupied the Gila/Colorado River drainages of western Arizona (Moriarty 1968) and were apparently migrating westward. Moriarty (1966, 1967) suggests a preceramic Yuman phase, as evidenced by his analysis of materials recovered from the Spindrift site in La Jolla. Based on a limited number of radiocarbon samples, Moriarty concluded that preceramic Yumans penetrated into, and occupied, the San Diego coast circa 2,000 years ago, and that by 1,200 years ago ceramic technology had diffused from the eastern deserts. The Yuman speakers may have shared cultural traits with the people occupying San Diego County before 2,000 years B.P., but their influence is better documented after 1,300 years B.P. with the introduction of small points, ceramics, Obsidian Butte obsidian, and the practice of cremation of the dead. True (1966, 1970) proposed the concept of the Cuyamaca complex, based on excavations within Cuyamaca Rancho State Park and examination of San Diego Museum of Man collections, as a vehicle for contrasting interior San Diego County assemblages from Meighan's (1954) San Luis Rey complex. It is widely accepted that the Cuyamaca complex is associated with the Hokan-based, Yuman-speaking peoples (Diegueño/Kumeyaay) and that the San Luis Rey complex is associated with the Takic Shoshonean-speaking peoples (Luiseño).

The interface between the La Jolla complex people and the early arriving Yumans (Diegueño/Kumeyaay) is not well documented. The La Jollans may have either assimilated with, or were displaced by, Yumans. True (1970) uses data from his research in the interior of San Diego County to support the Milling Stone Horizon (La Jolla) to Diegueño (Kumeyaay) continuum, while acknowledging substantial influences from the Colorado River area. San Luis Rey complex sites are most frequently characterized by small projectile points, most commonly Cottonwood Triangular style points, with Desert Side-notched points rare to absent. Desert Side-notched points, on the other hand, are quite common in Cuyamaca complex sites.

Ceramics, while present during the Late Prehistoric period throughout San Diego County, southwestern Riverside County, and southernmost Orange County, are more common in the southern and eastern portions of San Diego County, where they occur earlier in time and appear to be somewhat more specialized in form. A variety of vessel types, along with rattles, straight and bow shaped pipes, and effigies, have been found within the areas of both complexes. While, according to Kroeber (1925), the Luiseño/Juaneño primarily cremated the dead, some archaeological evidence indicates they may also have occasionally buried their dead by inhumation. The use of special burial urns for cremation interment, however, typical for the Diegueño (Kumeyaay), was apparently not commonly practiced by the Luiseño/Juaneño.

A summary of this regional sequence for coastal southern California prehistory is presented in Figure II-1.

2. History

Prehistory ended and historic cultural activities began within what is now San Diego County, between the late 1500s and early 1900s. These cultural activities provide a record of Spanish, Mexican, and American rule, occupation and land use. An abbreviated history of this area is presented to provide a background on the presence, chronological significance, and historical relationship of cultural resources within the study area.

a. General History

The historic period began in California with the early exploration by Juan Cabrillo in 1542. In 1769, an expedition headed by Gaspar de Portolá traveled north from San Diego to extend the Spanish Empire from Baja California into Alta California by seeking out locations for a chain of presidios and missions in the area.

Years A.D./B.C.	Coastal San Diego County 1 (Rogers 1939, 1945)	2 (Moriarty 1966)	3 (Warren et al. 1998)	Interior San Diego County Northern (Meighan 1954; True 1958; 1966, 1970)	Southern (Meighan 1954; True 1958; 1966, 1970)	General Syntheses (Wallace 1955)	(Meighan 1959)	(Warren 1968)	(Wallace 1978)	Years B.P.
1500	Yuman III Culture	Diegueño II	Late Prehistoric Period	Luiseño	Diegueño	Horizon IV Late Prehistoric	Archaic Stage	Yuman / Shoshonean	Period III: Diversified Subsistence	500
1000	Yuman II Culture			San Luis Rey	Cuyamaca Complex					1000
500	Yuman I Culture			*Shoshonean Intrusion*		Horizon III Intermediate		Campbell Tradition		1500
A.D. B.C. 0		Diegueño I	Final Archaic Period	Transition or Hiatus?						2000
500										2500
1000	La Jolla II Culture									3000
1500		La Jolla III								3500
2000			Middle Archaic Period							4000
2500		La Jolla II								4500
3000	La Jolla I Culture			Millingstone Substratum (La Jolla/Pauma Complex		Horizon II Millingstone				5000
3500								Encinitas Tradition	Period II: Food Collecting	5500
4000		La Jolla I								6000
4500										6500
5000										7000
5500			Transitional Period							7500
6000		La Jolla/ San Dieguito Transition		San Dieguito		Horizon I Early Man	Early Lithic Stage	San Dieguito		8000
6500	San Dieguito Culture		Initial Period						Period I: Hunting	8500
7000		San Dieguito								9000

Adapted from Moratto 1984: Figure 4.17

Oak Country Estates

Concordance of Regional Cultural History Chronologies

Figure II-1

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The Spanish period extended to 1821 and encompassed early exploration and subsequent establishment of the San Diego presidio, and the San Diego, San Luis Rey, and San Juan Capistrano missions between 1769 and 1821. During this period the introduction of horses, cattle, sheep, pigs, corn, wheat, olives and other agricultural goods and implements, and a new method of building construction and architectural style also occurred in California. After 1821, California came under Mexican rule, but Spanish culture and influence continued as the missions continued to operate as they had in the past, and laws governing the distribution of land were also retained for a period of time.

Following Mexico's independence from Spain in 1821, the Mexican period began, which lasted until 1848, ending as a result of the Mexican-American War. During this period most Spanish laws and practices continued until shortly before secularization of the Mission San Luis Rey, Mission San Juan Capistrano, and the Mission San Diego de Alcalá in the 1830s. Some large grants of land were made prior to 1834, but after secularization, vast tracts of land were granted and the Rancho Era began. The Pueblo of San Diego was established, transportation routes were expanded, and cattle ranching continued to predominate over other agricultural activities, with trade in hides and tallow trade increasing during the early part of this period.

Mexico's defeat in the Mexican-American War in 1848 initiated the American period, when Mexico ceded California to the United States under the Treaty of Guadalupe Hidalgo. Subsequently, land ownership by the Mexicans living in California became a matter of considerable legal wrangling. A Lands Commission was created by the State of California in response to the Act of 1851 (in apparent violation of the treaty), to validate land ownership throughout the state through settlement of land claims. Because of legal costs and a lack of what Americans considered to be sufficient evidence to provide title claims, however, few Mexican ranchos remained intact, and much of the land that once constituted rancho holdings became public land, available for settlement by emigrants to California. The discovery of gold in the state, the conclusion of the Civil War, and the subsequent availability of free land through passage of the Homestead Act, all resulted in an influx of people to California and the San Diego region after 1848. California's importance to the country as an agricultural area began in the latter half of the nineteenth century and was subsequently supported by the construction of connecting railways for the transportation of people and goods.

During the period of the late 1880s, cycles of "boom and bust" reflected by the growth and decline of towns, were characteristic and occurred in response to an ever increasing population, and substantial but unstable economic growth. Thousands of people came to the county to take advantage of the possibilities of the region, but many found that their dreams were not to be realized here and moved on. By the end of the 1880s, the "boom" had become a "bust" and thousands of people left. However, not all of them left and many remained to form the foundations of many small pioneering communities across the county. These families practiced dry farming, planted orchards, raised livestock, built schools and post offices, and created a life for themselves in the valleys and mesas of San Diego County. Gradually the farming and ranching lifestyle of the post-Civil War period of the late nineteenth century and early twentieth century faded away with the added influence of military development, beginning in 1916-17 during World War I. During the Second World War, the need to fight a two-ocean war resulted in substantial development in many parts of the state by the military, and thousands of people moved to the state in response to a good climate and defense industry jobs or military transfers. Following WWII, development in the area began to shift to new businesses, suburban tracts of homes, and shopping centers.

b. Ramona Area History

The historic period for the Santa Maria (Ramona) Valley generally, began in 1795. In that year Friar Juan Mariner and Captain Grijalva led a military scouting party from the San Diego presidio in search of a potential mission site. While Mariner and Grijalva simply passed through the area and left no lasting marks, their entourage marked the beginning of the Spanish era in the area (Carrico and Flanigan 1991). Over the next twenty-five years Spanish colonists focused on maintaining their tenuous grip on southern San Diego

County. They established several missions along the coast of California and several asistencias including Santa Ysabel in 1818. In 1821 Friar Mariano Payeras and Jose Sanchez traveled through the Santa Maria Valley, the site of the current Oak Country project, again in search of an inland mission site. With the coming of the Mexican Revolution and later secularization of the missions, Santa Maria Valley was abandoned as a possible mission site in favor of the asistencia built at Santa Ysabel. Instead, a large land grant comprised of 17,708.85 acres in the valley served as the grazing grounds for livestock from Mission San Diego de Alcalá.

Following secularization of Mission San Diego in 1833, Narcisco Botello, a Mexican soldier, received the Santa Maria land grant. Unable to successfully ranch the land, Botello abandoned it and the grant passed to Jose Joaquin Ortega and son-in-law Captain Edward Stokes in 1843. Ortega held the position of majordomo for the Mission San Diego district from 1835 to 1840 and for the Mission San Luis Rey from 1843-1845. During this time, the valley became part of the travel route connecting the back country to San Diego.

Over the next thirty years the land grant stayed in the Stokes family and Edward Stokes' three sons built three adobes on the Santa Maria Rancho including one that still stands east of the intersection of Highway 78 and Magnolia. In 1848, Captain Gillespie and his U.S. Army volunteers camped at the Stokes adobe at the east end of the valley before joining the ill-fated Kearny expedition in the Battle of San Pasqual (Pourade 1963).

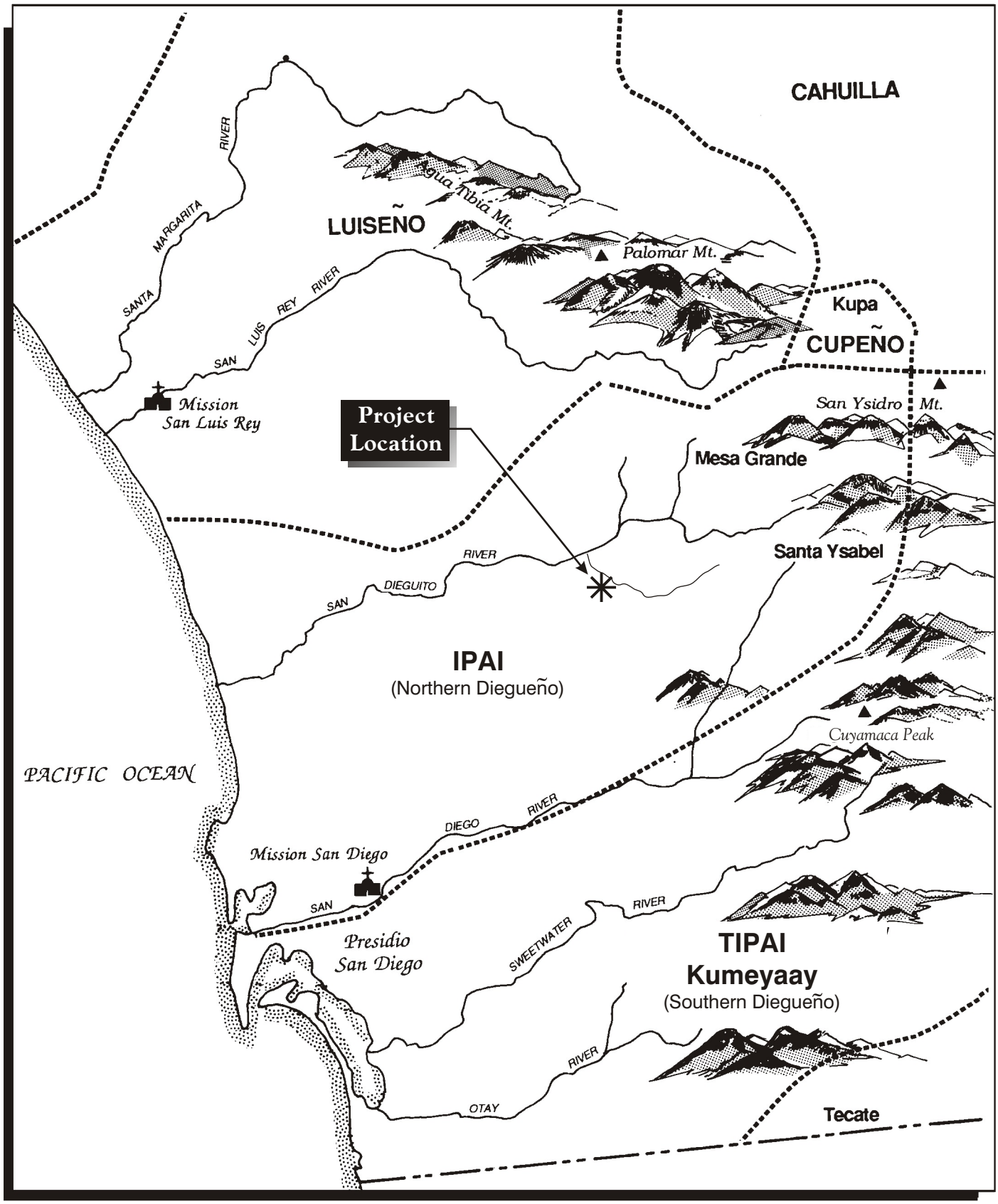
In 1872, having purchased the interests of his brother, Adolfo Stokes sold all but 1,000 acres for $40,000 to Juan Arrambide. Stokes retained the 1,000 acres in Valle de los Amigos, now known as Goose Valley. Arrambide joined forces with French immigrant Bernardo Etcheverry and developed the valley in fruit orchards, vineyards, grain fields, and a prosperous sheep operation on several thousand acres in Santa Maria Valley (LeMenager 1989). By the late 1870s, Etcheverry had 12,000 head of sheep grazing in the valley. The operations of Arrambide and Etcheverry were probably the first intensive ranching activities to affect the vegetation and landscape of the valley.

The 1880s and 1890s brought a steady flow of settlers to southern California and the Santa Maria Valley with its little village of Nuevo (later renamed Ramona). During this time the Santa Maria land grant was sold off in large and small parcels to various land speculators, mostly from San Francisco, and a few homesteaders who tried their hand at ranching. Throughout the early 1900s the area gradually grew with an emphasis on ranching, horse stables, bee "farming," and many turkey ranches.

3. Ethnographic Overview

a. General Ethnographic Background

The project site is situated within the traditional territory of the people known to the Spaniards as the Diegueño, a term later adopted by anthropologists (Kroeber 1925) and further segmented into the southern and northern Diegueño in an attempt to describe the Yuman-speaking people of San Diego County. More recently, some researchers have separated the groups into the 'Ipai (Northern Diegueño) north of the San Diego River and the Tipai (Southern Diegueño) south of the river and into Baja California (Langdon 1975:64-70; Hedges 1975:71-83) (Map II-1). The linguistic and language boundaries as seen by Shipek (1982) subsume the Yuman speakers into a single nomenclature, the Kumeyaay, a name applied previously to the mountain Tipai or Southern Diegueño by Lee (1937), while Almstedt (1974:1) noted that 'Ipai applied to the Northern Diegueño with Tipai and Kumeyaay for the Southern Diegueño. However, Luomala (1978:592) has suggested that while these groups consisted of over thirty patrilineal clans, no singular tribal name was used and she referred to the Yuman-speaking people as 'Ipai/Tipai.



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Oak Country Estates
Ethnographic Map

Map II-1

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The project property, located north of the San Diego River, is within the Northern Diegueño (Kumeyaay/'Ipai) territory as understood by the Spaniards and most later chroniclers and researchers (e.g. Luomala 1978:593). The Kumeyaay are traditionally considered to be a hunting-gathering society characterized by central-based nomadism. While a large variety of terrestrial and marine food sources were exploited, emphasis was placed on acorn procurement and processing, as well as the capture of rabbit and deer. Shipek (1989; 1963) has strongly suggested that the Kumeyaay, or at least some bands of the Kumeyaay, were practicing proto-agriculture at the time of Spanish contact. While the evidence is problematic, the Kumeyaay were certainly adept land and resource managers with a history of intensive plant husbandry.

As with most hunting-gathering societies (Service 1966:33), Kumeyaay social organization was formed in terms of kinship. More specifically, the Kumeyaay were a patrilocal type of band organization with band exogamy (marriage outside of one's band) and virilocal marital residence (the married couple integrates into the male's band). The band is often considered as synonymous with a village or *ranchería*, which is a political entity. Almstedt (1980: 45) has suggested that the term *ranchería* be applied to both a social and geographical unit, as well as to the particular population and territory held in common by a native group or band. She also stressed that the territory for a *ranchería* might comprise a 30 square mile area.

Many households would constitute a village or *ranchería* and several villages were part of a much larger social system usually referred to as a consanguineal kin group (*cimuL*). The *cimuL* is typically an exogamous, multilocal, patrilineal, consanguineal descent unit, often widely dispersed in local lineage. The members of the *cimuL* do not intermarry because of their presumed common ancestry, but they maintain close relations and often share territory and resources (Sahlins 1968: 23; Service 1971: 105-106; Luomala 1963: 287-289). Territorial divisions among Kumeyaay residential communities are normally set by the circuit of moves between villages by *cimuLs* in search in food. As Spier (1923:307) noted, the entire territory was not occupied at one time, but rather the communities moved between resources in such a manner that in the course of a year all of the recognized settlements may have been occupied. While a *cimuL* could own, or more correctly control, a tract of land with proscribed rights (Luomala 1963: 285: Spier 1923: 306), no one from another *cimuL* was denied access to the resources of nature since no individual owned the resources, they were to be shared.

The Kumeyaay practiced many forms of spiritualism with the assistance of shamans (*kuessay*) and *cimuL* leaders. Spiritual leaders were neither elected to, nor inherited their position, but achieved status because they knew all the songs involved in ceremonies (Shipek 1991) and had an inclination toward the supernatural. Important Kumeyaay ceremonies included male and female puberty rites, the fire ceremony, the whirling dance, the eclipse ceremony, the eagle dance and the cremation ceremony, as well as the yearly mourning ceremony (Spier 1923: 311-326). The primary ceremonial direction among the Kumeyaay is east with entrance to ceremonial enclosures usually facing this direction (Kroeber 1925: 717) and with rock art frequently positioned toward the east. The Kumeyaay are the only California tribe known to possess a color-direction system where white represents east, green-blue the south, black the west, and red for the north (Kroeber 1925: 717).

c. Local Ethnographic Background

With a presence stretching back at least 2,000 years, the Kumeyaay, at the point of Spanish contact, were settled in permanent villages or *rancherías* with strong alliances. Locally, examples of known Kumeyaay villages were *Pa'mu* (within the western Santa Maria Creek area), and *Pauha* and *Ahmakattkatl* (Santa Ysabel Creek/San Dieguito River drainage area) (Kroeber 1925). The prehistoric and early historic era *ranchería* of *Pa'mu* or Pamo de la Asumpcion, may have extended across the Santa Maria Valley and included the present day Oak Country project as well as the nearby Highlanders, Esquilago, and Montecito Ranch projects. Sometime, after the 1778 insurrection described below, the village moved into a long-somewhat narrow

valley that extends northward from what was historically known as the Pamo Plain and is now Santa Maria Valley and the town of Ramona. Shipek has suggested that a settlement such as *Pa'mu* would have contained at least 75 to 100 persons and been comprised of five or more sibs (*cimuLs*).

In modern historic times the village of *Pa'mu* was ethnographically tied to the Shrichak (owl) clan in the winter, to the *U'u*, and to the *Kwitlp* (Kroeber 1925:719). According to Kroeber the *U'u* and *Kwitlp* were also associated with Mesa Grande. This would seem to indicate that the three clans resided at *Pa'mu* at least during the colder months of winter and moved to higher elevations at Mesa Grade in the summer months. Perhaps because of the mixed clans that lived at *Pa'mu*, Kroeber (1925:720) reported that the village maintained a *kwaipai* (political leader) for the community as a whole while individual clans also kept a *kwaipai*. He does caution, however, that such a state of political diversification may be the result of missionization and cultural change. Shipek, using ethnographic research notes that a modern family name equivalent has not been determined for *Shrichak* but that *Kwilp* (*Kwitlp*) has endured as *Quilp*.

Kroeber's point regarding the probable unreliability of his informants in the first decades of the 1900s as reflections of earlier clan composition is borne out through review of Spanish baptismal records for *Pa'mu* in 1778-1779. For example, the primary leader, or *kwaipai* was *Hachil Llachap* and a second leader was listed as *Aaran Matuhuir*. These men are associated with *Matuwir*, modern Duro, and *LaChapa*, modern LaChappa (Shipek 1982). Their presence at *Pa'mu* in the 1770s and 1780s may be explained as indicative of *Pa'mu* having at least two previously undocumented clans (*LaChapa* and *Matuwir*) or it may reflect the marriage of a Pa'mu woman with a strong clan member from outside the village. The latter is partially borne out by a cursory review of baptism records for *Pa'mu* between 1770 and 1799; there are no other examples of surnames for the *Matuwir* or *LaChapa* clans. The presence of male clan members from distant clans and villages has been suggested by Shipek to reflect a network of alliances. The movement of people throughout the area as a result of marriage and kinship ties may also explain the introduction and use of some so-called trade goods or “exotic” items.

Given its distance of more than thirty miles from the presidio and more importantly, its remoteness, the rare appearance of *Pa'mu* in early Spanish mission and presidial records is understandable. The *ranchería* at *Pa'mu* first appears in the Spanish records in March 1778 when Lt. Jose Francisco Ortega sent an armed force to confront what he perceived to be fomenting revolt (Ortega 1778 I:43). In one of his documents, penned in 1778, Ortega notes that *Pa'mu* was known in 1775 as one of the villages threatening revolt after the November 1775 sacking of Mission San Diego but offers no details. Mention of *Pa'mu* appears only sporadically and most frequently in the mission baptismal records. *Pa'mu* was slow to embrace Christianity and it may have been only after the death of traditional leaders around 1800 that the villagers broke with the older religions. Between 1778 and 1796 only 29 persons from *Pa'mu* were baptized; in 1797 there were 23 baptismals, and 10 baptismals in 1798. The upsurge in 1797-1798 reflects the efforts of mission priests to visit several of the more remote mountain villages including *Pa'mu*, *Cullamac* (Capitan Grande), and *Yguai*.

On March 16, 1778, Benito, a Kumeyaay from the Christian ranchería of San Dieguito, reported to Spanish officials that villagers from *Pa'mu* were arming themselves and planning a second attack against the Spaniards (Ortega 1778:1:41). According to Benito, *Pa'mu* captains from Pa'mu sought to ally themselves with at least three other nearby mountain villages and strike out against the weakened Spanish forces.

When warned by Lieutenant Ortega to remain peaceful and loyal, *Pa'mu* leader *Aaran Matuhuir*, threw down the gauntlet replying that Spanish troops should come out of their hiding place and into the mountains to meet the clubs of his people (Bancroft 1884:I:315). Rather than waiting for the possible insurrection to spread and gain strength, Ortega dispatched Sergeant Mariano Carrillo to take action. Leaving the coastal presidio on March 30, 1778, Carrillo marched thirty miles east into the mountains with eight soldiers, an interpreter, and two guides with instructions to "castigate the insolent ones (Ortega 1778:41)."

A veteran of several punitive expeditions, Sergeant Carrillo was under specific orders to subdue and question the cabecillas (leaders) at Pa'mu and, if they admitted guilt or were insolent, to bring them back to the presidio to receive a flogging of 30-40 azotes (lashes). Carrillo and his men entered Pa'mu at three in the morning on April 1. Woefully outnumbered in the midst of a darkened enemy village in a strange territory, Sergeant Carrillo may have lost sight of the non-punitive nature of his mission. During a brief skirmish at least two Indians were killed outright and Carrillo ordered the torching of huts, burning "a few who refused to come out of the hut in which they had taken refuge (Bancroft 1884:I:316; Ortega 1778:41). Carrillo's forces captured and burned 80 bows, 1500 arrows, and an unspecified number of clubs. In spite of denying that they were plotting an insurrection, five Indian cabecillas, or *kwaipai* as the Kumeyaay called them, were flogged on the spot as an example to the other villagers. Four of the alleged rebels, *Aaran*, *Achil*, *ALchuirin*, and *Taguagui*, were shackled and marched to the presidio for further interrogation (Ortega 1778:41).

On April 6 the four leaders were found guilty of disobedience and disloyalty, rather than the more serious crime of conspiracy and publicly flogged to set an example for other native leaders. Immediately following the flogging, Lieutenant Ortega sentenced the four leaders to death at nine in the morning on April 11 by firing squad. The execution was scheduled to take place in the presence of Christian Kumeyaay surrounded by armed troops "so that it may serve them as an incentive to behave well (Ortega 1778:41)." In mandating that the leaders be shot with two rounds each, Ortega was well beyond his powers. According to Spanish law, only the governor could impose capital punishment.

Historians from Bancroft (1884:1:315-316) to Castillo (1989:386) have maintained that the four *Pa'mu* leaders were in fact executed on April 11, 1778. Bancroft called the execution "California's first" and it has thusly entered the literature as a result of those who have subsequently relied solely upon secondary sources for the event. In his discussion of native response to Spanish colonization, Castillo compounded the error in writing that Father Fermin Lasuen blessed the execution (Castillo 1989:386). In reality, Lasuen was tasked by Junipero Serra to offer religious services to the condemned men to include baptism. Two noted historians of the 1920s and 1940, Zephyrin Englehardt and Tomas Temple, respectively, came closer to the truth when Englehardt (1920:96) wrote that "Probably the execution was postponed…" and with more certainty Temple (1940:128) noted that "their execution was not carried out, and we find them three years later as stubborn and bellicose as ever." Temple did not entirely avoid the vicissitudes of research however. In footnotes to his translations of Ortega's letters, he incorrectly cites Guillermo Carrillo as the captor of the Pa'mu leaders when it was his brother Mariano Carrillo.

Of the four leaders who were captured, there is evidence that *Aaran*, possibly *Jaran* or *Laran* in Kumeyaay, and *Achil* (*Hacil*) were actually baptized. Baptismal record number 633 indicates that on August 15, 1778 *Hachil Llachap*, 40 years of age and a captain of the *ranchería* of *Pa'mu* received the sacrament and became the Christian Mariano. The next entry, number 634 is for a new convert, Buenaventura Maria, 60 years of age and previously known as *Aaran Matuhuir*, a second captain of Pamo. The baptismal records do not carry the name of the third leader, *Alchuirin* although a baptism (Number 610) of an Indian name Tabaco, an adult from Pa'mu on May 16, 1778, may be *Taguagui*. Baptism and last rites were given to this unfortunate man who was subsequently buried in the campo de santo at the presidio on May 20, 1778, under his Christian name of Juan Nepo. His remains may have been one of the adult male Indians excavated and reinterred during the San Diego State University archaeological excavations within the presidio cemetery (Howard 1975).

What is known of the four men who were yanked from their mountain village and imprisoned in the dank stone presidio prison varies. For Aalcuirin and Taguaqui little is known beyond Ortega's assertion that they were captains of the village and that Taguagui died in prison, while *ALchuirin* was apparently released to return to his village. Aaran carried the second name of *Matuhuir* (*Matuwir*) and *Hachil* was of the *LlaChap* clan. Both of these clans were influential and powerful with members throughout the hills and mountains of San Diego County. Except for Ortega's complaint to Governor Neve in 1781, there is no further mention of

Aaran Matuhuir or *Hachil LlaChap*. As a village, *Pa'mu* was occupied well into the 1800s although it may have moved to a deep valley to the northeast when its members were dispersed into nearby villages and settlements. Baptisms continued, although sporadically until the 1830s and a recent interview with a Kumeyaay from the Osuna indicated that the village was completely abandoned in the 1850s. Many of the *Pa'mu* people ultimately found a home in their old summer home at Mesa Grande. Today the *Matuhuir* clan (Duro) and *Llachap* (La Chappa) clans are represented by influential family members at several local reservations including Barona and Mesa Grande.

III. RESEARCH PLAN

A. Introduction

The following research plan is based on our knowledge of the sites within the Oak Country project and the County of San Diego's requirements for archaeological testing and evaluation. The proposed program is consistent with the County's obligations to fulfill their requirements for mitigation of impacts under the California Environmental Quality Act (CEQA). Site significance is based on the criteria used for nomination of sites to the California Historical Landmark Register and by local research questions that can reasonably be expected to be addressed by the data sets at the sites.

Thirty-two prehistoric archaeological sites are located within the Oak Country project. This figure is a combination of site numbers previously assigned by Polan (1980) and now subsumed within a series of single numbers for what were earlier described as separate sites, and new site numbers assigned as a result of the recordation of previously unrecorded resources. Based on the surface survey and the excavation of STPs, a wide range of data sets are known to be present at the sites. At a minimum, the sites contain obsidian that can have its origin location sourced and can possibly be used to provide chronological information; ceramics that can be placed into a cultural and chronological context (styles, types, forms), lithic technology that may be used to define site functions; analysis of a large assemblage of faunal materials that can be used to address questions of diet and possibly seasonal site occupation; and pollens that can be used to address the prehistoric environment in the valley; and other data sets.

While not definitive at this point, it would appear that all of the sites are associated with the Late Prehistoric Period from circa A.D. 900, although there is some evidence for a possible earlier occupation of the sites back to the Early Milling Archaic (Early Millingstone) Period. These findings are based on the presence of late period arrow point styles, the presence of pottery, and the extensive use of bedrock milling including mortars probably associated with acorn processing. It is possible that this series of sites comprises the *ranchería* of Pamo (*Pa'mu*) that is known to be in the general area. The village of *Pa'mu* was occupied by the *Shrichak* (owl clan) in the winter with movement to Mesa Grande in the summer for acorn harvesting and hunting.

While it is not necessary to pose rigid research questions for a Phase II test and evaluation program, the proposed testing addresses questions of: 1) site function (temporary settlement versus seasonal village), as noted above, it is assumed that this set of sites may form a portion of the *ranchería* of *Pa'mu*, a bipolar settlement inhabited by the *Shrichak* clan of Mesa Grande in the winter; 2) period of occupation, including possible multicomponent aspects of the site(s) (Late Prehistoric versus late Archaic) based on the presence of pre-bow and arrow type points, and with artifacts recovered from the surface and from STPs indicating a Late Prehistoric occupation, also it is known from ethnographic and ethnohistoric accounts that the settlement of *Pa'mu* was occupied well into the early 1800s; 3) food and lithic resource procurement, including determining the diet of the occupants, which may correspond to winter and spring foodstuffs, and determining whether lithic raw materials were procured locally and/or were brought to the valley from nearby environmental settings; 4) ascertaining trade patterns, at a minimum, introduction of obsidian, presumably from Obsidian Butte in the Imperial Valley and Piedra de Lumbre chert, possibly obtained by exchange from the Camp Pendleton area in northwesternmost San Diego County; and 5) environmental change, particularly severe drought which may have occurred circa 1250-1290 A.D. and the degree to which collectors and foragers, such as the site inhabitants may have been affected by the drought.

B. Research Topic Realms

1. Site (Settlement) Function

Introduction:

It is hypothesized that the aggregate of sites within the study area, and probably several beyond the study area, represent a large, dispersed semi-permanent Late Prehistoric settlement as distinct from a series of large temporary camps. White has called such occupation sites rancherías and stresses that they can extend over large tracts of land, are fluid in their internal structure over long periods of occupations, and reflect a wide range of human activities.

Question 1:

Does the artifact record at the sites, or at some sites, reflect a wide range of human activities indicative of intensive occupation and use associated with a village or *ranchería* and do those activities speak to both genders participating in the activities practiced there?

Implications:

The implication of a wide range of artifacts and features within the sites is that the activities conducted there may be associated with semi-permanent occupation and use. The further implication is that analysis and study of the sites may allow for a better understanding of the cultural patterns within the settlement as a whole and at the intrasite level.

Data Sets Required

While not strictly a quantitative question, sample sets of at least fifty specimens would seem to indicate that a given activity (milling, pottery use, cooking, tool sharpening) was actually being practiced on a routine basis and not as an occasional, or infrequent event. The types of data sets would include pottery, milling equipment, pounding equipment, lithic debris from maintaining and sharpening tools, and scraping and fleshing tools. For the pottery to represent more than casual use, or indicative of a single function (cooking, water storage, cremation) there should be a variety of vessel forms and stylistic variations.

Question 2:

It is hypothesized that the site complex at Oak Country was occupied as part of a seasonal settlement pattern associated with a second village (*Tekemuk*) at Mesa Grande. Is there evidence to support the contention that Oak Country, as an element of the *ranchería* of *Pa'mu*, was occupied at least during the winter months when Mesa Grande would have been abandoned, and probably during the subsequent spring and early summer months?

Implication:

The implication for a positive answer to the question of seasonal settlement would be to better document the seasonal round of the Ipai. A second, and perhaps more significant implication would be that the village of Pa'mu, or at least a portion of the village may have been archaeologically identified.

Data Requirements:

Assessing and determining seasonality required several data sets. Faunal remains can be used to determine the season of capture. Examples of such indicators include deer, seasonal water fowl (ducks and geese), rabbits, fish, and pond turtle. Winter occupation would be indicated by the presence of migratory birds. Juvenile rabbits and other game may be associated with spring as are pond turtles, when they come out of hibernation. In addition to faunal remains, data on what plants would have been available for processing and consumption can also provide seasonal information. While not as conclusive as data from faunal remains, there should ve a correlation between the season of occupation and the availability of plant resources. For example, while acorns are gathered in September of early October, they are stored and often not processed until February when they are "ripe" and when other food stuffs are not available.

2. Procurement of Lithic Resources

Introduction

Preliminary analysis of the flaked lithic materials from the surface of the sites as well as from the shovel test pits indicated that, while metavolcanics and milky quartz may have served as the most frequently used lithic material, several other varieties served the prehistoric community. Analysis of these lithic materials (obsidians, Piedra de Lumbre chert, metasediments, and several other miscellaneous, fine-grained, siliceous rocks) can lead to a better understanding of lithic procurement techniques and strategies to include trading for such materials and traveling to lithic resources to procure them.

The importance to prehistoric hunter-gatherers, of flaked stone tools cannot be overemphasized because they represented such a large percentage of their subsistence tools. Consequently, their influence within, and upon, the hunter-gatherer mobility system is substantial. The prehistoric importance of the procurement of the fine-grained lithic raw materials with the property of conchoidal fracture, from which these tools were made, also cannot be overemphasized. They were absolutely essential to prehistoric hunter-gatherers because they represented the basic material from which this large percentage of their tools was made. In modern terms they were to their tool industry like iron, steel, and plastic are to us today. Such lithic materials, especially those of the best quality, were also, frequently, relatively rare and often restricted in accessability in the natural environment.

It was essential for prehistoric hunter-gatherers to know very well what materials were available in their local environment and where to find them. As a consequence of this importance, the procurement of these raw materials in the local environment usually became an "embedded" element of their subsistence and mobility strategies (Binford 1979) with such invaluable knowledge undoubtedly handed down and taught from parent to child. Because of their frequently restricted accessibility, hunter-gatherer groups had to plan for, and incorporate, the procurement of these resources into their subsistence and mobility strategies. For example, these strategies could include 1) procurement within the immediate (one day) gathering range of a settlement, 2) procurement within a more extended but still short, range (1 to 3 days), 3) procurement within a greater range requiring travel (perhaps a week), or 4) procurement by trade with local groups. Recognition of this causal or influential factor in the mobility and procurement ranges and, therefore, the settlement and subsistence patterns of mobile hunter-gatherers is essential.

Question 1:

Did the occupants of the settlement make use of nearby outcroppings of the Bedford Canyon Formation metasediments and/or the more distant outcroppings of the same metasediments at Mesa Grande thirty-five miles to the east? Can it be assumed that if the occupants made use of the nearby source that the lithic debris will reflect primary as well as secondary phases of stone reduction? And that as a corollary, if the more

distant source was used, then the tools would have been roughed out at the occupation site at Mesa Grande and the lithic debris at these sites would reflect maintenance and sharpening of the already completed tools (secondary and tertiary lithic production).

Implications:

The implication of this question is whether these people made consistent use in both of their major encampment locations, of a specific locally sourced/available lithic material that they had found to be of particular useful. Further, if it can be determined that the Mesa Grande source was used, this could be additional evidence that the people from this settlement traveled to Mesa Grande on some basis, perhaps seasonally. In general, if this could be ascertained, then the familiarity and use by the site inhabitants of such locally sourced lithic raw materials could provide a better understanding of the local exploitation patterns of lithic resources by these mobile hunter gatherers.

Data Sets Required:

Identification of the local (nearby) source and sufficient specimens of Bedford Canyon Formation lithics within the sites. Because this question is not necessarily based on quantitative data, no set threshold can be set. However, the presence of a given lithic, in this case metasediments, should not be a singular or rare occurrence.

Question 2:

Is the obsidian on the sites from Obsidian Butte eight-five miles (135 km) to the east in the Imperial Desert, as is most typically the case in Late Period sites, or did some/all of the obsidian originate at other more distant sources such as Coso to the north or San Felipe within Baja California? Likewise, is the Piedra de Lumbre chert on the sites also a candidate for procurement by exchange, as the source is located more than 38 miles (62 kilometers) to the northwest of the project area?

Implications:

The implications for obsidian from any source is that these relatively exotic lithic materials were either brought to the site as a result of trade or through travel to the sources and direct procurement. If the source is Obsidian Butte, the occupants of this settlement could have conducted trade with the Yuman-speaking, Kamia allies to the east or perhaps made forays into the desert and directly procured the resources. While still not exactly certain, Obsidian Butte material would have been available by 1000 A.D. To the south in Baja California, San Felipe is situated in an area occupied by Yuman-speaking people often labeled the Cochimi. Trade with, or travel to, this region would have been practical and culturally viable.

By contrast, the presence of Coso obsidian would more likely indicate trade over a long distance (circa 300 miles) rather than direct procurement. This assumption is based on the sheer distance and, more importantly, the location of Coso in Shoshonean-speaking territory, a territory occupied by linguistically and cultural differing people. Given these differences, the source, or sources, for the obsidian at the Santa Maria settlement could reflect long distance trading with other similar or disparate cultures, travel into culturally familiar or “exotic” territory, or combinations of these efforts. It can also be assumed that Coso obsidian would be more “expensive” or treasured because of the costs inherent in its procurement.

As with Obsidian Butte obsidian, the implications for Piedra de Lumbre chert, from the only known source thirty-nine miles (62 km) to the northwest on Camp Pendleton, are that these relatively exotic lithic materials were either brought to the site as a result of trade or through travel to the sources and direct procurement. The occupants of this settlement would have had to have conducted trade with the Shoshonean-speaking,

Luiseño or Juaneño or, perhaps, made forays into the north county area and directly procured the resource. Trade with, or travel to, this region could, possibly, have been dangerous and/or not culturally viable.

Data Sets Required:

Because the questions do not address chronological questions, possible changes over time, or relative frequencies, the data set can be relatively small. The presence of obsidian from any or all of the known sources will serve to verify the existence of either trade or travel. The presence of Piedra de Lumbre chert from the only known source thirty-nine miles away, will serve to verify the existence of either trade with, or travel into the area of a people other than Yuman-speaking groups.

Question 3:

The STP data suggests that the two lithic raw materials most frequently used at the sites for flaked stone tool manufacture were Santiago Peak metavolcanics and milky quartz. Do the relative proportions of these particular types, as well as of other of lithic raw materials present at the sites, reflect the ease of gathering of these materials?

Implications:

As indicated above, lithic materials, especially those of the best quality, were often relatively rare and restricted in accessability in the natural environment. It was, therefore, essential for prehistoric hunter-gatherers to know very well what materials were available in their environment and where to find them. The importance of these resources and their frequently restricted accessability, required hunter-gatherer groups to plan for, and incorporate, the procurement of these resources into their subsistence and mobility strategies. Recognition of this causal or influential factor in the mobility and procurement ranges and therefore, the settlement and subsistence patterns is important in assessing the relative mobility a particular hunter-gatherer group.

Data Sets Required:

Identification of the lithic material types of the flaked stone tools and debitage recovered from the sites and comparison of the relative quantities of these materials. Identification of potential sources of these materials relative to the project sites.

3. Temporal Setting for the Sites (Settlement)

Introduction

It has been suggested by one of the report authors that the sites under study represent the prehistoric/ethnohistoric period settlement of *Pa'mu* (Pamo). This hypothesis is based on a synthesis of historic documents, on the features and artifacts, and on the location of the sites within the Santa Maria Valley. The general artifact assemblage, the bedrock mortars, and other indices clearly reflect a cultural component associated with the Late Prehistoric circa post 2000 years ago. If the site was occupied during the early historic period (probably circa 1769-1790) and was moved further to the north and east into what is now known as Pamo Valley, the occupants would have had an opportunity to trade with Spanish or Mexican settlers and may be the ranchería noted as *Pa'mu* in historical documents.

Question 1:

Do the sites reflect a temporal setting that places them within the Late Prehistoric period circa 2,000 years ago to the time of Spanish contact circa 1769 A.D.? Is there any evidence that the sites were occupied subsequent to the intrusion of the Spaniards and, therefore, a contact period settlement?

Implication:

Relatively few of the known sites in the Santa Maria Valley and western Ramona area assumed to be from the Late Prehistoric period have been accurately dated. Dating of these sites and tying the cultural materials into a chronological framework would verify that the valley was settled by Kumeyaay people of this time period, and in conjunction with other research questions, may indicate that these sites were in fact a Late Prehistoric to Contact Period ranchería, possibly *Pa'mu*.

Data Sets Required:

Questions of chronology can be addressed through the recovery of organic materials for radiocarbon dating, through obsidian hydration and sourcing, through and the recovery of temporally diagnostic artifacts such as desert side notched or Cottonwood triangular arrowpoints, ceramics, and historic materials.

4. Technological and/or Environmental Change

Introduction

It has been suggested that a severe drought took place during the A.D. 1250-1290 era of the late Holocene. In the Southwest this drought is well documented and led to a decrease in agriculture and a decline in the populations and cultures of that region. The degree to which southern California and San Diego County cultures were affected is uncertain. Collectors and foragers, as well as people with incipient agriculture may not have been as affected by the drought as agricultural people to the east.

It has also been suggested that the period circa A.D. 0-700 may have been a time of technological change when a hunting technology, the dart and atlatal, that had been use for several millennia, was replaced by a new and superior hunting technology, the bow and arrow (McDonald and Eighmey 1998: III-23). Discussion amongst researchers involves specifically when, and how quickly, this change occurred and what artifacts (principally projectile points) are indicative of one technology versus the other. Questions regarding both the size and style of these artifacts continue to be debated with the answers lying in sites which contain both the pertinent diagnostic artifacts and time depth; the latter being verifiable by radiometric dating.

Question 1:

Can a drought of circa A.D. 1250-1290 be documented at the Oak Country site? If so, are there any discernible changes in artifact types, faunal remains, or pollens that might reflect vegetation changes, or intensity of occupation?

Implication

If there is evidence of a drought and indications that the Ipai adapted to the drought, the implication would be that the drought can be documented in southern California and that the adaptive measures taken by the prehistoric people can be compared and contrasted locally and regionally. If, on the other hand, the Ipai withstood the drought without significant cultural and technological change, this could indicate that

Collectors, versus sedentary agriculturalists, were less affected by the drought and may have been more malleable in their food procurement and processing techniques.

Data Sets

The data sets required to address this question include pollens from stratified natural and cultural deposits, radiocarbon dates that correspond the 1200-1300 A.D. period, and faunal remains/artifacts associated with food procurement and processing.

Question 2:

Can the period circa A.D. 0-700 be documented at the Oak Country sites? If so, are there any discernible changes in projectile point artifact types diagnostic of either dart and atlatal or the bow and arrow indicative of technological change?

Implication

If such time depth and artifact types can be documented, the implication would be that the sites may have been occupied, either by more than one cultural group using distinct hunting technologies, or by the same cultural group for many generations during which a significant new subsistence technology was acquired or developed.

Data Sets

The data sets required to address this question include radiocarbon dates and diagnostic artifacts indicative of both of these types of hunting technologies.

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IV. FIELD AND RESEARCH METHODS

A. Introduction

A Phase I cultural resources inventory, Extended Phase I boundary determination program, and a Phase II site significance evaluation program were conducted for cultural resources on the project property. The following sections present descriptions of the inventory data gathering methods (Phase I), resource extent determination methods (Extended Phase I), and site significance evaluation methods (Phase II), employed during the various stages of this project. The first two data gathering methods described below - initial research and field survey - constitute the Phase I inventory and are referred to as inventory methods. This initial data collection involves records and literature searches; review of historic and landmark registers; initial archival research; and examination of early maps and aerial photographs. The next stage of the Phase I data collection involved field survey of the project property. The results from the Phase I studies provide an inventory of cultural resources for the project property.

The Extended Phase I program methods consisted, principally, of subsurface testing using shovel test pits (STPs) to delineate the subsurface and horizontal extent of thirty-two prehistoric archaeological sites on the property. The Phase II site evaluation program methods consisted of subsurface testing using 1 m^2 controlled excavation units to determine the significance of the sites. The methods described below are general, site specific method implementations are described in Section V.

B. Phase I Inventory Methods

The Phase I inventory, including an archaeological records search, literature review, historic maps check, and field survey, was conducted to identify cultural resources within the project area. Field surveys were initially conducted from May through July 2000. For the Phase I inventory, project personnel included Richard Carrico, Project Manager and Principal Investigator; Josh Smallwood, Field Crew Chief; and Laura Barrie, Kimberly Lauko, Jennale Peacock, and K. Ross Way, field survey crew members. Field survey included complete systematic coverage of the property.

1. Site Records and Literature Search

A site records and literature search was initially conducted in July 2000 with updates in June and July, 2001. This search included examining in-house survey records and data provided by the South Coastal Information Center (SCIC) at San Diego State University and the San Diego Museum of Man (Appendix B). The SCIC search included a review of the National Register of Historic Places listings and the State of California Historic Landmarks and county registers. The information obtained from these reviews was used to determine the presence or absence of previously recorded cultural resource sites and to identify previous studies conducted within and adjacent to the project area.

2. Historic Research

The methodology for the historic portion of the Phase I investigation included a review of historic background data, as well as a field survey for any existing structures located within the project property. Historic topographic maps provided by the SCIC at San Diego State University were initially reviewed to determine if any mapped structures occurred at different periods of time. The National Register of Historic Places and the various State of California historic registers, including the local San Diego Historic Landmarks listings at the SCIC were consulted to determine if any buildings or structures within the study area were officially listed on these registers of historic sites. Historic topographic maps and 1928 aerial photographs in the San Diego Historical Society archives and the San Diego County Department of Planning and Land Use

collections were consulted to determine the presence of structures and associated developments in earlier periods of the project area. Local historical files at the San Diego Historical Society and the California Room of the San Diego Public Library were also reviewed for information regarding the presence or prior existence of historic resources on the project property.

3. Field Survey

Survey methods consisted of a systematic walk-over of the accessable surface of the property. Transects over the project area were surveyed on foot at approximately 15-meter intervals. Areas that were exceptionally steep were spot-checked to assure that nothing would be missed. When an artifact or bedrock feature was encountered, the area immediately adjacent was intensively searched for associated artifacts. The project area, contained mostly natural vegetation including sage scrub, chaparral, oak woodland, and disturbed grassland plant communities. Overall visibility within the project area averaged approximately sixty-five percent of the ground surface, with dense chaparral or grasses and perennial shrubs and herbs obscuring the ground surface in some areas. In these areas, visibility was limited to approximately twenty percent, while in some other open areas visibility approached 80 percent. Portions of the project area have been disturbed by previous activities including grading, agriculture, and cattle grazing. The survey transects extended across the entire horizontal extent of the project property, and, overall, the surface visibility was adequate for resource discovery.

All newly discovered cultural resources were recorded on Department of Parks and Recreation (DPR) primary and site record forms. Previously recorded sites located within the project areas were revisited and if new and previously unknown information was observed, then site update records are completed (included as confidential Appendix K - bound separately). Bedrock milling features are classified as sites and are recorded on primary and archaeological site record forms. Normally, non-feature artifact finds constituting only one class of artifacts and totaling three or less in number, situated in an area three meters or less in diameter, are classified as isolates. Isolates are recorded only on DPR primary or “P” forms. Because of the extensive scatter of artifacts across the property, however, the recordation of isolates was generally not feasible. All sites were photographed and sketch maps of the occurrence of the surface evidence observed were created.

C. Field Testing Program Methods

1. Introduction

For this phase of the cultural resource studies, general field procedures for archaeological subsurface test excavations are outlined below. To ensure equal treatment, varying levels of testing were proposed, appropriate to the site, for the cultural resources in the project area. These measures are described below, in general, and include 1) limited surface collection; 2) shovel test pits (STPs) to determine site size and depth; 3) controlled excavation test units to evaluate site significance; 4) laboratory processing and data analysis; and 5) reporting of results. All but one of the sites investigated were strictly prehistoric sites. The program methods described below are general; the site-specific applications of these general methodologies are presented in Section V in the Extended Phase I boundary determination program description. Location of individual sites and of site grids on the property was accomplished using the Global Positioning System (GPS). Specific site by site methods are described in Section V.

2. Extended Phase I Boundary Determination Field Methods

The Extended Phase I boundary determination program methods described below consisted, principally, of field subsurface testing of sites to establish the horizontal and vertical extent of subsurface deposits. This program was conducted between April 17, 2001 and August 7, 2001. For this program, project personnel included Richard Carrico, Project Manager and Co-Principal Investigator; Theodore Cooley, Project Archaeologist and Co-Principal Investigator; Carol Serr, Lab Director and Artifact Analyst; Laura Barrie, Field Crew Chief; and Christopher Beach, David Caterino, Cristela Cuellar, Laura McElvana, Patrick McGinnis, Chrissy Mittendorff, Josh Smallwood, and Kristen Walker, field crew members. Additional historic research was conducted by Dr. Stacey Jordan.

a. Surface Collection

Because of the substantial extent of surface materials and prohibitive vegetation such as dense grass, chaparral, poison oak, and sumac on several sites, no systematic surface collection was conducted as part of these investigations. Instead, only observed diagnostic artifacts were mapped in and collected during this Extended Phase I testing phase (Plate IV-1A). These collections were made either by grid point provenience using tapes or by theodolite and stadia rod. All cultural material collected was bagged for laboratory analysis and cataloguing. Each bag was marked with the site trinomial or temporary number, artifact number, and provenience.

b. Shovel Test Pits (STPs)

Shovel test pits were used to test for the presence or absence of a subsurface deposit at sites, and if a deposit was found to be present, for boundary determination to ascertain site subsurface horizontal extent and depth of the deposit. STPs were circular, 44 cm in diameter, and excavated in 10 cm levels (Plate IV-1B). Results were recorded for each level. In areas where the horizontal extent of sites appeared likely to be substantial, STPs were positioned on points along north- south/east-west metric grids established over the site areas. On these sites, STP grid point locations were achieved using tapes or by theodolite and stadia rod. Grid intervals for STPs were usually 10, 20, or 40 m apart, depending on site size and content. Intervals of 20 m were most often used, except in areas of dense surface or subsurface artifact concentration, where smaller intervals were required. For larger sites (i.e., sites over 4.0 acres), a 20 m interval coupled with some 10 m and some 40 m interval STPs was used, depending upon artifact density. At small isolated milling feature sites, initial STPs were positioned purposively in areas adjacent to features to determine if any subsurface deposit was present. If no deposit was found to be present, then no grid was established at the site.

In areas where grids were used, a series of grid systems were established for the testing program. Grid A, the first and largest of these systems, encompassed nine sites in the southwestern portion of the project area. The datum point North 0/East 0 was set at site CA-SDI-7326 and the grid was extended north to sites CA-SDI-7325, CA-SDI-7758, CA-SDI-7757, CA-SDI-7759, CA-SDI-7764, CA-SDI-7756, CA-SDI-7755, CA-SDI-16076. Grid B, in the central west side of the property, was established at site CA-SDI-7753 and this grid was not extended to any other sites. Grid C was set up over site CA-SDI-7321 in the northeastern portion of the property. It did not continue to any other sites, but is adjacent to Grid D. Grid D, also in the northeastern portion of the property, was established at site CA-SDI-7752 and extended south and west to include sites CA-SDI-7751, CA-SDI-7322, and CA-SDI-7768. Grid E datum was established in a northern corner of the property at CA-SDI-7754 and was not continued to any other sites.

Excavated soil was dry-sifted through 1/8th-inch mesh screen. All cultural material collected from each 10 cm level was sorted and bagged for laboratory analysis and cataloguing. Each bag was marked with the site trinomial number, STP number, date, and level. Field forms were kept on a daily basis and provide

information identifying excavators, date, location, STP number, level, types and quantities of materials collected, and changes in soil.

3. Phase II Significance Evaluation Methods

The Phase II significance determination program methods described below consist, principally, of field subsurface testing to establish the significance of individual sites in the project area and laboratory methods which include special studies and more detailed analyses of some data sets. All but one of the sites evaluated were strictly prehistoric sites. Unit locations were chosen based, primarily, on the results of the Extended Phase I STP results. The Phase II significance evaluation program was conducted between July 2, 2001 and October 17, 2001. During this program, project personnel were the same as those listed above for the Extended Phase I program.

a. Test Units

Test unit size on the project measured 1 by 1 m and units were positioned, principally, on points along north-south/east-west metric grids established over the site areas. All excavation of deposit was in 10 cm levels and this soil was dry-sifted in the field through 1/8th-inch mesh screen. All cultural material collected from each 10 cm level was sorted and bagged for laboratory analysis and cataloguing. Each bag was marked with the site trinomial or temporary number, unit number, and level. Field unit level forms were kept on a daily basis to provide information identifying excavators, date, location, unit number, level, types and quantities of materials collected, and changes in soil (Plate IV-2A). Photographs of each completed unit were taken showing the unit wall containing the best stratigraphic detail, in addition, a profile sketch was drawn of this wall for each unit. Soil column samples, measuring 20 by 20 by 10 cm, and 10 by 10 by 2 cm soil samples for pollen studies were also taken from the sidewalls of seven units, four from sites CA-SDI-7322, CA-SDI-7755, CA-SDI-7756, and CA-SDI-7759 and from three off-site locations as control samples (Plate IV-2B).

D. Laboratory Processing

In the Mooney & Associates Cultural Resources Laboratory, processing of artifacts and cultural debris included cleaning (as necessary), cataloging, and analysis of the recovered materials. The cataloging consisted of entry into a computerized data base with entries for each item (Appendix C). Analysis followed standard archaeological techniques including construction of a typology for each artifact, a description of the artifact types, and a comparison of the data with other sites in the area, particularly sites in the Santa Maria Valley area. Artifacts were sorted into prehistoric and modern material classes, and further sorted into types (e.g., debitage, core, unifacial tool, percussing tool, milling tool). Specialized studies anticipated included: pollen analysis, radiocarbon dating, faunal studies, and column sampling. These special studies were conducted after the initial sorting and cataloging. Faunal bone remains were preliminarily sorted by family size and condition. Data analysis provided information as to horizontal and vertical distribution of cultural material. Diagnostic or important artifacts were sketched or photographed.

A.) Surface Artifact Collected at CA-SDI-7757

B.) STP Excavation at CA-SDI-7755

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A.) Unit Excavation at CA-SDI-7757

B.) Column and Pollen Samples from Off-site Control Unit 1

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1. Analyses

a. Flaked Stone Analysis

Flaked stone tools and their manufacturing and maintenance debris were analyzed in the Mooney & Associates Cultural Resources Laboratory with a focus towards determining material type (i.e., stone type) - volcanic/metavolcanic, quartzite, cryptocrystalline (e.g., chert, obsidian, jasper), milky quartz, etc.; reduction type - split cobble core, quarried stone core, or biface core; reduction purpose - to manufacture core tools, to manufacture simple flake tools (utilized and retouched flakes), to manufacture complex flake tools (projectile points, scrapers etc.), to resharpen and maintain finished tools (scraper planes, scrapers, hammerstones, biface knives etc.); or some combination of these activities. To these ends, all chipped stone tools were analyzed by first establishing material type based on analyst (i.e., the Principal Investigators's) expertise, examination of each tool, tool fragment, and piece of manufacturing and maintenance debris for platform characteristics, presence/absence of use wear on tool and flake edges, presence/absence of cortex on tools and flakes, and general sizing of whole debitage flakes from the control sample recovery.

It was anticipated that data generated by these analytical criteria, used in combination, could yield valuable information about lithic material sources for study of raw material procurement patterns, and assist in the study of site function through analysis of the reduction practices and tool use wear characteristics.

b. Faunal Analysis

Shellfish Remains

Shellfish remains, if present in sites can provide data for comparison with other nearby sites of the same time period, to test for differences and similarities in the collection patterns, and in subsistence practices and diet. The shellfish remains were analyzed in the Mooney & Associates Cultural Resources Laboratory. This analysis consisted of identification and weighing by species. Included in the analysis, if feasible, is the identification of bivalve hinges and gastropod spires for minimum number of individuals (MNI) determinations. These shell data are then tabulated by unit location and by level. Statistical inferences are computed on the data to identify changes in collection patterns and/or species preferences and seasonal occupation patterns. Because of their relative paucity at the project sites, however, the shellfish data generated were too limited to substantially address such research questions relating to collection patterns, subsistence practices, and diet.

Animal Bone

The animal bone assemblage associated with the prehistoric human occupation of the sites, was analyzed by faunal specialist Dr. Thomas Wake of the Cotsen Institute of Archaeology - Zooarchaeology Laboratory at the University of California, Los Angeles. These materials were comprised of predominately small fragments of mammal bone with a limited amount of bird, reptile, and amphibian bones. An initial analysis, which included sorting and preliminary identification, was conducted in the Mooney & Associates Cultural Resources Laboratory. The materials were then submitted to Dr. Wake to be analyzed as to taxonomic classification including element, species (where possible), burned/unburned, and butchered/nonbutchered, to provide basic information from which concentration indices (e.g., total weight, minimum number of individuals (MNI), or number of specimens represented (NISP) could be derived. The faunal bone sample recovered was highly fragmented with some of the smaller pieces being difficult or impossible to identify to species. The bone data retrieved that could be analyzed, were tabulated by unit location and by level. Microscopic analysis of elements such as fish otoliths (the boney portion of the ear of fish), if present, can provide direct data on seasonality from the measurement and analysis of incremental annual growth layers.

Determination of mammal specimens representing juveniles can also provide data relating to seasonality. These results can be invaluable toward learning about scheduling in the yearly subsistence cycle followed by the inhabitants. Knowing the scheduling of this cycle can provide possible insight, overall, into resource availability and resource exploitation strategies and practices. These data can then be compared to seasonality results from other temporally similar sites in the region. The results can aid in determination of prehistoric diet and food procurement practices of the site inhabitants.

c. Radiocarbon Dating Analysis

Suitable organic materials such as charcoal from hearths or other reliable sources (e.g., shellfish shell) within a site were submitted to Beta Analytic Laboratories of Miami, Florida for radiocarbon dating. The results of this laboratory analysis produce absolute dates to aid in establishing the chronological placement of a prehistoric site occupation.

d. Obsidian Sourcing and Hydration Rim Measurements

Obsidian from the sites was submitted for sourcing and hydration rim measurements. Trace element analysis, can, through comparison with other known trace element patterns from known obsidian sources, be used to determine the origin of the obsidian in many cases. Such information can then be used to infer possible trade relationships and patterns of exchange during prehistoric times. Hydration analysis involves measurement of the accumulation of layers of water induced surface alteration on a natural glass such as obsidian. Measurement and calibration of this build-up can be used to produce an index of the length of time required for the build-up to occur. The thickness of this build-up thus equates to the length of time since the material was worked prehistorically. This thickness, measured in microns, when calibrated with local radiocarbon dating, can be used to establish a relative dating for a site. The results of hydration studies, therefore, can aid in chronological placement of prehistoric sites and the obsidian sourcing identifies the place of origin of this material from known source locations such as the Coso Range un east-central California, Obsidian Butte near the Salton Sea, or San Felipe in Baja California, and others. Samples were submitted for trace element analysis for sourcing, to Dr. Steven Shackley of the P.A. Hearst Museum of Anthropology (formerly the Lowie Museum of Anthropology), at the Department of Geology and Geophysics, University of California, Berkeley. The hydration measurement study was performed by Thomas Origer of the Anthropological Studies Center, at the Sonoma State University Obsidian Hydration Laboratory.

e. Tool Protein and Pollen Studies

Soil samples and suitable artifacts were submitted to Dr. Linda Scott Cummings, Paleo Research Laboratories, Golden, Colorado to conduct palynology (pollen) and protein residue studies. Plant pollen casings are quite durable microscopic structures, which, because of their hardness are frequently preserved through time. Pollen casings are unique to the plants from which they derive and can, therefore, be used to identify source plants. The soil samples from which to extract pollen were taken from the sidewall of a selectively chosen unit to attempt to identify plant species that may have been present in the area at the time of the prehistoric occupation of the site. Some of these plants may no longer be present in the area possibly indicating environmental changes through time. Suitable artifacts, if recovered, were also to be submitted for pollen studies. Pollen casings can also sometimes be found still adhering to stone tools that were used to process the plants from which they derive. Positive study results can provide useful additional information concerning prehistoric diet by helping to determine vegetal foodstuff preferences and food preparation practices of the prehistoric site inhabitants, and/or the functional aspects of stone tools used for plant processing.

Plant and animal protein tool residue or tool pollen analysis can aid in determination of tool function. Such information can also aid in studies of prehistoric diet and food procurement practices. The detection and identification of organic residues is accomplished using forensic immunological techniques. Identifications are typically to the genus level, although a limited number of species-specific antisera are available. Both plant and animal antisera are available. The efficacy of using a limited spectrum of antisera is justified by ethnographical references to flaked and ground stone tool usage. Potential specimens are collected and packaged quickly to avoid contamination. A small soil control sample is collected to identify contamination within the matrix surrounding the artifact. The test is extremely sensitive and able to detect 10-8 grams of protein. Residues are removed using a five percent ammonia solution with special attention given to working edges. Resulting residue is compared against an applicable suite of anti-sera with positive results noted and discussed with regard to their likely source in the environ represented at the site during the period represented. The findings will be quantified by provenience, reported in a separate appendix, and summarized in the body of the report.

f. Column Sample Analysis

Four 20 cm by 20 cm column samples were taken, one each from the sidewall of three selectively chosen units at the sites. Additionally, three column samples were taken, one each from the sidewall of two units excavated "off-site" for purposes of presence-absence comparison with the column samples taken from site areas. As with the unit excavations, each column was excavated in 10 cm levels. The samples were first processed using water through a flotation device to separate the recovered light (float) organic materials from the heavy fractions. Following drying, the samples were then analyzed. The dried vegetal samples were packaged and sent to Dr. Virginia Popper of the Paleoethnobotany Laboratory of the Cotsen Institute of Archaeology, at the University of California at Los Angeles for macrobotanical analysis. In that laboratory analysis, charred items were separated out of the other recent vegetal materials in the samples and then identified to the most specific plant taxa possible. The heavy fraction was processed and analyzed in the Mooney & Associates Cultural Resources Laboratory. This consisted of sifting the materials through 1/4-inch and 1/8-inch mesh, with the smallest residue retained by window screen mesh. The three size residues were then examined for cultural materials which could include both organic (faunal) and lithic residues. The cultural materials retained in the three mesh sizes were sorted and counted and the three increment sample portions compared to the total quantity of cultural materials retained. Analysis of the window screen residues could indicate what kind and percentage of information was not recovered in the 1/8th-inch screen sizes during the investigation. The flaked stone materials from each column sample were counted and sorted by material type and any faunal remains that were identifiable were submitted to Dr. Wake to be identified and tabulated by taxonomic category.

E. Curation

The artifacts and materials recovered from the archaeological investigations belong to the property owner, in this case Donald C. White. During the analysis, they will be temporarily curated at Mooney & Associates (not to exceed one year), and upon project completion they will be transferred to a regional curatorial facility. The property owner is responsible for fees associated with this permanent curation. All artifacts and materials recovered were labeled, bagged, and placed in containers which meet federal standards for archaeological collections (36 CFR Part 79).

F. Consultation with Native American Community

The Native American consultation process was completed by contacts via letters, formal meetings, and informal meetings. The focus of the consultation was on informing interested and vested Native Americans (Kumeyaay/Ipai) of the archaeological discoveries within the project site and soliciting their input regarding the importance of such discoveries. Emphasis has been placed on working with members of the San Pasqual Band and Mesa Grande Band because ethnographic research indicates that these are the living people with the closest ties to the immediate project area and village of Pa'mu. Other groups were contacted because of their expressed interest or because they have cultural/lineal ties to the project site.

On May 11 and May 18, 2002, members of the County of San Diego Historic Sites Board were given a tour of the project. Kumeyaay who took part in the tour included Ms. Carmen Lucas, tribal elder (Kwaimai) and Mr. Jimmy Flores, tribal leader from Mesa Grande. Ms. Lucas visited the Mooney & Associates laboratory on May 29, 2002 and examine the artifacts and cultural materials from the excavation. On June 12, 2002 David Toler Cultural Resource Committee chairman and tribal council member for the San Pasqual Band of Mission Indians, and Ms. Lucas examined all of the large sites on the project and expressed their satisfaction with the proposed preservation of the site cultural resources. Consistent with CEQA requirements, the Native American Heritage Commission (NAHC) were notified of the project and were requested to review their sacred lands files by letter of June 28, 2002 (see Appendix M). On July 2, 2002 Mr. Rob Wood of the NAHC replied that the agency did not list any sacred sites in the project area. In the July 2, 2002 letter, Mr. Wood provided a list of possible Native American contacts for further consultation. Two of the contacts, a tribal official from Mesa Grande and Ms. Lucas, had already been consulted, as noted above. The Kumeyaay Cultural Repatriation Committee (KCRC) was kept abreast of the project and discoveries by way of Ms. Lucas (a member of the KCRC) and as part of a larger program of repatriation and consultation attended by Paul Cuero and Steve Banegas of the KCRC. Similarly, the Jamul Indian Village has been informed of the project through Mrs. Eleanor Miller, tribal liaison.

VI. SITE STRATIGRAPHY AND SUBSURFACE FEATURES

A. Introduction

The roughly 769 acre (311 hectare) area encompassing the current testing program is situated at the western margin of the Santa Maria Creek Valley. Dominant physical elements of the area include a substantial amount of surface exposed granitic bedrock and a lengthy extent of the bed of Santa Maria Creek along, and within, the project property. Prehistorically, oak woodland, sage scrub, and chaparral plant communities, still largely present today, would likely have been even more substantial and may have been augmented by riparian and marshland areas not substantially evident today. These natural elements contribute to, and form the environment for, the deposition of cultural materials left behind on the property by the people who lived here prehistorically and who subsisted by hunting and gathering. The content, intensity, disturbance, and location of the cultural deposits, and correlation with particular natural soil types, together, constitute the vertical and horizontal stratigraphy of cultural materials of the sites on the property. In the descriptions below it can be seen that the natural and cultural stratigraphy of these prehistoric sites are characterized by the occurrence of cultural materials within soil sequences and areal distributions that are mostly intact, but with some evidence for disturbance, both natural and man-caused.

Described first below, briefly, are the general geological circumstances, which represent the natural setting and basis for understanding the stratigraphy observed in the various current unit profiles. Following this are descriptions of the specific natural soil types and then the cultural strata identified in this testing program as evidenced in the test unit profiles. Lastly, a cluster of granitic rocks, interpreted as a possible subsurface prehistoric feature, is described and analyzed in relation to the stratigraphy and deposit characteristics present at the site.

B. Natural and Cultural Site Stratigraphy

1. Natural Stratigraphy and Factors of Disturbance

Of the 32 prehistoric archaeological sites defined within the subject property, 23 are situated in areas where the natural soils derive primarily from the decomposition and chemical weathering of granitic bedrock. Areas with these primarily derivative soils are present in the southwestern, northwestern, and northeastern quadrants of the property. The non-derivative soil content in these areas, consists of organic material, most of it originally deposited on the ground surface and then subsequently worked down into the soil, through time, by various agents including gravity, bioturbation, erosion, absorption, and human agricultural activities. In these areas, the soil profiles are relatively simple (i.e., a normal A, B, C soil horizon sequence) and are, consequently, somewhat repetitive in appearance from unit to unit. Differences visible between various unit profiles usually involve relative depths and variations in the organic content of the soil and/or in the chemical or crystalline make-up of the granitic bedrock in a particular location. In the near surface, or A Horizon portion of a soil profile, high organic content can result in a dark grey brown to near black coloration in the otherwise usually lighter-colored (B horizon) natural derivative subsoil. Variations in the chemical or crystalline make-up of the granitic bedrock can alter the nature or appearance of the derivative soil in one area compared to another. Such alterations can include more clay content or in an iron or other metallic stain coloration to the soil (evident mostly in the B and C Horizons).

The remaining eight sites are located primarily in the southeastern quadrant of the property in an area containing alluvium deposited by Santa Maria Creek onto eroded basal granitic bedrock. The soils in these areas of alluvium have a higher clay content than most of the primarily derivative soils and some contain variable quantities of gravels and/or subangular cobbles. As the depth of the alluvium is relatively shallow

in these areas, the soil profiles are also relatively simple. They differ, however, from those in the primarily derivative soil areas with A and B horizons having developed with inclusion of imported sediments as well as derivative soils from the decomposition and chemical weathering of the basal granitic bedrock at the C Horizon level.

This general characterization of soil origins correlates with the specific soil types identified by the USDA (1973) and listed in Section II. Within the project property, of the soil types previously listed, those most pertinent to archaeological sites areas tested are the Fallbrook sandy loam (9-15% slopes, eroded [FaD2], 15-30% slopes, eroded [FaE2]), and the Fallbrook rocky sandy loam (9-30% slopes [FeE]). These soils consist of "well-drained, moderately deep to deep sandy loams that formed in material weathered in place from granodiorite" (1973:46). Together these soil types make-up approximately 80 percent of the non-drainage areas of the western half and north central portion of the property and nearly 60 percent of the property, overall. Eighteen of the 32 sites on the property, including all but one of the sites tested in Phase II, are situated on, or predominantly on, these soils (Table VI-1). The remaining 14 sites are situated on either the Bonsall sandy loam (thick surface, 2-9% slopes [BmC]), Bonsall-Fallbrook sandy loams (2-5% slopes [BnB]), Bosanko clay (2-9% slopes [BsC]), and/or Las Posas fine sandy loam (5-9% slopes [LpC] and 5-9% slopes eroded [LpC2]). These soils form in areas of granitic bedrock and are characterized by a heavy clay loam subsoil. All but one of these latter 14 sites are located in the non-drainage areas of the southeastern quadrant of the property. The single exception is located in the northwest corner of the property. The Las Posas fine sandy loams form in material weathered in place, principally from gabbro (see Table VI-1).

As can be seen in Table VI-1, the most common Munsell hue and chroma coloration observed in the unit soil cultural stratum is 10YR brown 4/3, with darker chroma also common including dark grayish brown 4/2, dark brown 3/3, and very dark brown 2/2. In most instances, in a derivative soil sequence, the upper "cultural stratum" roughly correlates with the natural A soil horizon and a lower second "cultural stratum" with the B soil horizon or subsoil. Cultural materials present in a B soil horizon (or in the C Horizon) of a derivative soil sequence are usually there by way of some agent or agents of disturbance (see above). Moderate amounts of faunalturbation are evident in many of the test units, especially those within areas of sites with soils with high organic content. Floralturbation (mostly caused by root growth) is also evident in units located in proximity to large plants such as oaks and sumacs. Few subsurface features of cultural origin were encountered in the Phase II units. This is somewhat surprising given the placement of many of the units in site areas with high densities of prehistoric cultural materials indicated in the STPs. Only two instances of potential subsurface features were encountered in either of the testing programs. During the Extended Phase I program a concentration of fire-affected rocks, possibly representing a potential feature, was encountered in an STP at site CA-SDI-7751. A Phase II unit, placed immediately adjacent, however, did not reveal any additional extent of this concentration. At site CA-SDI-7756, during the Phase II testing, a possible feature was discovered consisting of a cluster of large granitic rocks (see below). It is not known whether this apparent paucity of intact subsurface features is due to factors of disturbance or is an actual indication of a lack of these types of activities at the sites. The presence of fire-affected rock (FAR) at a number of sites, however, would suggest that the former is more likely than the latter.

Table VI-1. Unit Depths and Soil Profile Characteristics

Site No.	Unit Number	Maximum Depth (cm)	Principal USDA Defined Soil Type(s)Associated	Quadrant of Property	Cultural Material Bearing Strata Observed	Munsell Range of Cultural Strata (Top to Bottom)	Figure Number
SDI-7320	1	50	LpC/BsC	SE	1	10YR 4/3 to 7.5YR 4/6	VI-1
SDI-7321	1	80	FeE	NE	1	10YR 4/3	-
SDI-7322	1	70	FeE	NE	1	10YR 4/3	VI-2
	2	110	FeE	NE	2	10YR 4/2 to 10YR 4/3	-
SDI-7324	1	60	BmC	NE	1	10YR 4/3	-
SDI-7325	1	70	FaD2	SW	2	10YR 4/3 to 10YR 4/4	-
SDI-7326	1	90	FaD2	SW	2	10YR 5/3 to 10YR 5/4	-
SDI-7751	1	70	FeE	NE	2	10YR 4/2 to 7.5YR 5/6	-
	2	80	FeE	NE	2	10YR 4/3 to 10YR 4/4	-
SDI-7752	1	100	FaD2	NE	2	10YR 4/3 to 10YR 4/4	-
SDI-7753	1	60	FaD2	NW	2	10YR 4/3 to 10YR 4/4	-
	2	40	FaD2	NW	1	10YR 4/3	-
	3	100	FaD2	NW	3	10YR 4/3 to 10YR 3/4 to 7.5YR 4/6	VI-3
SDI-7754	1	90	FaD2	NW	2	10YR 3/3 to 10YR 6/4	VI-4
	2	80	FaD2	NW	1	10YR 4/3	-
SDI-7755	1	90	FaD2	SW	1	10YR 4/2	-
	2	110	FaD2	SW	1	10YR 3/3	-
	3	100	FaD2	SW	2	10YR 4/2 to 7.5YR 4/4	VI-5
	4	90	FaD2	SW	2	10YR 4/3 to 7.5YR 4/6	-
SDI-7756	1	70	FaD2	SW	1	10YR 3/2	VI-6
	2	70	FaD2	SW	2	10YR 2/2 to 10YR 4/6	-
	3	50	FaD2	SW	2	10YR 4/2 to 10YR 4/3	-
	4	90	FaD2	SW	2	10YR 3/3 to 10YR 5/4	-
	5	50	FaD2	SW	2	10YR 4/2 to 10YR 4/3	-
SDI-7757	1	60	FaD2	SW	1	10YR 4/3	VI-7
	2	60	FaD2	SW	1	10YR 4/3	-
	3	60	FaD2	SW	1	10YR 4/3	-
SDI-7758	1	70	FaD2	SW	1	10YR 4/3	-
SDI-7759	1	110	FeE	SW	3	10YR 3/2 to 10YR 3/3 to 2.5YR 5/4	VI-8
	2	50	FeE	SW	2	10YR 4/3 to 10YR 4/6	-
	3	100	FaD2	SW	2	10YR 4/2 to 10YR 4/3	VI-9
	4	60	FaD2	SW	1	10YR 4/3	-
	5	50	FaD2	SW	1	10YR 4/3	-
SDI-7767	1	80	FaD2	NW	2	10YR 4/3 to 10YR 4/4	-
SDI-7768	1	60	FeE	NE	1	10YR 4/3	-
“SDI-7755"	1*	120	PeC2/FaD2	SW	-	-	VI-10
“SDI-7759"	2*	60	VaA	SW	-	-	VI-12
“SDI-7758"	3*	70	FaD2	SW	-	-	VI-11

* Offsite culturally sterile “control unit” (CU) located near sites listed

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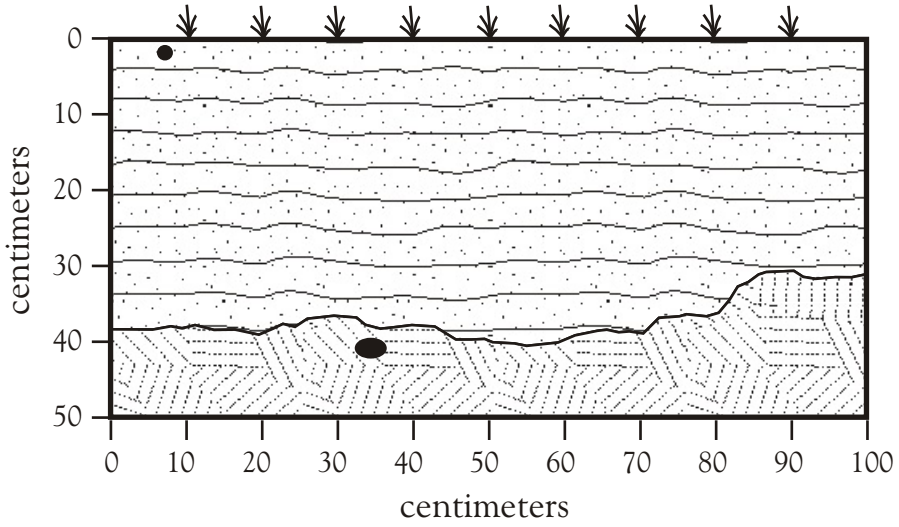

Stratum I Soil. Brown sandy loam, hard, with few fine annual grass rootlets, 15% angular gravel. 10 YR 4/3.

Stratum II Soil. Brown sandy silty clay with strong brown mottling, extremely hard, 15% angular gravel. 10 YR 4/3 and 7.5 YR 4/6 mottling.

Rock

Mooney & Associates

Oak Country Estates

CA-SDI-7320 - Unit 1 - West Sidewall Profile

Figure VI-1

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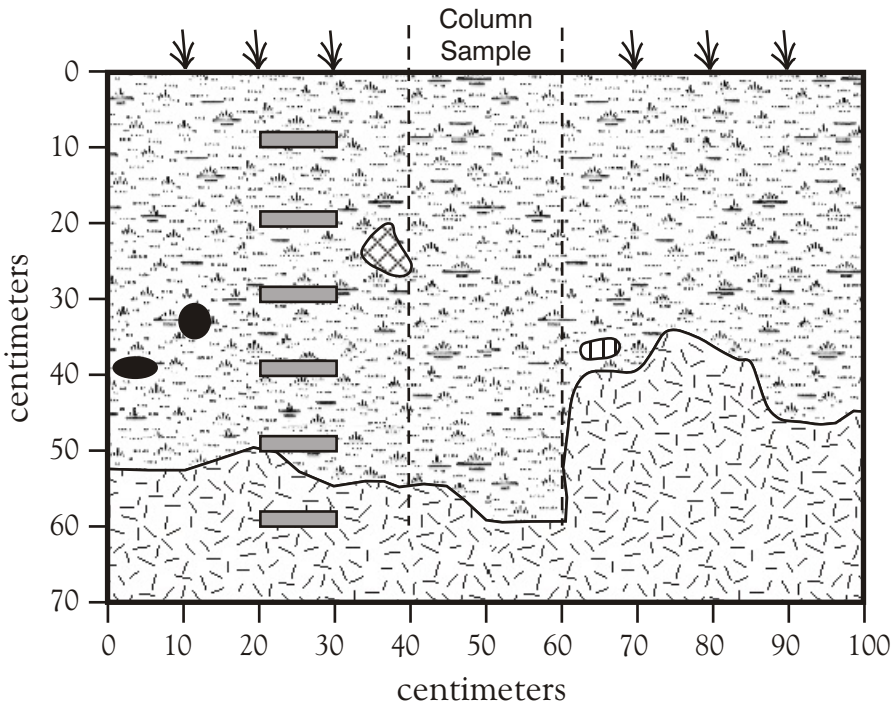

Stratum I Soil. Brown sandy loam, slightly hard, humus with few fine annual grass rootlets, 5% angular gravel. 10 YR 4/3.

Stratum II Soil. Light yellowish brown decomposing granite, very hard, 95% very angular gravel. 10 YR 6/4.

Rock

Krotovina

Bedrock

Pollen Sample

Mooney & Associates

Oak Country Estates

CA-SDI-7322 - Unit 1 - East Sidewall Profile

Figure VI-2

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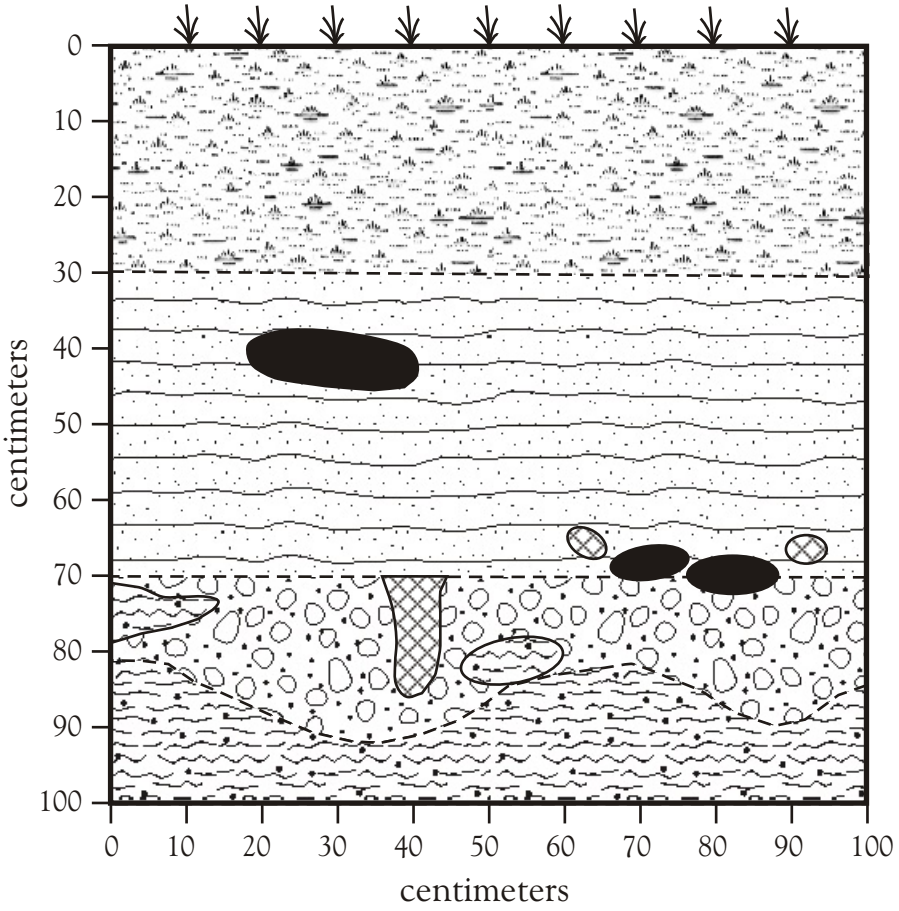

Stratum I Soil. Brown sandy loam, slightly hard, humus with few fine rootlets, 10% sub-angular gravel. 10 YR 4/3.

Stratum II Soil. Dark yellowish brown sandy loam, slightly hard, 15% sub-angular gravel. 10 YR 3/4.

Stratum III Soil. Strong brown decomposing loamy sand, very hard, 10% sub-angular gravel. 7.5 YR 4/6.

Stratum IV Soil. Strong brown compacted loamy sand, very hard, <5% sub-angular gravel. 7.5 YR 4/6.

Rock

Krotovina

Mooney & Associates

Oak Country Estates
CA-SDI-7753 - Unit 3 - East Sidewall Profile

Figure VI-3

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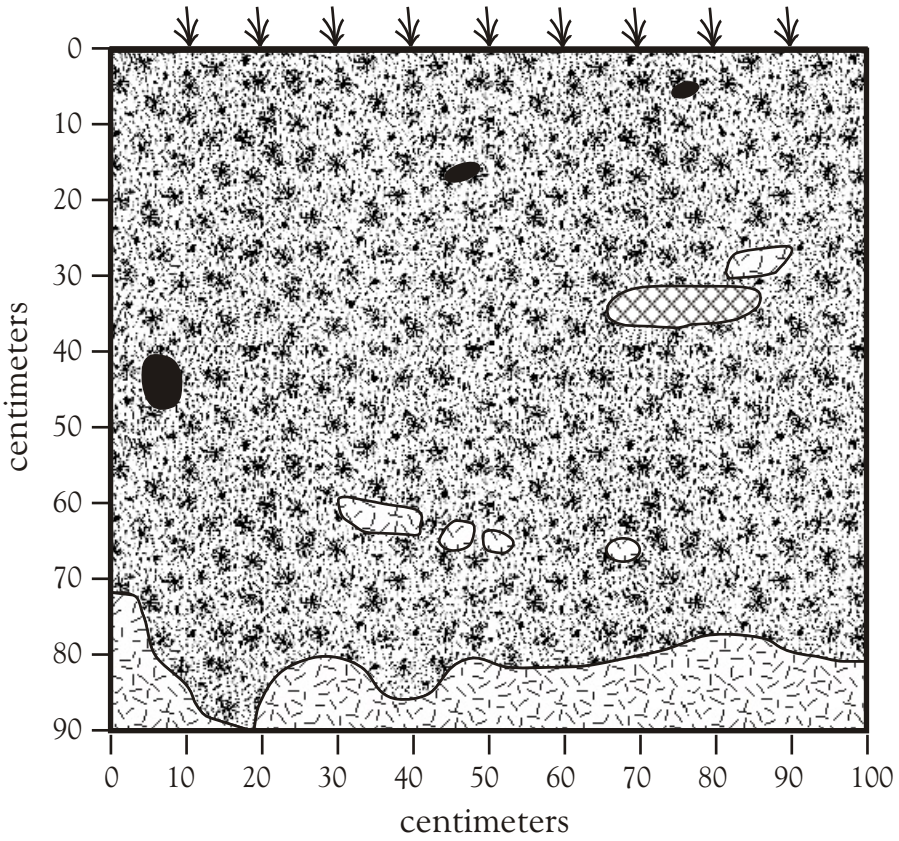

Stratum I Soil. Dark brown sandy loam, soft, humus with few fine rootlets, 15% sub-angular gravel. 10 YR 3/3.

Stratum II Soil. Light yellowish brown decomposing granite, very hard, 95% very angular gravel. 10 YR 6/4.

Rock

Krotovina

Mooney & Associates

Oak Country Estates

CA-SDI-7754 - Unit 1 - West Sidewall Profile

Figure VI-4

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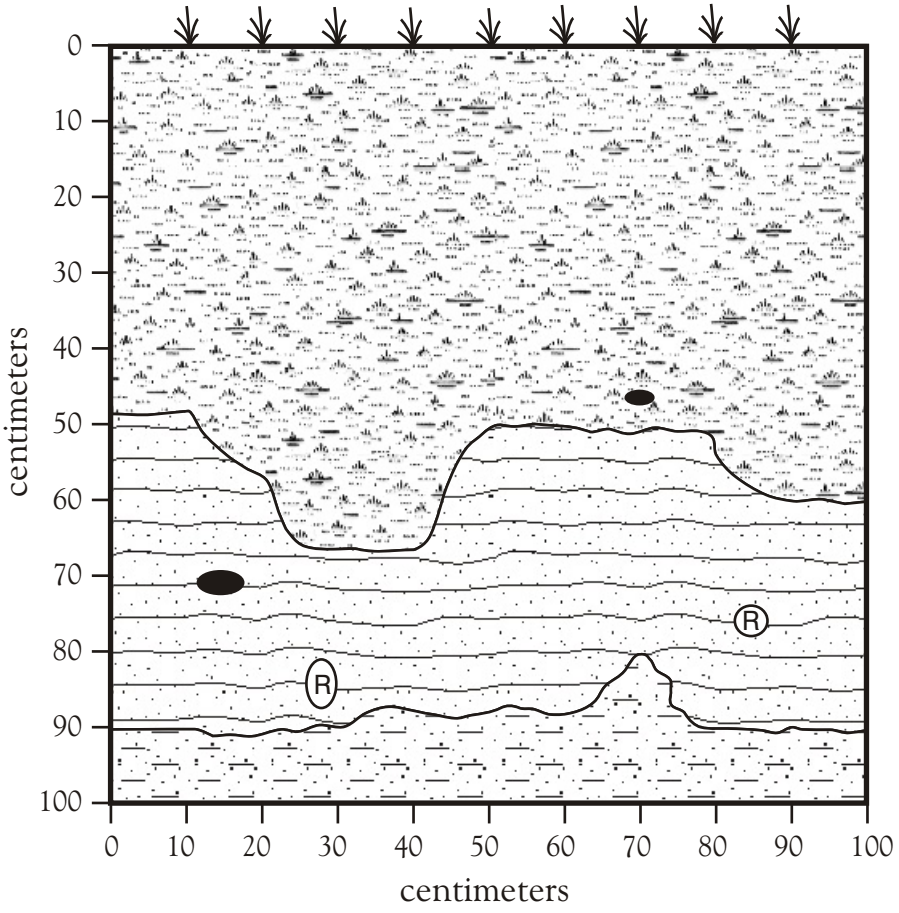

Stratum I Soil. Dark grayish brown sandy loam, slightly hard, humus with few fine rootlets, 15% angular gravel. 10 YR 4/2.

Stratum II Soil. Brown sandy loam, hard, 20% angular gravel. 7.5 YR 4/4.

Stratum III Soil. Brown sandy silt, very hard, 30% angular gravel. 7.5 YR 4/4.

Rock

Root

Mooney & Associates

Oak Country Estates

CA-SDI-7755 - Unit 3 - East Sidewall Profile

Figure VI-5

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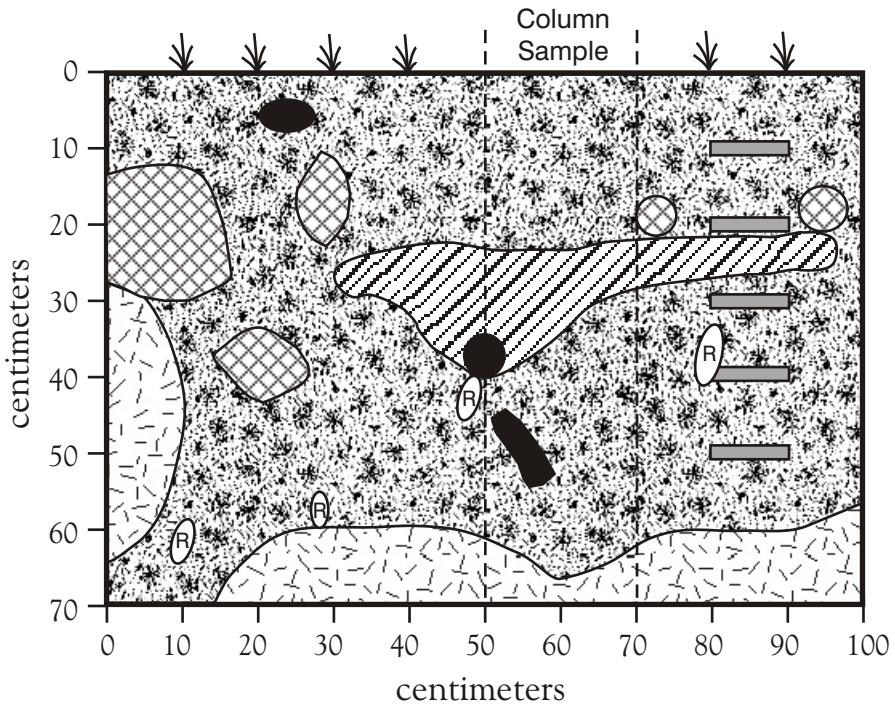

Stratum I Soil. Very dark grayish brown sandy loam, soft, humus with common medium size rootlets, 10% angular gravel. 10 YR 3/2.

Stratum II Soil. Light yellowish brown decomposing granite, hard, 90% very angular gravel.

Rock

Krotovina

Rodent Hole

Root

Pollen Sample

Mooney & Associates

Oak Country Estates

CA-SDI-7756 - Unit 1 - North Sidewall Profile

Figure VI-6

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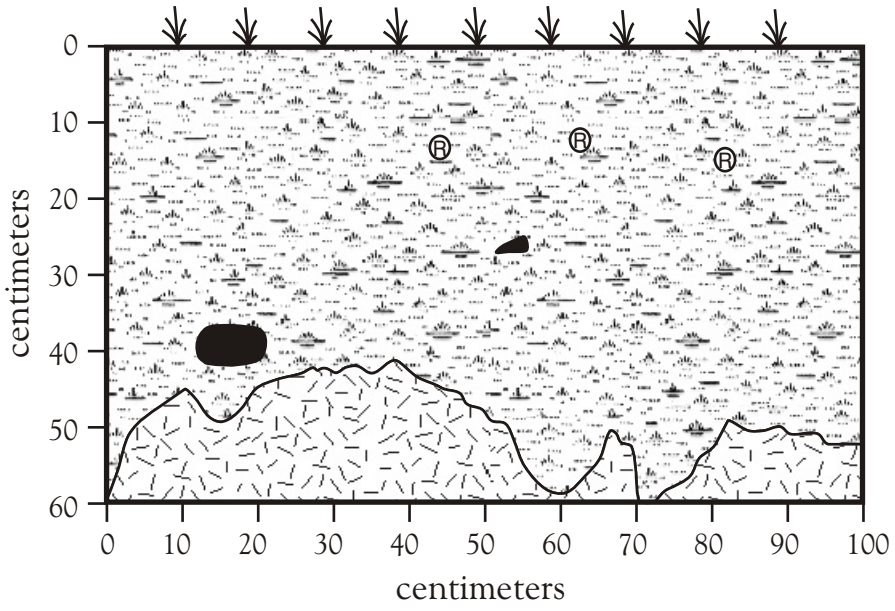

Stratum I Soil. Brown sandy loam, slightly hard, humus with few medium roots, 15% sub-angular gravel. 10 YR 4/3.

Stratum II Soil. Light yellowish brown decomposing granite, very hard, 95% very angular gravel.

Rock

Root

Mooney & Associates

Oak Country Estates

CA-SDI-7757 - Unit 1 - North Sidewall Profile

Figure VI-7

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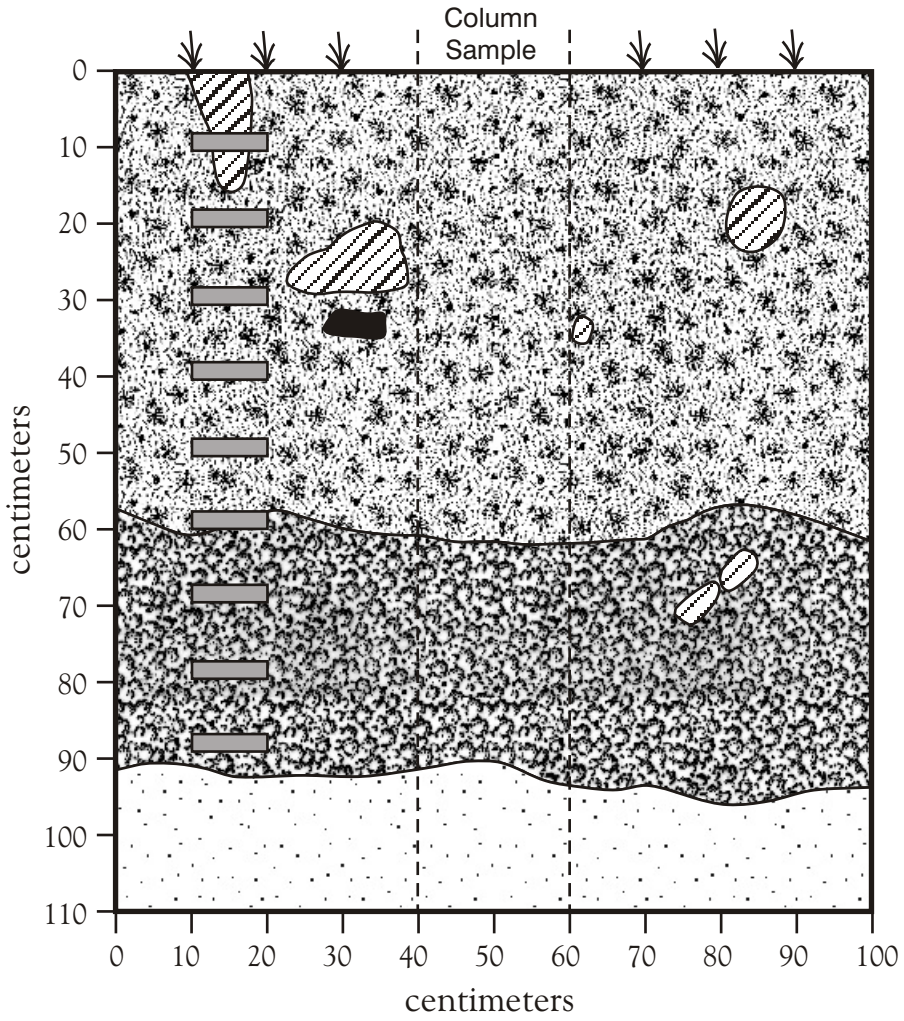

Stratum I Soil. Very dark grayish brown sandy loam, soft, humus with few fine rootlets, 10% angular gravels. 10 YR 3/2.

Stratum II Soil. Dark brown sandy loam, soft, 15% angular gravels. 10 YR 3/3.

Stratum III Soil. Light olive brown clay loam, very hard, dry, 5% sub-angular gravel.

Rock

Rodent Hole

Pollen Sample

Mooney & Associates

Oak Country Estates

CA-SDI-7759 - Unit 1 - West Sidewall Profile

Figure VI-8

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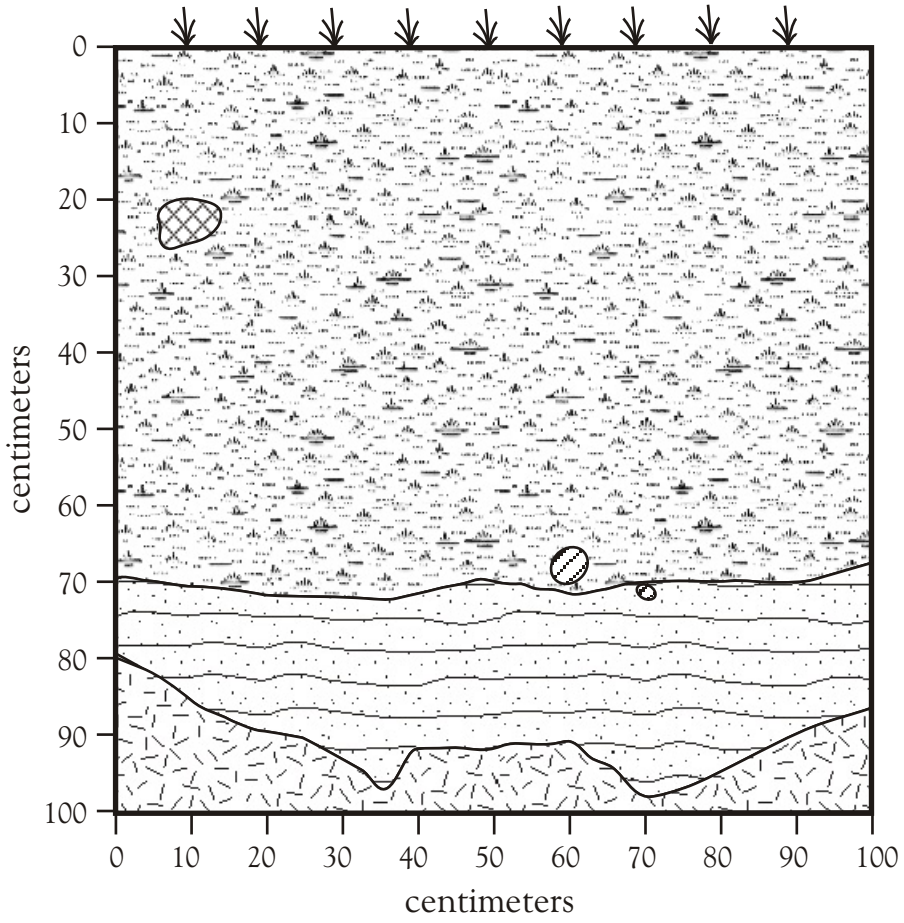

Stratum I Soil. Dark grayish brown sandy loam, slightly hard, humus with few fine rootlets, 10% angular gravel. 10 YR 4/2.

Stratum II Soil. Brown sandy loam, hard, 20% angular gravel. 10 YR 4/3.

Stratum III Soil. Light yellowish brown decomposing granite, very hard, 95% gravel. 10 YR 6/4.

Krotovina

Rodent Hole

Mooney & Associates

Oak Country Estates

CA-SDI-7759 - Unit 3 - North Sidewall Profile

Figure VI-9

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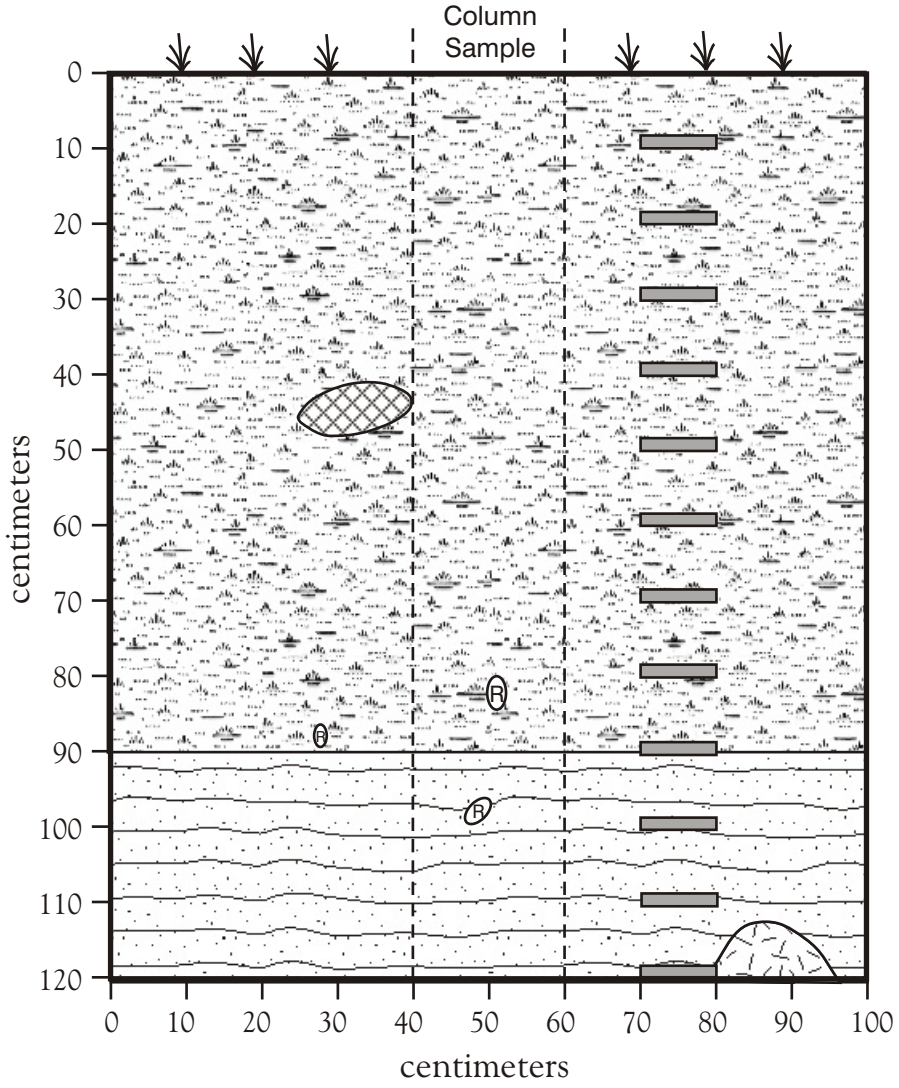

Stratum I Soil. Brown sandy loam, soft, humus with few fine rootlets, 5% angular gravel. 10 YR 4/3.

Stratum II Soil. Dark yellowish brown sandy loam, slightly hard, with few coarse size roots, 15% angular gravel. 10 YR 4/4.

Stratum III Soil. Light yellowish brown decomposing granite, hard, 85% very angular gravel. 10 YR 6/4.

Krotovina

Root

Pollen Sample

Mooney & Associates

Oak Country Estates

Offsite - Unit 1 - West Sidewall Profile

Figure VI-10

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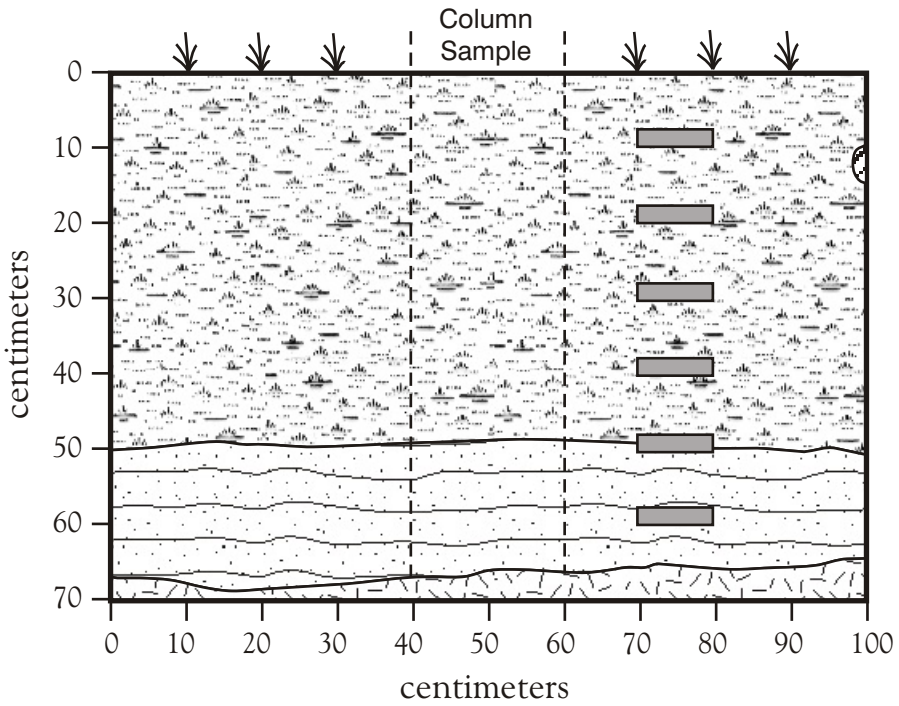

Stratum I Soil. Brown sandy loam, slightly hard, humus with few fine rootlets, 5% angular gravel. 10 YR 4/3.

Stratum II Soil. Brown sandy loam, hard, 5% angular gravel. 7.5 YR 4/3.

Stratum III Soil. Light yellowish brown decomposing granite, very hard, 95% very angular gravel, 10 YR 6/4.

Rodent Hole

Pollen Sample

Mooney & Associates

Oak Country Estates

Offsite - Unit 2 - East Sidewall Profile

Figure VI-11

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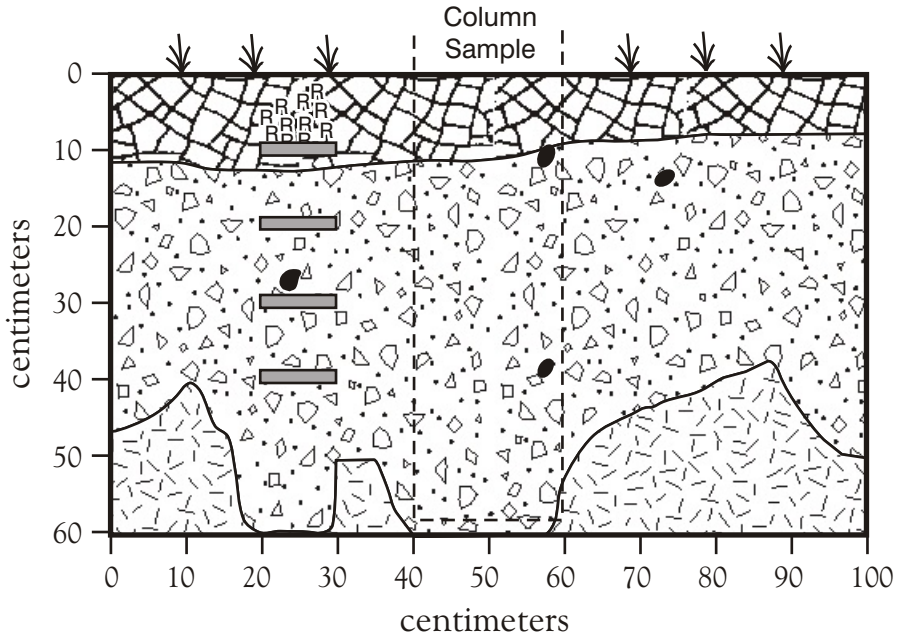

Stratum I Soil. Very dark grayish brown sandy clayey loam, hard, with common medium size roots, 5% angular gravel. 10 YR 4/2.

Stratum II Soil. Dark gray sandy clay, extremely hard, 10% angular gravel. 10 YR 4/1.

Stratum III Soil. Pale brown decomposing granite, extremely hard, 90% gravel. 10 YR 6/3.

Rock

R Root

Pollen Sample

Mooney & Associates

Oak Country Estates
Offsite - Unit 3 - East Sidewall Profile

Figure VI-12

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2. Cultural Stratigraphy

Cultural stratigraphy concerns the pattern of the occurrence of cultural materials horizontally across, and vertically within, the deposits of the archaeological sites investigated.

a. Vertical Cultural Stratigraphy

As indicated above, in most instances, in a derivative soil sequence, the upper "cultural stratum" roughly correlates with the natural A soil horizon and a second lower"cultural stratum" with the B soil horizon or subsoil. Cultural materials present in the subsoil B soil horizon or sometimes even in the C Horizon of a derivative soil sequence are usually there by way of some agent or agents of disturbance such as gravity, bioturbation, erosion, absorption, or human causes such as agricultural tilling activities. As can be seen in Table VI-2, little stratification by depth of the occurrence of cultural materials is evident. The cultural deposits at many sites are shallow, i.e., less than 60 cm in depth. The general vertical pattern of the occurrence of cultural materials between the upper and lower depths is a gradual diminishment with increasing depth (e.g., SDI-7320, SDI-7324, SDI-7753, SDI-7756). In most instances, these materials are occurring within the A soil horizon. Two, possibly patterned, irregularities to a general pattern of gradual diminishment from the surface are apparent, however. Six sites (SDI-7325, SDI-7753, SDI-7755, SDI-7757, SDI-7759 and SDI-7767) had a lesser amount of materials in the first ten centimeter level than in the second level, and nine sites (SDI-7322, SDI-7326, SDI-7751, SDI-7752, SDI-7754, SDI-7755, SDI-7758, SDI-7759, and SDI-7767) showed a greater occurrence of materials in a lower ten centimeter level than in a level that immediately preceded it. An example of this latter circumstance can be seen at site SDI-7751, where 47 artifacts were recovered from the 40 to 50 cm level compared to 35 items in the preceding 30 to 40 cm level.

Table VI-2. Unit Artifact Totals by Depth

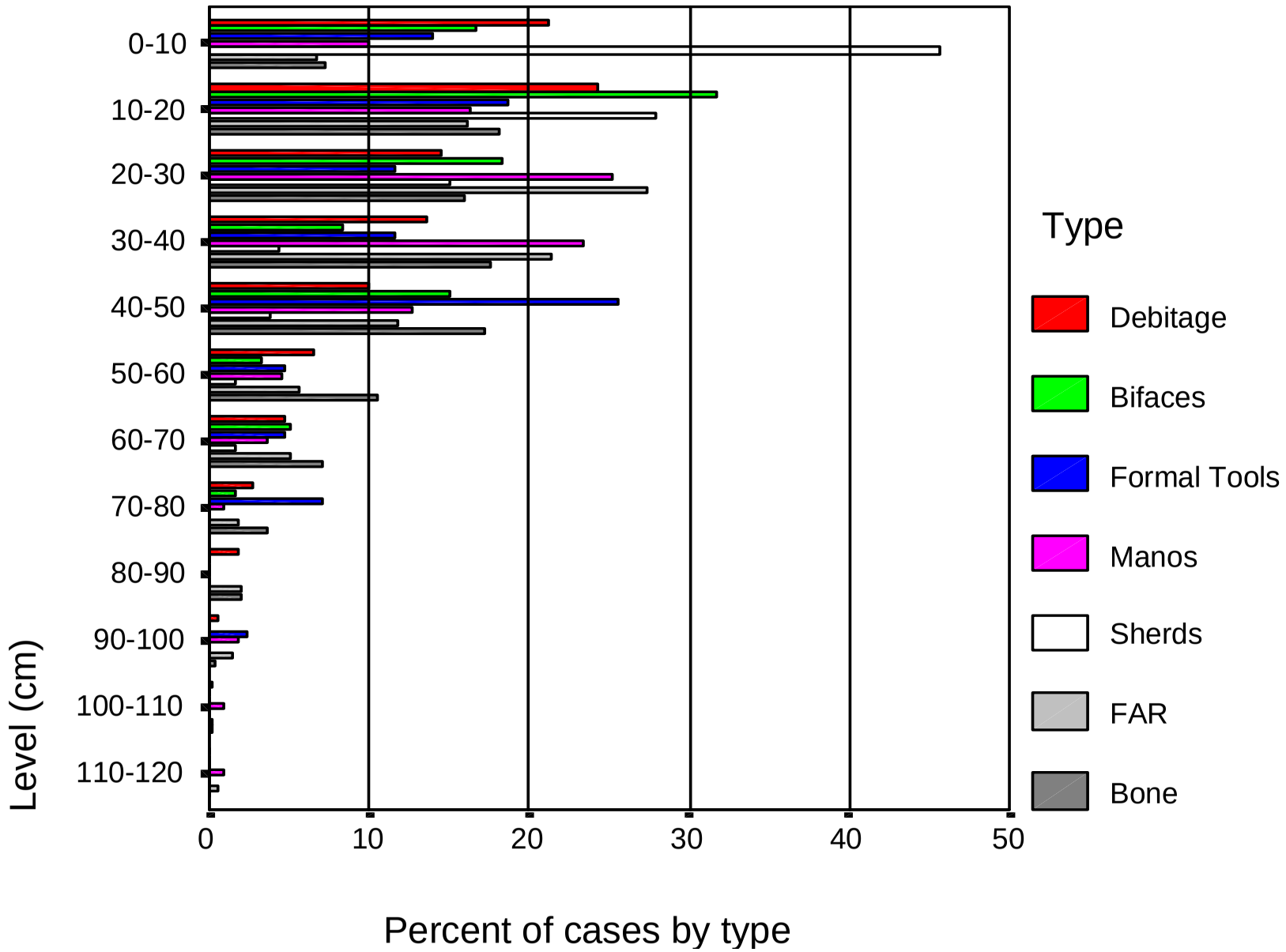
	Site Number CA-SDI-																	
Level (cm)	**7320 (1 unit)**	**7321 (1 unit)**	**7322 (2 units)**	**7324 (1 unit)**	**7325 (1 unit)**	**7326 (1 unit)**	**7751 (2 units)**	**7752 (1 unit)**	**7753 (3 units)**	**7754 (2 units)**	**7755 (4 units)**	**7756 (5 units)**	**7757 (3 units)**	**7758 (1 unit)**	**7759 (5 units)**	**7767 (1 unit)**	**7768 (1 unit)**	**Total**
0-10	7	-	97	25	26	29	66	1	132	44	301	316	246	44	314	4	4	1656
10-20	7	-	71	22	51	7	58	1	176	34	451	272	249	53	490	9	1	1952
20-30	2	3	67	17	29	17	34	4	80	29	241	177	156	29	242	-	1	1128
30-40	1	7	47	7	41	20	35	5	33	39	214	149	148	68	239	5	1	1059
40-50	-	1	52	-	15	6	47	5	31	28	233	133	94	23	170	1	-	839
50-60	-	2	11	-	4	23	28	8	21	30	161	76	28	51	80	3	-	526
60-70	-	-	15	-	-	12	17	3	12	12	174	30	-	15	95	-	-	385
70-80	-	-	16	-	-	6	-	1	2	4	106	7	-	-	75	-	-	217
80-90	-	-	10	-	-	1	-	1	4	-	31	1	-	-	93	-	-	141
90-100	-	-	5	-	-	-	-	-	-	-	9	-	-	-	27	-	-	41
100-110	-	-	2	-	-	-	-	-	-	-	-	-	-	-	5	-	-	7
Total	**17**	**13**	**393**	**71**	**166**	**121**	**285**	**29**	**491**	**220**	**1921**	**1161**	**921**	**283**	**1830**	**22**	**7**	**7951**

What these fluctuations each reflect is not certain. It seems possible that the variation in the near surface levels may be as a result of the accumulation since the last prehistoric occupation of a site (approximately 200 years ago), of a relatively thin layer of sterile wind borne dust and/or slopewash sediment, or a combination of both, on the surface of some sites. Such a thin build-up (possibly as much as 1 to 3 cm), over the last approximately 200 years, of culturally sterile material on a site surface would create a layer that could dilute the density of the cultural materials in the first ten centimeters excavated. While close scrutiny of the profiles did not reveal such a visually distinct layer overlying the cultural deposit, it would still seem likely that such

a layer could still be present. The other possible explanation is that the last occupation(s) of the sites was less intensive (e.g., fewer people may have lived here) and, consequently, less materials were deposited.

The deeper fluctuations are more problematic. Because nine sites have such a fluctuation at a depth, usually between 40 and 60 cm, it could reflect some minimal stratification of the cultural materials at these sites. Such stratification, if caused by cultural activity, could be reflective of differences in the intensity of occupation at the site at different times in the past. Just as indicated above for the 0-10 cm level, if fewer people lived at the site during some years, or lived there for a shorter length of time, or did not live there at all some years, such occurrences could serve to reduce the deposit of cultural materials for a period of time. The result might be reflected in the relative quantity of cultural materials at the site by depth. A few of these sites appear to manifest a vaguely bi-modal pattern that can be distinguished with a peak at approximately the 40-50 or 50-60 cm level, a subsequent abrupt decline, followed by a gradual increase in either the 10 to 20 or the 0-10 cm levels. This pattern, however, is only more than minimally distinguishable at four sites, SDI-7326, SDI-7751, SDI-7755, and SDI-7756. Two sites, SDI-7758, SDI-7759, have multiple fluctuations. What is indeterminate, however, is whether or not factors of disturbance (faunalturbation, etc.) would obliterate such fluctuations over a period of several hundred years. Differences between level totals are usually relatively small, as reflected in the fact that in the overall site totals, no bi-modal or other pattern is evident than gradual diminishment from the surface or near-surface, down (see Table VI-2; Figure VI-13). Qualitatively, within these sites, no notable patterns or differences were discerned to correlate with these fluctuations in either types or functions of artifacts.

As can be seen in Figure VI-14, overall, at the project sites, a few qualitatively notable materials, while consistent with an overall site pattern of gradual diminishment from the surface or near-surface, down, demonstrate a near exclusivity to the uppermost levels. Analysis of the vertical distribution of ceramics, obsidian, and Cottonwood Series projectile points identified a significant percentage occurring in the upper portion of the site deposits. Eighty-nine percent of all ceramics were recovered from depths from 0-30 cm. The greatest depth at which ceramics were found was 70 cm. Eighty percent of the sourced Obsidian Butte obsidian occurred from 0-30 cm. Overall, 66.7 percent (24 of 36) of obsidian identified through visual inspection as Obsidian Butte obsidian (including sourced specimens) occurred above 30 cm at the sites, with 94.4 percent of these materials occurring at or above 50 cm. Four of the six sourced pieces of Coso obsidian were recovered from the 10-20 cm level with one from the surface and another from the 60-70 cm level. For all excavated obsidian, 66.7 percent occurred at or above the 30 cm level and 82.5 percent above 50 cm with the maximum depth of occurrence in the 80-90 cm level. Seventy-five percent (9 of 12) of the Cottonwood Series projectile points occurred above the 30 cm level with 58 percent occurring from 0-20 cm. It should be borne in mind, however, that while these materials are substantially present in only the uppermost levels, it is also true that most of the cultural materials recovered also occurred primarily in the upper levels of the project sites (see Table VI-2, and Figure VI-13). This pattern, therefore, (i.e., maximum occurrence in the upper levels followed by gradual diminishment in the lower levels) is the general one for the vertical occurrence of cultural materials at the sites. The only exception noted to this pattern (other than the fluctuations discussed above) was the occurrence of marine shell, of which 80 percent, by weight, occurred below the 40 cm level. By count, however, 78 percent of this material occurred from 0-30 cm.



Vertical Distribution of Select Types of Cultural Material

Figure VI-13

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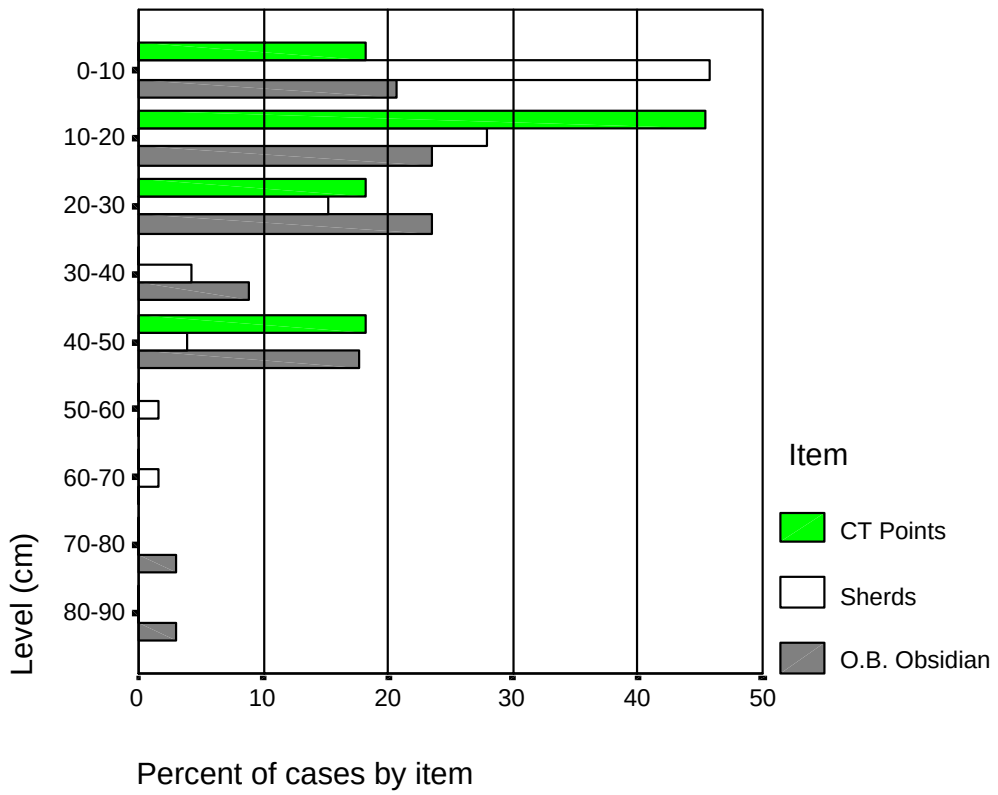

Vertical Distribution of Diagnostic Artifacts
Figure VI-14

C. Horizontal Cultural Stratigraphy

Two levels of horizontal stratigraphy are recognized for the sites within the project area. The first of these levels involves site boundaries. With the proximity and apparent contemporaneity of the prehistoric occupation of the area, in an overall sense, the boundaries of each site represent a delineated horizontal stratum of the overall occupation of the area (Map VI-1). These boundaries, while somewhat arbitrarily drawn, are based on a perception of activity foci representing combinations of concentrations of several criteria including surface artifacts, features, and/or the presence of subsurface deposits. An absence or near absence of these criteria represents evidence for a stratum or site boundary. The second level involves the horizontal arrangement of cultural elements within these defined site boundaries. The area of a defined deposit, for example, expressed horizontally within a site, represents a cultural stratum of the site. Other distinguishable activity foci such as milling feature clusters, surface feature clusters such as rock rooms, and surface artifact concentrations, may also represent other distinct and/or overlapping horizontal strata expressed within a site. While no formal analysis of either the inter or intra site horizontal stratigraphy was attempted in this testing program, the mapped results, as depicted in Map VI-1, indicate the horizontal relationships of several of these various criteria within and between site areas.

D. Subsurface Features

Features are defined here as discrete concentration areas within the site or site deposit that contain configurations potentially created by, and consequently, indicative of a specific human activity, or demonstrable intensity of several activities. Only one possible subsurface feature (Feature 1) was encountered in the Phase II units. While it appeared to be a discrete concentration, no distinct configuration could be discerned. Consequently, a definite cultural origin for this feature, is not certain. It was discovered at site CA-SDI-7756, and consisted of a cluster of large subangular granodiorite rocks resting on granodiorite bedrock. Feature 1 is described and discussed below.

1. Feature 1

Feature 1 was discovered in Unit 2 (N442 W279, Grid A) in the northwest corner of site CA-SDI-7756. As shown in Figure VI-15 and Plate VI-1, it consisted, principally, of a cluster of large (> 20 cm), non-fire-affected granodiorite rocks in a matrix of dark organic soil resting on decomposing granodiorite and/or granodiorite bedrock. It was initially encountered within the 10 to 20 cm level and it extended to a maximum depth of 67 cm from the ground surface (Figure VI-16). Horizontally, it extended into the west, south, and east walls of the unit (see Figure VI-15). Within the unit the cluster measured, roughly, 1.0 m east-west by 0.85 m north-south. Most of the rocks in the feature are subangular in shape and lack a significantly developed cortex. The soil matrix in the unit is a very dark brown 10YR 2/2 silty sandy loam. No artifacts were identifiably contained within the cluster itself, but within the soil matrix of the unit and feature, encompassing the levels from the surface to bedrock, a high density of cultural materials was recovered. These included: 9.3 grams of charcoal, 2 flaked stone biface fragments, two mano fragments, 25 pottery sherds, 2 pieces of modified bone, 1 piece of shellfish shell, 402 pieces of animal bone, and 263 pieces of flaked stone debitage. A radiocarbon date was secured from a sample of the charcoal from the 40-60 cm levels of the feature unit. The results produced a date of 100±40 B.P. uncalibrated (i.e., circa A.D. 1850) (see Section XII).

The function of this feature is uncertain. It is situated immediately adjacent to ten bedrock milling features (milling features 47 to 56) distributed along the rock ledge overlooking the unnamed drainage (and current pond) approximately 50 m to the northwest. While small amounts of charcoal were present in the soil, the feature rocks themselves did not appear to be fire affected. It seems unlikely, therefore, that the cluster constitutes a hearth, or a cooking, baking, or roasting pit, or oven structure (cf. Smith 1986:70). It may represent a portion of a rock wall or wind break structure. The exposure in the unit, however, is too limited (i.e., the feature extends into the walls) to determine whether the stones were “stacked” or placed as part of a larger configuration. Such stacking within bedrock outcrops to create “rock rooms” has been documented within adjacent site CA-SDI-7757, along the same drainage, approximately 300 m to the east of this location (see Section VIII). So a precedent for such a structure is present within the site complex.

Map VI-1. Site Boundaries and Subsurface Deposit Concentrations

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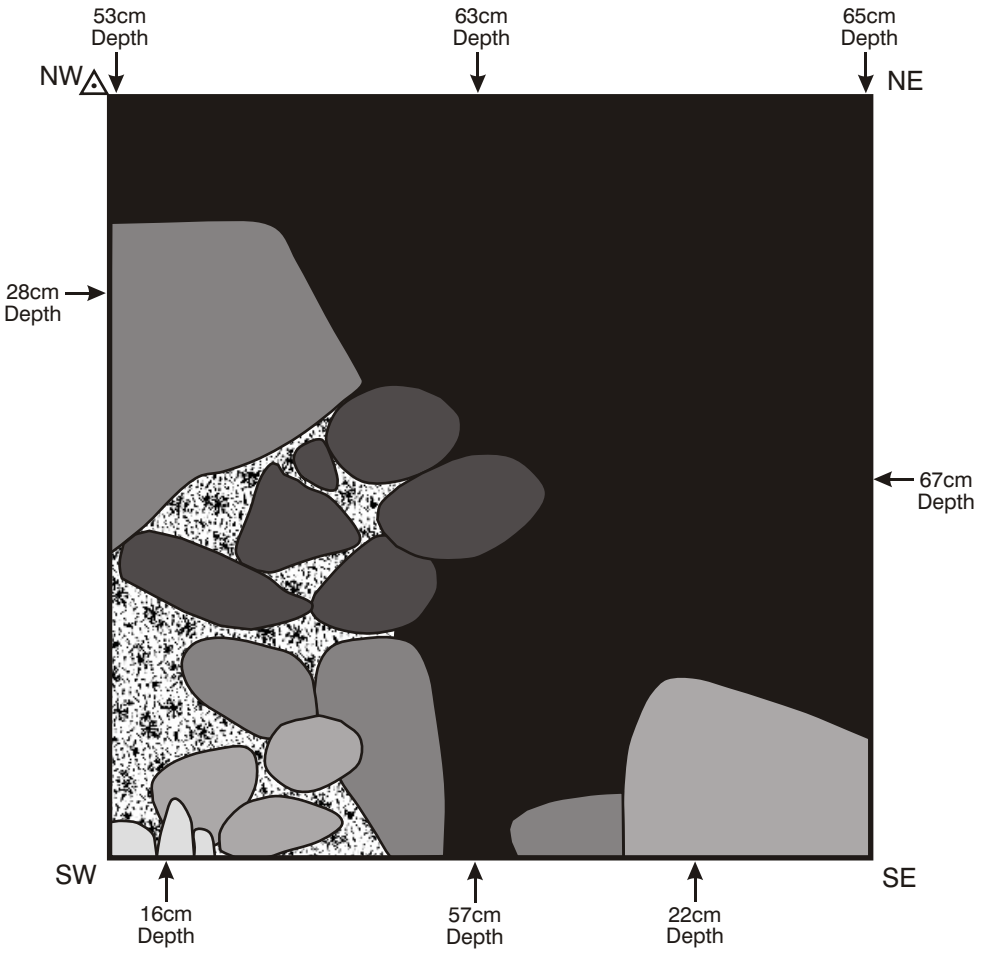

Stratum I Soil. Very dark grayish brown sandy loam, soft, humus with few fine rootlets, 10% sub-angular gravel. 10 YR 3/2.

Granite Cobbles. Shades increase in darkness according to increase in depth.

Bedrock

Mooney & Associates

N

0 5 10cm

Oak Country Estates
CA-SDI-7756 - Unit 2
Subsurface Feature 1 - Floor Plan

Figure VI-15

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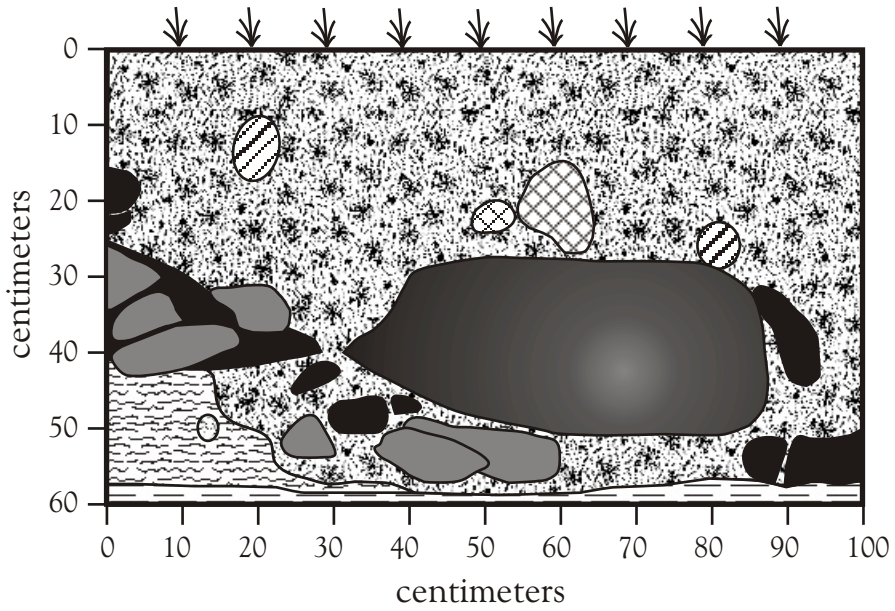

Stratum I Soil. Very dark grayish brown sandy loam, soft, humus with few fine rootlets, 10% sub-angular gravel. 10 YR 3/2.

Stratum II Soil. Yellowish brown sandy loam, with many coarse distinct mottles of very dark grayish brown, soft, 10% sub-angular gravel. 10 YR 5/3.

Stratum III. Solid granite floor.

Granite rocks near wall.

Granite rocks >30 cm east of wall.

Rodent hole

Krotovina

Mooney & Associates

Oak Country Estates

CA-SDI-7756 - Unit 2 - West Sidewall Profile

Figure VI-16

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A.) CA-SDI-7756, Unit 2, 0-60cm, Floor, View to South

B.) CA-SDI-7756, Unit 2, 0-60cm, Floor & West Wall, View to West

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VII. FLAKED STONE ARTIFACTS

A. Introduction

This section presents the results of the analysis of the flaked stone artifacts from the thirty-two sites investigated during the Extended Phase I and Phase II testing programs on the Oak Country Estate property. The description, and the qualitative and quantitative analyses, will include the materials from both programs. Presented first below is a description of the types and sources of the flaked stone raw materials represented at the sites. This is followed by the description and analysis of the flaked stone artifacts recovered.

B. Flaked Stone Raw Materials Represented at the Sites

1. Introduction

As previously discussed in Section III, the prehistoric importance to prehistoric hunter-gatherers, of flaked stone tools cannot be overemphasized because they represented such a large percentage of their subsistence tools. Because their influence within, and upon, the hunter-gatherer mobility system is substantial, the importance of the procurement of fine-grained lithic raw materials with the property of conchoidal fracture, from which a large percentage of these tools were made, also cannot be overemphasized. In modern terms these materials were to their tool industry like iron, steel, and plastic are to us today. Such lithic materials, especially those of the best quality, were also relatively rare and often restricted in accessability in the natural environment. It was, therefore, essential for prehistoric hunter-gatherers to know very well what materials were available in their environment and where to find them. Due to the importance of these resources and their frequently restricted accessability, hunter-gatherer groups had to plan for, and incorporate, the procurement of these resources into their subsistence and mobility strategies. Recognition of this causal or influential factor in the mobility and procurement ranges will allow for a better understanding of the settlement and subsistence patterns of mobile hunter-gatherers.

Researchers such as Pigniolo (1992) and Norwood (1979, 1982) have previously conducted research, locally, attempting to inventory the range of raw material resources for flaked lithic tools available to the prehistoric inhabitants of coastal San Diego County. As indicated below, by far, the two flaked lithic raw materials most frequently used at the project sites (92.9 percent), were varieties of metavolcanics from the Santiago Peak Volcanics (SPV) Formation (50.6 percent) and milky quartz (42.3 percent). All of the other materials, combined, constituted only 7.1 percent of the flaked stone materials.

2. Raw Material Definitions and Percentages

Eleven rock types categories were defined as raw materials for the flaked lithic assemblage. The definitions presented are an effort to allow objective comparison with other studies.

1. Santiago Peak Volcanics (SPV) Formation metavolcanics (50.6 percent). The most used material at the sites, these partially metamorphosed materials form a significant part of the bedrock of the local Peninsular Ranges mountains, extending north into Orange County and south into Baja California (Norris and Webb 1976). The rocks of the Santiago Peak Volcanics Formation formed during early Cretaceous Period times (Abbott 1999:24), possibly, originally as part of an island arc. They consist of andesitic, and to a lesser degree rhyolitic, volcanic rocks that have undergone varying amounts of metamorphosis (Jahns and Lance 1950). While the degree of metamorphosis is highly variable, most exhibit at least some degree of low-grade metamorphism.

   According to Williams (1985) this low-grade metamorphism often transforms the andesites and rhyolites through recrystallization and replacement of feldspar by quartz. This recrystallization

creates a more flakeable material due to the increased quartz content and more homogeneous texture. The andesitic varieties of the SPV metavolcanics vary in color from green to gray-green purple, to purple-dark grey, to essentially black. In different specimens these colors can be seen to gradate from one into another. The rhyolitic variety, is usually lighter green and more fine grained than the andesitic rocks. Many of these andesitic rocks are porphyritic with light-colored phenocrysts, usually of feldspar. The texture varies from fairly coarse-grained and/or porphyritic to aphanitic and fine grained. The textural variations of the SPV metavolcanics are perhaps the most significant differences, archaeologically. These differences appear to have had the greatest influence on what stones were selected for use as a particular kind of tool. As will be seen later, coarse-grained varieties were used for larger tools including scraper planes, chopping tools, and hammerstones, while finer grained varieties were used for smaller flake tools, bifaces, and projectile points. Regardless of texture, however, these rocks all manifest some degree of the property of conchoidal fracture. It is this property that makes them so useful for the manufacture of flaked stone tools. Not surprisingly, coarse-grained varieties were more frequently used for larger flaked stone tools as well as for some ground stone tools.

2. Quartz. The second most used material at the sites (42.3 percent), the category quartz consists mainly of milky quartz, but some specimens of clear quartz crystal were also recovered. This material is used exclusively for flaked stone tools and is essentially another fine-grained rock material. It does, however, lack some of the fine-grained characteristics of other materials such as chert and obsidian. Milky quartz is crystalline rather than microcrystalline in texture and consequently does not have the same degree or consistency of conchoidal fracture predictability as materials such as chert and obsidian. Never-the-less, based on the percentage present, it was a favored material at the sites for the manufacture of smaller tools such as projectile points. Milky quartz can derive from pegmatite dikes in the granitic rocks of the Southern California Batholith, which also forms an even greater part of the bedrock of the local Peninsular Ranges mountains. It can also derive from cobbles in local sedimentary formations.

3. Quartzite, while the third most used material at the sites, constituted 4.4 percent. It was a relatively fine-grained material of various colors, but mostly tan or pinkish tan. These materials are assumed to have derived from ancient cobbles of unknown bedrock origins embedded in local sedimentary formations.

4. Piedra de Lumbre (PDL) chert constituted only 0.2 percent. This fine grained material has high proportions of detrital quartz crystals in the matrix. It derives from Cretaceous age sedimentary formations exposed only in northwestern San Diego County. Colors range between gray, yellow, orange, red, and brown, and small pieces of archaeological debitage or projectile points are frequently polychrome. Projectile points are frequently produced from this source material which suggests that it is a fine medium for tool production. Specific sources have been recorded by Pigniolo (1992) and Apple and Cleland (1994).

5. Jasper (0.3 percent). This material is a chert that is colored nearly exclusively by iron resulting in either a red or yellow-orange coloration.

6. Miscellaneous cherts (0.3 percent) were those cherts that differed from the above aphanitic silicates in major attributes. In general, while chert can be formed in several different geologic circumstances, most commonly it is formed in sedimentary rocks. Most basically, within a formation, silica is dissolved into solution and then is redeposited as a precipitate elsewhere within the formation, sometimes as a layer and sometimes in pockets. In this redeposited form it has properties of homogeneous structure and aphanitic texture. One constituent of this catch-all category of fine grained materials is silicified wood. This material is defined here as a chert but its formation is unique. It forms as a silica replacement for what once was a living tree or shrub. In this case the

silica in solution fills in the "pocket" left by the decaying vegetation. Interestingly, the replacement takes place on such a minute basis that the internal structure of the plant is retained and expressed in the replacement stone. Locally, this material is generally brownish, in color and often has a distinct remnant wood grain or vascular structure visible. Each of these raw materials was rare.

7. Chalcedony (0.2 percent) is a fine grained siliceous material distinguished from the cherts by it translucent quality. While there are also petrogenetic differences between chert and chalcedony, the quantities of this stone were so low that it is not really important elaborate on them here.

8. Obsidian (0.6 percent), a natural volcanic glass, is a rare but important raw material that does not have a natural source within San Diego County. Because of its superior workability, it was highly valued by prehistoric people as a material for the manufacture of flaked stone tools. Most of the obsidian from the project sites was procured from Obsidian Butte, a source in southeastern California. A few pieces derived from the Coso Volcanic Field and Casa Diablo, both in east central California, and from an unknown source.

9. Metasediments (Bedford Canyon?) (0.6 percent), used for flaked stone tools, consist mostly of meta-mudstones (meta-argillite) and meta-sandstones (quartzite). Its most consistent visual attribute is it's coloration, usually a dark blue gray to nearly black. The weathered surface, however, is usually light gray in color. Similar to the SPV metavolcanics, the metamorphosis of these sediments varies in intensity, such that, these materials are not always sufficiently homogeneous to be useful for the manufacture of all types of flaked stone tools. Along with the SPV metavolcanics and the granitic rocks of the Southern California Batholith, this formation forms a significant portion of the bedrock core of the western mountains of the Peninsular Ranges. It is the oldest of these core bedrock formations, dating to the Jurassic Period, and like the SPV metavolcanics, it likely formed as part of ancient island arcs. As with the SPV metavolcanics these islands have since drifted on the Pacific plate to the continental coast of California where they have become part of the current continental coastline. The andesitic SPV volcanic magmas (now metavolcanics) intruded the already existing Bedford Canyon sedimentary (now metasedimentary) rocks during Cretaceous times. Because of the inconsistent structure and variable property of conchoidal fracture, this type of rock is not as useful for flaked stone manufacture requiring micro-conchoidal fracture. It is useful, however, for larger tools such as hammerstones and scraper planes because, while not as hard as the metavolcanics, it is a heavy dense stone and these larger tool types require less precise predictability of fracture to manufacture. This formation may contribute small amounts of float material to local drainages such Santa Maria Creek from small local outcrops and/or from the mountains farther to the east, which also contain outcrops of this formation (Weber 1963).

10. Granodiorite and Gabbro (0.1 and 0.1 percent, respectively). In general these granitic rocks do not readily exhibit the property of conchoidal fracture. They are granular in texture and, consequently, they are more commonly associated with ground stone tools. They do occasionally occur, however, in the flaked stone category, mostly as materials used for hammerstones and/or large digging chopping tools. Flakes can sometimes be generated by manufacture or shaping on ground stone tools. The source of these materials is immediately local as they form the bedrock within the project property, i.e., the Woodson Mountain Granodiorite Formation and the San Marcos Gabbro Formation.

11. Cobble Volcanic (<0.1 percent). These materials consist of volcanic rock types that are not commonly associated with SPV metavolcanics, and therefore, are assumed to have derived from ancient cobbles of unknown bedrock origins embedded in various cobble formations in the area (e.g. the Poway Conglomerate Formation).

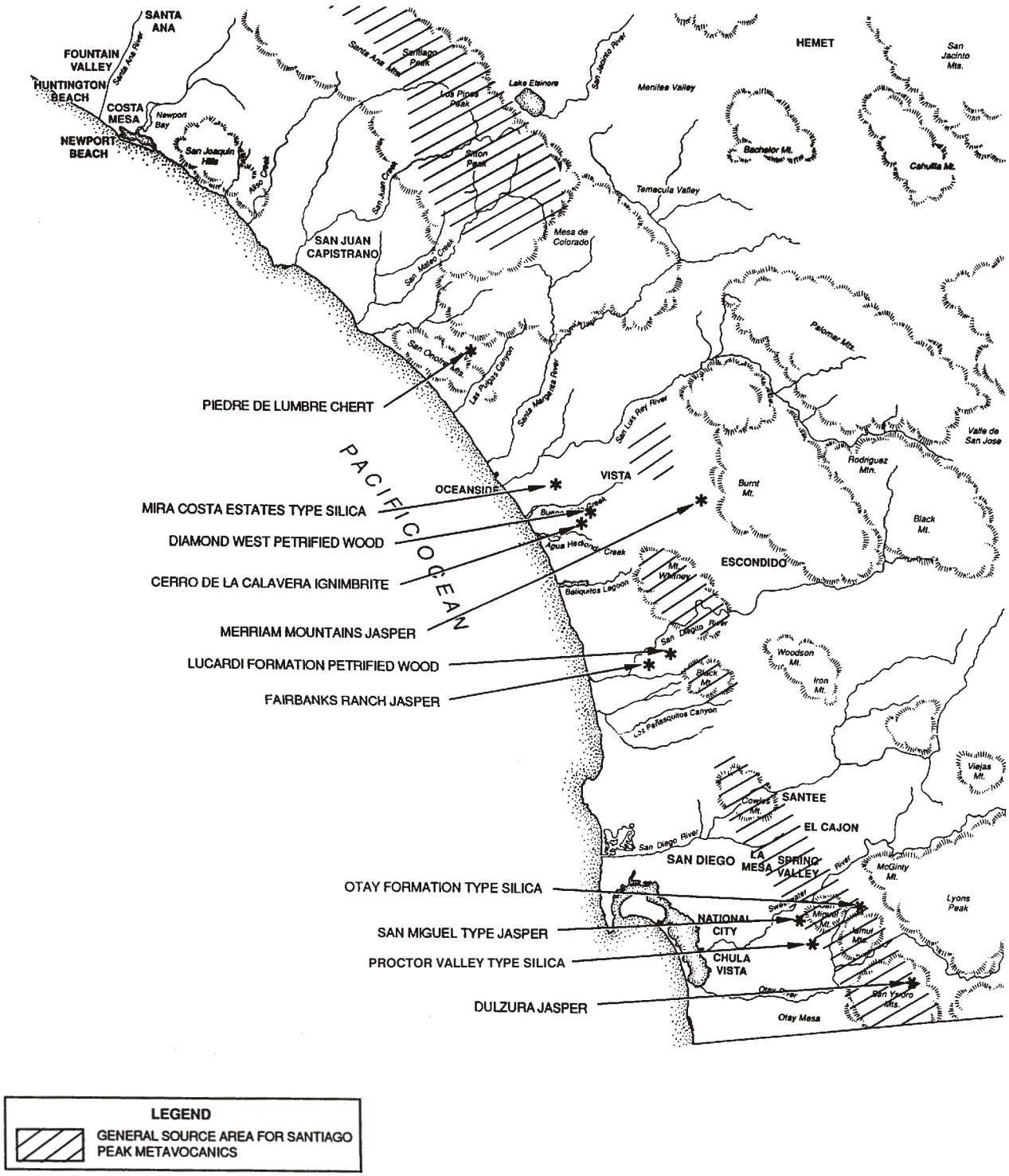
12. The "unknown" or other category (0.1 percent) included a small number of materials of which the origin and type could not be determined.

3. Source Proximity of Site Lithic Materials

Relative to the project sites, the nearest bedrock outcrops of the SPV metavolcanics are approximately 12 kilometers to the west along the San Dieguito River Valley. They are exposed beginning at Lake Hodges and extending west. Having existed since Jurassic times, they have, however, contributed substantial amounts of rock in cobble form to several of the later Cenezoic sedimentary formations present in the coastal San Diego County area. These have then been re-eroded into drainages and are now present in some drainages as secondary depositions. The amount of this material available from this secondary source, locally (in the Ramona area), however, is not known. The source(s) of milky quartz, the second most utilized flaked stone raw material, is, along with quartzite, probably the most immediately local. Milky quartz can derive, primarily, from two possible local geologic sources: from the numerous pegmatite dikes exposed in the granitic bedrock on the property and elsewhere in the vicinity (cf. Saunders 1993: 55-56), and from local sedimentary formations containing cobbles such as are present in the southern project area (Plate VII-1A and 1B). Crystalline quartz was observed to be present in some of the larger dikes in the granodiorite outcrops in and around several of the project sites. Two sites in particular (SDI-7753 and SDI-7768) had exposed and fragmented dikes that may have been quarried (Plate VII-2A and 2B). Numerous cobbles of milky quartz were observed to be present amongst scatters of cobbles on the surface in the southern project area. Quartzite, the third most popular flaked stone material at the project sites is also readily available in proximity to the sites. Quartzite occurs as cobbles in the same local sedimentary formations in the southern project area that also contain numerous cobbles of milky quartz. Quartzite cobbles, however, were much more numerous amongst scatters of cobbles on the surface in this area.

Metasedimentary materials, most likely from the Bedford Canyon Formation, may have been picked up, either in the Santa Maria Creek drainage, or were procured directly from a few small outcrops present in the Santa Maria Valley (Weber 1963).

The sources of some of the more specialized siliceous materials such as obsidian, jasper, silicified wood, PDL chert, and miscellaneous chert and/or chalcedony, while possibly local, are less definite. Map VII-1 indicates the local sources for some of the siliceous rocks described below. Each of these types represents only a small percentage of usage at the sites, i.e., one percent or less. Obsidian represents a definitely exotic flaked stone raw material at the sites. The closest known source of obsidian is Obsidian Butte near the Salton Sea, in Imperial County, approximately 135 kilometers (85 miles) from the project sites. The closest source of PDL chert is on Camp Pendleton at a distance of approximately 62 kilometers (39 miles) from the project sites (Pigniolo 1992). Sources for jasper have been discussed as available in San Diego County by Norwood (1979; 1982) and Pigniolo (1992) including one near Del Mar (Fairbanks Ranch jasper), approximately 25 kilometers west from the project area, and another just north of Escondido (Merriam Mountains jasper), approximately 20 kilometers northwest from the project area. While the specific source of silicified wood is not known, several possible sources have been suggested by Norwood (1979; 1982) and Pigniolo (1992) in San Diego County, including one just south of Rancho Santa Fe (Lucardi Formation petrified wood), approximately 20 kilometers west from the project area. Chalcedony shares some visual similarities with translucent varieties of chert such as sometimes are present as layerings in some cherts. While there are petrogenetic differences between chert and true chalcedony, with the latter deriving from a source other than a sedimentary formation such as chert, the quantities of this stone were so low that speculation as to possible sources for such chalcedony are not worth attempting.



Modified from Pigniolo 1992

Mooney & Associates

N

0 6 12 Miles

0 9.7 19.3 Km

Oak Country Estates

Locations of Cryptocrystalline Silica Rocks in San Diego County

Map VII-1

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A.) Surface Cobbles at CA-SDI-16078, View East

B.) Granite with Pegmatite Dike at CA-SDI-7768, View Northwest

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A.) Quartz Quarry Location at CA-SDI-7753, View West

B.) Quartz Quarry Location at CA-SDI-7768, View Northwest

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C. Flaked Stone Assemblage Analysis Results

1. Introduction

As stated above, this section presents the results of the analysis of the flaked stone artifacts from the thirty-two sites investigated during the Extended Phase I and Phase II testing programs (Table VII-1). A total of 9,287 flaked stone artifacts were recovered from the thirty sites including twenty-four cores, thirty utilized/modified flakes and chunks, thirteen uniface tools, sixty-seven biface tools, thirty-eight percussing tools, and 9,115 pieces of manufacturing debitage. These materials were analyzed consistent with the Research Plan developed for the program derived from this and other previous work in the area.

Table VII-1. Summary of Flaked Stone Artifacts by Recovery Method

	Artifact Type																		
Site No. CA-	Debitage			Cores			Modified Flakes			Unifaces			Bifaces			Percussing Tools			
SDI-	Surf	STPs	Units	Surf	STPs	Units	Surf	STPs	Units	Surf	STPs	Units	Surf	STPs	Units	Surf	STPs	Units	Total
7317	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
7320	-	10	17	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	28
7321	-	19	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	31
7322	-	139	374	-	-	1	-	-	-	-	1	1	-	-	2	-	1	1	520
7324	-	65	68	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	135
7325	-	27	159	-	-	2	-	-	-	-	-	-	-	-	2	-	-	1	191
7326	-	36	119	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	156
7751	-	132	268	-	-	2	-	2	2	-	-	1	1	1	-	4	2	-	415
7752	-	26	23	-	-	-	-	-	2	-	-	-	-	-	-	-	-	3	54
7753	-	130	441	-	1	1	-	-	1	-	-	1	2	1	4	-	-	1	583
7754	-	27	199	-	-	-	1	1	1	-	-	1	1	1	1	1	-	1	235
7755	-	321	1842	-	1	2	1	2	7	-	1	1	-	-	9	-	4	8	2199
7756	-	220	991	-	3	3	-	3	1	-	-	1	-	2	14	-	2	2	1242
7757	2	155	895	-	-	1	-	-	-	-	-	2	1	1	5	-	1	1	1064
7758	-	67	269	-	1	3	-	-	2	-	-	-	-	1	1	-	2	1	347
7759	-	228	1786	-	1	2	-	1	1	-	-	1	1	-	15	-	1	1	2038
7760	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5
7764	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
7767	-	9	21	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	31
7768	-	2	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9
15981	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
16076	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
16077	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
16078	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
16079	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
16080	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
16081	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
Total	**2**	**1622**	**7491**	**0**	**7**	**17**	**2**	**9**	**19**	**1**	**3**	**9**	**6**	**7**	**54**	**5**	**13**	**20**	**9287**

The majority of tools used for activities other than grinding are made by the removal of flakes from a mass of raw material (or core). Flaked stone artifacts are typically the most common form found at many prehistoric sites. They consist not only of tools but also the worked source stone (cores) and the residual debris (debitage) from the manufacture of these tools. The flakes removed from cores are either used as a smaller tool base or to shape the larger mass into an appropriately sized or configured implement. Alternatively, some tools are created simply by using a suitable unmodified stone, either a whole cobble or a fragment, and the resulting use-damage is the only indication of cultural alteration. In this analysis, for

instance, stones displaying extensively battered or crushed edges are designated as percussing tools (hammerstones) and are discussed with the flaked stone artifacts even tho some of these tools do not have a flaked base form. Uniface and biface tool categories refer to the way that tools were worked during manufacture, i.e., flake edges were worked in either one (unifacial) or two (bifacial) directions. Flaked stone artifacts are also categorized by tool types with names based on implied function (e.g., hammerstones, chopping tools, scrapers, projectile points and knives). In general, the term, "formal tools," implies not only use but some degree of working beyond minimal retouch in order to create the tool. These functionally named classifications, however, have been used for many decades by archaeologists and the morphological criteria that define them are well documented in the archaeological literature for the southern California coastal area. Special analytical significance in archaeology is often attributed to one group of flaked stone formal tools, biface tools (primarily projectile points and knives). Much attention has been payed in the archaeological literature to the manufacture and stylistic relevance of these tools. Presented below are the results of the current flaked stone analysis.

2. Core Results

Twenty-four cores were recovered, all from the excavations. Unit excavations produced seventeen cores and STP excavations seven (see Table VII-1). Cores can be defined as a nucleus stone, of suitable raw material, manifesting one or more negative flake scars that do not exhibit evidence of use as a tool. Suitable material indicates a rock material that is rich in silica, homogeneous in texture, and has the property of conchoidal fracture. Basic core preparation usually involves fracturing a cobble or piece of quarried material such that a flat platform is created. The edge of this platform is then used to remove flakes that can be used as tools or as blanks from which to make a formal tool such as a projectile point or scraper. Core "types" are based on the number of platforms and directions that flakes have been struck from the core: unidirectional (one platform), bidirectional (two platforms), multidirectional (multiple platforms), bifacial (one platform - two directions), and indeterminate (usually the result of being incomplete). In regard to the description of a core as being whole or complete, since the intention is to reduce a core to produce flakes to use as tools or for the manufacture of other tools, the terms whole or complete are, at best, estimates on the part of the analyst of what might represent a complete item.

The ways and degrees to which cores are reduced can often be indicative of the technological intentions and constraints of the people who produced them (Shackley et al. 1989). Constraints include raw material quality and availability. The degree of reduction of a core can reflect these constraints. Multidirectional cores often with considerable working may be indicative of a need for maximum production from available raw material.

This could also be suggestive of intensive core reduction indicating a significant investment in time and energy at the site. Of these twenty-four cores, only five retain a portion of waterworn cortex. While only two of the quartz specimens retain any waterworn cortex, it seems likely that most of these cores originated from cobbles. The large number of small core fragments (n=5) and small, apparently "spent", quartz specimens (n=9) indicates, both that the original cobble was probably not very large and that the procurers made maximum usage of the material before discarding a core.

Horizontally, within the sampled site areas (units and STPs), the distribution was clustered with nine of the thirty-two sites producing all of the twenty-four cores and core fragments and seven of the nine producing two or more cores. One site, SDI-7756, contained the most with six. The site with the greatest density of cores per cubic meter was site SDI-7758 with 1.96 followed by sites SDI-7325 with 1.63, SDI-7756 with 0.83, SDI-7751 with 0.58, SDI-7753 with 0.43, SDI-7759 with 0.41, SDI-7757 with 0.35, and site SDI-7322 with 0.22. Vertically, cores or core fragments were found in all levels of the sampled site areas from 0 to 60 cm. Nearly half (45.8 percent) of the cores were recovered between 20 and 40 cm with 75.0 percent recovered from above 40 cm. The 30 to 40 cm level had the highest density producing eight cores or 33.3 percent.

Using the excavated samples (units and STPs) to compare, the predominant raw materials of the cores are, not surprisingly, the same ones which constitute most of the debitage at the sites (Table VII-2). The two most abundant are present, however, in reverse order between core proportions and debitage. The raw material of the greatest number of cores is quartz with 62.5 percent, but quartz is second in debitage with 42.4 percent. The SPV metavolcanics rank second with 25.0 percent of the cores but first with 50.7 percent of the debitage. Other raw materials represented include, quartzite with 4.2 percent of the cores and 4.4 percent of the debitage, miscellaneous cherts with 4.2 percent of the cores and 0.3 percent of the debitage. The materials of the cores correspond to 97.8 percent of the raw materials represented in the debitage. The materials of the remaining 2.2 percent of the debitage, including metasediment (0.6 percent), obsidian (0.6 percent), PDL chert (0.4 percent) and miscellaneous (0.6 percent), are present in such limited quantities that the recovery of a core representing any of these materials would be fortuitous considering the limited overall sampling percentage recovered. It would also seem probable, in regard to the obsidian and PDL chert, that all or most of the debitage from these materials derived from biface tool reduction and maintenance activities and not from platform core reduction. Also a factor in the lack of cores for these materials is that in hunter-gatherer assemblages it might be expected for obsidian and PDL chert cores to be conserved and curated items due to their rarity and importance.

Table VII-2. Core Distribution and Attributes

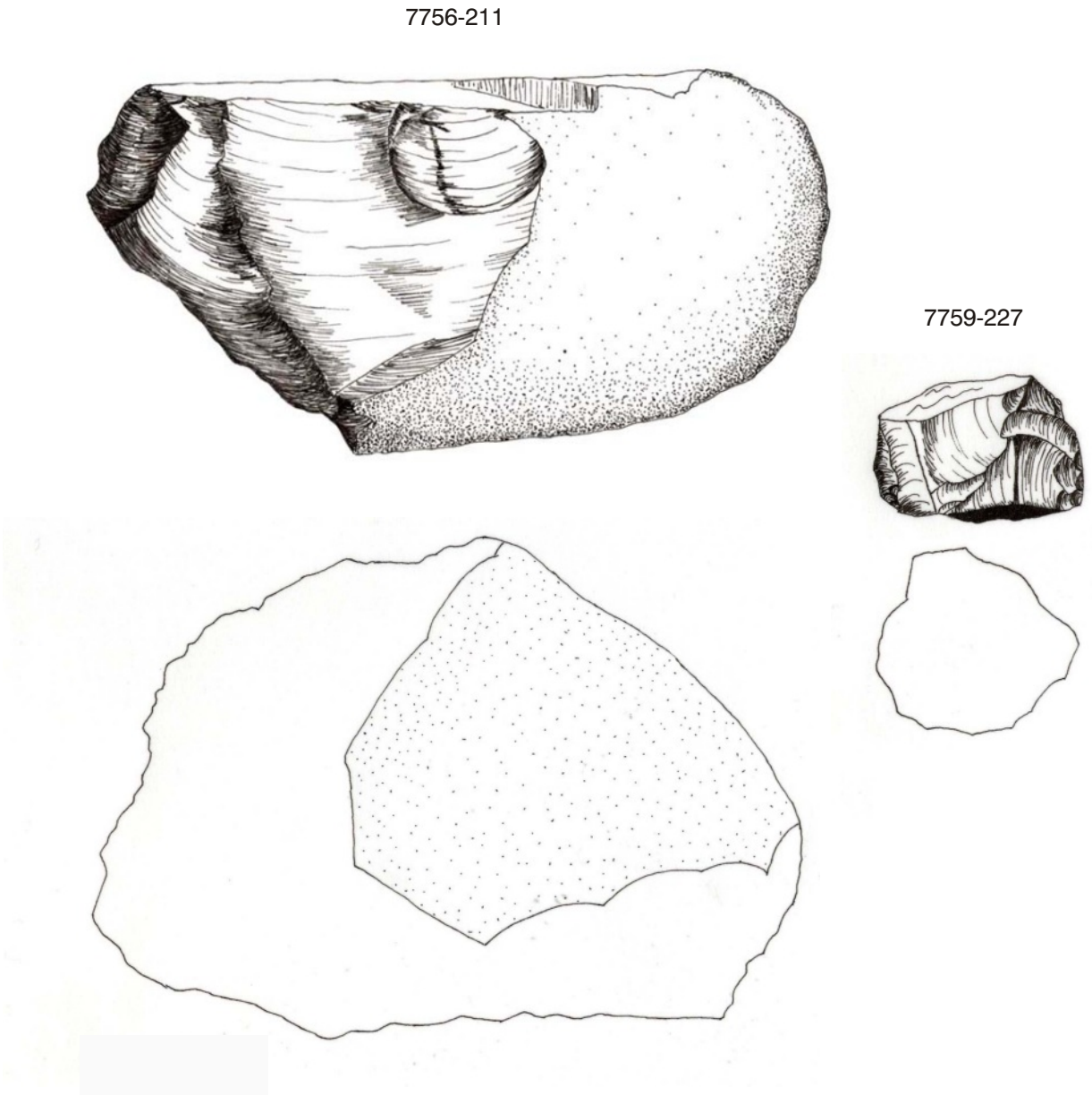
Site CA-SDI-	Cat. No.	Provenience		Coordinates N/S	Coordinates E/W	Level (cm)	Cond	Exp	Pat	Cortex	Material		Dimensions (cm) L	W	T	Wt (g)
Unidirectional																
7756	*211*	Unit	1	N450	W138	30-40	W	-	N	W	SPV	P	10.9	7.4	5.8	528.7
7756	113	STP		N520	W120	20-30	W	Y	-	A	QTZ	C	2.1	1.2	0.7	1.6
7756	258	Unit	4	N550	W126	20-30	F	-	Y	S	SPV	P	7.2	7.0	5.6	326.4
Bidirectional																
7757	97	Unit	1	N470	E067	30-40	W	-	D	S	SPV	A	7.3	4.8	3.1	149.4
Multidirectional																
7322	120	Unit	1	S097	W168	40-50	W	-	D	N	SPV	A	5.7	4.2	3.4	117.7
7751	88	Unit	1	S059	W022	20-30	W	-	-	N	QTZ	M	5.8	4.8	4.4	142.2
7753	32	STP		N040	W040	10-20	W	Y	-	N	QTZ	M	2.1	1.8	1.0	3.5
7758	60	Unit	1	N188	W001	30-40	W	Y	-	N	CHT		2.5	2.0	1.4	4.3
7759	200	Unit	1	N319	E192	30-40	W	Y	-	N	QTZ	M	2.5	2.2	1.6	6.9
7759	*227*	Unit	2	N231	E200	10-20	W	Y	-	N	QTZ	M	3.2	2.9	2.9	20.5
7759	27	STP		N160	E120	30-40	W	-	-	S	QTZ	C	5.3	4.8	2.5	48.7
7755	209	Unit	2	N696	E058	0-10	F	Y	-	N	QTZ	M	-	-	-	8.1
Bipolar																
7755	259	Unit	3	N708	E028	50-60	W	Y	-	N	QTZ	M	2.5	1.9	1.4	7.8
7758	67	Unit	1	N188	W001	50-60	W	Y	-	N	QTZ	C	1.8	1.2	0.8	1.1
Indeterminate Fragments																
7325	26	Unit	1	N096	E176	40-50	F	Y	-	N	QTZ	M	-	-	-	13.9
7325	29	Unit	1	N096	E176	50-60	F	-	-	S	QTZ	M	-	-	-	49.2
7751	94	Unit	1	S059	W022	30-40	F	Y	-	N	QTZ	M	-	-	-	10.0
7753	61	Unit	1	S009	W005	0-10	F	Y	-	N	QTZ	M	-	-	-	13.0
7755	41	STP		N730	W018	50-60	F	-	-	N	QTZ	C	-	-	-	10.0
7756	212	Unit	1	N450	W138	30-40	F	Y	-	N	QTZ	M	-	-	-	5.9
7756	77	STP		N456.5	W120	30-40	F	-	-	W	QTE		-	-	-	113.3
7756	122	STP		N540	W120	10-20	F	-	-	N	QTZ	C	-	-	-	1.6
7758	52	Unit	1	N188	W001	10-20	F	-	Y	N	SPV	A	-	-	-	54.4
7758	7	STP		N180	E0	10-20	F	-	N	N	SPV	A	-	-	-	12.4

Italicized cat. no.s indicate those items that are illustrated in figure
Cond (condition): W = whole; F = fragment
Exp (expended): Y = yes; - = not applicable
Pat (patination): N = not apparent; Y = present; D = differential; - = not applicable
Cortex: N = none; W = waterworn; S = subangular; A = angular
Material: SPV = metavolcanic; QTZ = quartz; QTE = quartzite; CHT = chert; P = porphyritic; A = aphanitic; M = milky; C = crystal

Table VII-2 shows the relative numbers of each "core type." With the irregular nature of most of the cores at the site, several of these "types" may, in fact, only be a reflection of the stage or amount of reduction that has occurred. Some multidirectional cores appear to be severely reduced and nearly exhausted (see Figure VII-1 #227), while the large number of core fragments for which platform directions cannot be accurately ascertained further indicates maximum usage of raw materials at the sites. The largest whole core is from site SDI-7756 (#211) and is made of metavolcanic. It is one of only three unidirectional cores and represents, perhaps the most "complete" core recovered (see Figure VII-1 #211). Two cores show evidence of bipolar reduction. One of these cores (#259) from site SDI-7755 is quartz and has a battered spot on the more diminished end of the core, where it was seated on an anvil, while flakes were removed from a well-developed platform opposite. This example, however, is quite small and probably represents a nearly exhausted core. The other bipolar core, (#67) from site SDI-7758, is also quartz and is even smaller, and may, therefore, represent only a portion of the original core. Two other specimens, one from site SDI-7757 (#97) made of metavolcanic and the other from site SDI-7751 (#88) made of quartz, are both reworked hammerstones that, subsequent to breakage, were used as cores to produce flakes. Each shows areas of battering along ridges of unflaked portions of the artifact. One other specimen, #77 from site SDI-7756, made of quartzite, is a chopping tool fragment that, subsequent to breakage, was also used as a core to produce flakes. The intact portion of an acute angled edge (approximately 30 degrees) shows use wear including dulling and polish. The incomplete status of this edge, however, together with flake scars on adjacent areas indicate its subsequent use as a core. One other specimen, #120 from site SDI-7322, made of green Santiago Peak metavolcanic, is multidirectional in reduction pattern but is also highly patinated over most of its surface. There is one flake removal that is less patinated than the other numerous flake scars on the core. A small amount of recent breakage reveals the unpatinated appearance of the material. It can be seen that the single flake removal is somewhat patinated but much less so than the rest of the item. It appears possible, therefore, that this specimen represents a scavenged artifact from an older site that was brought to this site to use for raw material.

With 70.8 percent of the cores at the project sites having no cortex present, it appears that many of them may have been brought to the site having already been partially reduced. Shackley et al. (1989), working on prehistoric sites in southern Orange County, have made similar observations concerning cores and the usage of lithic materials at primarily Late Period sites. Regarding a similar paucity of cortex on specimens from their sites they observed that "this is probably also an effect of a high degree of recycling either through scavenging site material or continued reduction of cores in the personal gear" (1989:84). Core weights for the eleven whole project specimens ranged from a greatest weight of 528.7 grams to minimum weight of 1.1 grams. Shackley et al. observed that size may be mainly a function of portability with the upper range weight of cores being around 500 grams or about one pound. It must also be remembered, however, that these cores are rejected artifacts and that the size of the cores transported to the site may have been somewhat greater (cf. Shackley et al. 1989:84). The large number of very small whole cores (6 or 54.5 percent weighing less than 20 grams), again, is an indication of the maximum usage of flaked stone lithic raw materials at the sites.

In summary, the cores recovered from the sites are basically irregular but include unidirectional, bidirectional, and multidirectional forms with multidirectional predominating. The raw materials of the cores are all locally available within immediate easy access from the site and they correspond to the materials used for nearly 98 percent of the tools recovered from the sites. This indicates that stone raw materials were almost exclusively being procured locally and utilized to produce the bulk of the tools necessary for the required hunting and food processing activities of the sites inhabitants. The distribution of this assemblage of cores, between the various sites, indicates that non-biface or platform core reduction for flaked stone tool manufacture was a common activity, but it appears to have occurred primarily at the most intensively occupied sites with few examples recovered from sites situated away from these main habitation areas.



Mooney & Associates

0 1 2cm

Oak Country Estates
Representative Cores
Figure VII-1

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3. Formal Tool Analysis Results

a. Introduction

Uniface and biface tool categories refer to the way that tools were worked during manufacture, i.e., flake edges were worked in either one (unifacial) or two (bifacial) directions. Within these categories, however, flaked stone artifacts are most often designated with tool type names based on implied function (e.g., projectile points, knives, hammerstones, chopping tools, scraper planes, and scrapers). Tools such as hammerstones and choppers, because they are used in a manner that dictates percussion between the tool and the object being worked are sometimes included under a category termed "percussing tools". In general, the term, formal tools, implies not only use but some degree of working beyond minimal retouch in order to create the tool. These functionally named classifications, however, have been used for many decades by archaeologists and the morphological criteria that define them are well documented in the archaeological literature for the California coastal area. Some archaeologists take issue with the idea of artifacts being typed by implied function and gross morphology because it is a limited analytical approach compared to functional attribute analysis (cf. Shackley et al. 1989:69). While this is undoubtedly true to some degree, such a typological approach can still be useful if used in conjunction with a functional attribute approach. The biface group of flaked stone formal tools (primarily projectile points and knives), because of their special analytical significance in archaeology, has been separated out of this category. Much attention has been paid to the manufacture and stylistic relevance of these tools and so they are analyzed separately below.

As will become evident in the descriptions and analyses of the various types of formal tools below, the morphologies and use-wear patterns of these tools are often similar or overlapping. The reason for this is based in a concept proposed by Treganza and Malamud (1950) and later refined by Treganza and Bierman (1958) and referred to as a "core tool" assemblage. This concept involves the production of angular cores (established platforms with angles less than 90 degrees) to be used as tools such as hammerstones, chopping tools, large scrapers and scraper planes In such assemblages there often exists a near continuum of these core-based tools with differences reflected in the angles of the created platforms and in the use-wear patterns evident on these various platforms. Implied functions are often attributed based on the use-wear patterns as well as on the apparent utility of the variously angled platforms created. In regard to the latter, for example, greater platform acuity will produce a sharper but weaker use edge more suited to cutting or sawing rather than for battering, plaining, or scraping, and vice versa. This idea will be referred to below with specific applicability to the particular tool type being described.

b. Hammerstones

Introduction

Thirty-two whole, and fragments of hammerstones were recovered from the project sites. The majority of the hammerstones recovered are angular (established platforms, or naturally occurring cobbles, with angles between 45 and 90 degrees) with either points or the apices of acute-angled ridges bearing the evidence of battering impacts. There has been debate as to whether angular hammers (i.e., established platforms, or naturally occurring cobbles, with angles between 45 and 90 degrees) are used exclusively for ground stone manufacture (cf. Cooley 1982a:191-192). The debate is centered on the criterion of angularity, as that characteristic is necessary to effectively work ground stone, but is, arguably, a less effective attribute for the working of flaked stone tools. In general, it has been shown by several researchers that prehistoric hunters and gatherers, producing both flaked and ground stone tools, use hammerstones made of a hard material and with angular percussion points because they are the most useful for the manufacture and maintenance of ground stone tools (Treganza and Valdivia 1955; Hayden and Nelson 1981).

Further, Treganza and Bierman (1958) have suggested that some of these hammers were originally "prepared" to have acute-angled ridges by the purposeful removal of flakes creating platforms that then became the acute-

angled percussion points. This concept of angular hammerstone manufacture was referred to by Treganza and Bierman as a "core hammerstone." Again, Treganza and Bierman associated the attribute of angularity with hammerstones used to manufacture and maintain ground stone tools (1958:67). This association has been confirmed by subsequent research conducted by Hayden and Nelson (1981) that involved observation of living native peoples in Central America who still manufactured and resharpened ground stone grinding tools using stone hammers. The hammers used were angular, and dulled ones were resharpened by removing flakes much in the same fashion as described by Treganza and Bierman.

As indicated above, the majority of the hammerstones recovered from this investigation are angular with either points or the apices of acute-angled ridges bearing the evidence of battering impacts. Some of these hammers, as proposed by Treganza and Bierman (1958), show evidence of resharpening by means of flake removals along these ridges to reestablish the angularity of the impact points, and some were originally "prepared" to have acute-angled ridges by the purposeful removal of flakes creating platforms that then became the acute-angled percussion points.

As a result, of these studies some archaeological analysts have made a typological distinction based on this implied function, between battered tools (hammerstones) used to manufacture and/or rejuvenate ground stone tool surfaces and those used to work flaked stone. Dodd (1979), and others have called angular hammers used to manufacture and/or rejuvenate ground stone, "pecking stones" because that is the action that they perform when being used to shape or sharpen ground stone. While this term will not be used here, it is assumed that angularity may reflect hammer use for the purpose of working ground stone tools. This distinction is based on the criterion of angularity, as that characteristic is necessary to effectively work ground stone, but is, arguably, a less effective attribute for the working of flaked stone tools. In this study, the term hammerstone will be used (versus battered tools and pecking stones) and these tools will be distinguished as either angular or not angular using the same analytical criteria indicated above.

Results

Thirty-one whole, and fragments of hammerstones were recovered from eleven of the thirty-two sites on the property. Unit excavations produced 17, STP excavations ten, and four were recovered in surface collection. In addition, three specimens (SDI-7751 #88, SDI-7756 #77, SDI-7757 #97), described above under the cores, are fragments of hammerstones that were subsequently reworked as cores. They will be typed with the thirty-one specimens below, but are not otherwise included in the tables or quantitative comparisons. The raw material of fourteen of thirty-one hammerstones consists of SPV metavolcanics, five others are cobble volcanic, six are quartzite, three are quartz, and three are granitic rock. The twelve specimens appearing to be whole or nearly whole range in weight from 107.2 to 526.5 grams. Of these thirty-one hammerstones and fragments, twenty-four (77.4 percent) retain a portion of cortex. With this high percentage of cortex, it seems likely that most of these cores originated from cobbles. The circumstances of individual artifact recovery, material types, and dimensions are indicated in Table VII-3.

Analysis of the horizontal distribution across the sampled site areas (units and STPs) indicated that nine of the twenty-seven hammerstones from the excavations were recovered from site SDI-7755, four from SDI-7756, three from SDI-7758, two each from sites SDI-7322, SDI-7752 and SDI-7757, and one each from sites SDI-7325, SDI-7751, SDI-7753, SDI-7754, and SDI-7759. The site with the greatest density of hammerstones per cubic meter was site SDI-7758 with 1.47 followed by sites SDI-7755 with 1.16, SDI-7752 with 0.94, SDI-7325 with 0.81, SDI-7757 with 0.70, SDI-7756 with 0.55, SDI-7751 and SDI-7754 with 0.29, SDI-7753 with 0.22, and site SDI-7759 with 0.14. The site with the greatest number of hammerstones collected from the surface was site SDI-7751 with three, followed by site SDI-7754 with one. Vertically, with the exception of the 80 to 90 cm level, hammerstones or hammerstone fragments were found at all depth levels from 0 to 100 cm of the sampled site areas. The level with greatest frequency of occurrence was the 40 to 50 cm level with nine (33.3 percent).

Typological analysis indicated that the hammerstones recovered from Oak Country Estate project sites during the current investigation could be seen to fall into six groups based on similarities of morphological attributes. These groups are characterized by evidence of repetition, both of modes of manufacture and of patterns of subsequent use and resharpening, resulting in artifact groups with similar morphological characteristics. Differences between the groups may reflect different types of hammerstone usage, i.e., different tasks requiring specialized shapes or sizes. In some instances, limited modification and/or other morphological evidence may be indicative of only limited or expedient usage.

Table VII-3 . Hammerstone Distribution and Attributes

Site				Coordinates		Level							Dimensions (cm)			
SDI-	Cat #	Provenience		N/S	E/W	(cm)	Cond	Pat	Cort	Material		Wt (g)	Len	Wid	Thk	Comments
Group 1																
7753	*67*	Unit	1	S009	W005	10-20	W	-		VCB	P	115.3	5.5	5.1	2.9	
Group 2																
7754	64	Surface		-	-	-	W		N	SPV		115.0	6.0	5.6	2.7	
7755	*100*	STP		N760	W080	40-50	W	Y	W	SPV	P	107.2	5.1	4.8	3.8	
7755	188	Unit	1	N761	W086	0-10	F	-		QTZ	M	61.1				
7758	2	STP		N140	W020	0-10	W	-	W	QTE		128.2	5.9	5.3	3.3	
Group 3																
7322	113	Unit	1	S097	W168	20-30	F	-	W	VCB	P	269.3				RMF
7751	12	Surface		-	-	-	W	-	W	VCB	P	365.7	8.0	7.1	6.4	RMF
7751	4	Surface		-	-	-	W	-		GRN		526.5	7.5	6.6	5.9	RMF
7755	*227*	Unit	2	N696	E058	30-40	W	-	W	VCB	P	298.1	8.1	5.8	5.1	RMF
7755	*277*	Unit	4	N745	W026	40-50	W	-		VCB	P	383.2	10.4	5.5	4.5	RMF
7756	81	STP		N456.5	W120	40-50	W	-	W	GRN		153.2	6.6	5.0	4.1	
Group 4																
7751	*5*	Surface	4	-	-	-	W	-		QTE		231.7	7.0	5.7	3.8	
Group 5																
7325	*16*	Unit	1	N096	E176	10-20	W			SPV	A	164.0	6.1	5.0	4.2	
7755	*205*	Unit	1	N761	W086	60-70	W	-		QTZ	M	175.5	6.9	5.2	4.0	
Group 6																
7322	49	STP		S100	W170	60-70	F	Y	N	SPV	A	52.0	-	-	-	
7752	26	Unit	1	S009	E010	40-50	F	N	S	SPV	P	39.0	-	-	-	
7755	275	Unit	4	N745	W026	40-50	F	Y	N	SPV	P	2.1	-	-	-	
7756	191	Unit	1	N450	W138	20-20	F	-	S	QTE		71.7	-	-	-	
7751	44	STP		S060	W020	40-50	F	Y	N	SPV	A	10.1	-	-	-	
7755	276	Unit	4	N745	W026	40-50	F	N	N	SPV	P	15.7	-	-	-	
Indeterminate																
7752	24	Unit	1	S009	E010	30-40	F	-	W	QTE		15.1	-	-	-	
7754	51	Unit	2	S030	W010	0-10	F	Y		SPV	P	2.5	-	-	-	
7755	101	STP		N760	W080	40-50	F	-	N	QTZ	C	1.3	-	-	-	
7755	260	Unit	3	N708	E028	50-60	F	N	S	SPV	A	3.7	-	-	-	
7756	124	STP		N540	W120	10-20	F	-	W	GRN		15.7	-	-	-	
7756	265	Unit	4	N550	W126	40-50	F	Y	N	SPV	A	166.8	-	-	-	
7757	42	STP		N520	E120	90-100	F	N	N	SPV	P	1.6	-	-	-	
7757	114	Unit	2	N500	E111	20-30	F	Y	W	SPV	P	41.7	-	-	-	
7758	31	STP		N200	E0	70-80	F	-	W	QTE		30.1	-	-	-	
7758	49	Unit	1	N188	W001	0-10	F	N	S	SPV	P	47.5	-	-	-	
7759	88	STP		N240	E120	10-20	F	-	N	QTE		7.1	-	-	-	

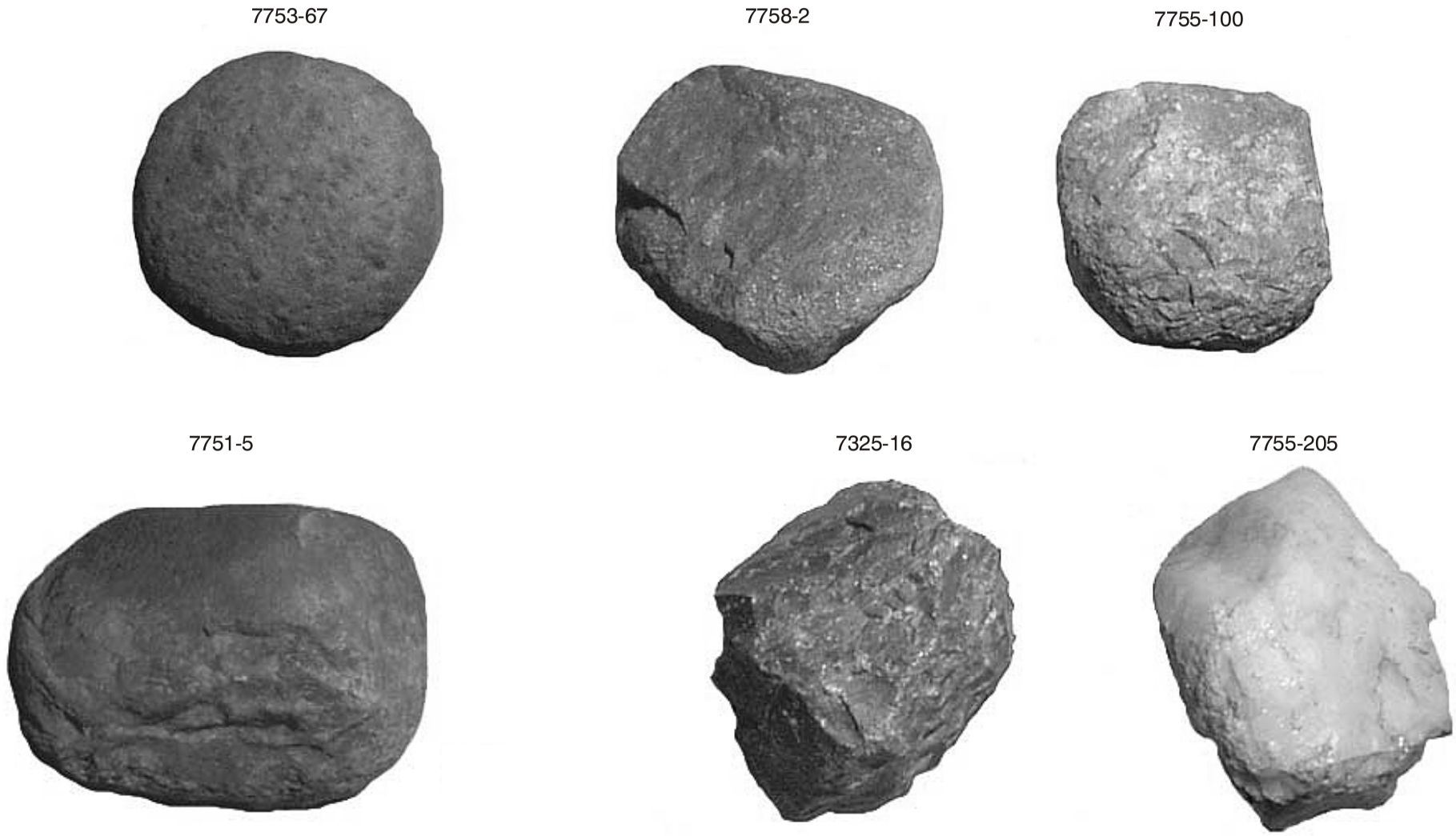
Italicized cat. no.s indicate those items that are illustrated in figures
Cond (condition): W = whole; F = fragment
Pat (patination): N = not apparent; Y = present
Cortex: N = none; W = waterworn; S = subangular
Material: VCB = volcanic cobble (Eocene); SPV = metavolcanic; QTZ = quartz; QTE = quartzite; GRN = granitic; P = porphyritic; A = aphanitic; M = milky; C = crystal
Comments: RMF = recycled mano fragment

Group 1 of the hammerstones from the sites consists of only one unworked cobble or pebble that has been used on an edge or end to perform percussion and/or abrasion on some object item. It does not have any evidence of resharpening or of the prior creation of an angular platform. The sole evidence for its use as a

hammer and/or abrader, therefore, is the resultant wear or damage visible on the cortex of the cobble. Specimen 7753-67 is relatively small, disk-shaped, stream cobble with distinguishable battering and possibly abrasion that has only slightly removed the cobble cortex. This wear is apparent on a single portion (approximately 30 percent) of the circular perimeter. It is made of cobble volcanic and appears to be fire-affected. A portion of cortex along the tool perimeter, opposite from the use area, has spalled away due to excessive heat. This probably occurred after the tool was discarded. It is 5.5 by 5.1 by 2.9 cm and weighs 115.3 grams. Similar small hammerstones have sometimes been referred to in the local literature as "knappers" (e.g., Butler 1974), indicative of an implied function as flaked stone working tools. Most frequently they are a hard rock and the battering is usually located at the ends or along the edge or perimeter of the cobble. In some instances they have what appear to be facets worn at particular impact points or restricted to small areas of the stone. While at first glance, these facets might appear to have been created by grinding, it is more likely that they were created by repeated glancing blows struck against a hard but sharp edge such as the platform edge of a biface tool during manufacture. This would suggest use during the careful edging work of such tool manufacture.

Group 2 consists of hammerstones that are, in most instances, roughly discoidal in shape with battering restricted to a single usually continuous circular perimeter and essentially absent on the sides (Figure VII-2). Two of these tools (7755-188 and 7755-100) are incomplete. Specimen 7755-188 represents approximately 60 percent of the original tool, while 7755-100 represents approximately 80 percent of the original tool. The two whole members of this group, 7758-2 and 7754-64, weigh 128.2 and 115.0 grams, respectively. Specimens 7755-188 and 7755-100 weigh 61.1 and 107.2 grams, respectively. It would appear likely, therefore, that if whole, these two hammerstones would weigh a similar amount to the whole specimens. Some cortex is present on all but specimen 7755-188. The amount is less than twenty percent of the surface of 7758-2 and 7754-64, but consists of approximately thirty percent on 7755-100. Specimens 7754-64 and 7755-100 are SPV metavolcanic, specimen 7755-188 is quartz, and specimen 7758-2 is quartzite. These hammers were created from either large primary flakes struck from cobbles or from split cobbles, with battering subsequently proceeding around the acute-angled edge. Often it appears that the last portion of the perimeter to be used was the original strike point or thickest portion of the flake or split cobble. In all but one instance, this perimeter use-edge also appears to have been subsequently resharpened and reduced through probably repeated bifacial flake removals. Different specimens in the group have various percentages of the perimeter battered, probably reflecting various degrees of tool usage.

Group 3 hammers consist of irregular chunks that in all but one instance are fragments of manos with battering on broken edges and/or corners. The other member is an irregular cobble fragment battered on one broken end (Figure VII-3). Because of the minimal amount of working on the items in this group, assigning a status of whole or fragment was not attempted, i.e., they are all considered to be whole tools. The six members of this group, which weigh from 153.2 to 536.5 grams, apparently represent an expedient usage type, where large angular chunks of stone or broken ground stone are used briefly and then discarded. It also seems likely that even though granitic rock is not a "hard" rock such as quartzite or metavolcanic, because the use wear (battering) on the specimens is located on angular points and ridges that these hammers were used to work ground stone. With the substantial number of milling features at the sites it would seem very likely that these hammers were used to create and/or resharpen the various milling elements in these features. While most of the battering on these hammerstones is on points, on specimen 7322-113 battering is present along a straight edge. As will be described below, this pattern is also present on the specimen in Group 4.



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Oak Country Estates
Select Hammerstones

Figure VII-2

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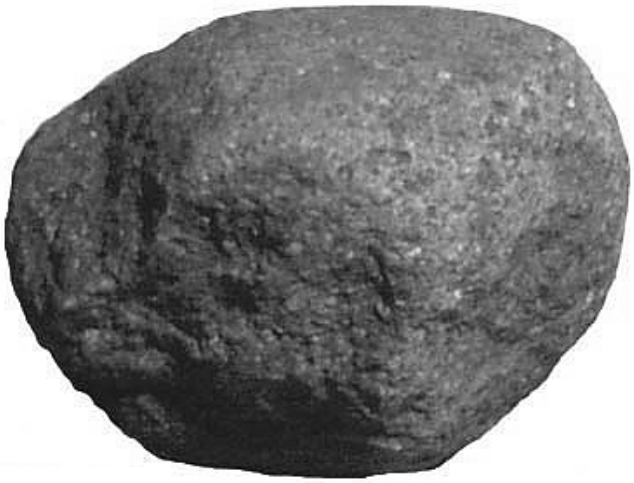
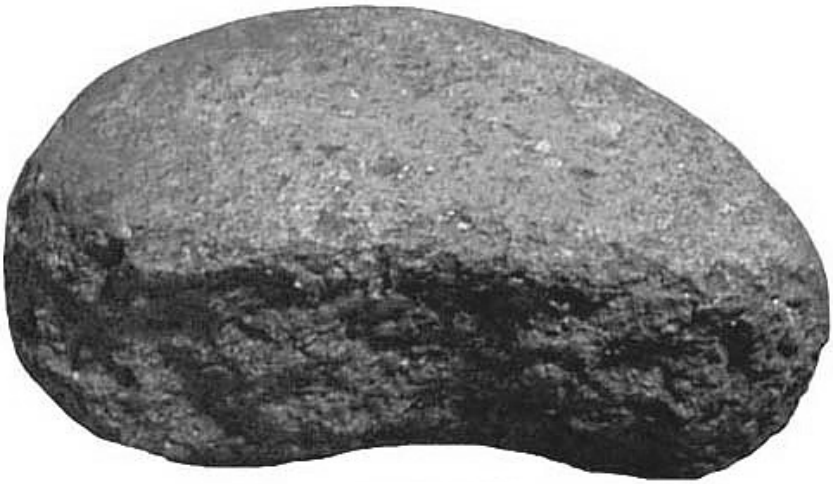
7755-227



7755-277



Mooney & Associates

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Oak Country Estates
Group 3 Hammerstones

Figure VII-3

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Group 4 hammerstones consist of a single, whole, quartzite cobble that has been used on two edges to perform percussion on some object item. Specimen 7751-5 is roughly rectangular shaped stream cobble with substantial battering along one straight long edge and then continues around one corner and partially onto the next edge of the cobble. It is 7.0 by 5.7 by 3.8 cm and weighs 231.7 grams. It has some evidence of resharpening and/or prior creation of an angular platform. The battering wear is apparent on a single continuous portion (approximately 50 percent) of the perimeter. This hammerstone, while manifesting similar patterns of wear to Group 3 hammerstones, is distinguished by the harder material, by the use of an intact cobble rather than a cobble or ground stone fragment, and by some evidence of resharpening. Despite these differences it seems likely that this tool, with use wear (battering) located on an angular edge and point, was used to work ground stone. As described for Group 3 hammerstones, with the substantial number of milling features at the sites it would seem very likely that it was used to create and/or resharpen the various milling elements in these features. The battering along a straight edge on this specimen, and on specimen 7322-113 in Group 3, is very similar and probably represents use for a specific task.

Group 5 hammerstones consists of two whole specimens (and two incomplete specimens categorized as cores - see above). Specimen 7755-205 is quartz, measures is 6.9 by 5.2 by 4.0 cm, and weighs 175.5 grams. Specimen 7325-16 is metavolcanic, measures 6.1 by 5.0 by 4.2 cm, and weighs 164.0 grams. These hammerstones are characterized by the creation of multiple directional acute-angled platforms producing an "irregular core." The intersecting platform edges, then, result in ridges usable as angular impact points. These hammers have little or no cortex present and, consequently, the nature (shape, origin, etc.) of the original raw material is unknown. Despite a similarity in manufacture, the use wear battering patterns are somewhat different. Specimen 7755-205 is battered primarily on two opposite "ends", while specimen 7325-16 has battering along a continuous central perimeter, similar to the pattern present on the discoidal specimens in Group 2. Both of these hammers are hard hammers and are angular and, therefore, may have been used for ground stone maintenance and/or manufacture. Also included in this group are two specimens categorized as cores (7751-88 of quartz and 7757-97 of metavolcanic). While incomplete, enough remains to allow categorization into this group. This based on the creation of multiple directional acute-angled platforms. Specimen 7757-97 is battered similar in pattern to specimen 7325-16 and 7751-88 to specimen 7755-205 .

Group 6 contains six members, all fragments. Four of these specimens have, both, an area of abrasion or polish, and an area of battering. The other two have only abrasion or polish on a surface. Five of these fragments are metavolcanic and the other is quartzite. The exact cause for the areas of abrasion and/or polish is not certain. It is not uncommon, however, for hammerstones that are used to work ground stone to have such areas. It is known that in the process of this working that the hammerstone will be used not only to hit the object surface but also to scrape the surface to remove the loosened and dislodge isolated and remnant stone fragments. This action would likely result in abraded areas on the tool. Some of the areas, however, are mostly polished rather than abraded. The cause of this type of wear is more problematic. The fragments with only abrasion and/or polish are assumed to have broken off of hammerstones without retaining any portions with battering.

Eleven fragmentary specimens (and one core, specimen 7756-77) could not be typed (see Table VII-3). These fragments have retained insufficient attributes to allow for categorization. All of these fragments have an area battering present indicating derivation from a hammerstone tool.

c. Chopping Tools

Introduction

Seven whole, and fragments of chopping tools were recovered from the property. Chopping tools are often manufactured by splitting a cobble or nodule lengthwise on a diagonal and then sharpening the resultant beveled (acute angled) edge by unifacially or bifacially removing flakes. Evidence for this method of manufacture is the presence of cortex on one side of the tool. While some of the chopping tools may have

been produced in this manner, most of the specimens from the sites are worked to such a degree that the mode of original manufacture is not definite. Most of the chopping tools are bifacially flaked to produce the primary working edge, but a few are also worked unifacially. A majority of the specimens also have more than one use location, some of which are either less extensively used and/or less prepared by flaked retouch. Chopping tools are also often characterized as big and heavy, i.e., weighing more than 600 grams. However, all but one of the whole tools recovered are relatively small, weighing only in the 70 to 250 gram range.

In general, use-wear on chopping tools is usually exhibited by a blunting or battering of the use edge as a result of the direct and substantial force applied in the chopping, digging, cutting-up, and/or working of hard materials such as wood or bone (cf. True 1970: 36). If used on softer materials such as fiber, then less substantial edge damage is usually present. Chopping use-wear, in some instances resembles the battering apparent on hammerstones. This could mean, either, that they were used on some very hard material, used as hammers (stone on stone), or were used on some material such as fiber laying on stone.

As with the hammerstones recovered, angularity and acute-angled ridges or edges with evidence of subsequent use-wear indicates the primary morphological requirement for membership in this tool category. Even more than with the hammerstones, acute-angled edges (for chopping tools, usually less than 30 degrees) were important. The majority of these tools also show evidence of resharpening by means, frequently, of bifacial flake removals along these ridges to reestablish and/or maintain a sufficiently acute angle for the use edges. It also appears evident that more of these tools than with hammerstones were originally "prepared" to create the edges by the purposeful removal of flakes creating platforms with sufficiently acute-angled use edges. While the originally intended angle of these platforms would, undoubtedly, be different between angular hammerstones and chopping tools, with use and resharpening, this optimum angle range would vary depending on the amount of use and rejuvenation that has occurred. This overlapping of preparation and use modes between angular hammerstones and other core-based tools often results in at least some common attributes between these tools types. These similarities are related to the core tool assemblage concept as described by Treganza and Bierman (1958:73), and previously discussed above.

Results

The eight whole, and fragments of chopping tools recovered came from five of the thirty-two sites on the property. Unit excavations produced three, STP excavations two, and two were recovered in surface collection. Five are made of SPV metavolcanic cobbles, one of a metasedimentary cobble, one of granite, and one of quartzite. The six specimens appearing to be whole or nearly whole range in weight from 70.7 to 3,125.0 grams. Of these seven whole specimens and fragments, three (37.5 percent) retain a portion of cortex. With this percentage of cortex, it seems likely that many of these chopping tools originated from cobbles. In general, these tools are used in a vertical, up and down, pounding manner for digging or for chopping, probably most frequently, some hard or tough organic material. The specific circumstances of recovery, material types, and dimensions are shown in Table VII-4.

Analysis of the horizontal distribution across the sampled site areas (units and STPs) indicated that three of the six chopping tools from the excavations were recovered from site SDI-7755 and one each from sites SDI-7751, SDI-7752, and SDI-7759. Two were recovered from the surface, one from site SDI-7754 and one from site SDI-7751. The site with the greatest density of chopping tools per cubic meter was site SDI-7752 with 0.47 followed by sites SDI-7755 with 0.39, SDI-7751 with 0.29, and SDI-7759 with 0.13. Vertically, two of these tools were found in each of 10 to 20 and 30 to 40 cm levels with one each found in the 40 to 50 and 70 to 80 cm levels.

Table VII-4. Chopper Distribution and Attributes

Site CA-SDI-	Cat #	Provenience		Coordinates N/S	Coordinates E/W	Level (cm)	Cond	Pat	Cort	Material		Wt (g)	Dimensions (cm) Len	Wid	Thk
Group 1															
7751	61	STP		S080	W020	10-20	W	N	W	SPV	A	70.5	5.4	3.0	2.1
7755	*272*	Unit	4	N745	W026	30-40	W	D	N	SPV	P	75.7	5.6	5.0	2.6
Group 2															
7752	27	Unit	1	S009	E010	40-50	W	-	W	QTE		124.5	7.4	5.4	2.6
7755	*56*	STP		N730	W040	30-40	W	P	N	SPV	A	99.3	6.0	4.2	2.8
Group 3															
7751	*1*	Surface		-	-	-	W			SPV		249.3	7.5	6.2	4.5
Group 4															
7759	*258*	Unit	4	N099	E076	10-20	W	D	N	MSD		78.2	6.0	5.7	2.6
Group 5															
7754	72	Surface		-	-	-	W		-	GRN		3125.0	21.5	21.0	5.1
Indeterminate															
7755	109	STP		N760	W080	70-80	F	P	N	SPV	P	48.9	-	-	-

Italicized cat. no.s indicate those items that are illustrated in figure
Cond (condition): W = whole; F = fragment
Pat (patination): N = not apparent; Y = present; D = differential
Cortex: N = none; W = waterworn
Material: SPV = metavolcanic; QTE = quartzite; MSD = metasedimentary; GRN = granitic;
P = porphyritic; A = aphanitic

Typological analysis indicated that the chopping tools from the project sites could be seen to fall into five groups (or Types) based on similarities of morphological and use-wear attributes. As with the hammerstones, these groups are characterized by evidence of repetition, both of modes of manufacture and of patterns of subsequent use and resharpening, resulting in artifact groups with similar morphological characteristics. Differences between the groups may reflect different kinds of tool usage, i.e., different tasks requiring specialized shapes or sizes. In some instances, limited modification and/or other morphological evidence may be indicative of only limited or expedient usage.

Group 1 consists of two chopping tools, both whole. Specimen 7751-61 is metavolcanic, measures 5.4 by 3.0 by 2.1 cm, and weighs 70.5 grams. Specimen 7755-272 is also metavolcanic, measures 5.6 by 5.0 by 2.6 cm, and weighs 75.7 grams. The morphology, in general, consists of a tool fashioned from a primary flake resulting in a plano-convex shape to the tool in cross-section. For one of these tools (7751-61) the original flake was struck from a cobble and used as-is with no edge modification. Consequently, there is cortex over the entire convex side of the tool. The other tool (7755-272) is made on a flake struck from a hammerstone (Figure VII-4). This flake is similar in size and shape to specimen 7751-61, but with no cortex present. An area of battering is present, however, on the convex side of the tool. Each tool has one principal chopping use edge exhibiting dulling and crushing wear indicative of such use. On specimen 7751-61 this chopping edge is oriented laterally, parallel to the long axis of the flake. On specimen 7755-272 the chopping edge is situated opposite from the flake platform and bulb of percussion, at the distal edge of the flake, perpendicular to its long axis. The edge of specimen 7755-272 has also been bifacially worked around nearly the entire perimeter indicating that it probably served as multifunction tool used for cutting and scraping as well as chopping. Only chopping use wear is evident on specimen 7751-61.

Group 2 chopping tools consist of two specimens, one (7755-56) made of SPV metavolcanic and the other (7752-27) made of quartzite. Specimen 7755-56 measures 6.0 by 4.2 by 2.8 cm, and weighs 99.3 grams (see Figure VII-4). Specimen 7752-27 measures 7.4 by 5.4 by 2.6 cm, and weighs 124.5 grams. The defining criterion for this group is the presence of a curved, continuous use edge that is absent on one side of the tool. Both have bifacial battering, and bifacial preparation and/or retouch. The method of original manufacture

of the tools in this group is suggested by the presence of cortex on one side of each tool. This would involve the removal of one end of a cobble, creating a platform perpendicular to the long axis of the cobble, and then splitting the cobble longitudinally using this newly created platform. This method would account for the cortex present on the dorsal face, of these chopping tools. While the Group 2 chopping tools may have been produced in this manner, both have been so worked and reworked that the morphology of the original tool nucleus and the mode of its manufacture could not be definitely determined. The battering present on specimen 7752-27 is so substantial that it must have been used on some very hard material, used as a hammer (stone on stone), or was used on some material such as fiber laying on stone.

Group 3 chopping tool consists of a single specimen (7751-1) that is a cobble with a naturally acute angled edge along one side that has been bifacially worked to create an edge used for chopping. Specimen 7751-1 is metavolcanic, measures 7.5 by 6.2 by 4.5 cm, and weighs 249.3 grams. This specimen is complete and is the heaviest of the chopping tools recovered. Cortex is present over two-thirds of the tool surface, missing only from the worked edge of the tool.

Group 4 chopping tool consists of a single specimen that is a large flake worked bifacially around its entire perimeter to create an edge used for chopping (See Figure VII-4). Specimen 7759-258 is metasedimentary, measures 6.0 by 5.7 by 2.6 cm, and weighs 78.2 grams. It is complete and has no cortex present. Some unifacial retouch is present on portions of the use edge. While no substantial use wear is present on the tool, its overall morphology indicates chopping as a likely function for this tool. It is also possible that it is a multi-functional tool.

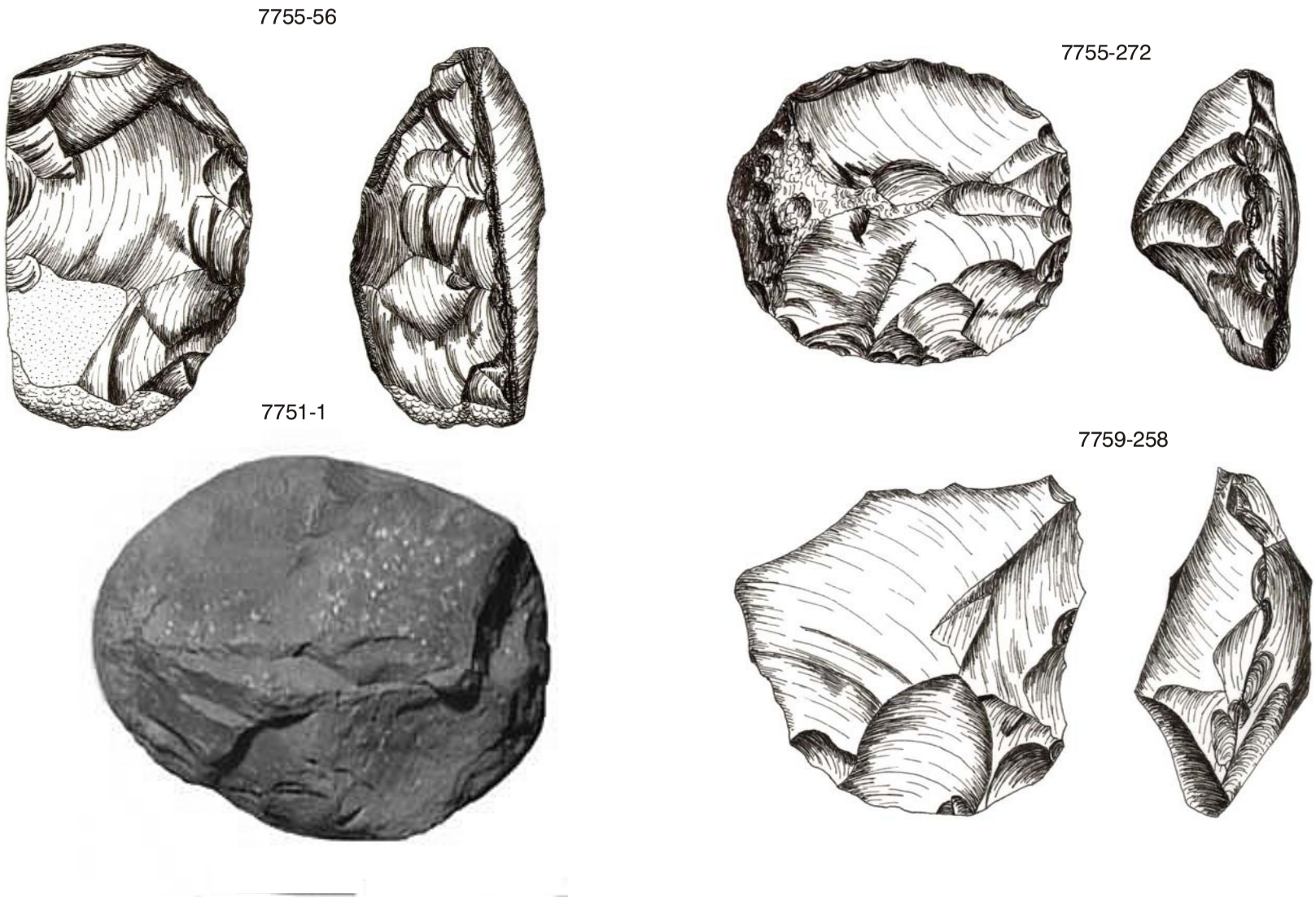
Group 5 chopping tool consists of a single specimen that is a large slab worked unifacially around one side to create an edge used for digging and/or chopping (See Figure VII-4). Specimen 7754-72 is granite, measures 21.5 by 21.0 by 5.1 cm, and weighs 3,125.0 grams. It is complete and has no cortex present. While no substantial use wear is present on the tool, its overall morphology indicates digging and/or chopping as a likely function for this tool.

One of the chopping tools (7755-109) is an untypable fragment that has unifacial retouch along one truncated edge.

d. Scraper Planes

A total of seven whole and fragments of scraper planes were recovered from the Oak Country sites. Like hammerstones and chopping tools, scraper planes are essentially “core tools”; that is they are cores from which flakes are struck, but they themselves are the intended tools. As such, they can be considered as dual function items; cores as well as tools. As the descriptive name suggests, scraper planes are tools used to scrape or plane an object or material True 1970: 34-35). The material on which it was used would be the determinant of whether its actual use was as more of a scraper or a plane. If, for example, the material on which it was used was wood, the tool would be a plane; if the material were something such as animal hide or a fibrous vegetal material such as, for example, yucca (cf. Cooley 1982b; Van Horn and Hernandez 1980) then it would be a scraper. When used as a plane, the tool would generally be held at an angle of between 75 and 45 degrees to the object material. When used as a scraper it would be held at an approximate angle of 90 degrees to the object material (cf. Ranere 1975:193-194).

Scraper planes are generally manufactured by the splitting of a cobble or nodule and then removing flakes, by percussion, from the fracture edge or platform. Scraper planes are usually characterized by a unifacially-prepared, steep-angled edge adjacent to a flat, basal, planar surface. The scraper planes at Oak Country were classified on the basis of both morphology and use-wear. Most frequently, in the literature they have been classified on the basis of morphology (i.e., shape) and/or technique of manufacture. Kowta (1969) for



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Oak Country Estates
Chopper Varieties

Figure VII-4

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instance described as a necessary attribute of scraper planes "... a profile with height equal to half or more of the maximum basal dimension" (1969:20-21), and in regard to manufacture "... a unifacially flaked edge of steep angle all along or, more commonly, a portion of the basal perimeter" (1969:20). Van Horn and Hernandez (1980:123) similarly state, "the tool is manufactured by flaking around part or all of the periphery of the piece using the flat bottom (either cortical or flaked) as a striking platform."

At the Oak Country sites these morphological criteria and aspects of manufacture were not considered to be as essential as were the presence of use-wear patterns indicating the function of the tool. Use-wear on scraper planes depends again upon the material on which it was used. On soft material such as hides or vegetal fibers, the edge is generally dulled and rounded, and the planar surface is polished and sometimes manifests striations. If, however, the tool is used on soft materials, against a hard backing surface such as stone, then additional edge damage such as chipping or flake removal will also occur. On harder materials such as bone or wood, the edge often manifests considerable small-flake removal, usually bifacially, but planar surface wear is frequently nonexistent.

The scraper planes recovered were all defined, on the basis of three general criteria. First, was the presence of indicative use-wear as described above; second was the presence of a flat planar surface adjacent to a steep angled edge or edges (greater than 45 degrees), and third was large size. The first criterion is important to distinguish these items from simple cores. The second criterion is necessary to make a distinction between these tools and scrapers. In regard to the latter of these criteria, the scraper planes recovered are relatively small for this tool type. So this criterion, which is usually also useful for distinguishing these tools from scrapers, was the least meaningful of the criteria used to define these tools.

Results

Of the seven scraper planes recovered, three are whole and four are fragments. Five of the scraper planes are made of SPV metavolcanic and one of metasediment. Unit excavations produced three of these tools, STP excavations two, and one was recovered in surface collection. Scraper planes occurred in three different 10 cm levels from 0 to 50 cm at the sites, with one occurring the 30 to 40 cm level and two each occurring in 0 to 10 and 40 to 50 cm levels. They also occurred at six different sites with one each from sites SDI-7320, SDI-7322, SDI-7324, SDI-7753, SDI-7756, and SDI-7759. The specific circumstances of recovery, material types, and dimensions are shown in Table VII-5.

Table VII-5. Scraper Plane Distribution and Attributes

Site				Coordinates		Level							Dimensions (cm)		
CA-SDI-	Cat #	Provenience		N/S	E/W	(cm)	Cond	Pat	Cort	Material		Wt (g)	Len	Wid	Thk
Group 1															
7322	*87*	STP		S260	W170	40-50	W	N	W	SPV	P	201.8	7.0	5.8	3.9
7324	*18*	STP	4	-	-	30-40	W	Y	W	SPV	P	476.3	7.8	7.5	4.1
Group 2															
7320	*13*	Surface		-	-	-	W	Y	N	MSD		197.0	6.2	5.8	4.4
7755	60	STP		N730	W040	50-60	F	Y	N	SPV	P	62.5	-	-	-
Nondiagnostic Fragments															
7753	96	Unit	3	S080	E006	40-50	F	Y	N	SPV	A	2.3	-	-	-
7756	274	Unit	5	N333	W275	0-10	F	Y	N	SPV	A	5.8	-	-	-
7759	256	Unit	4	N099	E076	0-10	F	Y	N	SPV	A	0.4	-	-	-

Italicized cat no. indicates illustrated artifact
Cond (condition): W = whole; F = fragment
Pat (patination): N = not apparent; Y = present
Cortex: N = none; W = waterworn
Material: SPV = metavolcanic; MSD = metasedimentary; P = porphyritic; A = aphanitic

Typological analysis indicated that the three whole scraper planes recovered and one of the fragments could be morphologically categorized and could be seen to fall into two groups based on similarities of morphological and use-wear attributes.

Group 1. Two of the whole specimens (7322-87 and 7324-18) are both water worn cobbles which retain most of the their cortex (Figure VII-5). Specimen 7322-87 is metavolcanic, measures 7.0 by 5.8 by 3.9 cm, and weighs 201.8 grams. Specimen 7324-18 is also metavolcanic, measures 7.8 by 7.5 by 4.1 cm, and weighs 476.3 grams. Specimen 7322-87 is an irregular, subangular cobble that has been worked on one edge with four or five flakes removed creating a denticulated, steep-angled use edge. Specimen 7324-18 is an ovate cobble that has been split in half latitudinally and then one edge of this fracture surface has been unifacially flaked to create a steep-angled use edge. No other working has occurred to these tools and they represent the simplest form of this tool type. The use edge of specimen 7324-18 has a limited amount of edge dulling indicative of use. No polish is visible on the platform or planer surface. Specimen 7322-87 has dulling on the use edge indicative of use with some polish also visible on the platform or planer surface.

Group 2. Whole scraper plane 7320-13 (Figure VII-6) and fragment 7755-60 both have well developed platforms with many flake removals and no visible cortex remaining. Specimen 7320-13 is metasedimentary, measures 6.2 by 5.8 by 4.4 cm, and weighs 197.0 grams. Specimen 7324-18 is metavolcanic. Specimen 7320-13 is flaked around the entire platform perimeter. The "frontal" use edge of this tool has dulling, polish, and some abrasion indicative of use. It has also been substantially battered or blunted on the opposite side along the platform edge. Some polish is also visible on the platform or planer surface of the tool. Specimen 7755-60 is a fragment of the "frontal" use edge and it represents probably less than one third of the original tool. The platform edge of this fragment has dulling and polish indicative of use. No polish is visible on the platform or planer surface.

The remaining three specimens are all edge or platform fragments that are too small to determine the morphological characteristics of the original tool. They are included in the scraper plane tool type based on visible use wear (dulling and polish) on the platform edge and by the steep angle of this platform. The could, however, also be fragments of scrapers. They probably all represent removals made during attempts to resharpen scraper planes.

e. Scrapers

Six scrapers were recovered from the Oak Country sites. While this formal tool category of flaked stone artifacts is termed "scrapers", which implies a function, it is, like the other formal tool types described previously, largely based on morphological criteria such as tool shape and the configuration of the created work locations on the tool. In general, then, the term scraper, as with the other formal tools, implies not only use but an additional degree of working in order to impart a shape to the tool beyond simple retouch to establish or maintain an expedient working edge. Items of the latter description are described below under utilized flakes. Unlike the previously described formal tools (hammerstones, chopping tools, and scraper planes) that are more frequently "core tools," or flaked cores that are themselves the intended tools, scrapers are more frequently flake tools, i.e., they are made most often from a flake struck from a core. This is at least partially a function of size, as scrapers are usually smaller in size than the other formal tools. As the descriptive name suggests, scrapers are tools used to scrape an object or material. Most frequently, they are associated with use on materials such as animal hides or vegetal materials such as fibrous plants, cane stocks, or in some instances, wood. Scrapers are usually held at a steep angle to the object material (usually approaching 90 degrees) and dragged across it (cf. Ranere 1975:193-194).

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Oak Country Estates
Scraper Planes

Figure VII-5

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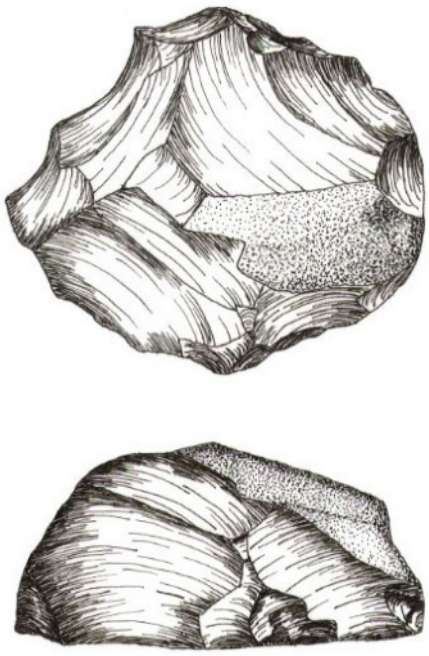
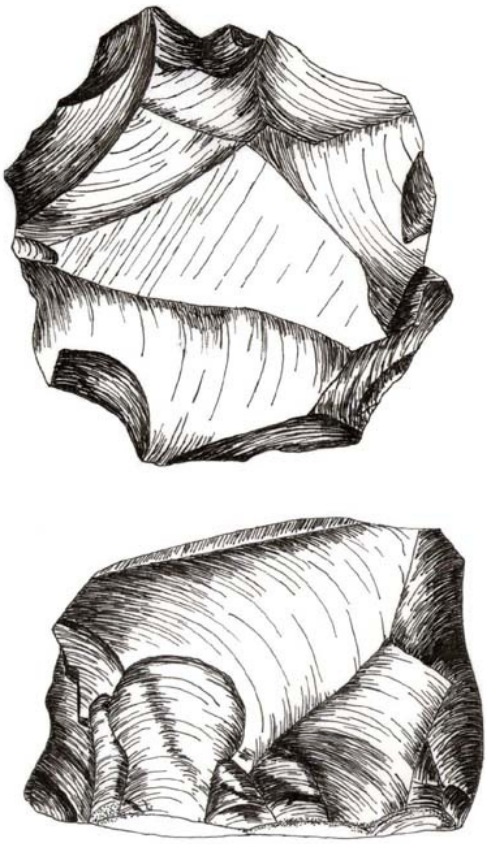
7751-82



7320-13



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Oak Country Estates
Scraper and Scraper Plane
Figure VII-6

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Results

Of the six scrapers recovered, four are whole and two are fragments (Table VII-6). Five of the scrapers are made of SPV metavolcanic, one of metasediment, and none have cortex present. All of the scrapers were found in the unit excavations. The recovery by depth varied considerably with three scrapers recovered in the 20 to 30 cm level and one each in the 10 to 20, 40 to 50, and 70 to 80 cm levels. They also occurred at five different sites with two from site SDI-7757 and one each from sites SDI-7322, SDI-7751, SDI-7754, and SDI-7755.

Table VII-6. Scraper Distribution and Attributes

Site CA-SDI-	Cat #	Provenience		Coordinates N/S	Coordinates E/W	Level (cm)	Cond	Pat	Cort	Material		Wt (g)	Dimensions (cm) Len	Wid	Thk
7322	121	Unit	1	S097	W168	40-50	F	Y	N	SPV	A	0.8	-	-	-
7751	*82*	Unit	1	S059	W022	10-20	W	-	N	SPV	A	72.6	5.5	4.9	2.7
7754	49	Unit	1	N021	E055	70-80	F	Y	N	SPV	A	0.5	-	-	-
7757	125	Unit	3	N420	E031	20-30	W	Y	N	SPV	P	31.6	5.7	3.9	1.6
7757	126	Unit	3	N420	E031	20-30	F	Y	S	MSD		115.2	6.8	6.0	2.3
7755	195	Unit	1	N761	W086	20-30	W	Y	N	SPV	A	49.4	4.4	4.0	2.5

Italicized cat no. indicates illustrated artifact
Cond (condition): W = whole; F = fragment
Pat (patination): N = not apparent; Y = present; - indeterminate (unwashed)
Cortex: N = none; S = subangular
Material: SPV = metavolcanic; MSD = metasedimentary; P = porphyritic; A = aphanitic

Typological analysis indicated that four of the six scrapers and scraper fragments could be analyzed for morphological attributes. But other than size no distinguishable subgroups or types could be seen to exist in this small assemblage of scrapers. Two of the specimens have well-developed platforms but flake removals do vary anywhere from ten to ninety percent of tool perimeters. These scrapers were also apparently used on both hard and relatively soft materials as indicated by contrasting wear patterns between some of the tools. While the edges of most specimens have not been substantially blunted, a few have.

Specimen 7755-195 is metavolcanic, measures 4.4 by 4.0 by 2.5 cm, and weighs 49.4 grams. It is unique in that it has apparent use wear on two separate platform edges on different planer angles from each other, and situated on opposite sides of the tool. This tool, which resembles a small scraper plane, has blunting, dulling, and unifacial chipping along one of these edges with dulling and polish on the other. Both edges have been unifacially retouched or resharpened. Specimen 7757-126 is metasedimentary, measures 6.8 by 6.0 by 2.3 cm, and weighs 115.2 grams. This scraper was made on a large flake fragment and has only one small portion of an edge used as a scraping tool. This edge has dulling and unifacial chipping along an approximately 3 cm wide section of this edge. This edge section has also been minimally unifacially retouched or resharpened. This tool also has a very small edge section, contiguous to the scraping edge, that has bifacial dulling characteristic of chopping use. This edge is truncated by a fracture which may indicate that the tool is incomplete and was once a multi-functional tool. Specimen 7757-125 is metavolcanic, measures 5.7 by 3.9 by 1.6 cm, and weighs 31.6 grams. This scraper was made on a flake fragment and nearly all of the edge has been retouched and used as a scraping tool. Edgewear includes unifacial chipping, dulling and polish. Specimen 7751-82 is metavolcanic, measures 5.5 by 4.9 by 2.7 cm, and weighs 72.6 grams (see Figure VII-6). This scraper is roughly circular in outline and plano-convex in cross-section. use wear is present, principally, on one half of the tool.

The remaining two specimens (7322-121 and 7754-49) are both edge fragments that are too small to determine the morphological characteristics of the original tool. They are included in the scraper tool type based on visible use wear (dulling and polish) on the platform edge and by an edge angle less than 45 degrees. They probably all represent removals made during attempts to resharpen the tools.

f. Discussion

As indicated above, the "formal tools" classification in this analysis did not include utilized flake tools, including tip tools, cutting tools, scraping tools, multiple-use tools, and miscellaneous tools. In this analysis, these latter types, because they consisted of tools defined primarily on the basis of use-wear, were, for the most part, analyzed as utilized flake and chunk tools. The formal tool types analyzed here: hammerstones, chopping tools, scraper planes, and scrapers (biface formal tools to be described below) are types more consistently recognized as recurrently "manufactured" tool types in southern California prehistoric sites.

What did become apparent, however, during the analysis was that the criteria of greater degree of workmanship or of substantial modification, established for artifacts to be considered as formal tools, could not be consistently maintained as a qualifying attribute for these tools. While many of the tools included here as formal tools did indeed manifest considerable workmanship to produce both a shape and a working edge, some of the tool groups identified above were, either, defined as a group because of the paucity of workmanship beyond use, or contained examples of tools interpreted as such, exclusively on the basis of use-wear (e.g., the Group 1 and Group 3 hammerstones). This use of fortuitously shaped natural cobbles and manufactured tools, apparently to accomplish the same task creates somewhat of a classificatory dilemma. While perhaps not completely analytically consistent, this dilemma was handled in this analysis by including such specimens with the formal tools, consistent with their same likely function, rather than by including them with the utilized flake and chunk tools.

4. Biface Tool Analysis

a. Introduction

Biface formal tools are produced through the reduction of a relatively thin piece of raw material, such as a flake, tabular rock, or cobble, by the removal flakes bifacially until a tool with both vertical and horizontal lenticular cross-sections is achieved. Such tools have sharp edges and points that can be readily resharpened and, most important, they can be securely hafted onto wooden or cane shafts to produce aerodynamic weapons such as spears and arrows. Because these tools have also been around in one form or another for thousands of years, archaeologists have focused considerable attention on both the method of manufacture and the diagnostic attributes inherent in the variation in the overall, and in particular, the hafting configurations of these tools. This latter interest involves the fact that through time, the configurations or "styles" of the hafting bases of biface spear (dart) and arrow points change. When a temporal sequence for these changes can be developed through study of the relative vertical provenience of biface artifacts with distinct hafting element styles in the layers of stratified sites, they can be used as time and cultural markers when found at other sites in the area.

In regard to manufacture, the concept of a biface tool production trajectory, defined in stages of manufacture, has long been a subject of interest in the archaeological literature, both in general (e.g., Holmes 1890, 1919; Ellis 1939; Muto 1971; Bradley 1975; Callahan 1979), as well as locally in southern California (e.g., Cooley 1982a, 1984; Rudolph 1984). Much of the early research on this subject, however, addressed primarily larger biface artifacts. Thomas (1981:15) indicated that the stage concept of arrow point (small biface) production was important to consider when attempting to assign stylistic types to these tools. He pointed out that typological confusion could be generated if unfinished forms were considered as finished points. Thomas

provided no descriptive criteria in 1981, however, to distinguish finished from unfinished arrow points. While he later (1983) described such staged forms for his Gatecliff biface assemblage, most of the distinctive criteria were still applicable primarily to larger dart point styles. The interpretations, made below, of small bifaces as preforms or stages of manufacture and, therefore, as unfinished tools is based on criteria described for a small biface production trajectory by Whittaker (1994).

Similar to larger forms, Whittaker's trajectory for small bifaces envisions identification of stages of manufacture once a satisfactory flake has been produced, usually from a platform core. For larger bifaces these stages are often described by terms such as "early stage," "late stage," and "finished" bifaces. The small biface production trajectory begins when a flake is first produced from a core that will normally be only slightly larger than the size of the intended tool. Ideally, the flake will be flat and be not much thicker than the intended point and will be approximately twice as wide and twenty-five percent longer. This selected flake, according to Whittaker, roughly equates to a blank. Being unmodified, however, this stage (called Stage 0) cannot be identified. The first modified stage (termed by Whittaker as Stage 1), when completed, is described as an "edged blank." At this stage the entire perimeter of the flake is abraded and/or pressure flaked to remove the fragile edges of the blank and establish a bifacial platform all around. The next stage, Stage 2 or "preform," is broken into an "early" phase and a "late" phase. This stage involves thinning and regularizing the piece (early phase) and then beginning to shape it in outline (late phase). While these preform phases might be identifiable if intact (whole), fragments would probably frequently be identified only as "worked flakes." Whittaker (1994:152-162).

The next stage, Stage 3, is described by Whittaker as an "unfinished point." In this stage, both a bifacial outline and cross-section have been created, but the basal hafting treatment has not been completed. It is this stage that, either whole or fragmented, can be identified as a preform for an arrow-size biface. Stage 4 is the finished point complete with basal hafting treatment. The third stage is the form that Thomas (1981) was referring to as having the potential to cause typological confusion. The basal or hafting treatment is usually considered to be the most typologically diagnostic attribute of an arrow point. Lacking a final basal treatment, this stage, if interpreted as a final stage, might be considered as a style distinct from the intended style, when the point was completed by the maker.

b. Results

Sixty-seven whole and fragments of biface artifacts were recovered from eleven of the thirty-two Oak Country sites (Table VII-7). These artifacts consisted of small arrow point related bifaces, a few small dart points, and a large number of mostly fragmentary larger size bifaces. In this study the bifaces defined as projectile points or possibly otherwise diagnostic bifaces were segregated and then described and analyzed separately from amorphous biface forms and nondiagnostic biface fragments. The former group consists mostly of triangular shaped arrow points, and small biface preforms likely connected with their manufacture. Included in this group as well are several other larger biface projectile point (dart?) types and some special function biface tools, i.e., reamers/perforators. The remaining bifaces consist mostly of largely amorphous, non-diagnostic biface fragments (e.g., tips and edge fragments), apparently derived from both larger and smaller biface tool manufacture. While most of these amorphous and fragmentary bifaces undoubtedly represent the earliest to intermediate stages, or from blank to earliest preform levels of reduction, a few fragments may be tips or edge fragments from finished tools. These amorphous bifaces were segregated, and then described and analyzed separately from those defined as projectile point bifaces.

Of the 67 bifaces recovered, seven are whole and sixty are fragments. Thirty-eight of the bifaces (56.7 percent) are made of quartz, twenty (29.8 percent) of SPV metavolcanic, two (3.0 percent) of obsidian, and one (1.5 percent) each of metasediment, PDL chert, jasper, chalcedony, and chert with one unknown. Unit excavations produced fifty-four of these tools, STP excavations seven, and six were recovered in surface collection. Biface tools occurred in all levels from 0 to 80 cm at the sites, with the greatest number (n=20)

occurring in the 10 to 20 cm level. Eleven biface artifacts occurred in the 20 to 30 cm level, ten in the 0 to 10 level, nine in the 40 to 50 cm level, four in the 30 to 40 cm level, two in the 50 to 60 cm level, two in the 60 to 70 cm level, and one in the 70 to 80 cm level. Of the eleven sites with biface artifacts, sites SDI-7756 and SDI-7759 produced the most with sixteen each. Eight biface artifacts occurred at SDI-7755; seven each at sites at SDI-7753 and SDI-7757; three at site SDI-7754; two each at sites SDI-7322, SDI-7325, and SDI-7751; and one at site SDI-7767. The specific circumstances of recovery, material types, and dimensions are shown in Table VII-7.

Table VII-7. Biface Distribution and Attributes

Site CA-SDI-	Cat #	Provenience	Coordinates N/S	Coordinates E/W	Level (cm)	Type	Portion	Pat	Material		Wt (g)	Dimensions (cm) Len	Wid	Thk
Arrow Point Preforms														
7753	*66*	Unit 1	S009	W005	10-20	CT	W	-	QTZ	M	2.7			
7753	104	Surface	-	-	-		B	Y	SPV	P	1.6	-	2.3	0.6
7756	*123*	STP	N540	W120	10-20	CT	B	-	QTZ	M	2.8	-	-	-
7756	254	Unit 4	N550	W126	10-20		B	-	QTZ	M	1.1	-	-	-
7756	*197*	Unit 1	N450	W138	20-30	CT	B	-	QTZ	M	1.9	-	-	-
7756	*240*	Unit 2	N442	W279	30-40		B	N	SPV	P	4.3	-	-	-
7755	242	Unit 3	N708	E028	0-10		PB	-	QTZ	C	0.9	-	-	-
7756	264	Unit 4	N550	W126	40-50		PB	-	QTZ	M	0.8	-	-	-
7754	9	STP	S020	E020	20-30		E	-	CHL		0.5	-	-	-
7325	15	Unit 1	N096	E176	10-20		M	-	PDL		0.6	-	-	-
7753	62	Unit 1	S009	W005	0-10		M	-	QTZ	M	0.4	-	-	-
7759	240	Unit 2	N231	E200	30-40		M	-	QTZ	C	1.5	-	-	-
7755	262	Unit 3	N708	E028	60-70		MS	-	QTZ	C	0.7	-	-	-
7756	237	Unit 2	N442	W279	20-30		MS	N	SPV	P	2.8	-	-	-
7759	236	Unit 2	N231	E200	20-30		MS	-	QTZ	M	1.8	-	-	-
7756	190	Unit 1	N450	W138	10-20		T	-	QTZ	M	0.8	-	-	-
7757	122	Unit 3	N420	E031	0-10		T	Y	SPV	A	0.9	-	-	-
7759	193	Unit 1	N319	E192	10-20		T	-	QTZ	M	0.2	-	-	-
7759	230	Unit 2	N231	E200	10-20		T	-	QTZ	M	0.3	-	-	-
7759	231	Unit 2	N231	E200	10-20		T	-	QTZ	M	0.2	-	-	-
7759	207	Unit 1	N319	E192	40-50		T	-	QTZ	C	0.7	-	-	-
7753	4	STP	N0	E0	10-20		I	-	QTZ	M	0.3	-	-	-
Arrow Points														
7756	*222*	Unit 1	N450	W138	40-50	CT	W	Y	SPV	A	1.2			
7756	*223*	Unit 1	N450	W138	40-50	CT	W	-	QTZ	M	0.5			
7759	*185*	Unit 1	N319	E192	0-10	CT	W	-	QTZ	M	0.5			
7755	*220*	Unit 2	N696	E058	10-20	CT	W	-	SPV	A	1.9			
7755	*211*	Unit 2	N696	E058	0-10	CT	"W"	-	QTZ	M	1.3			
7756	*198*	Unit 1	N450	W138	20-30	CT	"W"	Y	SPV	A	0.9			
7753	*65*	Unit 1	S009	W005	10-20	CT	B	-	QTZ	M	0.9	-	-	-
Other Projectile Points														
7759	*215*	Unit 1	N319	E192	70-80	CT/Drill?	B	N	SPV	P	3.2	-	-	-
7756	*72*	STP	N456.5	W120	10-20	Lg CT	B	Y	SPV	A	2.5	-	-	-
7757	*36*	STP	N520	E120	60-70	SN	W	-	QTZ	M	1.2			
7757	*1*	Surface	-	-	-	SN Dart?	B	-	QTZ	M	3.4	-	-	-
7755	*210*	Unit 2	N696	E058	0-10	SN Dart	B	Y	SPV	A	2.3	-	-	-

Site CA-SDI-	Cat #	Provenience	Coordinates N/S	Coordinates E/W	Level (cm)	Type	Portion	Pat	Material		Wt (g)	Dimensions (cm) Len	Wid	Thk
Large Bifaces/Knives														
7754	63	Surface	-	-	-	Knife	T	Y	SPV	A	14.0	-	2.4	1.0
7755	198	Unit 1	N761	W086	40-50	Knife	T	Y	SPV	A	2.8	-	-	-
7756	267	Unit 4	N550	W126	50-60	Knife	T	Y	SPV	A	2.1	-	-	-
7757	94	Unit 1	N470	E067	20-30	Knife	T	Y	UNK		12.5	-	-	-
7322	127	Unit 2	S140	W175	10-20	Lg Biface	M	-	OBS		0.6	-	-	-
7325	19	Unit 1	N096	E176	20-30	Lg Biface	M	-	SLW		0.5	-	-	-
7756	221	Unit 1	N450	W138	40-50	Lg Biface	M	-	JAS		0.05	-	-	-
7757	112	Unit 2	N500	E111	20-30	Lg Biface	T	N	SPV	A	0.5	-	-	-
7759	191	Unit 1	N319	E192	10-20	Lg Biface	T	Y	SPV	F	0.05	-	-	-
Non-diagnostic Biface Fragments														
7322	125	Unit 2	S140	W175	0-10	-	B	Y	SPV	F	8.1	-	-	-
7751	43	STP	S060	W020	40-50	-	B	-	QTZ	C	1.6	-	-	-
7753	83	Unit 3	S080	E006	0-10	-	B	Y	BED		4.2	-	-	-
7754	30	Unit 1	N021	E055	0-10	-	B	-	QTZ	C	3.3	-	-	-
7755	255	Unit 3	N708	E028	40-50	-	B	-	QTZ	M	11.4	-	-	-
7755	233	Unit 2	N696	E058	50-70	-	B	-	QTZ	M	2.4	-	-	-
7756	255	Unit 4	N550	W126	10-20	-	B	N	SPV	P	7.2	-	-	-
7756	213	Unit 1	N450	W138	30-40	-	B	-	QTZ	M	10.3	-	-	-
7757	113	Unit 2	N500	E111	20-30	-	B	-	QTZ	C	1.7	-	-	-
7758	40	STP	N220	E040	20-30	-	B	Y	SPV	A	7.4	-	-	-
7759	222	Unit 2	N231	E200	0-10	-	B	-	QTZ	M	2.5	-	-	-
7759	192	Unit 1	N319	E192	10-20	-	B	-	QTZ	M	2.5	-	-	-
7759	228	Unit 2	N231	E200	10-20	-	B	-	QTZ	M	5.5	-	-	-
7759	229	Unit 2	N231	E200	10-20	-	B	-	QTZ	M	4.8	-	-	-
7759	212	Unit 1	N319	E192	50-60	-	B	-	QTZ	C	1.4	-	-	-
7758	61	Unit 1	N188	W001	30-40	-	E	-	QTZ	M	1.8	-	-	-
7755	256	Unit 3	N708	E028	40-50	-	T	N	SPV	P	4.2	-	-	-
7759	273	Surface	-	-	-	-	T	Y	SPV	P	31.8	-	-	-
7751	14	Surface	-	-	-	-	M	-	QTZ		2.5	-	-	-
7756	189	Unit 1	N450	W138	10-20	-	M	-	QTZ	M	2.2	-	-	-
7757	106	Unit 2	N500	E111	10-20	-	M	-	QTZ	M	2.8	-	-	-
7759	197	Unit 1	N319	E192	20-30	-	M	-	QTZ	M	0.9	-	-	-
7767	14	Unit 1	N016	W014	20-40	-	M	-	QTZ	M	0.7	-	-	-
Drill Fragment														
7753	105	Surface	-	-	-	Drill ?	T	-	OBS		0.5	-	-	-

Italicized Cat No. indicates illustrated artifact
Portion: W = whole; "W" = essentially whole; B = base; PB = partial base; E = end; M = margin (edge);
MS = midsection; T = tip; I = indeterminate
Pat (patination): N = not apparent; Y = present
Material: QTZ = quartz; SPV = metavolcanic; SLW = silicified wood; JAS = jasper; OBS = obsidian;
MSD = metasedimentary; UNK = unknown (item unwashed)
P = porphyritic; A = aphanitic; F = fine-grained; M = milky; C = clear

c. Projectile Points and Projectile Point Preforms

Projectile Point Preforms

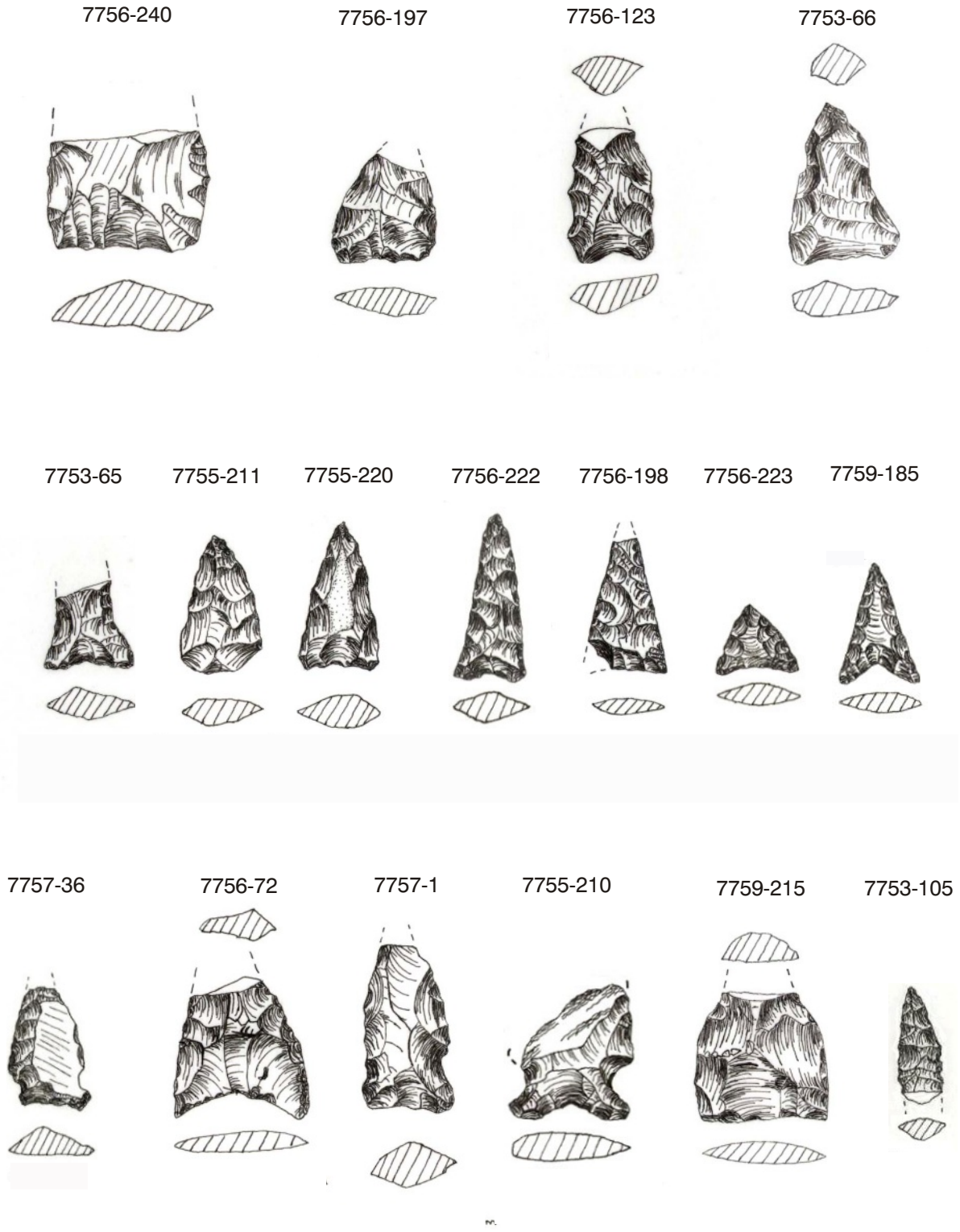
Twenty-two whole or fragmentary pieces of small projectile point preforms (Whittaker's stages 2 and 3) were recovered (see Table VII-7); seventeen (77.3 percent) made of milky quartz, four (18.2 percent) of SPV metavolcanics, one (4.5 percent) of PDL chert, and one (4.5 percent) of chalcedony. Six of these preforms were discarded at an early stage of manufacture and sixteen in a late stage of manufacture. Of these nineteen fragments, three appear to be bases (two straight with right angle corners [Figure VII-7, 7756-240] and one convex), four tips, and four edges or indeterminate portions of the original bifaces. The three specimens (7753-66, 7756-197, 7756-123) that are essentially whole (small portions of two may be missing), represent, for the most part, a late stage of manufacture (see Figure VII-7). Evident among these whole specimens are a completed outline and a roughly triangular shape, as prescribed by Whittaker (see above). Of the fragments, five (22.7 percent) are tips, three (13.6 percent) are basal portions, and eleven (50.0 percent) are edge fragments. The "whole" specimens all appear to have been rejected, as each manifests some obvious problem and/or flaw (e.g., excessive thickness or a thinning obstruction) that occurred during the reduction process.

Coastal Cottonwood Projectile Points

Locally, in the San Diego area, small triangular-shaped bifaces, with an inferred use as projectile points (and primarily but exclusively as arrow points), have frequently been described and analyzed without reference to, or association with, similar styles previously identified in the Great Basin and desert areas to the east (e.g. True 1970; Carrico and Taylor 1984). In the western Great Basin, triangular points were identified by Riddell (1951) at a site on Cottonwood Creek, and the Cottonwood Series of projectile points was subsequently defined by Lanning (1963) in a reanalysis of Riddell's materials and other materials from a site at Rose Springs. While it is generally agreed among archaeological researchers that these point styles diffused and/or were brought to the coast from the Great Basin, in the southern California coastal area they have only recently been referred to as Coastal Cottonwood projectile points. This term, first proposed by Eberhart (personal communication in Marshall 1979), has, since circa 1980, come into general use, in the Orange County area and elsewhere in the southern coastal area (e.g., Koerper and Drover 1983; Koerper et al. 1996). This term will be used here to refer to the small triangular bifaces recovered from the project sites.

Of the 67 biface artifacts recovered, nine (13.4 percent) consist of whole and fragments identifiable as belonging to the Coastal Cottonwood Series of projectile points. If the three "whole", Stage 3 preforms (described separately above) are assumed to also be associated as late manufacturing stage of these points (see Figure VII-7), then, together they would constitute 17.9 percent of the biface artifacts recovered. It should also be pointed out that an unknown number of the nondiagnostic fragments (tips and edge fragments, etc.) are probably also associated with these points and therefore, they may account, overall, for an even greater percentage of the bifaces recovered from the sites. The raw materials of the twelve bifaces identifiable as Cottonwood or likely Cottonwood points consist of seven (58.3 percent) of milky quartz, and five (41.7 percent) made of SPV metavolcanics.

Vertically in the deposit, 58.3 percent (n=7) of the twelve Coastal Cottonwood Series associated bifaces were found in the upper 20 cm of the sampled site areas with 41.7 percent (n=5) coming from the 10 to 20 cm level. Three specimens were found in the 40 to 50 cm level, one in the 20 to 30 cm level and one in the 70 to 80 cm level. Horizontally, they occurred in four of the thirty sites excavated, with six from site SDI-7756, and two each from sites SDI-7753, SDI-7755, and SDI-7759.



Mooney & Associates

0 1 2cm

Oak Country Estates

Arrow Point Preforms, Arrow and Dart Points, and Drills

Figure VII-7

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The seven Cottonwood Series triangular points with sufficiently intact or completed bases for evaluation have concave bases (see Figure VII-7). Most have only slightly concave bases, with the depth of the concavity varying from nearly (but not completely) flat to clearly but not substantially indented in three specimens. As a group they would all be considered as consistent with True's Type 1 Projectile Points (1970: 21-22). One exception may be the larger specimen 7756-72 (described below) which True might have categorized as a Type 3 knife (1970: 29). Waugh (1988) used a Discriminant Analysis Program derived linear classification functions for the identification of three variant forms of Cottonwood Series triangular points that may have chronological sensitivity. These forms were distinguished primarily by the basal configuration (straight, slightly concave, or deeply concave), but were further correlated with the variable of the thickness of the point as well. It has been previously suggested by Carrico and Taylor (1983) that the deep concave style may be more recent in time than the broad base and straight based configurations. It might be expected, therefore, in a stratified site deposit, that these latter forms would occur deeper in the deposit than the more concave configuration. Of the twelve Cottonwood Series triangular points that could be measured for the depth of the basal indentation and for overall biface thickness, using Waugh's (1988) linear classification functions, ten of the twelve points would be classified as the Broad Base variant form with the other two classified as the Deep Base variant. Little stratification by depth occurred for these artifacts at the sites, however, making it all but impossible to differentiate these forms by depth. Seventy-five percent (9 of 12), of these Cottonwood Series projectile points, occurred above the 30 cm level with 58 percent occurring from 0-20 cm. Both of the Deep Base variant specimens occurred from 0-20 cm with two of the Broad Base Specimens occurring in the 40-50 cm level and another in the 70 to 80 cm level. These results would appear to correlate with results achieved elsewhere where no definite differentiation by depth could be discerned for these style variants (cf. Waugh 1988; Koerper et al. 1996:269-272).

Two of the specimens included with the Cottonwood Triangular Series (7759-215 and SDI-7756-72) warrant special mention. Despite lacking a tip, the morphology of the remaining fragment of specimen 7759-215 (see Figure VII-7) suggests a function that has been previously associated with possible use as a drill (e.g., see Drills, Type 2, Lanning 1963:256, and Plate 9h). It was found in the 70 to 80 cm level of Unit 1 at site SDI-7759. It is made of a black SPV metavolcanic material and has a straight to slightly concave base with convergent biconvex sides. Approximately 1.7 cm up from the base, abrupt indentations occur on each side of the biface creating shoulders. While the tip is broken-off just above these shoulders, it appears that a narrower blade would have originally continued above this point. Proof of this function on a whole specimen would be demonstrated by the presence of use-wear on the edges and/or surfaces of the tip. Lacking the tip, only the morphology of the remaining basal portion (and perhaps the possible absence of the tip as a result of twisting use?) can be used to suggest this function. While, it is included here with the projectile points, it might actually belong with the biface reamers and/or perforators described below (cf. True 1970: 30-31).

The second biface, 7756-72, is made of a purple-gray, SPV metavolcanic material. It was found in the 10 to 20 cm level of an STP at site SDI-7756. It is a basal fragment with only the tip missing. It is distinctly triangular in shape with a concave basal configuration (see Figure VII-7), and while generally thin in cross-section, it has a small hump on one side near the fracture point. The fracture is end shock in type, which may indicate a production failure. What is unusual is its large size (the fragment weighs 2.5 grams, if whole, it would weigh more than three grams). Similar large triangular bifaces have also been noted at other sites in the southern coastal region (cf. Lyneis 1981; Shackley et al. 1989; Pigniolo and Cooley 1992; Cooley and Carrico 1999). Shackley et al. (1989:129) described a similar example as follows "This may be a late stage Cottonwood point, but appears too thin to be a stage of production. These large triangular points are uncommon, but do occur in Late Prehistoric contexts in southern California . . . They are thus-far generally non-diagnostic.". Koerper and Drover (1983), however, have categorized similar larger concave-based triangular bifaces (largest 3.1 grams) as part of the Cottonwood Series and have suggested that the largest may be earlier in time than smaller versions, i.e., circa A.D. 750. They also suggested, for their two largest examples (weights of 2.7 and 3.1 grams), that "It is not inconceivable that these two specimens are actually small dart points." (1983:16).

Other Projectile Points

Three other projectile points were recovered that have morphological characteristics distinct from the Cottonwood style. Two are nearly whole, one is a basal fragment, and each derived from a different site. Two (7757-1 and 7757-36) are made of milky quartz and the other (7755-210) of SPV metavolcanic (see Figure VII-7). Specimens 7757-1 and 7755-210 would probably be considered as belonging to True's Heavy Intrusive Points type (1970: 28). Specimen 7757-36 is small point with side-notches and it is eared. It is missing both an ear and the tip of the blade. It was found in the 60 to 70 cm level of an STP at site SDI-7757. While approximately 90 percent complete, its weight of 1.2 grams is still relevant. It is clear that, complete, it would still weigh only about 1.5 grams. Stylistically, it is somewhat aberrant and might be considered as similar to True's Type 4 small triangular point with side notches (1970: 25). In terms of its size it would be consistent with a Desert Side-notched assignment (Thomas 1981:16-18), but the basal configuration, while side-notched, is lacking in a basal concavity, which makes it somewhat inconsistent with this style. In basal configuration it more resembles an Elko Eared (Lanning 1963; Heizer and Hester 1978; Thomas 1981), but it would be very small for this style. While the presence at these sites of a Desert Side-notched point would not be too surprising (see e.g. Saunders 1993), no other examples were recovered in the testing program. Specimen 7757-1 is also a side-notched point with an eared configuration. It is missing only a small portion of the blade tip and appears to be approximately 98 percent complete. It was found on the surface at site SDI-7757 and it is heavier (3.4 grams) and thicker than specimen 7757-36. It also bears some resemblance to an Elko Eared type (Lanning 1963; Thomas 1981) or perhaps to Thomas' Large Side-notched group (1981:18-19, Figure 6c and 6d), which would also be more consistent with its size. Specimen 7755-210 is also a side-notched point with an eared configuration. It is missing most of the upper portion of the blade above the corner notches and appears to be only, at most, 60 percent complete. It was found in the 0 to 10 cm level of Unit 2 at site SDI-7755 and it weighs 2.3 grams. This point can be fairly confidently classified as an Elko Eared type (Lanning 1963:251, and Plate 6k; Heizer and Hester 1978; Thomas 1981).

Points such as specimen 7757-1 and 7755-210 have been the subject of recent discussion in the literature in regard to three interrelated subjects (1) the rejuvenation and reworking of dart type (and dart size) projectile points and the consequent effects on typology (e.g., Flenniken and Raymond 1986; Flenniken and Wilke 1989), (2) the previously discussed misidentification of stages of production as finished points (e.g., Thomas 1981), and (3) the stylistic configurations of the earliest arrow points in the southern coastal area (e.g., McDonald and Eighmey (1998); Koerper et al. 1996; Koerper et al. 1994; Van Horn 1990). Koerper et al. (1996:261-267), looking at biface assemblages from a number of sites in the Newport Bay area of coastal Orange County, discuss the possibility of early older dart point styles being used as templates for the manufacture of the first arrow points versus the contemporary reworking and reuse of dart points. In the Great Basin, Rose Spring and Eastgate style points (termed Rosegate points by Thomas [1981]) are often associated with the introduction of bow and arrow hunting technology (Heizer and Baumhoff 1961; Lanning 1963; O'Connell 1975). Koerper et al., point out, however that while many such points found in the coastal areas may be similar to Rose Spring and Eastgate (Rosegate) points in size, they rarely resemble them closely in style. Consequently, they conclude that while these shouldered and stemmed points may be connected to early bow and arrow usage in the area, Rose Spring and Eastgate points, as such, are not present in Orange County (1996:267).

Addressing this same problem, Van Horn (1990) identified a series of points (he termed Marymount points) at six sites in coastal Los Angeles and southern Ventura counties. He also examined the question of the early introduction of the bow and arrow in that area of the southern California coast, as possibly reflected in these points. Also of interest was the fact that since almost all of the points were made of fused shale (one was made of obsidian), a material local to that area of the coast, this indicated that they were being made locally and not brought in. Van Horn speculated that the points were associated with the early Shoshonean coastal inhabitants of the area and that they represented early bow and arrow usage, possibly connected with the use of single-shaft cane arrows. While acknowledging some similarity, Van Horn, like Koerper et al., did not

believe that these points represent actual Rose Spring or Eastgate points. Locally, in western San Diego county, according to McDonald and Eighmey (1998), a few, possibly "transitional"(i.e. between the final Archaic [dart points] and Late Prehistoric) arrow point types, suggested as Rose Spring types have been reported, but they have not been unequivocally classified as a Rose Spring or transitional point type. Consequently, they indicate that Rose Springs points have not as yet been definitely documented for "extreme southern California" (1998: III-23).

The above discussion serves as a basis for briefly addressing the possible presence of "transitional" arrow point types in the biface assemblage from the Oak Country sites that is otherwise dominated by Cottonwood Series arrow points. The introduction of the bow and arrow in the Great Basin has been postulated to have occurred circa A.D. 500 (Koerper et al. 1996:261). As will be discussed further later, with the possible time depth at the project sites (i.e., to circa 1800 B.P. or A.D. 150), and with several dates indicating continuing at least intermittent occupation of the sites over this nearly 1800 year period, it appears plausible that the incipient use of the bow and arrow could be expressed in the biface assemblage of the sites. As indicated above, biface 7757-1, as well as possibly the two large projectile point bifaces 7756-72 and 7755-210, may represent examples of early transitional dart to arrow points. Specimen 7757-1 could possibly be considered as a manifestation of these transitional point types due to its relatively small size (i.e., less than 3.5 grams [c.f. Fenenga 1955]), and to a degree, its minimal stylistic resemblance to some Great Basin transitional types (e.g., Thomas' Large Side-notched points [1981:18-19). It would seem mostly likely, however, that biface fragment 7755-210 (approximately 60 percent of the original point with a fragment weight of 2.3 grams), which has an Elko Eared basal configuration, probably weighed at least 3.8 grams when whole. This would seem to indicate that it functioned as a dart point unless the breakage represents attempts to rework it into a new form. With this basal morphology however, it does not seem likely that it could have functioned effectively as an arrow point even after it was reworked. The third possible candidate, specimen 7756-72, is Cottonwood Series in style with only its large size (fragment weight 2.5, whole weight extrapolated to be greater than 3 grams) making it doubtful as an arrow point. As already discussed, the function and temporal association of this point is unclear but Koerper and Drover (1983) have speculated that similar points found in coastal Orange County may date to as early as A.D. 750 and may have functioned as small dart points.

Larger Bifaces and Amorphous and Nondiagnostic Biface Fragments

In addition to the twenty-two small biface preforms, nine Coastal Cottonwood Series points, and three other projectile point types, thirty-three specimens consist of amorphous bifaces and nondiagnostic biface fragments. These mostly larger bifaces consist of one whole and thirty-two fragments. Seventeen of the thirty-three specimens are milky quartz, eight are SPV metavolcanic, two are obsidian, one is jasper, one is silicified wood, one is wonder stone, one is metasediment, and two are unknown. Many of these amorphous fragments constitute remnants from the earliest stages of biface reduction at the sites. Twenty-three of the fragments are interpreted as portions of blanks or preforms from larger biface manufacture, as they exhibit only percussion flaking and are thick and irregular in working. Of these twenty-three, eighteen appear to be bases (mostly convex), four tips, and four edges or indeterminate portions of the original bifaces. The eighteen specimens termed bases are nondiagnostic "base" fragments from amorphous early stage bifaces, often with so little shaping of the original biface having occurred that the interpretation of the fragment as a base versus a tip is tenuous at best. One of the tips (7759-273) is from a large SPV metavolcanic, biface blank (Figure VII-8). The flake scars are large and produced by percussion. Another tip (7755-256), made of an unusual volcanic, is probably from a preform (see Figure VII-8). While edging is incomplete on this item, finer work is visible with some evidence of pressure flaking evident. One other specimen of note (7322-127) is a small amorphous fragment made of Coso obsidian. This piece probably represents a reworked fragment of large tool such as a knife.

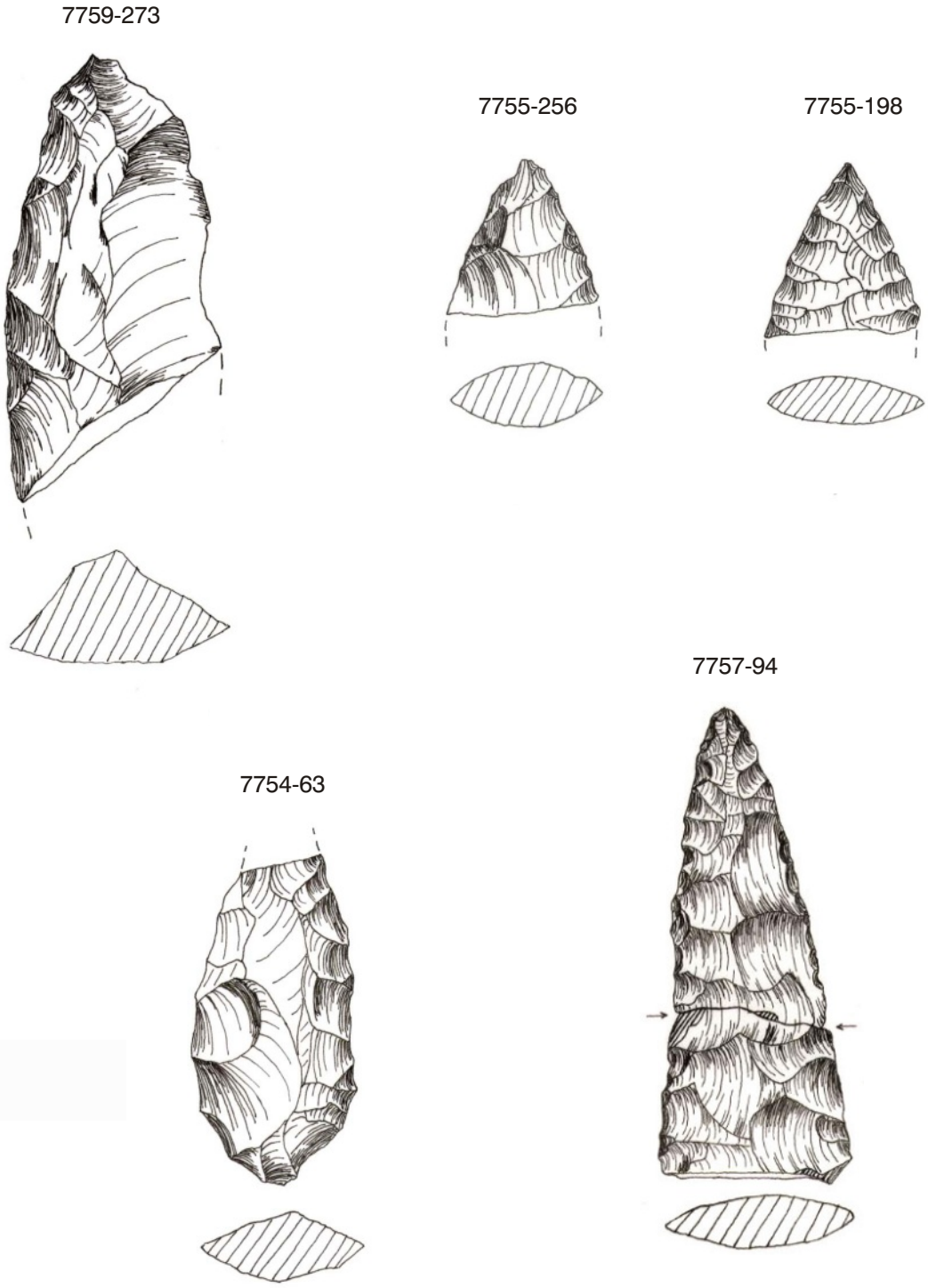
Nine other bifaces are interpreted to be fragments of completed larger bifaces. Of these nine, one is "whole" and eight are tips. Four of the tips (7756-221, 7757-112, 7325-19 and 7759-191) are too small make any

interpretations as to original tool function. What is interesting about two of these specimen is the material types from which they were made. Specimen 7756-221 is made of dark red jasper and specimen 7325-19 is silicified wood. Specimens 7759-191 and 7756-221 are made of SPV metavolcanic. The nearly whole biface (7754-63) is missing the very tip but is otherwise complete (see Figure VII-8). This biface appears to correlate with True's Type 4 knife (1970: 29). It is made of green SPV metavolcanic and it is highly patinated. The edges appear rounded and dulled suggesting use as cutting tool (knife), but the patination makes it difficult to be certain of the nature of this edge alteration. All flaking on this biface is by percussion and it seems possible that this artifact may represent a scavenged item from an older site in the area. Three of the tips (7755-198, 7756-267, and 7757-94) are probably from knives (see Figure VII-8). Tip fragment 7757-267 is made of SPV metavolcanic and like biface 7754-63 it is highly patinated. Also like 7754-63, the edges appear rounded and dulled suggesting use as cutting tool (knife), but the patination makes it difficult to be certain of the nature of this edge alteration. Specimen 7758-198 appears to be SPV metavolcanic, but it is substantially fire affected with color alteration and visible crenation fractures on its surface making it difficult for a certain material identification. Its condition also made use wear difficult to discern. Tip fragment 7757-94 derived from a very large biface of uncertain function (see Figure VII-8). It seems likely that it served as knife, as it is too large to have been a projectile point. It also appears to be fire affected and consequently the material type is uncertain and edge wear identification was hampered. One other biface fragment (7753-105) is defined as drill or reamer (see Figure VII-7). It is made of Obsidian Butte obsidian and is only the tip of the original tool, but it shows use-wear in the form of dulling and abrasion on portions of the bifacial edges. It is narrow and relatively thick in cross-section (cf. True 1970: 30-31).

Discussion

Some comparisons of materials and stylistic types can be made between the results from recent testing of thirty-six archaeological sites on the Montecito Ranch project located across Santa Maria Creek approximately two kilometers east of the Oak Country Estates project area (Saunders 1993). Twenty-two bifacial flaked artifacts recovered included four bifaces, four preforms, and fourteen projectile points. Quartz was the material of 59.1 percent of the twenty-two biface artifacts recovered in the Montecito program compared with 56.7 percent in the current program. The occurrence of other materials (with the current project in parentheses) included: obsidian 18.2 percent (3.0 percent), volcanic/metavolcanic 13.6 percent (28.8 percent), quartzite 4.5 percent (0.0 percent), and chert 4.5 percent (combined cherts and chalcedony 6.0 percent).

Of the twenty-two Montecito bifaces, eight are identified as Cottonwood Series projectile points. These eight points came from three sites, SDI-12,943 (1), SDI-12,947 (6), and SDI-12,504 (1). Of these eight, five are identified as concave based, two as straight, and one is not indicated. In the current project, of the twelve Coastal Cottonwood Series associated triangular projectile point bifaces (including biface 7759-215 categorized as a drill), all are concave based. In regard to materials, 75.0 percent (n=6) of the Montecito Cottonwood points are made of quartz, one of volcanic/metavocanic, and one of obsidian. In the current sample, of the twelve Cottonwood projectile points, seven 58.3 percent (n=7) are quartz, and five are volcanic/metavolcanic. Vertically in the deposits, 58.3 percent (n=7) of the eleven Cottonwood projectile points were found in the upper 20 cm of the sampled site areas with 41.7 percent (n=5) coming from the 10 to 20 cm level. Two specimens were found in the 20 to 30 cm level, two in the 40 to 50 cm level, and one in the 70 to 80 cm level. Of the eight Montecito Cottonwood points, 75 percent (n=6) were recovered from



Mooney & Associates

0 1 2cm

Oak Country Estates
Biface and Knife Fragments
Figure VII-8

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the upper 10 cm of the site areas with 62.5 percent (n=5) coming from the surface. One was recovered from the 20 to 30 cm, and one from 30 to 40 cm level. Horizontally, at the Oak Country sites, the twelve Cottonwood projectile points occurred in four of the thirty sites excavated, with six from site SDI-7756, and two each from sites SDI-7753, SDI-7755, and SDI-7759. In the Montecito project area, these points occurred at three of the thirty-six sites tested, with five from site SDI-12,497 and one each from sites SDI-12,493 and SDI-12,504.

Relevant to the research question of local raw material choice usage is the apparent preference displayed in Cottonwood projectile point production. Table VII-8 and Map VII-2 below, present the locations and the relative percentages of raw materials used for the production of Cottonwood Series points from various locations in the southwestern area of the county, including the project sites. As can be seen in the table, quartz is used in preference over SPV and other materials at Late Period sites in the Ramona Valley (current project and Montecito Ranch, Saunders 1993) and in the nearby San Dieguito River/San Pasqual Valley (Cooley et al. 1996 and Case et al. 2001), and at Rose Creek (SDI-12,557, Bissell 1997), whereas in areas downstream from SPV outcrops where this material becomes more readily available (in the major adjacent drainage?) and quartz less so, such as the Otay River Valley (SDI-12,809, Serr 1996) or the lower San Diego River Valley (Mission de Alcala, Carrico n.d.), SPV becomes the material of choice and quartz becomes a secondary material. As already indicated above, at the project sites, quartz was perhaps the most readily available material, that could be worked made into small tools such as biface projectile points. A bias in the use of quartz, then, would seem to likely be a function of the availability of this material locally versus other materials. Also of interest in regard to the possibly less than optimal workability of quartz is the fact that the percentage of quartz preforms and amorphous blank fragments is even higher than for the finished products (75.6 percent, 34 of 45 versus 58.3 percent, seven of twelve), possibly indicating that considerable breakage occurs during manufacture with this material. This was also in evidence at nearby site SDI-14,808 (Case et al. 2001), situated just to the north along the San Pasqual Valley, where the percentage of quartz preforms and amorphous blank fragments was similarly skewed for quartz with 67.3 percent (35 of 52) versus 81.8 percent (9 of 11) for the finished products. These data would, perhaps, further suggest that the substantial use of quartz is more a matter of availability than of preferability for the material at these sites.

Table VII-8. Comparison of Materials Percentage for Cottonwood Series Points

Material	Oak Country Current Project Four sites (n=12)	Montecito Ranch Saunders 1993 Three sites (n=8)	San Dieguito River Valley Cooley et al. 1996 Three sites (n=12)	San Pasqual/Wild Animal Park Case et al . 2001 One site (n=11)	Rose Canyon Bissell 1997 One site (n=30)	McGowan Site Serr 1996 One site (n=171)	Mission Alcala Carrico n.d. One site (n=70)
SPV	41.7	12.5	41.7	-	23.3	73.3	62.9
Quartz	58.3	75.0	58.3	81.8	40.0	7.6	21.4
PDL Chert	-	-	-	-	-	-	-
Obsidian	-	12.5	-	18.2	16.7	5.3	1.4
Misc. Chert	-	-	-	-	16.7	7.6	7.1
Quartzite	-	-	-	-	3.3	1.7	2.9
Jasper	-	-	-	-	-	1.2	-
Other	-	-	-	-	-	3.3	4.3

5. Worked and Utilized Flake and Chunk Tool Analysis

a. Utilized Flake and Chunk Analysis

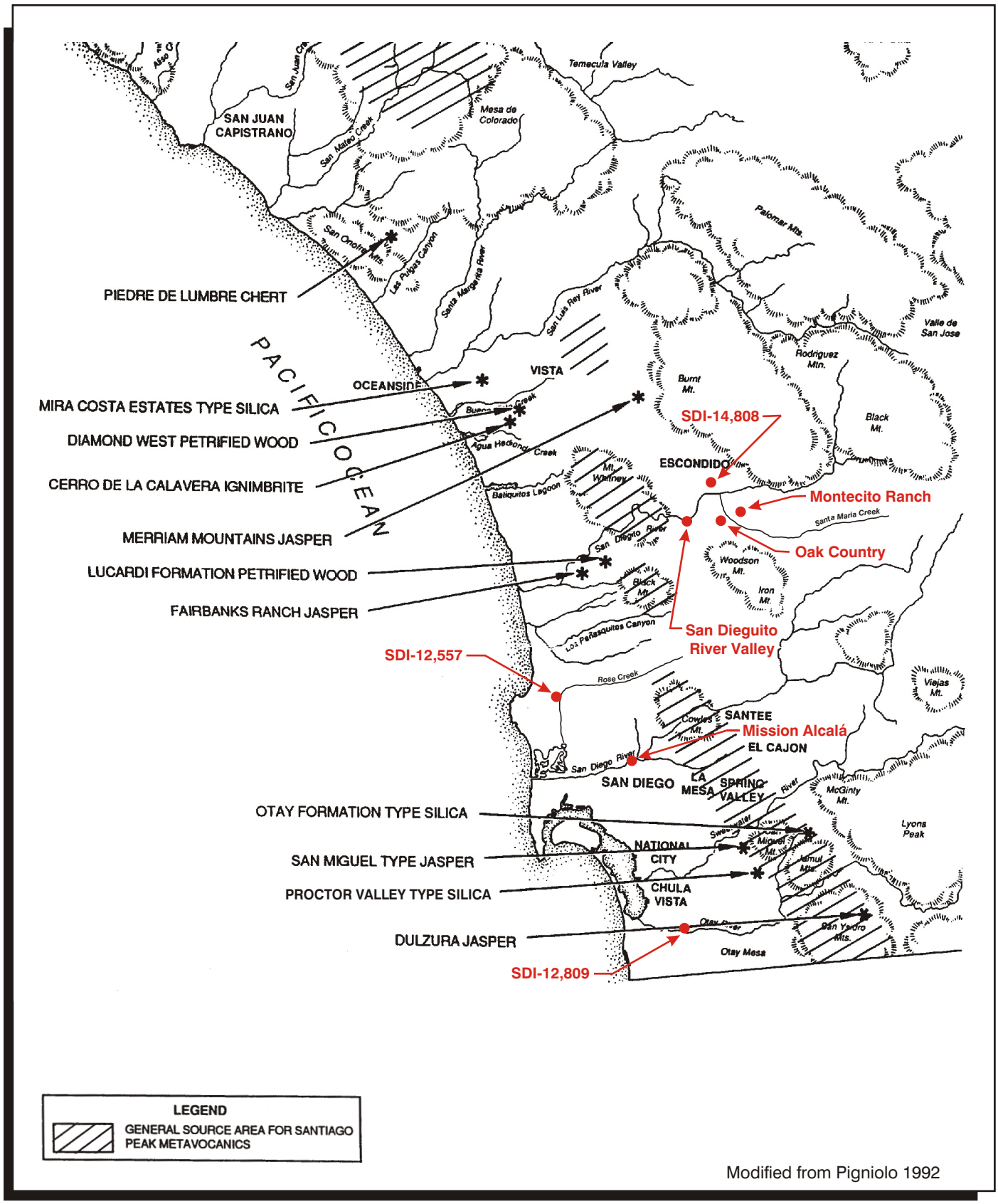
Twenty-five artifacts were recovered from the Oak Country sites that are flakes or chunks with evidence of use on some portion or portions of an edge or tip (cf. True 1970: 30). All of the specimens were examined and identified using a six to fifty variable power binocular microscope. These tools were manufactured by

the controlled fracture of a stone core through percussion, producing a flake or chunk with a sharp usable edge(s) or tip. Such blanks can be produced quickly and repetitively by an experienced knapper. The flakes and chunks utilized at the sites were all struck from non-biface cores (and core tools) such as those recovered from the site. Of these twenty-five tools, twenty-one (84.0 percent), were struck from SPV metavolcanic cobbles. Other materials represented include two of quartzite, one of milky quartz, and one of metasediment. The specific circumstances of recovery, material types, and dimensions are shown in Table VII-9.

Table VII-9. Attributes for Worked and Utilized Flakes and Chunks

Site CA-SDI-	Cat. No.	Provenience		Coordinates N/S	Coordinates E/W	Level (cm)	Cond	Pat	Cort	Material		Wt (g)	Dimensions (cm) Len	Wid	Thk
Scraping Tools															
7752	32	Unit	1	S009	E010	60-70	W		W	QTE		28.0	5.1	4.1	1.2
7755	284	Surface		-	-	-	W	Y	W	SPV	P	18.0	4.5	3.5	1.2
7755	22	STP		N690	E121	70-80	W	Y	N	SPV	A	16.1	4.6	2.6	1.2
7755	45	STP		N730	W018	60-70	W		N	QTZ	M	11.6	4.5	2.3	1.0
7755	193	Unit	1	N761	W086	10-20	W	N	x	SPV	P	12.4	4.4	2.5	1.6
7756	270	Unit	4	N550	W126	60-70	W	N	x	SPV	A	13.9	5.1	2.8	1.5
7759	206	Unit	1	N319	E192	40-50	W	Y	N	SPV	F	3.1	2.5	2.2	0.5
7326	24	Unit	1	N012	W001	0-10	F	Y	S	SPV	P	13.2			
7751	17	STP		S040	E0	30-40	F	Y	N	SPV	A	0.7			
7751	89	Unit	1	S059	W022	20-30	F	Y	N	SPV	A	28.8			
7751	111	Unit	2	S080	W002	30-40	F	Y	I	SPV	A	25.4			
7752	29	Unit	1	S009	E010	50-60	F	Y	N	SPV	A	15.0			
7753	78	Unit	2	N050	W015	10-20	F	Y	x	SPV	A	3.2			
7754	8	STP		S020	E020	20-30	F	Y	N	SPV	A	15.1			
7754	39	Unit	1	N021	E055	30-40	F	Y	x	SPV	A	5.4			
7755	187	Unit	1	N761	W086	0-10	F	Y	x	SPV	A	10.8			
7755	230	Unit	2	N696	E058	40-50	F	Y	S	SPV	A	25.1			
7755	254	Unit	3	N708	E028	40-50	F	N	N	SPV	A	14.1			
7755	281	Unit	4	N745	W026	60-70	F	N	N	MSD		26.3			
7756	85	STP		N456.5	W120	50-60	F		W	QTE		27.5			
7759	71	STP		N200	E200	0-10	F	Y	N	SPV	A	4.9			
Cutting Tools															
7755	192	Unit	1	N761	W086	10-20	W	Y	N	SPV	A	39.4	6.3	5.2	1.3
Tip-use Tools															
7756	46	STP		N420	W140	40-50	W	N	N	SPV	A	0.7	1.6	1.1	0.45
7758	55	Unit	1	N188	W001	20-30	F	N	N	SPV	A	0.7			
Multi-use Tools															
7751	31	STP		S060	E060	0-10	F	Y	N	SPV	P	3.1			
Worked Pieces															
7755	273	Unit	4	N745	W026	30-40	W	Y	N	SPV	A	1.7	1.4	1.3	0.8
7756	80	STP		N456.5	W120	40-50	W	N	N	SPV	P	32.4	5.1	3.8	1.7
7324	31	Unit	1	S005	E025	10-20	F	Y	N	SPV	A	0.8			
7758	54	Unit	1	N188	W001	20-30	F	Y	N	SPV	A	59.5			

Cond (condition): W = whole; F = fragment
Pat (patination): N = not apparent; Y = present
Cortex: N = none; S = subangular; W = well-rounded; I = indeterminate
Material: SPV = meatvolcanic; MSD = metasedimentary; P = porphyritic; A = aphanitic; M = milky



Modified from Pigniolo 1992

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0 5 10 Miles

0 8 16 Km

Oak Country Estates

Locations of Selected Sites in Relation to Rock Sources in San Diego County

Map VII-2

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In this analysis, these tools were generally broken down on the basis of function and associated, indicative wear patterns, into four general types of tools: (1) those used as scrapers; (2) those used as cutting tools; (3) tip tools or those used as perforators, drills, gravers, or reamers; and (4) multiple-use tools or those tools used for more than one of these tasks/functions. An example of this latter category is a flake or chunk which has both a tip used as a reamer and an edge used as a scraper. Of the twenty-five flake or chunk tools recovered, only one has separate and functionally different use locations. Characteristically, all of the flake and chunk tools manifest evidence, primarily, of use with a minimum of additional working beyond their original manufacture. Some examples, however, do have minor retouching and edge or tip reconstitution apparent. Two of these flake tools appear to be scraper or scraper plane resharpening flakes and one appears to be a hammerstone resharpening flake that were used as a tool subsequent to its removal. The scraper or scraper plane rejuvenation flakes were identified by the presence of truncated patterns of use-wear on the platform edge (i.e., the remnant planar surface and edge), or on the hammerstone flake by the presence of substantial battering in and around this same location. The kinds of evidence observed to distinguish each of the utilized flake and chunk tool categories were as follows:

1) Scraping tools - These tools are flakes or chunks with an acute primary spine angle of the use edge or edges (i.e., in cross-section), of usually greater than 30 degrees and less than, but sometimes approaching 90 degrees. An edge manifests one or more kinds of alterations caused by use such as scalar flaking, abrasion, dulling, and/or edge polish, and this wear is commonly oriented roughly perpendicular in direction to the use edge, and is frequently unifacial. A total of twenty-one tools with one or more of these kinds of wear on the primary use edge (and second or tertiary edges if present) were identified. Most of these tools (19) have convex use edges and the remaining two have straight edges.

   These tools have a mean primary spine edge angle of 53.95 degrees with a range from 35 degrees to a maximum of 78 degrees. With an assumption of an approximately normal distribution, the standard deviation indicates that two-thirds (66.67 percent) of the spine angles of the primary tool use edges were between 42.1 degrees and 65.8 degrees. Fourteen of the specimens have some amount of retouch of the edge(s). Four of these tools have a second scraping edge present. The most frequently occurring types of use-wear on these scraping tools is edge dulling, unifacial edge polish, and unifacial scalar flake removals. In the case of two of the specimens, however, the wear consisted entirely of substantial abrasion with ground facets or edge rounding present along an edge or edges. Striations on these facets run at an angle roughly perpendicular to the flake edge. As most of these flakes are a hard volcanic stone, this pattern and degree of reduction is indicative of the scraping of some very hard and/or abrasive material.

2) Cutting tools - These tools are flakes or chunks with acute, primary spine plane angles, usually less than 45 degrees that manifest randomly distributed bifacial scalar flaking, and/or which have bifacial polish or dulling of the use edge. Also, the angle of the flaking damage is frequently diagonal rather than perpendicular to the use edge. Most often the use-wear on these tools is edge dulling, polish, and scalar flaking with edge abrasion much less in evidence than on scraping tools. One tool with each of these types of wear on one use edge was identified. The primary use edge spine angle of this tool is 30 degrees.

3) Perforating, Drilling, Graving, and Reaming (i.e., tip use) tools - These tools are flakes or chunks with cross-sectionally ovoid to triangular and, in some cases, rectangular protruding points or projections that manifest polish or abrasion and/or scalar flaking wear around the protruding tip and/or along the protrusion sides or edges. Two tip tools with exclusively these wear patterns were identified. One of these specimens is a fragment that probably represents the tip broken off of a reaming tool. In addition, the multi-function tool (described below) also has a protruding point with wear indicating a graving use function. In the instance of a projection with an angular cross-section (i.e., with edges present), the presence of these wear patterns around the projection was taken to

indicate that they most likely occurred simultaneously during the tools use. Because the wear patterns indicative of a particular kind of usage (perforating, drilling, graving, or reaming) can grade from one into another on these tip tools, it was not considered feasible to consistently subcategorize each item to one of these tool functions. The wear evidence observed, however, on the two tools recovered consists principally but not exclusively of scalar flaking and polish around the sides of a pointed protrusion, suggests primarily reaming functions.

4) Multi-function tools - These tools are flakes or chunks that have two or more of the above described use-wear attributes indicative of different functions for different locations. This multi-functional usage would be consistent with expedient tool use where edges and/or tips on a flake or chunk would be used as needed on a task rather than procuring another flake or chunk to complete it. One specimen with wear patterns indicative of multiple usage was identified. While more than two tool functions can sometimes occur on such tools, on the tool recovered only two functions are present. This tool has a combination of scraping use on an edge and graving use on a tip. Graving use involves using a pointed tool to incise or to produce grooves in a material such as bone (cf. True 1970: 31). The wear evidence observed, on the scraper edge consists principally of unifacial scalar flaking and polish.

b. Worked Flakes and Chunks

Four artifacts were recovered from the Oak Country sites that are flakes or chunks with evidence of working but with no obvious use wear and no identifiable formal tool morphology. These items were modified by the controlled working of a stone core through percussion, producing identifiable unifacially and/or bifacially flaked edges. Such flakes and chunks may have been intended as tools but were broken or discontinued during manufacture. All of these items were struck from SPV metavolcanic rock.

c. Discussion

A majority of the utilized flake and chunk tools (23 including one multifunction tool) appear to have functioned as scraping tools, with the wear in most cases consisting of primarily unifacial edge dulling and polish with unifacial scalar edge flaking also frequently present. This use-wear pattern suggests that these tools were used in activities such as the working of materials such as wood, bone, vegetal fiber, and/or animal hides at the site. The similar use-wear and significant numbers of scrapers and small scraper planes present in the tool assemblage may also be suggestive of work on these materials and this type of activity at the site. The use which resulted in the severely abraded flake tools is more problematic. This degree of wear would seem to indicate use on some highly abrasive material, most likely some kind of stone. For purposes of demonstration, this degree of wear would result if a flake were scraped repeatedly across a fine grade of sandpaper. But it is not clear, in a prehistoric context, what kind of material would be similarly abrasive and be worked using a flake tool.

The raw material of the greatest number of cores is quartz with 62.5 percent, but quartz is second in debitage with 42.4 percent. The SPV metavolcanics rank second with 25.0 percent of the cores but first with 50.7 percent of the debitage. Of the flake and chunk tools, 80.8 percent were struck from SPV metavolcanic cores. Other materials represented include two of quartzite, one of milky quartz, one of granite, and one of metasediment. With regard to the raw material comparison between cores and utilized flakes it would not be unusual to expect that these expedient tools would be produced from cores reduced at the site, a pattern typical of casual tool production. Most of the quartz cores are relatively small in comparison to those of SPV metavolcanic. And, if it is considered that the prevalent use of quartz at the sites was for biface tools, then it would seem likely that large number of quartz cores is a reflection of the need to provide raw material for their manufacture. The quantity of SPV metavolcanic cores, thereby, becomes more comparable relative to the rather considerable use of this material for the expedient as well other tools at the sites.

Edge shape characteristic reflects different use activities such as both the cutting and scraping of flat surfaces, both hard and soft (straight and convex); the scraping of shafts (concave); the drilling, perforating, and reaming of soft and hard materials (protruding or pointed); and the sawing of hard and soft materials (straight, convex, and serrated). The expedient flake and chunk scraping tools from the sites manifested primarily convex edges. The protruding or pointed (tip) tools reflected reaming and graving functions while the only cutting tool identified showed use wear along a straight edge. The utilized flake and chunk tool assemblage reflects a diverse pattern of activities at the site, and possibly an extended period of residence. When viewed in conjunction with the rest of the flaked tool assemblage, it also indicates a considerable amount of resource processing occurred at the site.

6. Debitage

Twenty-one of the thirty-two sites produced some amount of debitage from the subsurface excavations (421 STPs and 35 units), resulting in the total recovery of 9,113 pieces from the deposit (Table VII-10). This material consists of whole flakes (n=1494; 16.4 percent), proximal (platform) flake fragments (n=1871; 20.6 percent), fragments lacking platforms (non-diagnostic) (n=5663; 62.1 percent), and some angular waste (n=85; 0.9 percent). Whole flakes were sized by arbitrary 1 cm size groupings, the smallest being less than 1 cm (or 0-1 cm), incrementally increasing by 1 cm to the maximum size flake in the sample. The entire assemblage was evaluated for material type, condition, cortical variability, presence of patination, and reduction type (when possible).

Table VII-10. Distribution of Debitage Types

	Debitage Type										
	Whole Flakes		Diagnostic Fragments		Non-diagnostic Fragments		Angular Debris				
Site No. CA-SDI-	Cortical	Noncort	Cortical	Noncort	Cortical	Noncort	Cortical	Noncort	Total	Percent	Density*
7320	-	8	2	6	1	10	-	-	27	0.3	24.5
7321	1	6	-	4	1	18	-	1	31	0.3	11.7
7322	16	85	7	84	11	302	4	4	513	5.6	112.7
7324	4	22	1	23	1	81	-	1	133	1.5	79.2
7325	2	38	-	25	3	116	-	2	186	2.0	151.2
7326	3	37	-	26	4	85	-	-	155	1.7	71.1
7751	14	90	11	67	16	197	-	5	400	4.4	117.0
7752	5	16	-	9	3	15	1	-	49	0.5	23.0
7753	8	95	10	106	7	339	-	6	571	6.3	123.6
7754	6	32	8	38	7	134	-	1	226	2.5	65.1
7755	26	282	19	411	33	1373	1	18	2163	23.7	278.7
7756	24	166	25	263	19	709	1	4	1211	13.3	166.6
7757	10	136	12	193	16	672	1	10	1050	11.5	367.1
7758	11	66	5	69	5	172	-	8	336	3.7	164.7
7759	35	239	18	422	31	1252	-	17	2014	22.1	274.0
7760	1	-	-	-	-	4	-	-	5	0.1	15.2
7767	1	7	-	4	1	17	-	-	30	0.3	19.9
7768	-	1	1	1	-	6	-	-	9	0.1	6.4
16076	-	-	-	-	-	1	-	-	1	0.0	4.8
16077	1	-	-	1	-	-	-	-	2	0.0	11.1
16079	-	-	-	-	-	1	-	-	1	0.0	4.8
Total	**168**	**1326**	**119**	**1752**	**159**	**5504**	**8**	**77**	**9113**	**100.0**	
Percent	**16.4**		**20.5**		**62.1**		**0.9**		**100.0**		

* Density is number of items per cubic meter
Diagnostic fragments are flakes retaining some portion of their platform; angular debris are chunks lacking flake characteristics

Volcanic material, of various varieties, is the most abundant type in the assemblage (n=4,615; 50.6 percent), followed closely by quartz (n=3,867; 42.4 percent), which is known to occur locally (Table VII-11).

Quartzite comprises 4.4 percent (n=399) of the assemblage, while the remaining types of material make up less than one percent each, and these include metasedimentary rock (n=53), obsidian (n=50), various varieties of chert/chalcedony combined (n=69), the distinctive PDL chert (n=33), highly porphyritic volcanic cobbles of Eocene age from secondary deposits on-site (n=2), varieties of local granitic rock (n=16), other non-local appearing material (but probably volcanic)(n= 8), and a single flake off of a porcelain dish.

Table VII-11. Debitage Reduction Variability by Material Type

	Reduction Type and Condition											
	Reduction Flakes			Biface Reduction Flakes			Non-diag. Frags		Angular Debris			
Material	**Whole**	**Frags**	**%**	**Whole**	**Frags**	**%**	**No.**	**%**	**No.**	**%**	**Total**	**Percent**
SPV	937	1062	43.3	54	84	3.0	2473	53.6	5	0.1	4615	50.6
QTZ	337	532	22.5	16	57	1.9	2847	73.6	78	2.0	3867	42.4
QTE	101	73	43.6	-	1	.3	224	56.1	-		399	4.4
MSD	9	20	54.7	-	-		24	45.3	-		53	0.6
OBS	5	6	22.0	2	5	14.0	32	64.0	-		50	0.5
CHT	3	3	20.7	1	-	3.4	21	72.4	1	3.4	29	0.3
JAS	3	2	25.0	2	2	20.0	10	50.0	1	5.0	20	0.2
CHL	5	3	40.0	2	3	25.0	7	35.0	-		20	0.2
PDL	5	8	39.4	1	1	6.1	18	54.5	-		33	0.4
VCB	-	-		-	-		2	100.0	-		2	0.0
GRN	6	3	100.0	-	-		-		-		9	0.1
GAB	2	5	100.0	-	-		-		-		7	0.1
OTH	1	1	25.0	1	-	12.5	5	62.5	-		8	0.1
PRC	1	-	100.0	-	-		-		-		1	0.0
Total	**1415**	**1718**	**34.4**	**79**	**153**	**2.5**	**5663**	**62.1**	**85**	**0.9**	**9113**	**100.0**

Material: SPV = metavolcanic; QTZ = quartz; QTE = quartzite; MSD = metasedimentary; OBS = obsidian;
CHT = chert; JAS = jasper; CHL = chalcedony; PDL =Piedra De Lumbre chert; VCB = volcanic cobble (Eocene);
GRN = granitic; GAB = gabbro; OTH = other; UNK = unknown; PRC = porcelain (ethnohistoric)

As previously mentioned, the majority of the percussing tools, unifacially modified flakes, and utilized flake tools were also made of volcanic material. However, the core and biface assemblages show a higher frequency in use of quartz indicating the relative utility of stone material to the different types of tools manufactured. Within the volcanic material varieties, distinction between porphyritic and aphanitic types was made although prehistoric material preference has not been proven to be exclusive to specific tool types. Sixty percent (n=2,772) of the volcanic debitage is aphanitic and porphyritic varieties account for 1,843 pieces. In the volcanic assemblage of cores and flaked tools, all but percussing tools are 50 percent or more aphanitic varieties. A reverse frequency occurs in the percussing tools, suggesting these heavy-duty tools do not require the finer trimming precision of smaller types of tools; essentially any dense rock is good for pounding and chopping activities.

As seen in Table VII-10, the majority (95 percent) of the debitage lack remnants of cortex. Of the 453 pieces that do retain some amount, the majority clearly show some evidence of being eroded and redeposited away from the primary source of the stone (Table VII-12). This cobble cortex is either well-rounded (47.7 percent) or partially rounded/subangular (41.9 percent) indicating an extensive or moderate amount of time exposed to water-tumbling forces. Of the small percentage of angular cortex, most of this is represented by clear quartz crystals that probably derived from pegmatite dikes on-site. However the majority of the cortical quartz debitage display subangular cortex indicating this cobble material was transported some distance from its original source. Alternatively, nearly all of the quartzite cobbles used by the site inhabitants probably derive from the secondary deposits of well-rounded rocks. Both well-rounded and subangular cortex is present on the many varieties of volcanic stone used by the people living in this valley prehistorically. The

cortex on a few flakes is of such small amount, cortical type can not be determined. Less common materials in the chert family, display odd forms of cortex that do not fit the main three categories. Nearly fifty percent of the whole flakes larger than 4 cm in size retain cortex, 69 percent of it well-rounded. This small assemblage of moderate to large cortical flakes strongly indicates that nodules of stone were not being initially reduced in the areas tested. Besides the scarcity of large flakes, flakes with more than 80 percent cortex are also rare in the assemblage. On 45 cortical flakes, cortex is present only on the flake platform.

Table VII-12. Debitage Cortex Variability by Material Type

	Cortex Type											
	Well-rounded		Subangular		Angular		Indeterminate		Other			
Material	No.	%	No.	%	No.	%	No.	%	No.	%	Total	Percent
SPV	113	44.5	126	49.6	12	4.7	3	1.2	-		254	56.1
QTZ	1	1.5	42	61.8	25	36.8	-		-		68	15.0
QTE	100	89.3	12	10.7	-		-		-		112	24.7
MSD	-		5	83.3	1	16.7	-		-		6	1.3
OBS	-		1	100.0	-		-		-		1	0.2
CHT	-		-		-		-		2	100.0	2	0.4
JAS	-		-		1	100.0	-		-		1	0.2
CHL	-		1	50.0	-		-		1	50.0	2	0.4
PDL	-		-		1	100.0	-		-		1	0.2
GRN	1	25.0	3	75.0	-		-		-		4	0.9
GAB	-		1	100.0	-		-		-		1	0.2
OTH	1	100.0	-		-		-		-		1	0.2
Total	**216**	**47.7**	**191**	**42.2**	**40**	**8.8**	**3**	**0.7**	**3**	**0.7**	**453**	

Material: SPV = metavolcanic; QTZ = quartz; QTE = quartzite; MSD = metasedimentary;
OBS = obsidian; CHT = chert; JAS = jasper; CHL = chalcedony; PDL =Piedra De Lumbre chert;
GRN = granitic; GAB = gabbro; OTH = other

For the entire sample of whole flakes (n=1494; 16.4 percent), the greatest amount (n=664; 44.4 percent) are from 1-2 cm in size; another 30.5 percent (n=455) are less than 1 cm in size (Table VII-13). The remaining flakes, from 2 to 9 cm in size, comprise only twenty-five percent of the sample. Cortex is present on 167 of the whole flakes, and less than seven percent of the flakes smaller than 2 cm have any cortical matter. The substantial quantity of small flakes is indicative of the breadth of the flaked stone industry at the site, including the manufacture and maintenance of tools, especially small-sized bifaces which comprise 45.3 percent of the recovered tools.

As shown in Table VII-11, 232 (6.9 percent) of the 3,365 (36.9 percent) diagnostic flakes were identified as being produced during bifacial reduction processes, however other flakes with less characteristic attributes were probably produced during bifacial tool manufacture but were not readily identified during this analysis. Not surprisingly, 62 (78.5 percent) of the 79 whole biface reduction flakes are less than 2 cm in size (see Table VII-13). A volcanic and chalcedony flake of this subassemblage, each of the 2-3 cm size range, have subangular cortex and the remaining flakes associated with biface manufacture lack cortex. While 25.3 percent of the non-bifacial reduction whole flakes are greater than 2 cm, this is not a significant difference in percentage from the amount of biface reduction flakes. However the obvious difference is in the greater variety of sizes of flakes larger than 3 cm, represented in the non-bifacial reduction assemblage. While larger flakes would be expected from core reduction and non-bifacial tool manufacture, the presence of a high frequency of small flakes in the total whole flake sample indicates that probably smaller tools such as scrapers were being made as well as that tool rejuvenation was performed at various locations. Flakes of moderate to large size (> 5 cm) are commonly selected for use as unmodified expedient tools or to be worked into a more formal tool.

Table VII-13. Size Variability within the Whole Flake Sample by Reduction Type

	Size (cm)									
Material	**0-1**	**1-2**	**2-3**	**3-4**	**4-5**	**5-6**	**6-7**	**8-9**	**Total**	**Percent**
Standard Reduction										
SPV	255	441	171	49	14	3	3	1	937	66.2
QTZ	138	134	49	14	1	1	-	-	337	23.8
QTE	21	40	24	12	3	-	1	-	101	7.1
MSD	1	2	1	2	3	-	-	-	9	0.6
OBS	3	2	-	-	-	-	-	-	5	0.4
CHT	2	1	-	-	-	-	-	-	3	0.2
JAS	1	1	1	-	-	-	-	-	3	0.2
CHL	2	3	-	-	-	-	-	-	5	0.4
PDL	1	4	-	-	-	-	-	-	5	0.4
GRN	-	2	1	1	2	-	-	-	6	0.4
GAB	-	2	-	-	-	-	-	-	2	0.1
OTH	-	-	-	1	-	-	-	-	1	0.1
PRC	1	-	-	-	-	-	-	-	1	0.1
Subtotal	425	632	247	79	23	4	4	1	1415	94.7
	30.0	44.7	17.5	5.6	1.6	0.3	0.3	0.1	100.0	
Bifacial Thinning Flakes										
SPV	16	23	13	1	1	-	-	-	54	68.4
QTZ	10	5	1	-	-	-	-	-	16	20.3
OBS	1	1	-	-	-	-	-	-	2	2.5
CHT	1	-	-	-	-	-	-	-	1	1.3
JAS	1	1	-	-	-	-	-	-	2	2.5
CHL	1	-	1	-	-	-	-	-	2	2.5
PDL	-	1	-	-	-	-	-	-	1	1.3
OTH	-	1	-	-	-	-	-	-	1	1.3
Subtotal	30	32	15	1	1				79	5.3
	38.0	40.5	19.0	1.3	1.3				100.0	
Total	455	664	262	80	24	4	4	1	1494	
Percent	30.5	44.4	17.5	5.4	1.6	0.3	0.3	0.1	100.0	

Material: SPV = metavolcanic; QTZ = quartz; QTE = quartzite; MSD = metasedimentary; OBS = obsidian; CHT = chert; JAS = jasper; CHL = chalcedony; PDL =Piedra De Lumbre chert; GRN = granitic; GAB = gabbro; OTH = other; PRC = porcelain (ethnohistoric)

D. Discussion of Flaked Stone at the Oak Country Estates Sites

As discussed above, the large number of flaked stone tools indicates their importance to prehistoric hunter-gatherers for accomplishing subsistence tasks. Consequently, their influence within, and upon, the hunter-gatherer mobility system is substantial. For each tool type, the diversity of use-wear and tool functions indicated by the presence of these tools demonstrates the amount of industry carried on at the sites. This combination of task diversity and intensity demonstrates the degree of habitation associated with the sites. The quantity of faunal bone materials recovered at the sites (see Section XI) attests to the importance of hunting at the sites. The quantity of hunting associated biface tools as well as the stages of their manufacture indicates the production and maintenance of these tools by the sites inhabitants. The flaked stone tool types with apparent uses for scraping, cutting, chopping and hammering undoubtedly represent not only augmenting tools for the manufacture and maintenance of hunting associated biface tools and vegetal processing associated ground stone tools and bedrock milling features but also tools for the procurement and/or the processing of resources associated with these other tool types. Hammerstones are essential for the manufacture and maintenance of both flaked stone and ground stone tools. Chopping tools, scrapers, and scraper planes are tools used to both procure and process materials such as wood or cane for the manufacture of shafts for arrows and spears or for the handles of knives. If thatch for structure construction, or fiber to make twine or cordage for nets and traps, or animal sinew to create binding straps for a variety of purposes,

or bone to make awls, soft hammers, and other tools, were being produced at the site (which seems likely, given the quantity and types of faunal remains present), then these formal stone tool types would be necessary to process fibrous plants such as yucca or cattail tule and to accomplish the butchering and to process/work the hides and bones of animals. All of these tasks are consistent with the use-wear observed on many of these tools as well as on the utilized flake and chunk tools. The variety and magnitude implied by both the quantity of these tools present and by the degree of usage of many of the tools provides strong evidence for the nature and intensity of the occupation associated with these sites.

The prehistoric importance of the procurement of fine-grained lithic raw materials with the property of conchoidal fracture, from which these tools were made, also cannot be overemphasized. They were essential to prehistoric hunter-gatherers because they represented the basic material from which this large percentage of their tools were made. It is clear from the results reported above that most of the flaked lithic tools recovered were made from immediately available lithic materials by the sites inhabitants. Such immediately available materials as quartz, metavolcanics, quartzite, and metasediments account for 97.9 percent of the flaked stone materials recovered. The role that "exotic" lithic raw materials such as obsidian and Piedra de Lumbre (PDL) chert play in a raw material assemblage can be somewhat problematic. Exotic materials requiring trade and/or non-local travel were probably procured either through some form of inter-family exchange with relatives in adjacent procurement ranges or by traveling outside of the normal range of hunting and gathering activities. Varieties of other materials such as silicified wood and jasper, while also possibly exotic, were potentially available within approximately 20 kilometers of the project sites. They, therefore, represent resources that may have been procured as part of the overall local resource procurement range and subsistence practices of a mobile hunter-gather group. In some instances, the presence of exotic materials can be influenced by the situation, i.e., the relative availability of good quality raw materials locally. If good quality raw materials are not readily available locally, then this would represent a reason for increased procurement of such materials through one means or another of exchange and/or non-local travel. If, on the other hand, good quality materials are locally available, one might expect that exotic materials, not being essential, would not be present in a lithic assemblage. At some prehistoric sites, however, such materials may still be acquired (cf. Cooley and Carrico 1999). Under this circumstance, the expenditure of effort for something they could do without probably indicates that a cultural imperative other than simple need is involved.

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VIII. GROUND STONE ARTIFACTS AND BEDROCK FEATURES

A. Introduction

This section discusses the recovered milling tools followed by descriptions of the bedrock milling features and elements, as well as other types of rock features present at the various sites. This comprehensive section permits the comparison of the milling assemblage with milling features, as well as rock alignments possibly associated with storage and milling.

B. Ground Stone Milling Tools

The current investigation of thirty-two sites resulted in the recovery of 167 pieces of stone exhibiting some form of grinding wear. Forty-one of the milling tools were collected from the surface of fourteen sites, and in two cases, this is the only type of artifact found at the site (Table VIII-1). The remaining 126 implements came from subsurface excavations (nineteen STPs and thirty units) at fourteen sites, not necessarily those sites that produced implements on their surface. The tool assemblage is comprised of four identifiable types that represent 147 (88 percent) manos, two (1.2 percent) multi-use pestle/manos implements, and fifteen (9 percent) metates. The remaining three pieces are too fragmentary to allow further identification other than one was probably a handstone and two may be from milling base fragments. The identified implements were further analyzed for various attributes that include presence of shaping, pecking, end battering, thermal alteration, and the intensity of use based on wear polish. All objects were weighed and measurements were taken of whole specimens.

Table VIII-1. Milling Tool Types by Recovery Method

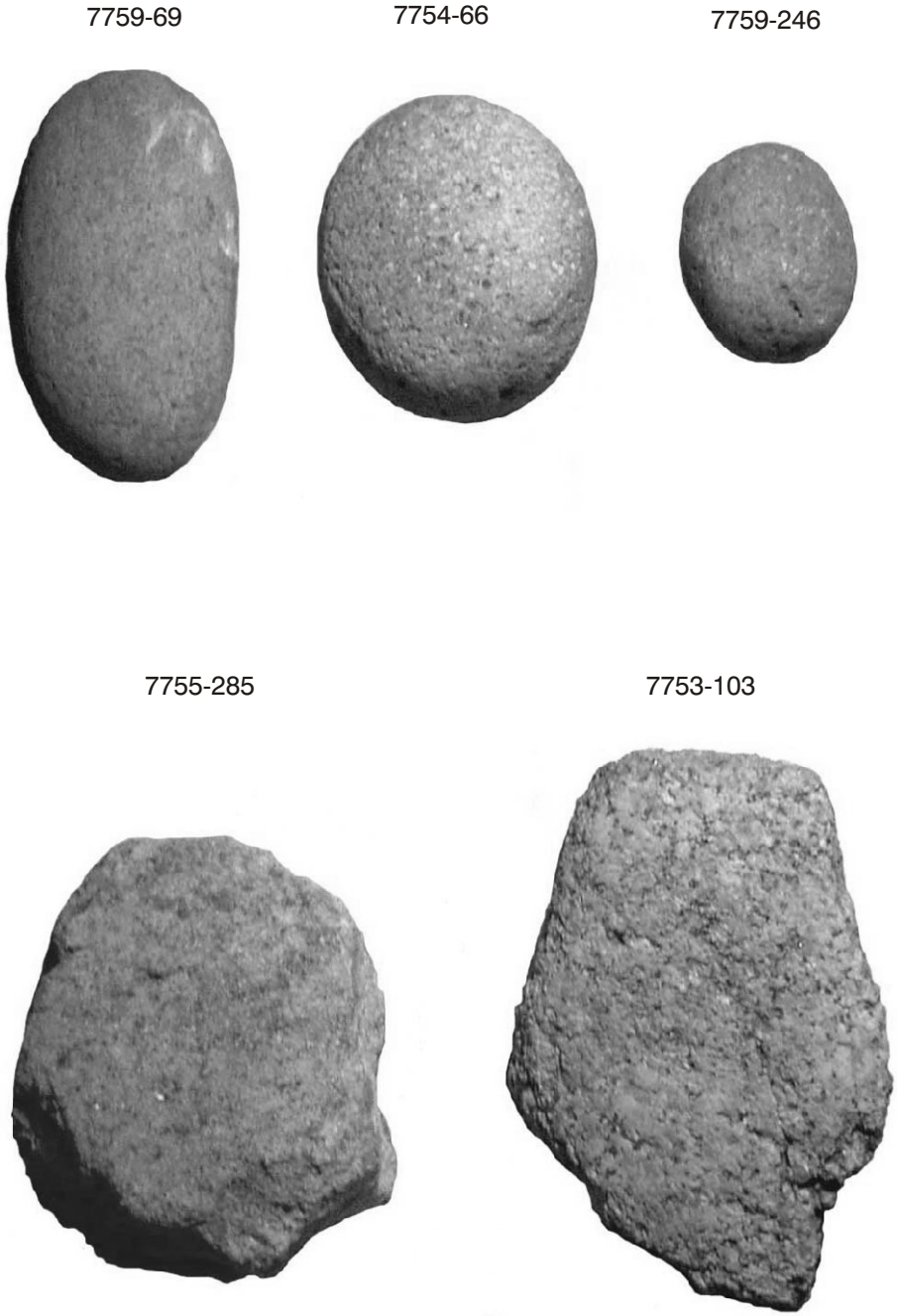
	Milling Implement Type														
Site No. CA-	Manos				Pestle/Manos			Metates			Indeterminate Fragments			Total	
SDI-	Surf	STPs	Units	Total	Surf	STPs	Total	Surf	Units	Total	STPs	Units	Total		Percent
7317	1	-	-	1	-	-		-	-		-	-		1	0.6
7320	9	-	-	9	-	-		-	-		-	-		9	5.4
7321	-	-	1	1	-	-		-	-		-	-		1	0.6
7322	-	2	7	9	1	-	1	-	1	1	-	-		11	6.6
7324	-	-	1	1	-	-		-	1	1	-	-		2	1.2
7325	1	-	2	3	-	-		1	-	1	-	-		4	2.4
7326	1	-	1	2	-	-		-	-		-	-		2	1.2
7751	9	2	9	20	-	-		-	3	3	-	-		23	13.8
7752	-	-	1	1	-	-		-	-		-	-		1	0.6
7753	1	3	3	7	-	-		-	1	1	-	1	1	9	5.4
7754	5	-	4	9	-	-		2	1	3	-	1	1	13	7.8
7755	2	5	14	21	-	-		1	1	2	1	-	1	24	14.4
7756	1	5	18	24	-	-		-	2	2	-	-		26	15.6
7757	2	-	5	7	-	-		-	1	1	-	-		8	4.8
7758	-	-	7	7	-	-		-	-		-	-		7	4.2
7759	2	9	11	22	-	1	1	-	-		-	-		23	13.8
7767	1	-	-	1	-	-		-	-		-	-		1	0.6
7768	-	1	-	1	-	-		-	-		-	-		1	0.6
15981	1	-	-	1	-	-		-	-		-	-		1	0.6
Total	**36**	**27**	**83**	**147**	**1**	**1**	**2**	**4**	**11**	**15**	**1**	**2**	**3**	**167**	**100.0**
Percent	**24.5**	**18.4**	**56.5**	**88.0**	**50.0**	**50.0**	**1.2**	**26.7**	**73.3**	**9.0**	**33.3**	**66.7**	**1.8**	**100.0**	

Ground stone tools are created by the grinding or pounding of two stone surfaces against one another during original manufacture as well as during the processing of various resources. The hand-held implements may be unmodified cobbles or modified/shaped through chipping, pecking and grinding. Ground stone tools are commonly associated with vegetal food processing but have also been shown to have a variety of other uses including processing meat, pigments, and ceremonial or medicinal plants (Gross et al. 1989:151). As the grinding tools are used, the surfaces become continually smoother and less efficient for grinding, thus requiring maintenance or restoration of a textured surface. Grinding surfaces, therefore, are frequently rejuvenated by pecking the use surface with an angular pounding tool or hammer (alternatively called hammerstone or pecking stone) to roughen the grinding area. The more modified shaped ground stone tools are created also by chipping, pecking and grinding to form them (Treganza and Valdivia 1955; Haden and Nelson 1981); debris from this process is not always recognized in the excavated material however. Manos and pestles are the "handstones" used in union with a milling or anvil base (metate or mortar, respectively) that may be either portable or on bedrock boulders. Metates are milling bases that are either flat or basin form, with some amount of depth, in which items are processed by being ground in a back-and-forth or circular motion with a mano. Mortars serve as an anvil base for the pounding and crushing of items such as acorns with a pestle in an up and down rotary motion.

1. Manos

Of the 147 manos, twenty-seven (18.4 percent) are complete while 102 fragments (69.4 percent) are less than half of their original tool dimension (Table VIII-2). The most prevalent material used for these handstones is porphyritic volcanic river cobbles (n=88; 59.9 percent) followed by either chunks or river cobbles of granitic varieties (n=54; 36.8 percent) (Table VIII-3). The remaining materials include quartzite (n=3; 2 percent), an atypical volcanic cobble (n=1; 0.7 percent), and one tool that the material type was indeterminate since the tool was unwashed prior to submittal for residue analysis. Of the 105 pieces large enough to evaluate shaping, ninety-six (91.4 percent) do not appear to have been modified for use (Figure VIII-1) and only nine (8.6 percent) exhibit evidence of some degree of shaping (Figure VIII-2). Use-wear patterns reveal that, on ninety-two diagnostic items, seventy-seven (83.7 percent) were used on both faces (bifacial), thirteen (14.1 percent) were used on only one surface (unifacial), and two (2.2 percent) were used on more than two faces. The preponderance of bifacial manos is consistent with the larger Late Prehistoric habitation sites rather than Early Archaic or Late Prehistoric camp sites. On ninety-eight manos that are complete enough to determine surface maintenance attributes, thirty-seven (37.6 percent) have been pecked on at least one grinding face. At times, manos were probably used to resharpen the metate grinding surfaces as indicated by the number of specimens complete enough to determine the presence of some amount of end battering (n=15; 35.7 percent). Battering damage could also result from various types of resource processing tasks such as cracking hard nuts or pounding up small animals.

Intensity of use was determined on all but five specimens. The majority (n=64; 43.6 percent) display light or slightly moderate use alone, however, eleven specimens have variable use with only light use on one face while the opposite face displays moderate to heavy use. Another forty-six items (31.3 percent) exhibit moderate to somewhat more extensive use and eighteen (12.2 percent) were used so much the once rounded tool face is essentially flat from wear. Three manos (2 percent) have a combination of moderate and heavy use on opposite faces. Many times manos were used for other purposes after breakage or after their usefulness as a grinding implement had been maximized. Ninety-three (63.3 percent) of the manos show evidence of being fire-affected (or thermally altered) from use as heating or hearth stones once they were no longer serving as grinding implements. Reuse in such a manner accounts for the highly fragmentary state of the collection. As was discussed in Section VII, five Group 3 hammer tools were made out of broken manos since the rocks were of durable material.



Mooney & Associates

0 2 4cm

Oak Country Estates
Unshaped Manos

Figure VIII-1

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7320-22

7751-11

Mooney & Associates

0 1 2cm

Oak Country Estates
Shaped Manos

Figure VIII-2

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Table VIII-2. Mano Distribution and Attributes

Site No. CA-SDI-	Cat. No.	Provenience		Coordinates N/S	Coordinates E/W	Level (cm)	% Comp	Use	Shaped	Pecked	Battered	F-A	Mat	Wt (g)	Dimensions (cm) Leng.	Wid.	Thick.
Unifacial																	
7317	1	Surface		-	-	-	100	M	N	N	N	Y	GRN	595.0	10.4	8.2	6.3
7320	14	Surface		-	-	-	100	L-M	N	Y	-	N	VCB	1045.0	12.5	9.5	6.2
7322	114	Unit	1	S097	W168	110-120	100	M	N	N	N	Y	GRN	627.2	10.8	7.9	5.1
7753	*103*	Surface		-	-	-	100	L-M	N	N	N	Y	GRN	897.4	14.7	9.6	4.4
7754	68	Surface		-	-	-	100	L	N	N	Y	Y	VOL	252.3	9.4	5.0	3.9
7755	286	Surface		-	-	-	100	L	N	N	N	N	GRN	769.1	11.8	10.2	4.5
7757	130	Surface		-	-	-	>90	H	N	N	N	Y	GRN	309.3	7.2	7.1	4.3
7322	65	STP		S100	W170	SURF	50	H	N	Y	-	Y	GRN	780.2	—	—	—
7751	8	Surface		-	-	-	<25	L	N	N	-	Y	GRN	258.2	—	—	—
7754	65	Surface		-	-	-	50	M	N	N	Y	N	VCB	487.9	—	—	—
7754	69	Surface		-	-	-	25-50	M	N	Y	N	Y	VCB	262.4	—	—	—
7755	278	Unit	4	N745	W026	40-50	25-50	L	N	N	N	N	GRN	292.7	—	—	—
15981	1	Surface		-	-	-	>75	L	N	N	N	N	GRN	490.4	—	—	—
Bifacial																	
7320	15	Surface		-	-	-	100	H	N	N	Y	N	GRN	895.6	12.5	8.5	5.0
7320	16	Surface		-	-	-	100	M-H	N	Y	N	N	GAB	677.7	10.3	8.0	4.7
7320	17	Surface		-	-	-	100	L	N	N	N	N	VCB	350.4	8.5	6.7	4.5
7320	*22*	Surface		-	-	-	100	H	Y	Y	Y	N	VCB	1107.7	12.6	9.3	6.0
7321	20	Unit	1	N030	W035	50-60	100	L	N	N	Y	N	VCB	600.9	10.0	8.0	5.6
7325	22	Unit	1	N096	E176	30-40	100	M	N	Y	Y	N	VCB	735.1	11.5	8.5	5.3
7751	6	Surface		-	-	-	100	L/H	N	Y	Y	N	VCB	750.9	11.5	8.2	5.6
7751	*11*	Surface		-	-	-	100	L/M	Y	N	Y	Y	GRN	1600.0	12.8	11.0	7.8
7753	23	STP		N0	W080	40-50	100	L-M	N	N	Y	N	VCB	572.8	10.6	7.1	5.7
7754	*66*	Surface		-	-	-	100	L-M	N	Y	N	N	VCB	517.3	9.2	7.7	5.0
7754	67	Surface		-	-	-	100	L	N	Y	N	N	GRN	940.9	11.8	8.5	6.7
7754	62	Unit	1	N021	E055	30-40	100	L	Y	Y	N	N	VCB	588.4	10.0	8.2	4.5
7755	*285*	Surface		-	-	-	100	H	N	N	Y	N	VCB	607.1	11.9	7.7	4.5
7758	62	Unit	1	N188	W001	30-40	100	H	N	Y	Y	N	VCB	781.6	10.5	8.8	5.6
7759	65	STP		N200	E140	0-10	100	L/H	N	Y	N	N	QTE	348.2	9.7	5.7	4.5
7759	68	STP		N200	E140	10-20	100	L/H	N	Y	N	N	VCB	559.6	11.4	6.6	5.1
7759	*69*	STP		N200	E140	10-20	100	L/H	N	Y	N	N	VCB	534.4	12.0	6.2	4.7
7759	237	Unit	2	N231	E200	20-30	100	H/M	N	Y	N	N	UNK	679.3	10.9	8.1	5.2
7759	*246*	Unit	3	N161	E100	30-40	100	L	N	N	N	N	VCB	176.7	6.3	5.0	3.7
7320	18	Surface		-	-	-	75	M	N	Y	Y	Y	VCB	837.1	12.6	-8.4	5.8
7320	19	Surface		-	-	-	50	L	N	N	-	N	VCB	283.8	—	—	—
7320	20	Surface		-	-	-	<25	L-M	N	-	-	-	VCB	193.8	—	—	—
7320	21	Surface		-	-	-	25-50	M	N	Y	Y	N	GRN	238.4	—	—	—
7322	111	Unit	1	S097	W168	10-20	<25	M	N	N	N	Y	GRN	364.3	—	—	—
7322	118	Unit	1	S097	W168	30-40	<25	L	N	Y	-	N	VCB	472.6	—	—	—
7322	137	Unit	2	S140	W175	60-70	<25	L	N	-	-	Y	VCB	92.5	—	—	—
7326	20	Surface		-	-	-	<25	L-M	N	-	-	Y	GRN	112.0	—	—	—
7751	2	Surface		-	-	-	25-50	H	Y	N	-	Y	VCB	570.1	—	—	—
7751	3	Surface		-	-	-	50	M/H	N	Y	-	Y	VCB	431.0	—	—	—
7751	7	Surface		-	-	-	<25	L/H	N	Y	-	Y	VCB	432.6	—	—	—
7751	9	Surface		-	-	-	75	L	N	N	N	Y	GRN	843.2	—	—	—
7751	10	Surface		-	-	-	50-75	L/H	N	Y	N	N	VCB	933.4	—	—	—
7751	13	Surface		-	-	-	50-75	M-H	Y	N	-	N	VCB	627.2	—	—	—
7751	40	STP		S060	W020	30-40	75	L	N	N	N	N	VCB	950.6	—	—	—
7751	83	Unit	1	S059	W022	10-20	<25	H	-	-	-	-	GRN	88.0	—	—	—
7751	90	Unit	1	S059	W022	20-30	50	L-M	N	Y	N	N	VCB	466.2	—	—	—
7751	112	Unit	2	S080	W002	30-40	<25	L	N	Y	-	Y	VCB	162.4	—	—	—
7753	22	STP		N0	W080	30-40	25-50	H	N	N	Y	Y	VCB	343.7	—	—	—
7753	28	STP		N040	E020	10-20	50	L-M	N	N	-	Y	GRN	556.2	—	—	—
7753	71	Unit	1	S009	W005	20-30	<25	M	N	N	N	-	VCB	69.3	—	—	—
7755	78	STP		N745	W105	40-50	<25	L/H	N	N	-	N	GRN	22.8	—	—	—
7755	114	STP		N760	W080	90-100	<25	L	-	N	-	Y	VCB	79.4	—	—	—
7755	214	Unit	2	N696	E058	10-20	<25	M	N	N	-	Y	GRN	132.5	—	—	—

Site No. CA-SDI-	Cat. No.	Provenience		Coordinates N/S	Coordinates E/W	Level (cm)	% Comp	Use	Shaped	Pecked	Battered	F-A	Mat	Wt (g)	Dimensions (cm) Leng.	Dimensions (cm) Wid.	Dimensions (cm) Thick.
7755	215	Unit	2	N696	E058	10-20	<25	M	-	-	-	Y	VCB	75.6	—	—	—
7755	222	Unit	2	N696	E058	20-30	<25	M	N	Y	-	Y	VCB	139.3	—	—	—
7755	234	Unit	2	N696	E058	50-70	<25	M	N	-	-	Y	GRN	155.7	—	—	—
7755	235	Unit	2	N696	E058	50-70	<25	M	N	Y	-	Y	VCB	33.5	—	—	—
7755	247	Unit	3	N708	E028	10-20	<25	L	N	N	-	Y	VCB	166.2	—	—	—
7756	278	Surface		-	-	-	25-50	L/H	N	Y	-	Y	VCB	649.8	—	—	—
7756	39	STP		N420	W140	10-20	25-50	H	Y	N	-	Y	GRN	362.7	—	—	—
7756	199	Unit	1	N450	W138	20-30	<25	H	N	N	Y	Y	GRN	104.4	—	—	—
7756	200	Unit	1	N450	W138	20-30	<25	M	-	N	-	Y	GRN	91.1	—	—	—
7756	201	Unit	1	N450	W138	20-30	50	M	N	N	-	Y	VCB	286.3	—	—	—
7756	214	Unit	1	N450	W138	30-40	<25	M/H	N	N	-	Y	VCB	110.1	—	—	—
7756	215	Unit	1	N450	W138	30-40	<25	M	N	N	-	Y	VCB	62.4	—	—	—
7756	224	Unit	1	N450	W138	40-50	50-75	L	N	N	N	N	GAB	178.7	—	—	—
7756	241	Unit	2	N442	W279	30-40	<25	M	-	-	-	Y	VCB	45.1	—	—	—
7756	256	Unit	4	N550	W126	10-20	<25	L-M	N	-	-	Y	GRN	25.4	—	—	—
7756	259	Unit	4	N550	W126	20-30	<25	M	N	-	-	Y	VCB	69.3	—	—	—
7756	260	Unit	4	N550	W126	20-30	<25	H	N	Y	-	Y	VCB	149.8	—	—	—
7757	129	Surface	4	-	-	-	<25	H	N	N	-	Y	GRN	493.5	—	—	—
7757	98	Unit	1	N470	E067	30-40	25-50	L	N	N	-	Y	GRN	148.9	—	—	—
7757	100	Unit	1	N470	E067	40-50	50-75	L	N	N	-	Y	VCB	336.7	—	—	—
7757	107	Unit	2	N500	E111	10-20	<25	L	N	N	-	Y	VCB	82.1	—	—	—
7757	127	Unit	3	N420	E031	20-30	<25	M	Y	Y	-	Y	VCB	486.0	—	—	—
7758	56	Unit	1	N188	W001	20-30	<25	L-M	N	Y	-	Y	VCB	203.8	—	—	—
7758	57	Unit	1	N188	W001	20-30	<25	L	-	-	-	Y	VCB	100.2	—	—	—
7758	63	Unit	1	N188	W001	30-40	<25	L	-	-	-	Y	VCB	61.2	—	—	—
7759	1	Surface		-	-	-	50	M	-	N	-	Y	VCB	240.2	—	—	—
7759	150	Surface		-	-	-	<25	M	N	Y	-	Y	VCB	192.7	—	—	—
7759	8	STP		N100	E080	20-30	50	L	N	N	-	N	QTE	472.1	—	—	—
7759	115	STP		N319	E200	30-40	<25	L	N	N	-	Y	VCB	120.4	—	—	—
7759	219	Unit	1	N319	E192	90-100	<25	L-M	N	N	-	Y	VCB	187.3	—	—	—
7759	247	Unit	3	N161	E100	30-40	<25	L	N	-	-	N	GAB	95.3	—	—	—
7759	271	Unit	5	N321	E146	30-40	<25	M-H	N	-	-	Y	GRN	29.2	—	—	—
7767	8	Surface		-	-	-	25-50	L/H	Y	Y	-	N	GRN	671.7	—	—	—
7768	4	STP		N0	W200	30-40	50-75	L/H	N	N	N	N	GRN	403.7	—	—	—
Multifacial																	
7759	114	STP		N319	E200	30-40	<25	M	N	N	Y	N	VCB	1029.7	13.3	10	5.3
7325	1	Surface		-	-	-	100	H	Y	-	-	-	GRN	98.2	—	—	—
Indeterminate Fragments																	
7751	71	STP		S100	E040	0-10	<25	L	-	-	-	-	VCB	9.8	—	—	—
7322	61	STP		S100	W170	100-110	<25	M	-	-	-	N	GRN	2.9	—	—	—
7753	70	Unit	1	S009	W005	20-30	<25	M	-	Y	-	Y	VCB	56.9	—	—	—
7755	66	STP		N730	E120	0-10	<25	L	-	-	-	N	VCB	7.6	—	—	—
7755	88	STP		N755	E0	10-20	<25	M	N	N	-	Y	VCB	162.8	—	—	—
7755	130	STP		N770	E120	20-30	<25	M	-	-	-	Y	VCB	3.8	—	—	—
7755	231	Unit	2	N696	E058	40-50	<25	M	-	Y	-	Y	VCB	14.8	—	—	—
7756	21	STP		N395	W270	0-10	<25	L	N	N	-	Y	VCB	40.9	—	—	—
7756	27	STP		N420	W120	0-10	<25	L	N	N	-	Y	VCB	33.3	—	—	—
7756	78	STP		N456.5	W120	30-40	<25	L	-	N	-	Y	VCB	19.0	—	—	—
7756	91	STP		N460	W240	20-30	<25	H	N	Y	-	Y	VCB	44.9	—	—	—
7759	116	STP		N319	E200	30-40	<25	L	N	N	-	Y	VCB	83.6	—	—	—
7759	133	STP		N360	E200	10-20	<25	M	-	-	-	Y	VCB	31.2	—	—	—
7759	134	STP		N360	E200	20-30	<25	L-M	-	-	-	Y	VCB	83	—	—	—
7322	115	Unit	1	S097	W168	20-30	<25	M	-	-	-	Y	VCB	7.7	—	—	—
7322	132	Unit	2	S140	W175	40-50	<25	L	N	-	-	Y	GRN	69.4	—	—	—
7322	139	Unit	2	S140	W175	70-80	<25	-	-	-	-	Y	GAB	2.6	—	—	—
7324	33	Unit	1	S005	E025	20-30	<25	L	N	N	-	Y	GRN	312.2	—	—	—
7325	23	Unit	1	N096	E176	30-40	<25	M	-	N	-	Y	VCB	60.2	—	—	—
7326	25	Unit	1	N012	W001	0-10	<25	-	-	-	-	N	GAB	13.0	—	—	—
7751	79	Unit	1	S059	W022	0-10	<25	L	N	-	-	Y	VCB	19.4	—	—	—
7751	84	Unit	1	S059	W022	10-20	<25	H	-	-	-	Y	VCB	28.7	—	—	—
7751	85	Unit	1	S059	W022	10-20	<25	L	N	-	-	Y	GAB	57.4	—	—	—

Site No. CA-SDI-	Cat. No.	Provenience		Coordinates N/S	Coordinates E/W	Level (cm)	% Comp	Use	Shaped	Pecked	Battered	F-A	Mat	Wt (g)	Dimensions (cm) Leng.	Dimensions (cm) Wid.	Dimensions (cm) Thick.
7751	98	Unit	1	S059	W022	40-50	<25	M	-	-	-	Y	VCB	2.6	—	—	—
7751	99	Unit	1	S059	W022	40-50	<25	M	-	-	-	Y	VCB	16.7	—	—	—
7751	113	Unit	2	S080	W002	30-40	<25	L-M	-	-	-	Y	VCB	1.1	—	—	—
7752	30	Unit	1	S009	E010	50-60	<25	L-M	N	N	-	Y	VCB	95.0	—	—	—
7753	97	Unit	3	S080	E006	40-50	<25	L	N	N	N	N	GRN	210.0	—	—	—
7754	36	Unit	1	N021	E055	20-30	<25	M	-	-	-	Y	VCB	15.6	—	—	—
7754	45	Unit	1	N021	E055	50-60	25-50	M	N	Y	Y	Y	VCB	466.4	—	—	—
7754	54	Unit	2	S030	W010	10-20	<25	L	-	-	-	N	QTE	10.1	—	—	—
7755	199	Unit	1	N761	W086	40-50	<25	-	-	-	-	Y	GRN	1.9	—	—	—
7755	201	Unit	1	N761	W086	50-60	<25	L-M	N	-	-	N	GRN	47.6	—	—	—
7755	216	Unit	2	N696	E058	10-20	<25	M	-	-	-	N	GRN	12.8	—	—	—
7755	223	Unit	2	N696	E058	20-30	<25	M	N	Y	-	Y	VCB	104.3	—	—	—
7755	236	Unit	2	N696	E058	50-70	<25	L-M	-	Y	-	Y	VCB	17.2	—	—	—
7755	252	Unit	3	N708	E028	30-40	<25	L-M	-	-	-	N	GRN	15.2	—	—	—
7756	181	Unit	1	N450	W138	0-10	<25	M	-	-	-	Y	VCB	15.9	—	—	—
7756	182	Unit	1	N450	W138	0-10	<25	L	N	-	-	Y	GRN	13.7	—	—	—
7756	202	Unit	1	N450	W138	20-30	<25	M	-	-	-	Y	GRN	37.7	—	—	—
7756	203	Unit	1	N450	W138	20-30	<25	-	-	-	-	Y	GRN	13.1	—	—	—
7756	204	Unit	1	N450	W138	20-30	<25	L	N	-	-	Y	VCB	9.9	—	—	—
7756	229	Unit	1	N450	W138	50-60	<25	H	Y	N	-	Y	GRN	152.6	—	—	—
7756	242	Unit	2	N442	W279	30-40	<25	M-H	-	-	-	Y	VCB	25.3	—	—	—
7756	261	Unit	4	N550	W126	20-30	<25	M-H	-	-	-	Y	GRN	87.4	—	—	—
7757	115	Unit	2	N500	E111	20-30	25-50	L	-	N	-	Y	GRN	114.3	—	—	—
7758	50	Unit	1	N188	W001	0-10	<25	L	-	-	-	Y	VCB	29.7	—	—	—
7758	58	Unit	1	N188	W001	20-30	<25	L	N	-	-	Y	GRN	20.2	—	—	—
7758	64	Unit	1	N188	W001	30-40	<25	M	-	-	-	Y	VCB	48.1	—	—	—
7759	186	Unit	1	N319	E192	0-10	<25	M	-	-	-	Y	GRN	70.9	—	—	—
7759	208	Unit	1	N319	E192	40-50	<25	L	N	N	-	Y	VCB	124.6	—	—	—
7759	209	Unit	1	N319	E192	40-50	<25	L	-	-	-	Y	VCB	2.2	—	—	—
7759	210	Unit	1	N319	E192	40-50	<25	-	N	N	-	N	GAB	18.7	—	—	—
7759	232	Unit	2	N231	E200	10-20	<25	L	-	-	-	Y	VCB	44.3	—	—	—
7759	248	Unit	3	N161	E100	30-40	<25	L	N	N	-	Y	VCB	111.0	—	—	—

% comp = percent complete
FA = fire-affected
Use: L = light; M = moderate; H = heavy; - =indeterminate
Shaped/Pecked/Battered/F-A (fire-affected): N = no; Y = yes; - =indeterminate
Mat (material): VCB = volcanic river cobble; GRN = granitic; GAB = gabbro; QTZ = quartz;
Italicized cat. no. are illustrated in figures

Table VIII-3. Milling Tool Material Types

Material	Milling Implement Type: Manos	Pestle/Manos	Metates	Indeterminate Fragments	Total	Percent
Volcanic Cobble	88	-	-	1	89	53.3
Granitic	48	2	13	1	64	38.3
Gabbro	6	-	-	1	7	4.2
Quartzite	3	-	-	-	3	1.8
Volcanic	1	-	-	-	1	0.6
Schist	-	-	1	-	1	0.6
Unknown	1*	-	1	-	2	1.2
Total	**147**	**2**	**15**	**3**	**167**	**100.0**

* = unwashed at time of analysis

2. Pestle/Manos

Two complete large pestles, with minimal use as a mano also, were recovered from two sites. Pestles are tools held in the hand and used in an up and down and sometimes rotary motion in a mortar, most frequently to crush and pulverize vegetal materials and/or small animals as part of food preparation. They were also sometimes used to crush materials such as hematite to make pigments or to mash vegetal materials to produce ceremonial and/or medicinal concoctions. Often they are heavy stones, since the weight aids in their crushing ability. Pestles with use displayed by wear on a flat side were tools that could obviously serve a dual function without the need to keep a second tool for grinding near by.

The largest tool of this kind came from the surface of SDI-7322, and was slightly embedded in the ground situated next to a bedrock outcrop containing several milling elements (Feature 7), including mortars, basins, and slicks. The granitic rock weighs 7,150 grams, measures 26 cm long by 18.2 cm wide by 11.9 cm thick, and is humped on one side and flat on the opposite side (Figure VIII-3). The more narrow end of this lichen-covered rock is shouldered and worn from pestle use. The flat face displays light to moderate polish on the high spots of this surface.

The second tool came from the 10-20 cm level of an STP excavated at SDI-7759. The irregular-shaped subangular granitic cobble has a well worn end from pestle use and also displays polish on the high spots of both faces of the stone, indicating use horizontally as a mano (Figure VIII-4). This specimen weighs 3,025 grams and measures 23 cm long by 14.2 cm wide and 7.3 cm thick.

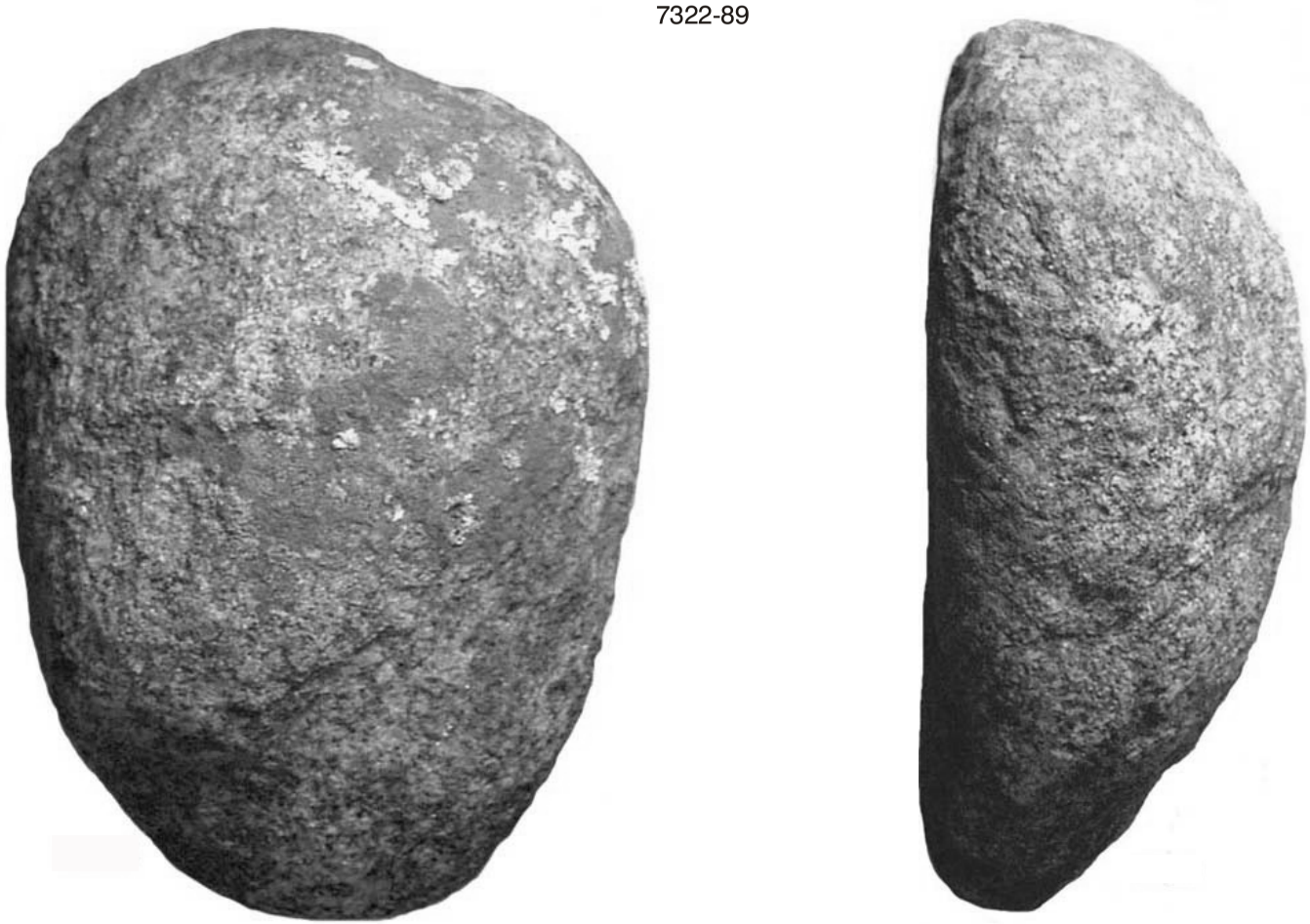
No evidence of recycling for heating or hearth stones is displayed on either specimen. No single function pestles were recognized in the extensive milling handstone assemblage.

3. Metates

Fifteen recovered items were identified as metates or grinding bases. All are fragments except for a small chunk of granitic rock that displays use on both sides. For all but one very small, indeterminate specimen, the metate fragments were divided by use type or intensity into those with little or no depression (n=6; 40.0 percent) and those displaying a depression or basin (n=8; 53.3 percent) created from extensive use (Table VIII-4). On the flat pieces, use intensity was light (n=4; 26.7 percent) to moderate (n=3; 20.0 percent).

Three of the metates are large enough pieces to display evidence of pecking to resharpen or rough-up their grinding surface. Only five specimens retain portions of the exterior tool edge, and of these only one appears to have been moderately shaped. The material preference for metates in this area was clearly granitic stone (n=13; 86.7 percent), although a lightly ground tabular chunk of schist was recovered at SDI-7751 and an odd also tabular chunk of volcanic-type stone with only light polish came from the surface of SDI-7755. Thermal alteration is noticeable on seven (46.7 percent) pieces, including a rather large chunk (4,330 grams).

The only complete metate is noticeably smaller than a typical grinding base, measuring 17.2 cm long by 15.2 cm wide by 7.8 cm thick. Use intensity varies from light to moderate on the opposite faces. This unshaped slab of granitic stone may have served as a pigment palette or some use other than food processing.



Mooney & Associates

0 2 4cm

Oak Country Estates
Shaped Pestle/Mano

Figure VIII-3

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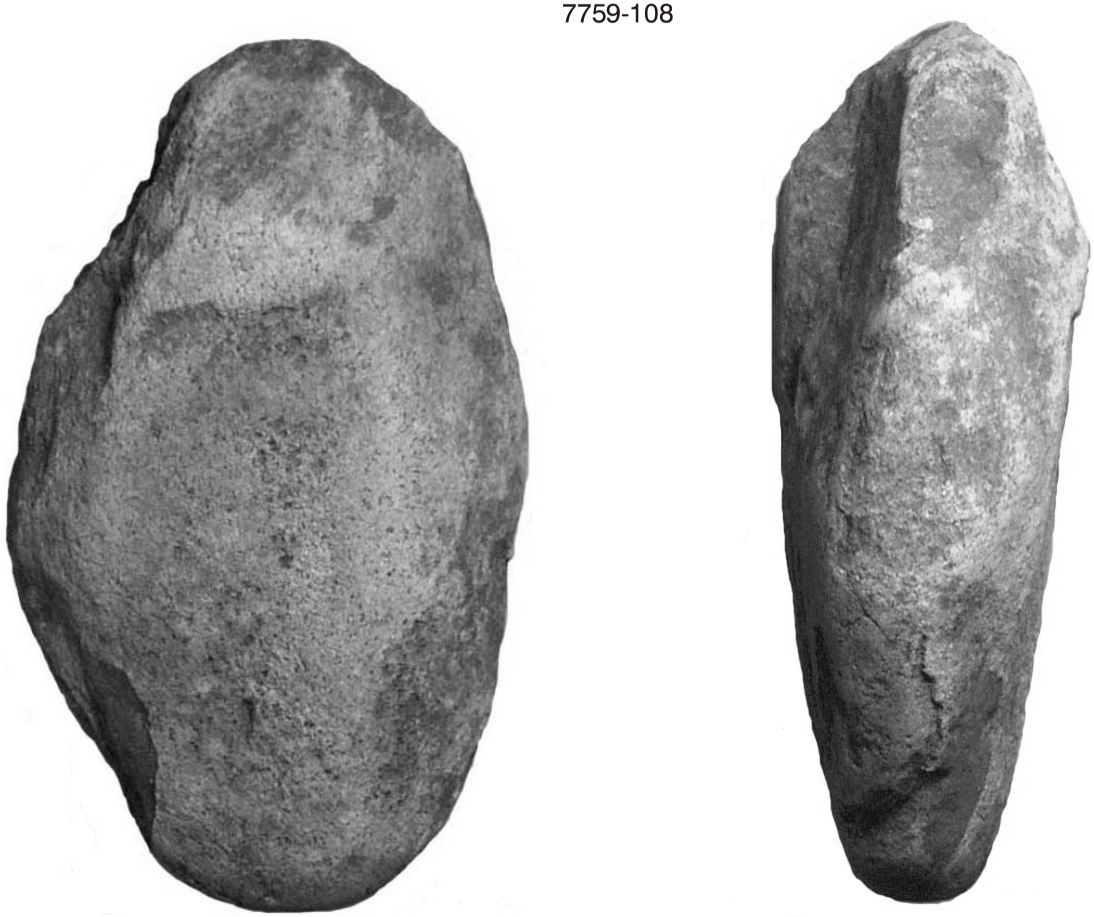
7759-108



Mooney & Associates

0 2 4cm

Oak Country Estates
Unshaped Pestle/Mano

Figure VIII-4

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Table VIII-4. Metate Attributes

Site No. CA-SDI-	Cat. No.	Provenience		Coordinates N/S	Coordinates E/W	Level (cm)	% Comp.	Use	Shaped	Pecked	Pecked	F-A	MatWt (g)
Flat													
7754	70	Surface		-	-	-	100	L	N	N	N	GRN	2650.0
7322	133	Unit	2	S140	W175	40-50	<25	L	-	N	Y	GRN	278.3
7751	100	Unit	1	S059	W022	40-50	<25	L	-	N	N	SCH	100.3
7754	33	Unit	1	N021	E055	10-20	<25	M	-	N	Y	GRN	585.5
7755	287	Surface		-	-	-	<25	L	-	N	N	UNK	149.8
7756	206	Unit	1	N450	W138	20-30	50	L	N	N	N	GRN	7225.0
Basin													
7324	34	Unit	1	S005	E025	20-30	<25	H	-	N	Y	GRN	583.9
7325	12	Surface		-	-	-	25-50	M-H	N	Y	N	GRN	4550.0
7751	91	Unit	1	S059	W022	20-30	25-50	H	N	N	Y	GRN	4330.0
7751	95	Unit	1	S059	W022	30-40	<25	H	-	N	Y	GRN	282.1
7753	90	Unit	3	S080	E006	20-30	<25	H	-	N	N	GRN	79.2
7754	71	Surface		-	-	-	<25	H	Y	Y	N	GRN	1104.0
7755	269	Unit	4	N745	W026	10-20	<10	H	-	N	N	GRN	3.2
7757	95	Unit	1	N470	E067	20-30	<25	M	-	N	Y	GRN	121.7
Indeterminate Piece													
7756	205	Unit	1	N450	W138	20-30	<25	L	-	-	Y	GRN	145.2

Use: L = light; M = moderate; H = heavy; - =indeterminate
Shaped/Pecked/Battered/F-A (fire-affected): N = no; Y = yes; - =indeterminate
Mat (material): GRN = granitic; SCH = schist; UNK = unknown

4. Non-diagnostic Fragments

Three fragments are so small that while grinding is detected on the extant surface, the actual function is not diagnostic, however two are possible manos and one seems so flat it was probably part of a milling bases. Two of the pieces are granitic and one is a porphyritic volcanic cobble. The two larger pieces, from sites SDI-7754 and -7755, are both fire-affected while the tiny gabbro fragment from SDI-7753 does not appear to be burned.

5. Tool Distribution

Four sites only produced manos from their surface (SDI-7317, -7320, -7767, and -15,981), no milling implements were found subsurface in these locations. Milling tools were collected from the surface at ten other sites also (see Table VIII-1), but the surface artifact assemblage will not be included in the following discussion of distribution since the sample was not quantitative.

Of the 126 subsurface artifacts, from both STPs and units, the largest amounts came from three sites (SDI-7755, -7756, and -7759) situated among the bedrock boulders on the west side of Santa Maria Creek (Table VIII-5). Each of these sites produced twenty-one to twenty-five tools, primarily manos. Two other sites (SDI-7322 and -7751), across the creek and to the northeast, yielded moderate amounts of milling tools. The remaining ten sites produced seven or less items. All of the sites with subsurface milling tool recovery have bedrock milling features associated with them, varying from six to as many as forty-two slick elements present on the boulders.

Vertically, throughout the project location, the greatest concentration of items occurred between 10 to 40 cm (n= 85; 67.5 percent) with the 20-30 level producing the most (Table VIII-6). Twenty-four implements were found below 40 cm to a depth of 60, below this depth the frequency drops off dramatically with no more than two items recovered to a depth of 120 cm; no milling implements came from the 80-90 cm level. At two sites (SDI-7321 and -7752) the vertical distribution was unique in that the only milling tool specimen came from the 50-60 cm level. At three other sites (SDI-7324, -7325, and -7768) milling elements were only produced from between 20-40 cm. In all of these cases except one, the items were whole or substantial fragments, not small bits.

Table VIII-5. Depth Distribution of Milling Implements

Level	Site CA-SDI-																
(cm)	7321	7322	7324	7325	7326	7751	7752	7753	7754	7755	7756	7757	7758	7759	7768	Total	Percent
0-10	-	-	-	-	1	2	-	-	-	1	4	-	1	2	-	11	8.7
10-20	-	1	-	-	-	3	-	1	2	7	2	1	-	5	-	22	17.5
20-30	-	2	2	-	-	2	-	4	1	3	12	3	3	3	-	35	27.8
30-40	-	1	-	2	-	4	-	1	2	1	5	1	3	7	1	28	22.2
40-50	-	2		-	-	3	-	2	-	4	1	1	-	3		16	12.7
50-60	1	-		-	-	-	1	-	1	4	1	-	-	-		8	6.4
60-70		1			-	-	-	-	-	-	-		-	-		1	0.8
70-80		1			-		-	-	-	-	-			-		1	0.8
80-90		-					-	-		-	-			-		0	0.0
90-100		-								1				1		2	1.6
100-110		1												-		1	0.8
110-120		1														1	0.8
Total	**1**	**10**	**2**	**2**	**1**	**14**	**1**	**8**	**6**	**21**	**25**	**6**	**7**	**21**	**1**	**126**	**100.0**
Percent	**0.8**	**7.9**	**1.6**	**1.6**	**0.8**	**11.1**	**0.8**	**6.3**	**4.8**	**16.7**	**19.8**	**4.8**	**5.6**	**16.7**	**0.8**	**100.0**	

gray shading = unexcavated

As for distribution of tool types, whole or portions of manos occurred in all levels of recovery as indicated on Table VIII-6. The one subsurface pestle/mano came from the second level of excavation, and the metate fragments were all recovered from between 10-50 cm only. Six sites each produced a single whole mano from depths ranging between 20-60 cm, and SDI-7759 yielded six manos besides the pestle/mano from the subsurface deposit. Recovery of these manos ranged from the first level to 40 cm deep.

Table VIII-6. Milling Tool Depth Distribution

	Milling Implement Type					
Level (cm)	**Manos**	**Pestle/ Manos**	**Metates**	**Indeterm. Fragments**	**Total**	**Percent Subsurface**
Surface	36	1	4		41	
0-10	11	-	-	-	11	8.7
10-20	18	1	2	1	22	17.5
20-30	28	-	6	1	35	27.8
30-40	26	-	1	1	28	22.2
40-50	14	-	2	-	16	12.7
50-60	8	-	-	-	8	6.4
60-70	1	-	-	-	1	0.8
70-80	1	-	-	-	1	0.8
80-90	0	-	-	-	0	
90-100	2	-	-	-	2	1.6
100-110	1	-	-	-	1	0.8
110-120	1	-	-	-	1	0.8
Total	**147**	**2**	**15**	**3**	**167**	**100.0**

C. Bedrock Milling Features

The preliminary sum of milling elements present at the thirty-two sites include 1,317 slicks, 243 basins, and fifty-eight mortars. These elements were found among 350 separate bedrock features (see Map V-10). The bedrock elements were recorded in detail at twenty-two of the sites, while only cursory totals were made of the elements at ten sites having much great numbers of features and elements (Table VIII-7). Milling feature drawings are provided as Appendix D. For the ten specified sites, detailed recording and mapping of the milling features should be done during the data recovery mitigation phase.

Table VIII-7. Milling Element Distribution

		No. of Element Types					
Site No. CA-SDI-	**No. of Features**	**Slicks**	**Basins**	**Conical Mortars**	**Saucer Mortars**	**Acorn Anvils**	**Figure No.s in Appendix D**
Recorded Features							
7317	7	18	-	-	-	-	1-7
7318	2	3	-	-	-	-	8-9
7319	1	1	-	-	-	-	10
7320	2	3	-	-	-	-	11-12
7321	18	40	2	-	-	-	13-27
7324	9	29	-	-	-	-	28-37
7326	2	6	1	-	-	-	38-39
7752	4	12	-	-	-	-	40-43
7760	5	7	-	-	-	-	44-46
7764	4	8	1	-	-	-	47-50
7767	5	19	-	-	3	-	51-54
7768	9	38	-	-	-	-	55-63
15,979	1	1	-	-	-	-	64
15,980	2	8	-	-	-	-	65-66
15,981	5	24	-	-	-	-	64-65
15,982	1	1	-	-	-	-	66
16,076	4	5	-	-	-	-	67-70
16,077	1	1	-	-	-	-	71
16,078	1	3	-	-	-	-	72
16,079	3	3	-	-	-	-	73
16,080	2	4	1	-	-	-	74
16,081	2	3	-	-	-	-	75
Unrecorded Features (preliminary counts of elements)							
7322	19	137	29	9	-	-	
7325	5	16	1	-	-	-	
7751	2	18	-	-	-	-	
7753	14	40	1	4	5	-	
7754	10	30	1	1	1	-	
7755	59	270	50	7	1	-	
7756	81	342	94	13	-	6	
7757	46	157	45	12	1	-	
7758	5	21	1	-	-	-	
7759	19	49	16	1	-	-	
Total	**350**	**1317**	**243**	**47**	**11**	**6**	

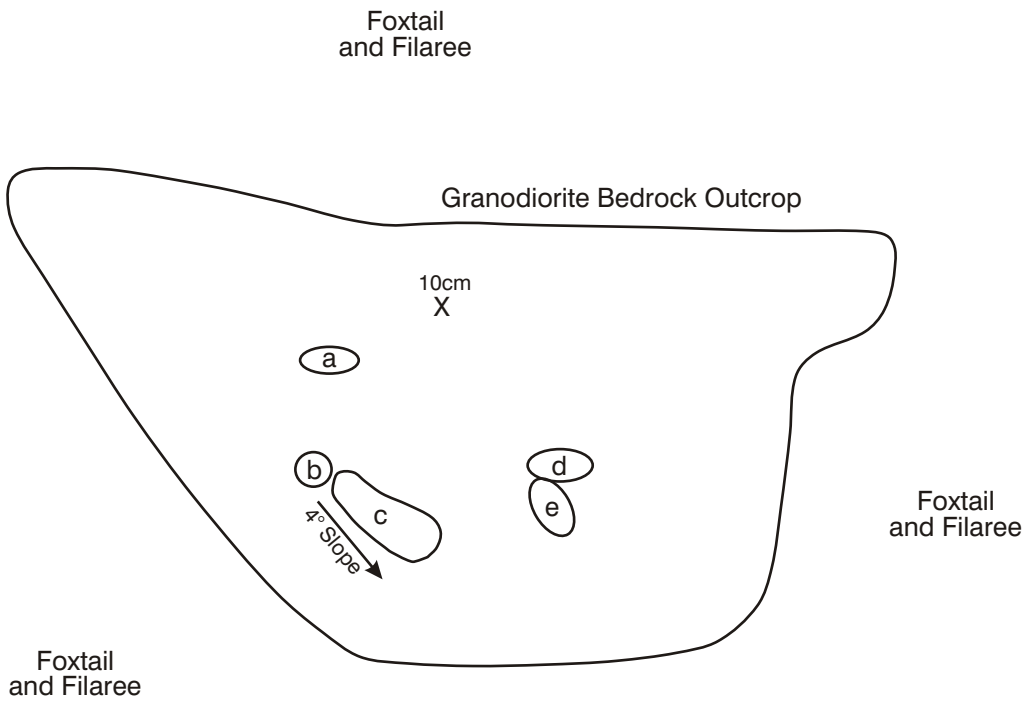
Milling elements on the bedrock features identified during this project include: milling slicks, basins, conical mortars, saucer mortars, acorn anvils, and surface pecking. The majority of elements are milling slicks, which comprise eighty-one percent of the total elements identified. Basin elements account for fifteen percent, and mortars account for four percent. Other features such as pecking features or acorn anvils are much less common, but will be included in the following discussion.

Milling slicks account for a large portion of the milling feature elements present, however, their use is somewhat enigmatic (Schroth 1996:4). Slicks are typically found on the flat surfaces of bedrock outcrops and occasionally on some gently sloping surfaces (Figure VIII-5). Slicks can be circular or amorphous in outline and represent the same function as a flat portable metate. Some slicks have a minimal depth formed through use, or sometimes from placement within a natural depression in the bedrock surface. Milling basins are distinguished from slicks by having a depth greater than 1 cm. Anthropologist William D. Hohenthal's ethnographic account of the Tipai of Baja describes the production of a slick: "for making bedrock metates, the old women would take a sharp rock and peck away at the surface of the rock; then they would rub the abraded surface with a rough stone, brush away the powdered rock with the hand, and repeat" (Hohenthal 2001:175). At SDI-16,076, a granodiorite bedrock boulder measuring 55 cm by 30 cm has a 15 cm by 15 cm area displaying only pecking, but no grinding as found on slicks in other portions of the site. This modification to the bedrock is probably an example of the initial preparation for a bedrock metate (or slick). Ethnographic accounts state that slab metates were not used for purposes any different from the basin type, and that if a slab metate was used long enough it would eventually acquire the depth of a basin form (Hohenthal 2001:174). The slab or basin metate was ground upon using a handstone or mano for grinding grain and seeds (Schroth 1996:4). Occasionally, during the current investigation, manos were found in the crevices of boulders with milling or adjacent to milling features (Plate VIII-1A), possibly stashed for future use.

The typical basin element form is oval and restricted, rather than amorphous like many slick areas, and basin depths are as deep as 4 cm (Figure VIII-6). These more extensively ground elements possibly served a different function than the ubiquitous slicks. An impressive feature was identified at SDI-7755, that has over seventeen basin elements and a large expanse of polished surface encompassing a major portion of the exposed bedrock (Plate VIII-1B). The bedrock is exposed at surface level, and soil has accumulated on the bedrock covering up unknown numbers of elements. This feature is distinct from the other sites in its intensive use and combination of elements.

Mortars have a specific function in that they are used in conjunction with a pestle that is pounded and rotated in the circular depression, and they often appear in clusters with slicks as well as basins (Plate VIII-2A). Ethnographic accounts indicate a batch of acorn kernels were pounded in a mortar for one-half hour or more, until a coarse meal was produced (Hedges 1986:5). The effective depth of a given mortar was 4-8 inches, and if a mortar became too deep it was abandoned since the pestle would crush the acorns too much. (Hohenthal 2001:175). The metric equivalent of 4-8 inches is roughly 10-20 cm. Our survey data found the depths of mortars ranged from 7 cm to 28 cm.

Ten sites are projected to be recorded during the data recovery mitigation phase, and seven of the ten sites contain mortars. Further data will be available at that time regarding the frequency and range of mortar variation, especially in regards to frequency of "collars" and "side-cars." Collars are slick areas formed around a mortar and side-cars are small depressions pecked into the rock immediately adjacent to the mortars (Schroth 1996:3). From preliminary survey data, slick collars are present on many of the mortar elements yet to be recorded. No side-cars have been identified during the preliminary survey.



LEGEND

Milling Slick

X Greatest Height of Outcrop

Mooney & Associates

N

0 0.5 1m

Oak Country Estates
Representative Milling Feature
at CA-SDI-7752 (Feature 3)
Figure VIII-5

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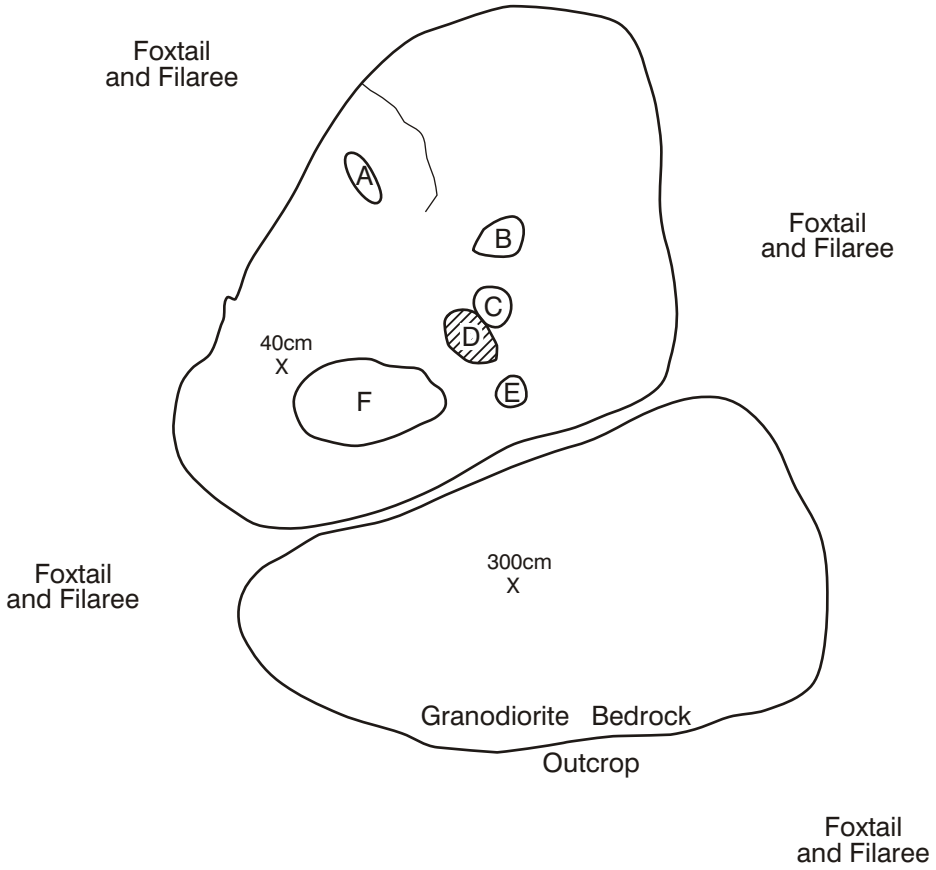

LEGEND

Milling Slick

Basin Milling

X Greatest Height of Outcrop

Mooney & Associates

N

0 0.5 1m

Oak Country Estates

Representative Milling Elements at CA-SDI-7326 (Feature 1)

Figure VIII-6

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A.) CA-SDI-7751, Artifacts in Crevice of Feature 2, View Southeast

B.) CA-SDI-7755, Feature 19, View North

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A.) CA-SDI-7756, Feature 11, View Southeast

B.) CA-SDI-7756, Feature 8, View East

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Six acorn anvils were identified at site SDI-7756 on three separate bedrock outcrop features. These anvils were located adjacent to other bedrock milling features, including mortars. Acorn anvils are often called cupules, that are sometimes confused with vertical cupule petroglyphs (Minor 1975). When these cupules occur adjacent to bedrock milling, on a horizontal surface, it is often associated with acorn processing (True 1970:17). These anvils are small shallow depressions, that are rough and without polish (see Plate VIII-2B), used to cradle the acorn when cracking their hulls. At site SDI-7756 these acorn anvil elements represent only one percent of the total milling elements identified at the site.

Milling features can be analyzed by their horizontal distribution within each site, and the distribution of elements by feature. All of the thirty-two sites on the property have milling slicks, thirteen of the sites have basin elements, and eight of the sites have mortars. If elements are analyzed site by site, mortars constitute 0-18 percent of the elements, basins constitute 0-24 percent of the elements, and slicks account for 73-100 percent of the elements recorded.

D. L. True's article regarding bedrock milling elements as indicators of subsistence and settlement patterns is an interesting comparison to what was found during the current project. True's broad based study of Luiseño sites along a long transect of the San Luis Rey river was mainly concerned with the relative frequency of kinds of milling elements and the relationships between elements (True 1993:3). True found that mortar to [basin]/slick percentages over 80 percent represent evidence of intensive acorn processing and frequencies less than 50 percent suggest generalized processing with a considerable emphasis on hard seeds and small animal processing (True 1993:11). The project average is four percent mortars to ninety-six percent basin/slicks. The suggested intensity of processing hard seeds and small animals is significant to understanding seasonality of these sites.

Two varieties of oak trees are found within the project area: the coast live oak *(Quercus agrifolia)* and scrub oak *(Quercus dumosa)*. The favorite acorns for food came from the black oak, and secondarily the coast live oak. The scrub oak is used for food only when others do not bear (Hedges 1986:5). Several varieties of edible plants are present on the property including manzanita, buckwheat, golden yarrow, filaree, mallow, wild peony, wild cherry, squawbush, wild rose, curly dock, white sage, elderberry, clover, pansy, fan palm, and yucca.

D. Other Bedrock Associated Features

1. Rock Enclosures

Six rock enclosures were identified at SDI-7757. The site is situated on a knoll that slopes down gently to the west, south, and east, however the slope is steep on the north side. The top of the knoll and the north side of the knoll are characterized by large coast live oaks and several granodiorite boulders, on which several milling features are present. The rock enclosures are located amongst these boulders on the north side of the knoll, halfway down the slope. A freshwater seep borders the site to the north.

These rock enclosures are generally circular in shape with central depressions, and boundaries demarcated by large granodiorite bedrock boulders and stacked granodiorite rocks. Each rock enclosure was drawn and photographed (Figures VIII-7 through VIII-12, Plates VIII-3A through VIII-5B). Rock enclosure one appears to have sustained some modern disturbance. Many of the granitic cobbles have been "blown out" or scattered haphazardly. Several pieces of wood are within the rock enclosure and are assumed to be part of the remains of a pothunter's screen. A similar, and intact pothunter's screen was located on the east side of the site, tucked between granitic boulders.

The average size of these rock enclosures is 4 m by 4 m. Rock enclosure one is partially obscured by foxtail grasses. Rock enclosures two through six are obscured by a large volume of leaf litter from the oak trees above the enclosures. Munsell soil color readings were taken from the area inside the rock enclosures and produced a 10YR 3/2 dark grayish brown reading for all six enclosures. All soils are a sandy loam with a high organic content. No excavations were conducted in the enclosures.

Rock enclosures in San Diego County are thought to be primarily habitation structures, although they have also been described as ceremonial sites, forts, and hunting blinds (Minor 1975). Enclosures in southern California vary in construction, are associated with various cultural assemblages, and are located in diverse environments (Oxendine 1981:232). These structures are most often built into bedrock formations or outcrops, although their bases are frequently sunk into A Horizon soils. Given the well-documented practical attitude toward dwelling construction, the occurrence of walled room dwellings built to take advantage of existing bedrock outcrops and materials is not unexpected (Van Wormer and Carrico 1993:244). Excavation within these features often produce artifacts and refuse clearly associated with habitation including formalized tools, faunal remains, and ornamentation (Carrico 1988:119). Without having excavated the rock enclosures, it is difficult to identify these as being definitively for defense, storage, or habitation.

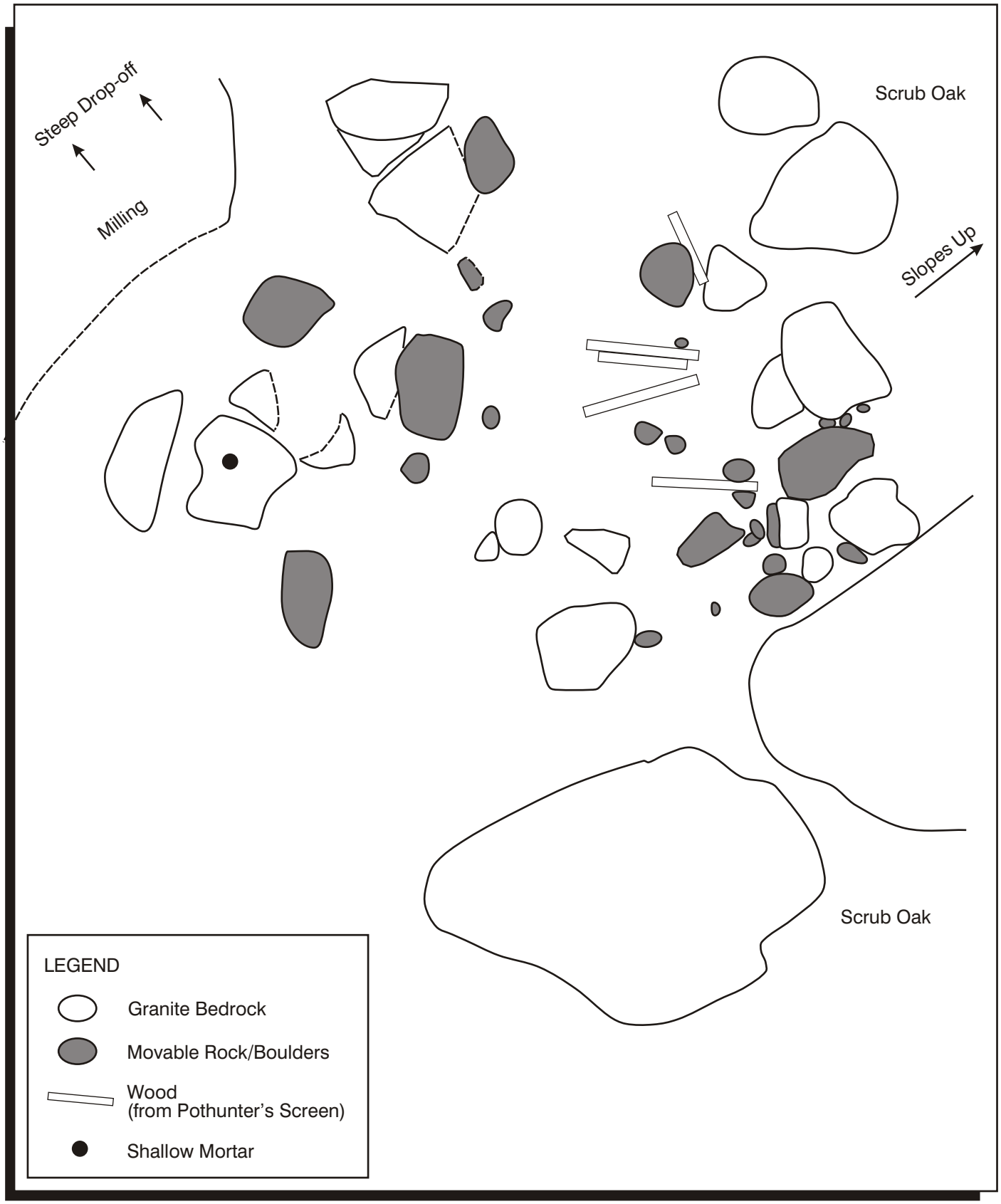
2. Granary Bases

One granary base was identified at site SDI-7760. Rock rings on bedrock slabs were typically used to hold large willow baskets above the rock surface. The site has four milling features containing seven slick elements. The granary base is a circular rock alignment of native granodiorite cobbles, that rests upon a flat granodiorite bedrock exposure with milling elements located south of the base. The exposed bedrock is at ground level and the granary base is located very close to the surrounding ground surface. This granary base seems somewhat disturbed (Figure VIII-13); however, a few of the cobbles remain stacked (Plate VIII-6A). Surface survey and subsurface excavation revealed a sparse lithic scatter around the site. No ceramic sherds were located near the site during this project, despite intensive surface survey; however, previous site records indicate ceramic sherds were present when originally recorded (Polan 1980). This site is one of the more isolated locations in the project area.

Granary baskets were used to store acorns and other food stuff after collection and until processing. For example, while acorns were gathered in September and October, the were often stored away until the winter months. One account noted that acorns were at their best in February, five months after harvest. Patterns have been observed with granary bases in San Diego County, regarding their size, location, and context (James 1995). A comparison of James' findings with the findings at SDI-7760 may be useful in placing this isolated feature within a larger contextual pattern. James notes these specific characteristics regarding granary bases: they are usually between 1 and 2 m in diameter; they are usually found on outcrops or boulders, but almost never on bare ground; they are all found in a late period context; many are in virtually isolated locations; and that many are located in elevations just above the oak/riparian habitat (James 1995). The granary base at SDI-7760 generally fits within this pattern, although the placement of the granary base at ground level is apparently somewhat unusual, the placement on a bedrock outcrop fits the general pattern.

3. Female Ceremonial Rock Features

One possible female ceremonial rock feature was identified at SDI-7324 (Figure VIII-14 and VIII-15). Similar features have been found throughout San Diego County and northern Baja, California (McGowan 1982). These features are often a natural fissure in granite bedrock. The fissure generally has an oval shape with a central bisecting line, and occasionally these fissures are enhanced by grinding. Sometimes, around



Mooney & Associates

N

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Oak Country Estates
CA-SDI-7757, Rock Enclosure 1
Figure VIII-7

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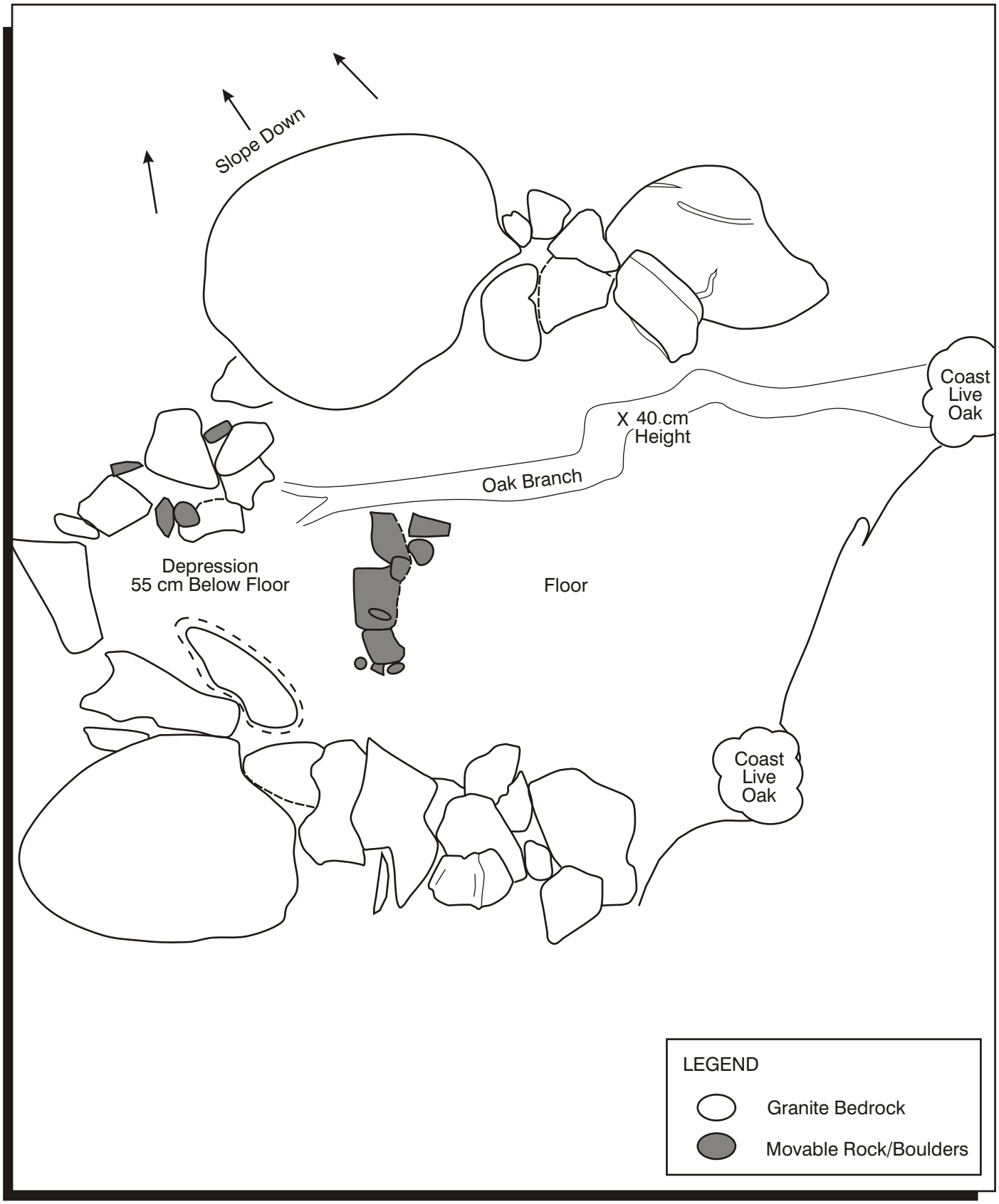

Mooney & Associates

N

0 .5 1m

Oak Country Estates

CA-SDI-7757, Rock Enclosure 2

Figure VIII-8

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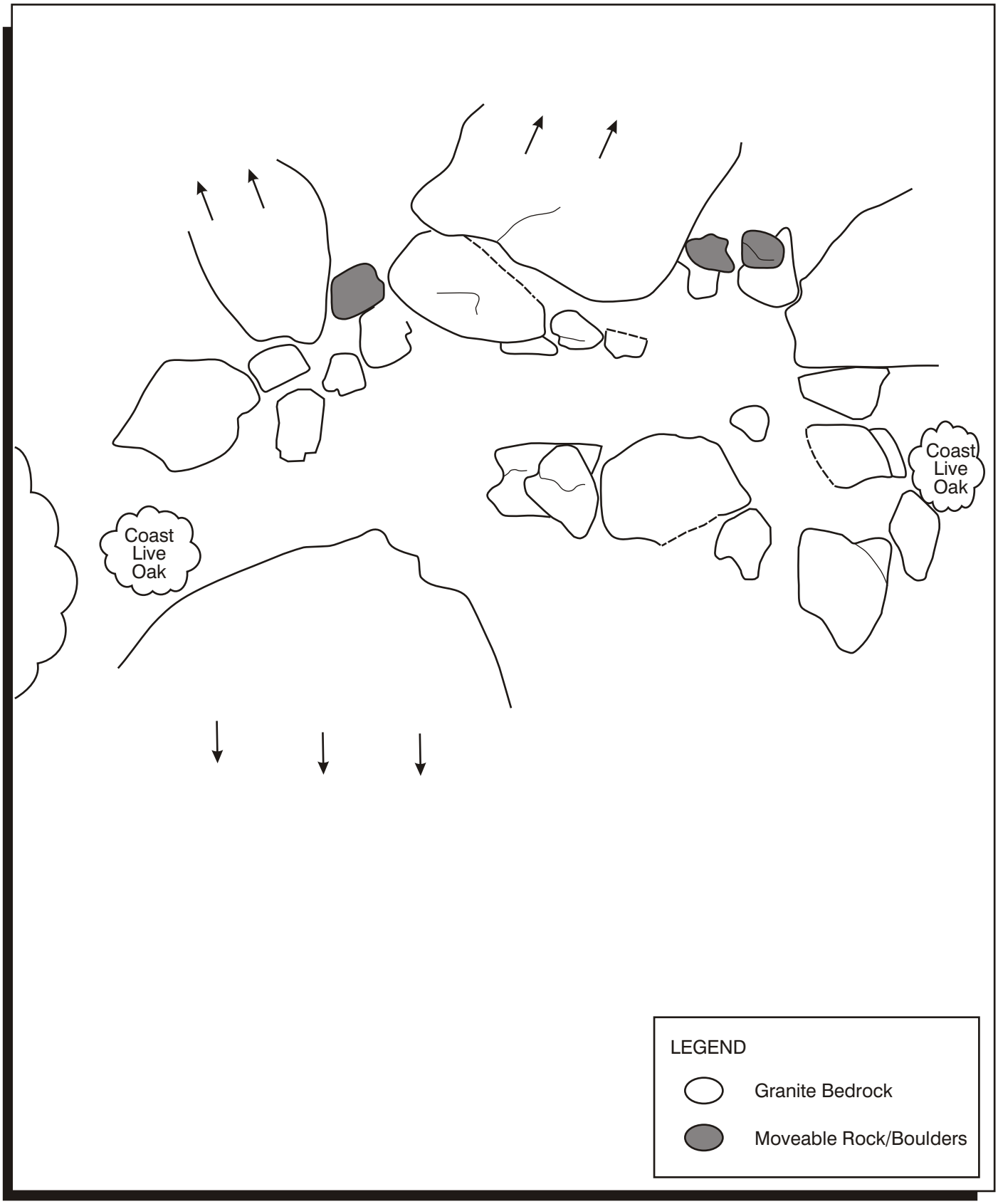

Mooney & Associates

N

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Oak Country Estates
CA-SDI-7757, Rock Feature 3
Figure VIII-9

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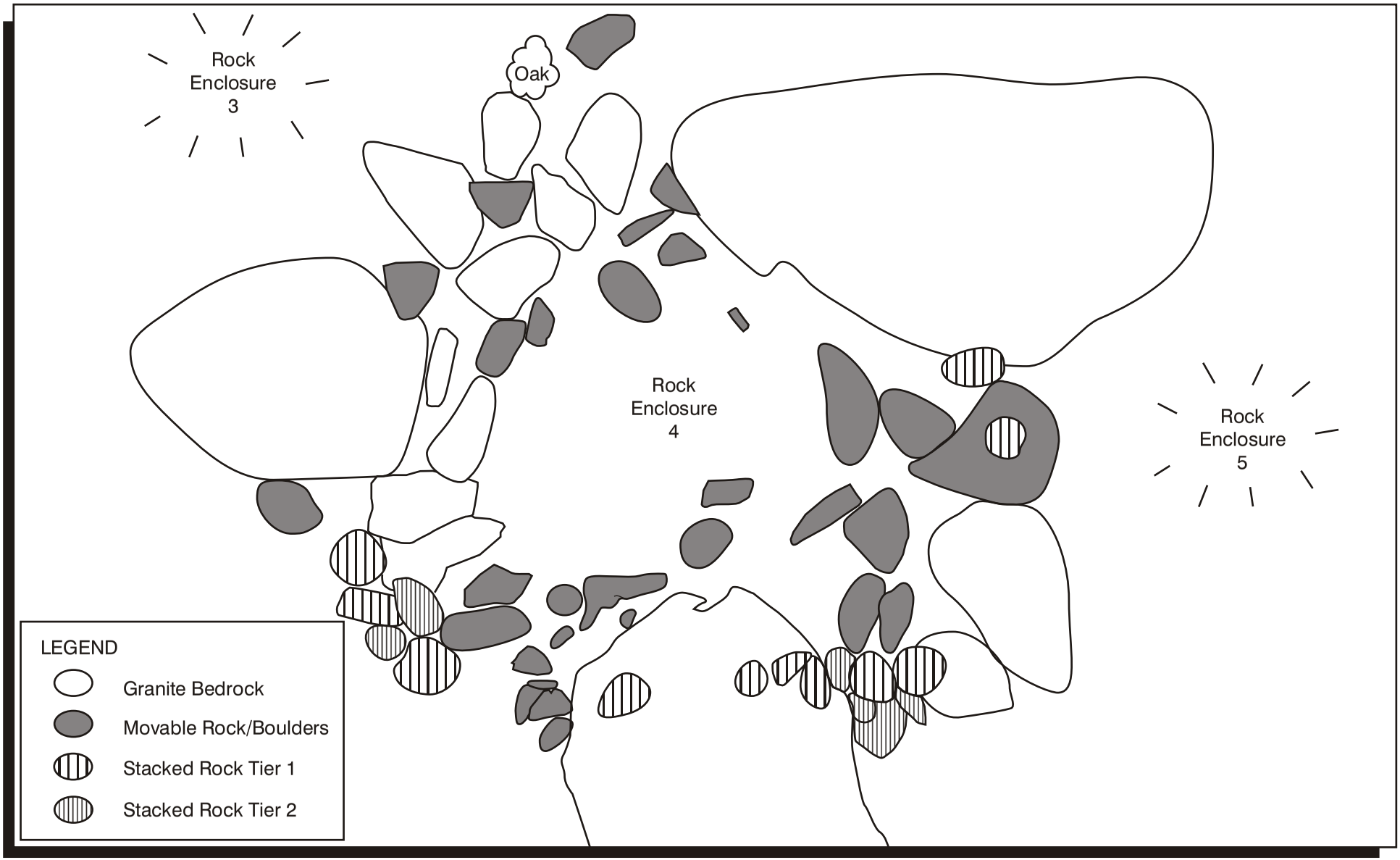

Mooney & Associates

N

0 0.5 1m

Oak Country Estates
CA-SDI-7757, Rock Enclosure 4
Figure VIII-10

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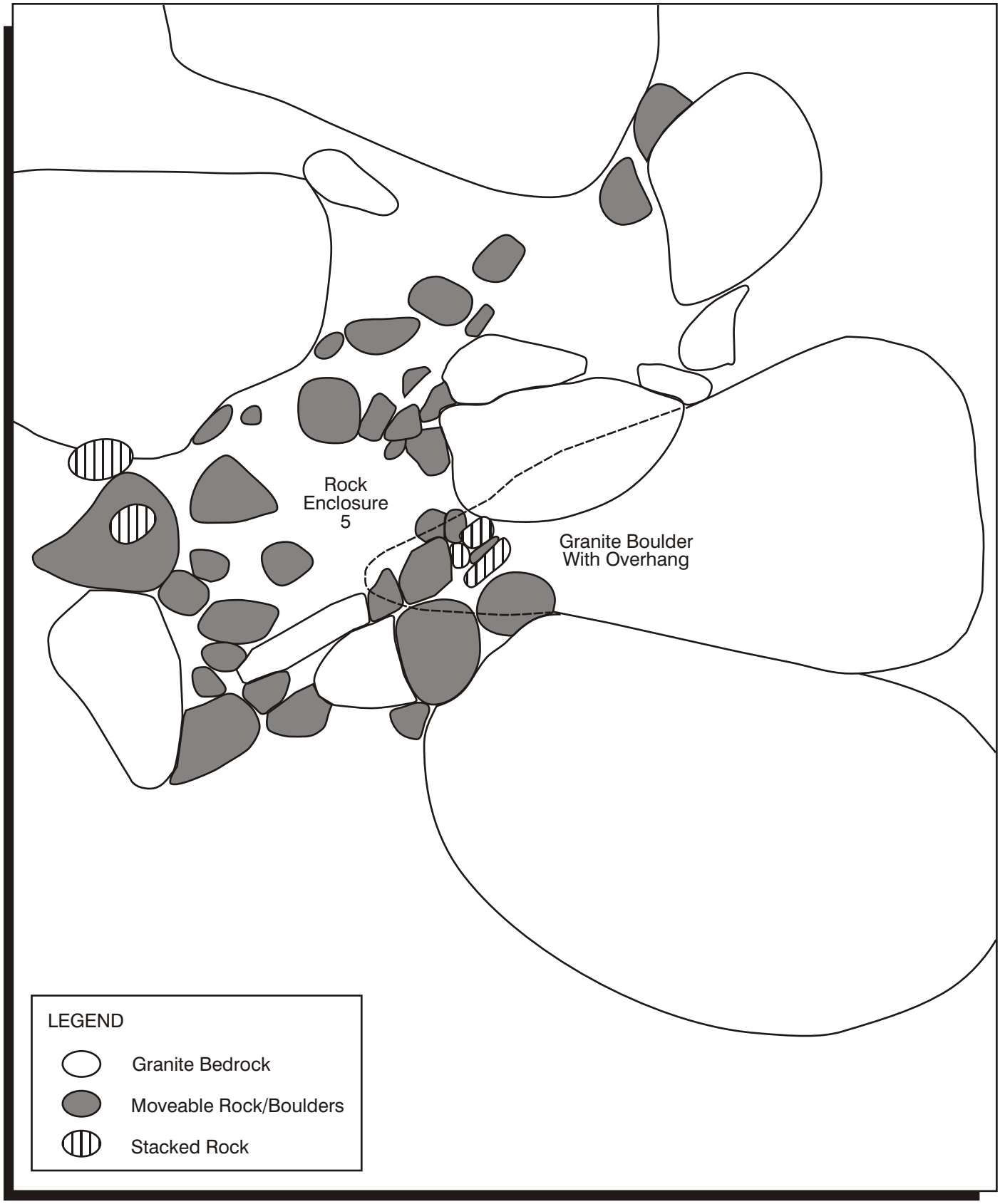

Mooney & Associates

N

0 0.5 1m

Oak Country Estates

CA-SDI-7757, Rock Enclosure 5

Figure VIII-11

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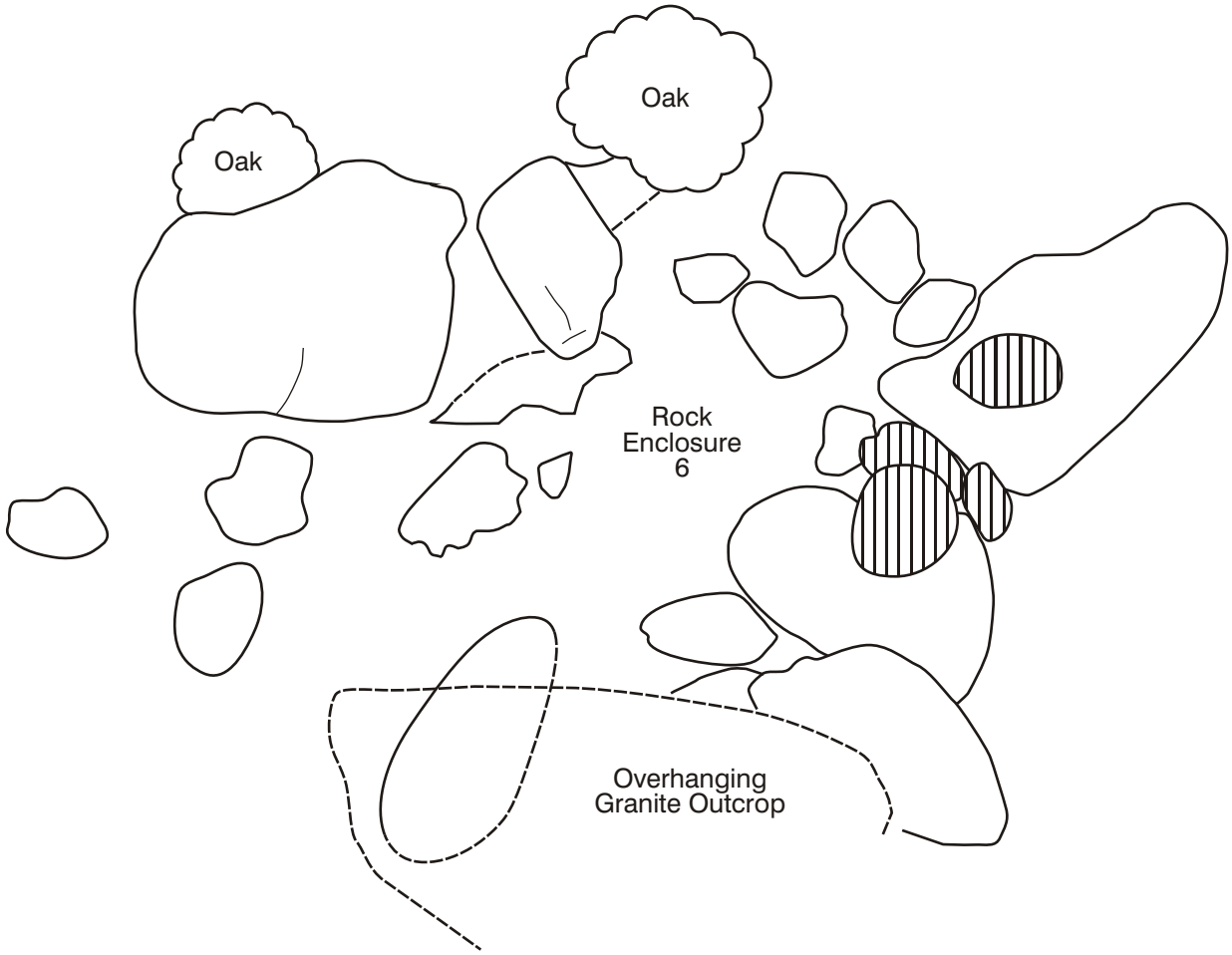

LEGEND

Granite Bedrock

Stacked Rock

Mooney & Associates

N

0 0.5 1m

Oak Country Estates

CA-SDI-7757, Rock Enclosure 6

Figure VIII-12

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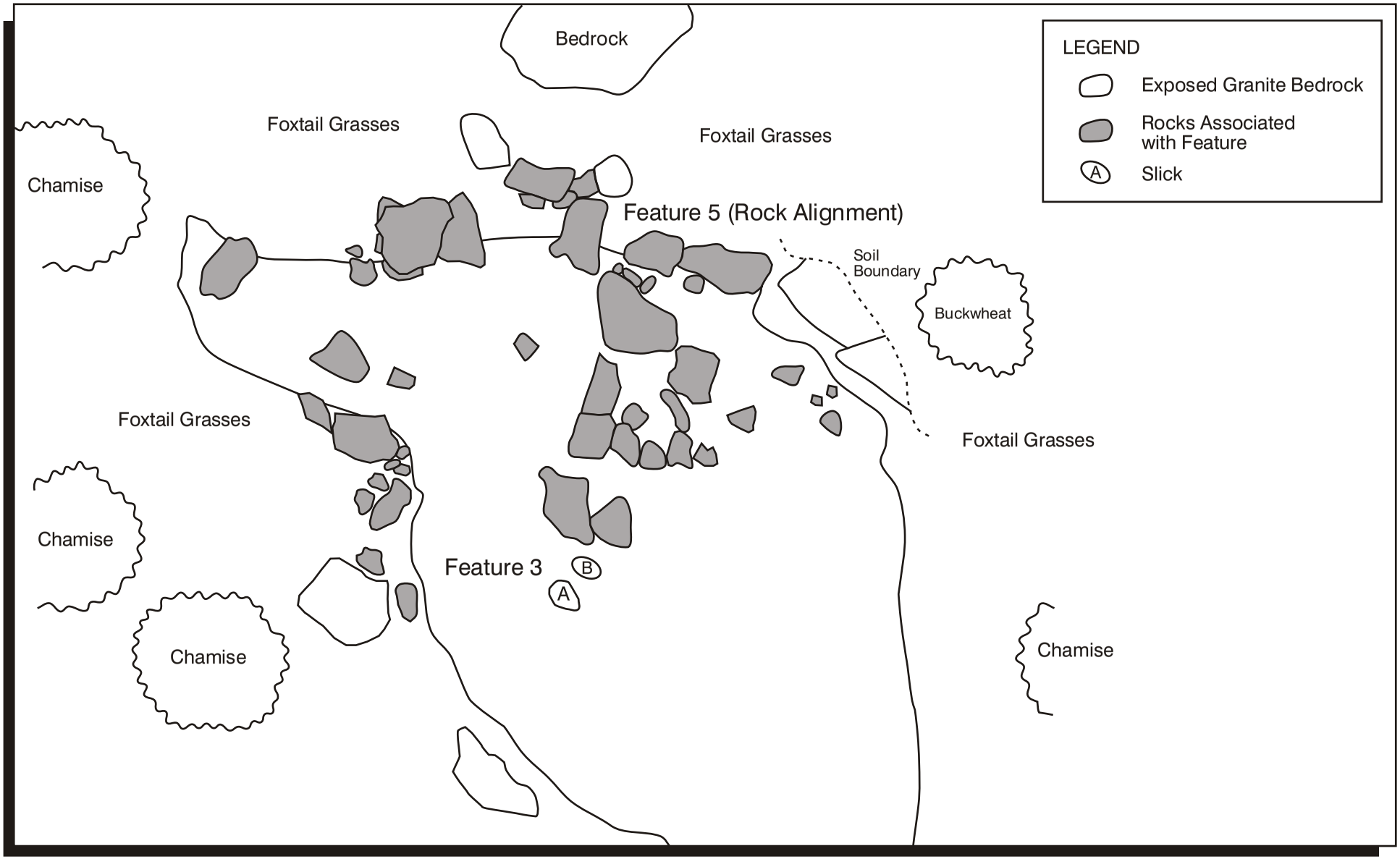

Mooney & Associates

N

0 35 70cm

Oak Country Estates
CA-SDI-7760 Granary Base Feature 5
(& Milling Feature 3)
Figure VIII-13

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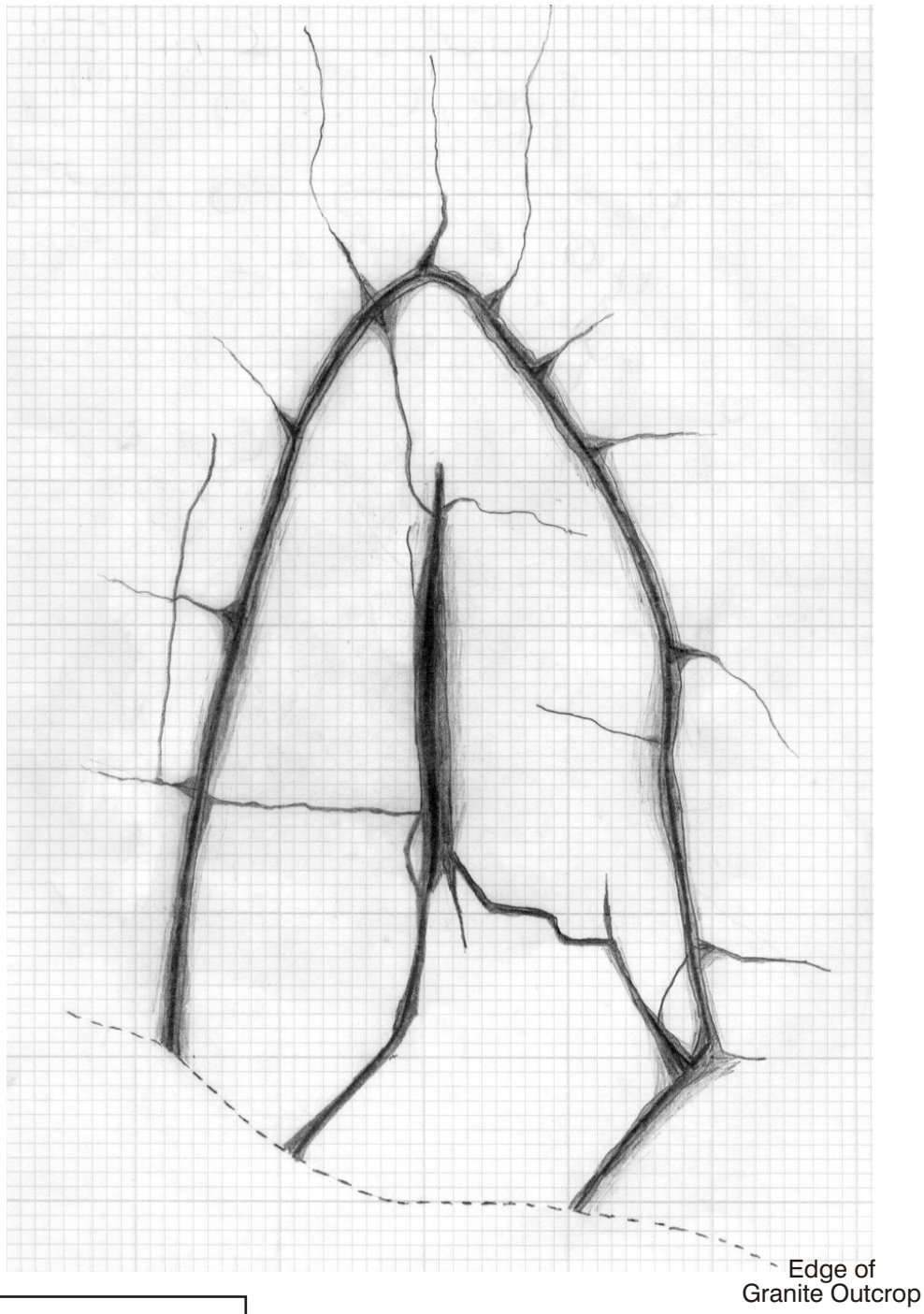

LEGEND

Increasing Depth

Mooney & Associates

N

0 12.5 25cm

Oak Country Estates

CA-SDI-7324, Female Ceremonial Rock Feature

Figure VIII-14

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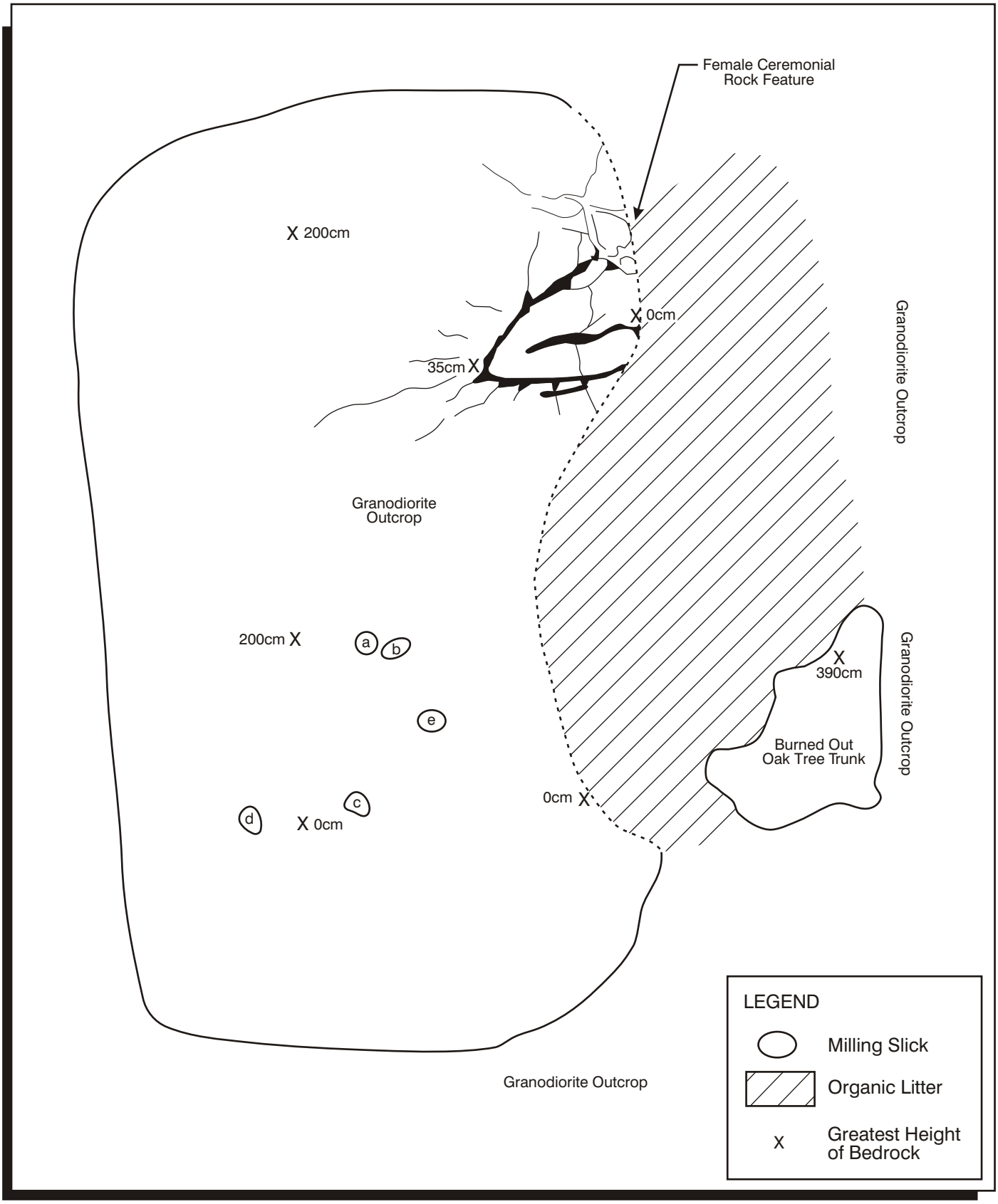

Mooney & Associates

N

0 0.5 1m

Oak Country Estates

CA-SDI-7324, Milling and Rock Feature

Figure VIII-15

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A.) CA-SDI-7757, View South, Disturbed Rock Enclosure, Feature 1

B.) CA-SDI-7757, View Southwest, Rock Enclosure, Feature 2

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A.) CA-SDI-7757, View East, Rock Enclosure, Feature 3

B.) CA-SDI-7757, View Southeast, Rock Enclosure, Feature 4

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A.) CA-SDI-7757, View Southeast, Rock Enclosure, Feature 5

B.) CA-SDI-7757, View Southeast, Rock Enclosure, Feature 6

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A.) CA-SDI-7760, View North, Milling Feature 3, Elements A & B, Granary Bases, Feature 5

B.) CA-SDI-7759, Concentration of Fire-affected Rocks Among Boulders in Locus A, View East

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the oval, smaller fissures extending outwards are enhanced to give the appearance of a sunburst (Gough 1987:55). Ethnographic accounts link a major female ceremonial rock feature complex, located in eastern San Diego County, to women with fertility problems:

> "[I had an] interview with Robert Crawford concerning [these] features...He told us about these fertility stones up here. He said that when a girl acquired a man and she didn't have any children right away, they would take them up and show the magic stones — and he described where they were and Grace and I went up there and found them, up by the old Indian shack that used to be there [McGowan 1982:6]."

The feature at SDI-7324 is located on a large boulder, adjacent to several milling slicks. Several milling features also surround this site. The feature measures approximately 2 m by 1 m and is located on the east side of the large granite boulder. It does not appear to be enhanced by grinding or pecking; it can only be conjectured, therefore, as to whether or not this natural rock fissure was recognized prehistorically.

4. Hearths

At site SDI-5579 a possible hearth feature was located on the surface, amongst several granitic boulders (see Plate VIII-6B). Several cobble-size pieces of fire affected granodiorite rock were found scatter in a roughly circular pattern. No ash or charcoal pieces were noted. Several pieces of lithic debitage were scattered in and around the feature. On a granodiorite boulder nearby, a pothunter's pile of flakes rested on the flat bedrock surface. Further investigations are necessary to verify if this concentration of fire-affected rock is a modern disturbance or a historic/prehistoric hearth feature.

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IX. PREHISTORIC CERAMIC ARTIFACTS

A. Introduction

Of the thirty-two sites tested for this project, seven contained prehistoric ceramic items, predominately fragments of vessels. A limited surface collection and excavations produced 256 ceramic fragments (615 grams). In the subsurface deposit, ceramic pieces occurred from the first level to a depth of 70 cm at some sites. The variety of ceramics recovered include 245 vessel body sherds, nine vessel rim sherds, one pipe fragment, and one piece of probable clay daub (Table IX-1). Vessel sherds include both Tizon Brown Ware and Salton Brown Ware types. Research questions regarding the function of the vessels, typology, spatial distribution and chronology will be addressed.

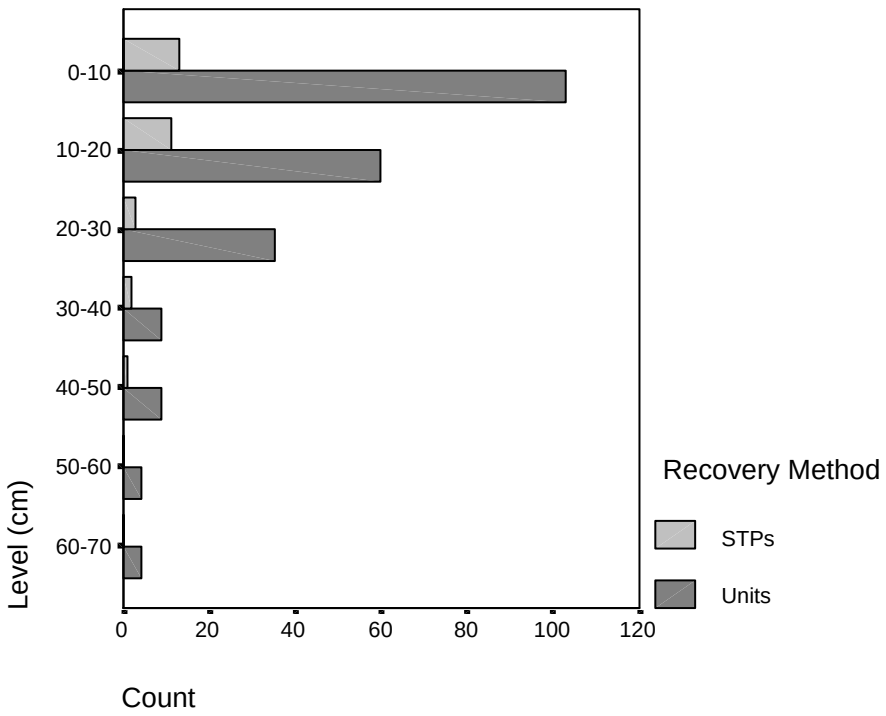
Table IX-1. Ceramic Item Distribution

	Site CA-SDI-								
Item	**7322**	**7753**	**7754**	**7755**	**7756**	**7757**	**7759**	**Total**	**Percent**
Body sherds	7	46	10	28	134	8	12	245	95.7
Rim Sherds	1	2	-	2	2	1	1	9	3.5
Daub	-	-	-	1	-	-	-	1	0.4
Pipe fragment	-	-	-	-	1	-	-	1	0.4
Total	**8**	**48**	**10**	**31**	**137**	**9**	**13**	**256**	**100.0**

All vessel sherds, except one rim fragment, were recovered from the subsurface deposits of the sites. Due to the diagnostic attributes of this large rim sherd, found in a crevice among the bedrock boulders, it was collected for analysis. Unit excavations produced 223 (88 percent) of the subsurface ceramic sherds recovered and STP excavations yielded thirty (12 percent). By weight (523 g), unit excavations account for eighty-four percent of the sample and STPs for sixteen percent. The majority (n=224; 88.5 percent) of the subsurface sherds were recovered from between depths of 0-30 cm in both STPs and units (Table IX-2 and Figure IX-1). Only a limited amount of sherds were recovered to 50 cm in STPs and 70 cm in units, suggesting their distribution below 30 cm is not cultural in nature. In comparison, the greatest depth of lithic debitage was 120 cm. The distribution of sherds indicates ceramic vessels were in use in the latter periods of site occupation up until site abandonment.

Table IX-2. Vertical Distribution of Ceramic Sherds

Level (cm)	STPs	Units	Total	Percent
0-10	13	103	116	45.8
10-20	11	60	71	28.1
20-30	3	34	37	14.6
30-40	2	9	11	4.3
40-50	1	9	10	3.9
50-60	-	7	7	2.8
60-70	-	1	1	0.4
Total	**30**	**223**	**253**	**100.0**



Vertical Distribution of Ceramic Sherds by Subsurface Excavation Method

Figure IX-1

B. Ethnographic Background

In northwestern Arizona and the Peninsular Ranges of southern California and Baja California, a type of ceramic was produced called Tizon Brown Ware. This type of ceramic is produced by using residual clays derived from eroding granitic batholith using the coil/paddle-and-anvil technique. In the western region of the Salton Trough, Salton Brown Ware ceramics are produced from alluvial clays, eroded from the Penninsular Range batholith (Hildebrand et al. 2000). Visually, these two brown wares appear similar; however, these two wares can be identified and separated using trace element analysis. A "ware" is an assemblage of pottery grouped together because of material similarities and a common method of production (Lyneis 1988).

Generally, the introduction of ceramics in San Diego County is thought to have occurred in the Late Prehistoric Period, after, circa A.D. 1,000 (May 1976), but earlier dates have been proposed of circa A.D. 700 to 800 (cf. Moriarty 1966:27; Carrico and Taylor 1983:147-148). However, placing Brown Ware ceramics in a specific temporal context is difficult, due to the similarity of vessels through time and the reliance upon relative dating techniques. Hagstrum and Hildebrand (1990:338) found that through time, vessel volume increased while vessel shape remained consistent. Key time-sensitive characteristics, such as decoration, are not present in this assemblage.

Vessel wares were identified as both Tizon and Salton Brown Ware. Brown Wares are characterized by a high iron content that turns the fired ceramics a reddish brown hue (Lyneis 1988:149). Ethnographic data

from the Tipai of Baja California indicate that the preferred clay to make pottery is *mat' sukwin ačau* since it is already self tempering, but there is a similar clay *mat' xwit*, that is no good because it has too much sand and not enough mica (Hohenthal 2001:167). No temper is added to either the water or the clay itself (Hedges 1986:47). The clay needs only a minimum of sorting and winnowing (Van Camp 1979:48). Informants mention division of labor for women: "not all women were potters, and not all of those who could occasionally make pots were very good at it" (Hohenthal 2001:168).

The various forms of pottery vessels and methods of construction have been described in detail by several authors (Rogers 1936, Michelsen 1971, Hohenthal 2001, Griset 1996, Lyneis 1988, Hedges 1986). To make a vessel the potter pounds up the dried lumps of clay in a stone portable mortar with a stone pestle, winnows the material, and then grinds the powder even finer on a slab or basin metate (Michelsen 1971:1). The construction of the pot begins with a base that is formed over an old pot, and consecutive coils of wet clay are pinched along the outside and shaped by beating it with a wooden paddle on the outside against an anvil held on the inside (Hedges 1986:47). Firing is accomplished in a pit using the fuel available, but the bark of the coast live oak (*Quercus agrifolia*) produces the hottest fire (Hedges 1986:47). Pottery vessels are known as *sukwin* (Hohenthal 2001:171). It has been suggested that summer months were the best time to manufacture and fire pottery (Rogers 1936).

C. Ceramic Vessels and Typology

The following seven sites contained ceramics: CA-SDI-7322, CA-SDI-7753, CA-SDI-7754, CA-SDI-7755, CA-SDI-7756, CA-SDI-7757, CA-SDI-7759 (Map IX-1). These sites are expansive, with significant midden accumulation, and several milling features. It is interesting to note that of the thirty sites in the project area, seven have bedrock conical mortar features. Those seven sites with deep conical mortars are also the same seven sites with ceramics. This indicates a greater variability of activities amongst these seven sites and may suggest some correlation between pottery use and acorn processing at these sites. For example, some of the vessels may have contained water used in the acorn leaching process. The density of sherds recovered by site, per cubic meter is presented in Table IX-3.

Table IX-3. Subsurface Ceramic Sherd Density

Site CA-SDI-	No. of Sherds	Density (#/m^3)
7756	136	18.71
7753	48	10.39
7755	31	3.99
7754	10	2.88
7757	8	2.80
7759	13	1.77
7322	8	1.76

The majority of ceramics recovered during this project consist of small body fragments from utilitarian vessels and only nine rim sherds. With so few diagnostic sherds, it was difficult to identify the majority of the assemblage as belonging to any vessel type. All sherds were examined for presence of fire clouds, soot, carbon residue, evidence of surface treatment, firing technique, and paste composition. Rim sherds were analyzed by all of the above methods, as well as observing the form of the sherd. By reconstructing vessel size, vessel shape, and observing firing patterns, it appears that the vessels recovered during this project are largely utilitarian vessels, such as pots and bowls (Rogers 1936:52). It should be noted that broken vessel sherds were often recycled as lids, gaming pieces, parts of necklaces, or possibly buttons (Van Camp 1979:60).

The surface treatment of the pottery is relatively plain, with no decoration identified on any sherds. The exterior surface texture is smooth, but not polished, and horizontal mop striations occur on many sherds. The interior surface texture may be smooth or irregular from anvil impressions or finger imprints.

Surface color classification is culturally and technologically meaningless, because pottery from the same tradition, the same potter, the same firing, and even the same vessel can vary considerably (Rye 1981:119). Differential access to air during firing and cooling can cause variation in the surface color over a single vessel (Rye 1981:120). The firing process, which is somewhat uncontrolled, causes some portions of the vessel to be oxidized and some portions to be reduced (Van Camp 1979:66). Surface features, such as fire clouds, are part of the firing process and fire clouds were present on the exterior of ninety-four (37 percent) of the sherds.

All sherds were examined for firing cores, which are indicators of the atmosphere and temperature of firing. A fresh break is created on a sherd and examined for color, as well as paste and temper. The pottery broke easily, with a friable edge, indicating it was probably fired below about 750^0 C (Rye 1981:121). The color of a core is examined because it is less likely to change than the surface color, especially during use and subsequent deposition, which may alter surface and subsurface coloration (Rye 1981). The surface color of a sherd may be markedly different than the core.

The recovered sherds indicate that the pottery is characteristic of vessels fired in oxidizing conditions with incomplete oxidation over the vessel. Brown ware sherds may have dark brown, terra cotta, dark gray, and occasionally black cores (Van Camp 1979:50). Generally, sherds that are completely oxidized have the same color interior as the surface. Sherds without access to air are in a reduced environment and have gray or black cores with diffuse margins that grade into the surface color (Rye 1981). Seventy-six percent of the recovered sherds display characteristics from a reduction atmosphere firing and twenty-four percent were in an oxidation atmosphere. The margins are diffuse, indicating slow cooling, and the complete gray or black core indicates that organics were originally present in the paste.

The assemblage of 254 sherds was examined for evidence of cooking use using Griset's method for analysis, where visual discrimination is made between fire clouds produced during manufacture, thin carbon deposits from cooking activities, and thick carbon in the form of soot layers (Griset 1996:167). Ninety-four (37 percent) of the sherds have exterior fire clouds, thirty (12 percent) have thin interior carbon deposits, six (2 percent) have heavy exterior carbon soot, and twenty-one (8 percent) have heavy interior carbon soot. This indicates that twenty-two percent of the sherds exhibit use from cooking. Sites with sherds exhibiting cooking use are SDI-7756, SDI-7322, SDI-7753, SDI-7754, and SDI-7755; no sherds with carbon residue were collected at SDI-7757 and SDI-7759. No correlation could be made between sites with densities of fire-affected rock and sites with ceramics used for cooking.

Prehistoric ceramic containers were tools used in culinary and ceremonial activity (Hagstrum and Hildebrand 1990:338). Vessel forms include large storage ollas, water ollas, bowls, pots, scoops, mushroom shaped pottery anvils, rattles, figurines, and pipes (Rogers 1936; Griset 1996). The majority (96 percent) of the sherds are non-diagnostic body fragments. Of the four percent of sherds that are rim sherds, most are too small to be reliable indicators of vessel size or shape. Rim sherd profiles are shown in Figure IX-2 and Table IX-4 provides attributes for the recovered rim sherds.

Generally, the majority (77.8 percent; n=7) of rims appear to be from bowls. Bowls were made in large, medium, small, and miniature sizes. Two basic forms include restricted bowls that are used in cooking, and unrestricted bowls that are used for serving food (Van Camp 1979:56). The two restricted mouth bowls (7322-33 and 7759-234) appear to be similar to Roger's vessel type number 7 "cooking bowl" (1936:52). The two direct rim bowls (7755-217 and 7756-193) and two slightly wider mouth hemispherical bowls (7755-224 and 7756-207) appear to be similar to Roger's vessel number 12 (1936:52). One wide mouth bowl (7753-86) is also associated with serving food. This indicates two of the rim sherds were likely cooking

Map IX-1. Sites with Ceramics

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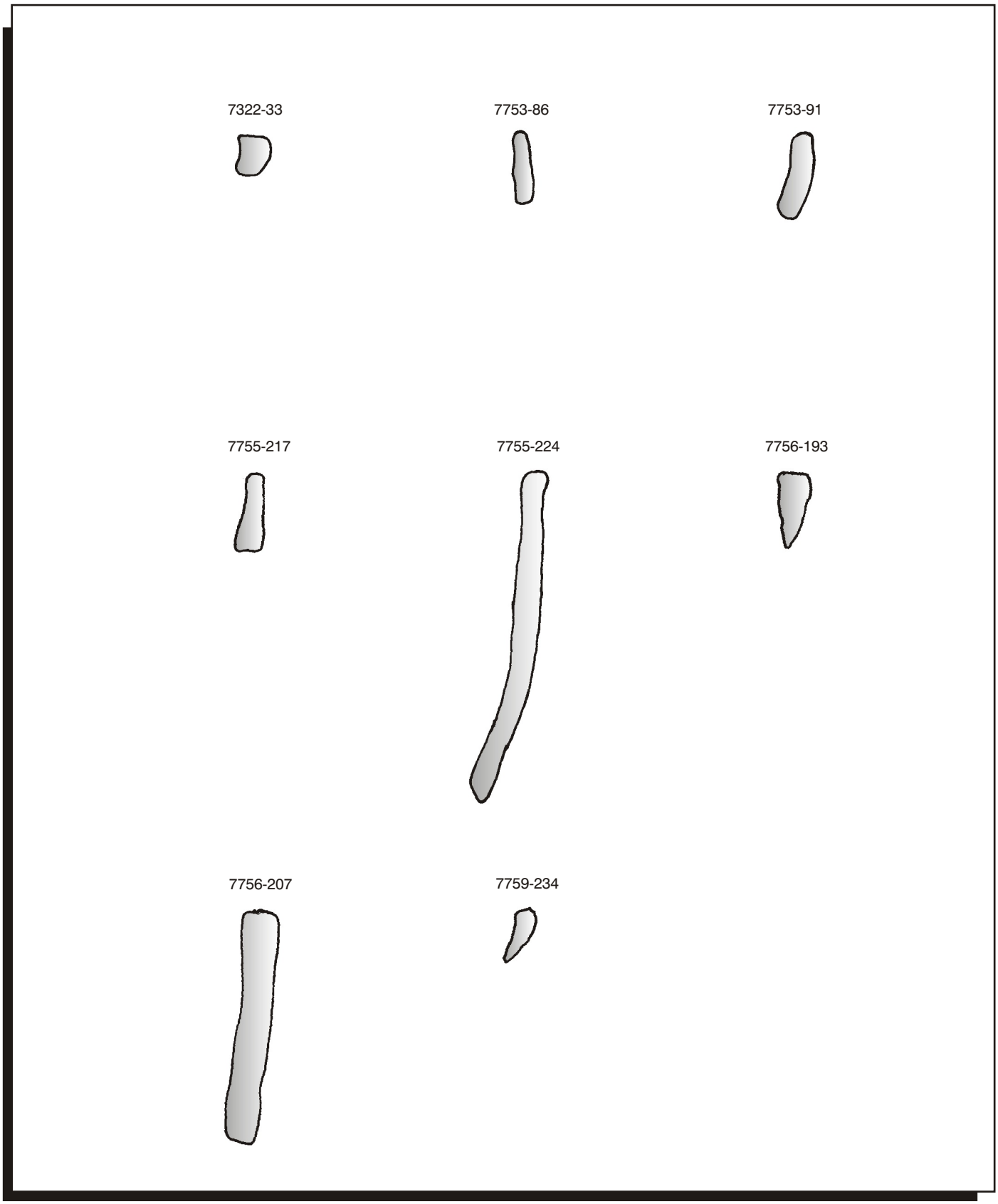

Mooney & Associates

0 1 2cm

Oak Country Estates
Ceramic Vessel Rim Orientation
Figure IX-2

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Table IX-4. Ceramic Vessel Rim Sherd Attributes

Site CA-SDI-	Cat. No.	Provenience			Level (cm)	Weight (g)	Estimated Vessel Type
7322	33	STP	S100	W170	10-20	0.6	Bowl with slightly restricted mouth
7753	86	Unit 3	S80	E6	10-20	1.1	Wide mouth bowl
7753	91	Unit 3	S80	E6	20-30	1.4	Pot with restricted mouth
7755	217	Unit 2	N696	E58	10-20	1.9	Direct rim bowl
7755	224	Unit 2	N696	E58	20-30	15.1	Hemispherical bowl
7756	193	Unit 1	N450	W138	10-20	2.0	Direct rim bowl
7756	207	Unit 1	N450	W138	20-30	12.8	Hemispherical bowl
7757	2	Surface			-	91.4	Pot with restricted mouth
7759	234	Unit 2	N231	E200	10-20	0.7	Bowl with slightly restricted mouth

bowls and five were likely serving bowls. It should be noted that none of the rim sherds have evidence of carbon residue, that would indicate cooking use.

Pots also come in various sizes, consisting of large, medium, small, and miniature sizes. Large pots were used in the storage of dried foodstuffs, small and medium sized were for short term storage of food and water and may have had ceremonial uses. The function of miniature pots is uncertain (Van Camp 1979:54). Two rims appear to be from medium sized pots (7757-2 and 7753-91), similar to Malcolm Roger's vessel number 6, that he calls a cooking pot (Rogers 1936:52). The largest rim sherd (7757-2) recovered during the project is a medium sized pot that is illustrated in Figure IX-4, along with its speculated vessel form (Roger's vessel number 6). None of the rim sherds have evidence of modification or use that would help identify the vessel's prehistoric use as to whether they had utilitarian or ceremonial function.

Ceramic studies in San Diego County often refer to a single type of brown ware pottery, Tizon Brown Ware; however, recent studies indicate that a second type of brown ware can be discerned by sourcing, called Salton Brown Ware, after the type defined by Rogers (1945b), produced along the western margin of the Salton Trough from alluvial clays with sand temper or inclusions (Hildebrand et al. 2000; Gallucci 2001). It is important to keep in mind that the separation of these two brown wares is based upon material availability, rather than cultural selection (Hildebrand et al 2000). The geographic source of materials used in the production of ceramics are important to understanding trade, mobility, and change in the past.

Discerning the difference between Tizon Brown Ware and Salton Brown Ware at the hand specimen level, even with magnification, is difficult and often inaccurate, due to the visual similarity of the paste and color (see Gallucci 2001). A special study was performed to identify the sources of raw materials used in the production of ceramics from a sample of sherds from sites within the Oak Country Estates project. Fourteen sherds were chosen, two from each of the seven sites with ceramics, and submitted to Dr. John Hildebrand at Scripps Institute of Oceanography. These fourteen sherds were examined at the hand specimen level and later subjected to neutron activation analysis (NAA) to allow quantitative estimation of elemental abundances (Hildebrand et al. 2000:2). Elemental concentrations were derived from irradiations and gamma spectra counts to assay a total of 33 elements. The NAA results from the fourteen sherds were compared to a database of clay samples obtained from several locations throughout southern California. These clay samples were obtained at locations ranging from the west coast to the eastern deserts and subjected to NAA.

Sherds from distant locations were chosen at each of the sites in order to gain a better understanding of the variety of ceramics present, with factors such as sherd size, depth, and appearance contributed to the selection. Table IX-5 lists each sherd chosen and the preliminary NAA results. Although the results from Dr. Hildebrand are preliminary, certain data are available for discussion. The clay sources and fourteen sherd samples have been plotted on a scandium-lanthanum chart, with a diagonal line separating desert Salton

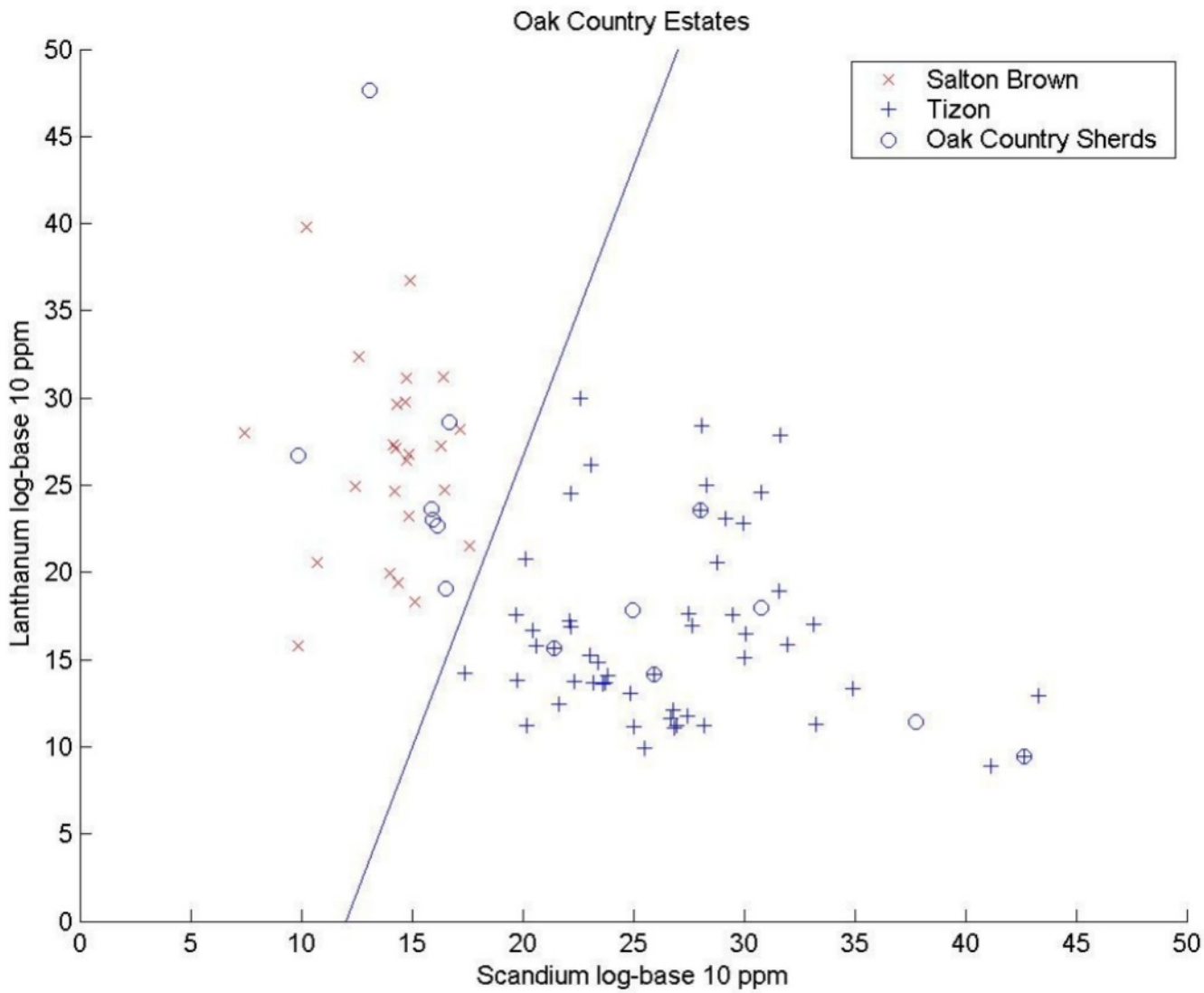
Brown Ware sherds from mountain Tizon Brown Ware sherds (Figure IX-3). In general, the Salton Brown Ware sherds have high rare earth elements (REE), whereas Tizon Brown Ware sherds have high metals. Lanthanum is a REE and scandium is a heavy metal (Hildebrand, personal communication).

Table IX-5. Special Study Results of Ceramic Trace Element Analysis

Sample Number	Site SDI-	Cat Number	Unit	Depth (cm)	Hand Classification	NAA Type	Rim
436	7322	2001-116	1	20-30	Tizon	Tizon	
437	7322	2001-129	2	20-30	Tizon	Unassigned	
438	7753	2001-63	1	0-10	Tizon	Tizon	
439	7753	2001-98	3	40-50	Salton Brown	Salton Brown	
440	7754	2001-31	1	0-10	Tizon	Salton Brown	
441	7754	2001-47	1	60-70	Tizon	Tizon	
442	7755	2001-224	2	20-30	Salton Brown	Salton Brown	Direct
443	7755	2001-250	3	20-30	Tizon	Tizon	
444	7756	2001-207	1	20-30	Salton Brown	Unassigned	Direct
445	7756	2001-235	2	10 20	Tizon	Tizon	
446	7757	2001-2	SC # 1	Surface	Salton Brown	Salton Brown	Rim
447	7757	2001-120	2	50-60	Tizon	Salton Brown	
448	7759	2001-107	STP N319/E200	10 20	Tizon	Tizon	
449	7759	2001-233	2	10 20	Tizon	Tizon	

The results of the NAA indicate that seven Tizon Brown Ware sherds, five Salton Brown Ware sherd and two unassigned sherds are present among the sample of sherds. Two sherds, thought to be Tizon Brown Ware at the hand specimen level, were, in fact, Salton Brown Ware sherds. The two unassigned sherds appear to fall within the Salton Brown type, although this is not yet confirmed. The presence of Salton Brown Ware sherds indicates a much greater eastward import of ceramics at these sites than previously expected.

Four organic samples were sent out for radiocarbon dates (see Section XII). The results of those dates and their pertinence to ceramics are presented in Table IX-6. The most recent date comes from SDI-7756, Unit 2, indicating that charcoal collected from 30-50 cm dates to 100±40 B.P. (outside of calibration range). Three sherds were recovered from the dated levels at 30-40 cm; three sherds were recovered from below the dated level at 50-60 cm; and nineteen sherds were recovered above the dated level at 0-30 cm. The next date is from SDI-7753, Unit 3, 30-90 cm, indicating that charcoal collected from 30-90 cm has a calibrated (CAL intercept) date of 530 B.P. (A.D. 1420). Two sherds were recovered from the dated levels (30-50), but because of the small sample, the sherds may represent downward drift in stratigraphy. Twenty-three sherds belong to levels above the dated levels. The next two dates come from SDI-7322. Unit 1, 30-50 cm produced charcoal with a calibrated (CAL intercept) date of 1,060 B.P. (A.D. 890). There were no sherds from the same level as the sample, however, three sherds were found above at 0-30 cm. This gives us a base line date for the sherds occurrence. The oldest date comes from SDI-7322, STP South 100/ West 170. Pieces of the same Saxidomus shell from the 90-100 cm and 110-120 cm levels produced a calibrated (CAL intercept) date of 1,800 B.P. (A.D. 150). Only one ceramic sherd was found in this STP, at 10-20 cm. Thus, no correlation can be made between the 1,800 B.P. date and the presence of ceramics.



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Oak Country Estates
Neutron Activation Analysis Results

Figure IX-3

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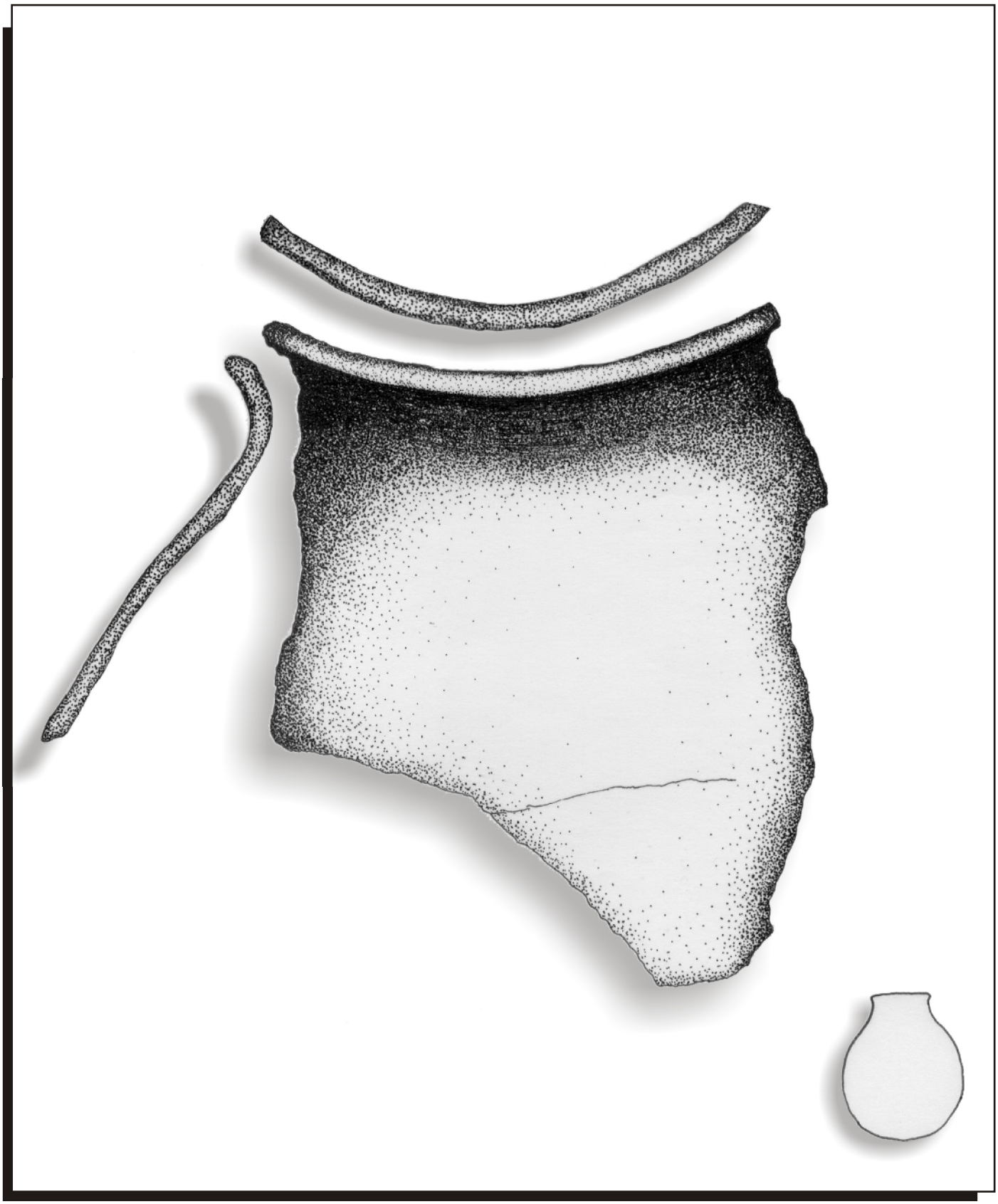

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Oak Country Estates

CA-SDI-7757 Cooking Vessel Rim Sherd

Figure IX-4

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Table IX-6. Correlation of Radiocarbon Dates to Ceramic Vessel Depth

Site CA-SDI-	Provenience	Dated Levels	Dated Material	Radiocarbon Date (CAL Intercept given when available)	Amount of Sherds		
					Above Dated Levels	At Dated Levels	Below Dated Levels
7756	Unit 2	30-50 cm	Charcoal	100 ±40 B.P.	19 / 0-30 cm	3 / 30-40 cm	3 / 50-60 cm
7753	Unit 3	30-90 cm	Charcoal	(530 B.P.)	23 / 0-30 cm	2 / 30-50 cm	--
7322	Unit 1	30-50 cm	Charcoal	(1,060 B.P.)	3 / 0-30 cm	--	--
7322	STP S100 /W170	90-100 & 110-120 cm	Shell	(1,800 B.P.)	1 / 10-20 cm	--	--

D. Other Ceramic Items

1. Pipe Fragment

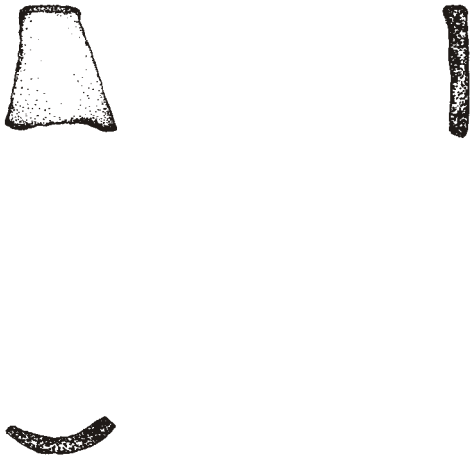
One fragment of a ceramic smoking pipe was identified at SDI-7756, Unit 1, 10-20 cm (Figure IX-5). The bowl rim fragment is a small piece of the edge or rim of a pipe bowl. It is a smooth Brown Ware, possibly burnished, without slip, with very little visible mica in the paste, and has a flat rim. Compared to the storage and cookware vessels discussed above, the pipe fragment is thinner and the paste is finer grained and better sorted. The concave interior surface is grayish brown while the exterior is brown, smooth and slightly shiny, indicating it may have been burnished. No decoration is visible on the small portion of pipe fragment. Malcolm Rogers identified two types of pipes, bowed and straight (1936:19-21). The fragment is too small to be certain of original pipe shape. Rogers informants claimed gender exclusivity as to who made pipes, one claimed that only women made pipes and another claimed that only men made pipes (Rogers 1936:21). Hohenthal's ethnographic accounts of the Tipai in Baja California describe that pipes are both tubular and elbow shaped, both called *mukwin*, and in the old days a person would lie down on their back when smoking and it made the person "drunk" (2001:281). Hohenthal reports that tobacco smoke was blown three times in the air when a coyote appeared by the domicile, to ward off the evil (2001:248). Hohenthal also reports that once a person became a shaman, he would henceforth only smoke 'coyote tobacco.' For curing, smoke was blown over the patient's head and body in conjunction with sucking and singing (2001:254-255). The type of tobacco found on the property is *Nicotiana glauca* or tree tobacco.

2. Daub

A small piece of possible ceramic daub was identified at SDI-7755 in Unit 2 at 10-20 cm. This slightly curved piece of clay appears consistent with Tizon Brown Ware, and has impressions of small, thin twigs impressed on both surfaces. The core of the daub is dark gray. It is uncertain whether it has been fired or not. Mud with a high clay content if exposed to a fire, or some times just heated by the sun, will result in a "low-fire" ceramic. Some prehistoric housing construction involved the use of what has been called "wattle and daub" where reeds and other linear vegetation is woven together and then encased in mud to produce walls and roofs. This specific construction, while not documented locally, is the source of the term daub. One of Hohenthal's Tipai informants claimed that in the old days the thatched dome-like houses and sweat houses, *ewa tuwup*, had earth banked up over the sides. It was customary after death to burn the house in which the death occurred (2001:181,194). Luomala reports similar construction and destruction of houses (1978: 597). It is difficult to identify this isolated piece of daub as being a natural or cultural phenomenon. Further investigations may identify the context in which these enigmatic fragments are created. Despite ethnographic data, the exact origin must remain problematic as such low fired mud can also occur naturally in an area where naturally occurring soils have a high clay content.

E. Conclusions

It is proposed that the aggregate of sites within the study area represent a large, dispersed semi-permanent Late Prehistoric settlement, and that a range of artifacts and features may be associated with semi-permanent occupation and use. As previously indicated, ceramic technology was introduced to San Diego County in the Late Prehistoric period. The presence of ceramic vessels is an indicator of storage and long term habitation. Ceramics were recovered at seven sites on the property. These same seven sites also exclusively have bedrock mortars. A connection between these activities seems apparent, whether the ceramics were used for storage of water for leaching acorns or for storage of acorn meal, etc. The remains of the ceramic vessels are small and fragmentary, and few diagnostic vessel sherds are present. The few diagnostic sherds tell us they were shaped to be both cooking and serving bowls, as well as pots possibly used for cooking, storage, or ceremonial purposes. Twenty-two percent of the sherds indicate their use in cooking activities. Radiocarbon dates place the ceramics well within the Late Prehistoric period. The presence of a clay pipe indicates that either leisurely and/or ceremonial activities were taking place, depending on the owner of the pipe. Ceramic usage is documented for both males and females. Ceramic manufacture is documented for females; however, the literature is somewhat contradictory regarding male participation in manufacture. The piece of clay daub may indicate a house structure or sweat lodge structure. Generally, the ceramic remains indicate a wide range of human activities, consisting of food preparation, cooking, and storage, leisure, and ceremonial activity.



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Oak Country Estates
CA-SDI-7756 Pipe Bowl
Figure IX-5

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X. OTHER RECOVERED CULTURAL ITEMS

A. Introduction

Recovered items that do not fit within any of the previously described categories include: sixteen pieces of modified bone, two modified quartz crystals, a ground piece of slate, and two items with asphaltum residue (Tables X-1 and X-2). Also recovered are nine unmodified pebbles that were classified as possible manuport stones since their presence seemed somewhat out of place in the deposit. These stones may have been brought to the site in prehistoric times for various uses.

Table X-1. Site Summary of Recovered Miscellaneous Items

	Item					
Site CA-SDI-	**Modified Bone**	**Shaped Stone**	**Modified Crystals**	**Asphaltum Residue**	**Manuports**	**Total Artifacts***
7322	-	-	-	-	1	-
7751	-	-	-	-	1	-
7753	1	-	-	2	1	2
7754	2	-	-	-	1	1
7755	5	-	-	-	3	8
7756	4	-	2	-	-	5
7757	2	1	-	-	-	3
7758	-	-	-	-	1	-
7759	-	-	-	-	1	2
Total	**16**	**1**	**2**	**2**	**(9)**	**21**

* manuports not included in artifact count

Table X-2. Recovery Depth of Miscellaneous Items

	Item						
Level (cm)	**Modified Bone**	**Shaped Stone**	**Modified Crystals**	**Asphaltum Residue**	**Manuports**	**Total Artifacts***	**Percent Artifacts**
0-10	1	-	-	-	2	1	4.8
10-20	11	-	-	-	1	11	52.4
20-30	2	-	-	1	3	3	14.3
30-40	-	-	-	-	-	-	
40-50	-	-	1	-	1	1	4.8
50-60	-	1	1	1	-	3	14.3
60-70	2	-	-	-	2	2	9.5
	16	**1**	**2**	**2**	**(9)**	**21**	**100.0**

* manuports not included in artifact count

B. Modified Items

1. Modified Bone

The sixteen pieces of modified bone all are small fragments of items that were ground into shape for various functions (Table X-3). While some of the fragments are tip portions that could be interpreted to have been used as awls, without the remainder of the tool body, the function can only be speculated. The fragments from the units were analyzed by Dr. Tom Wake of the Zooarchaeology Lab at UCLA (see Appendix E).

Table X-3. Modified Bone

Site	Cat #	Unit	Level	Taxon	Element	Wt	Cond.	Type	Portion
7753	45	1	10-20	Lg. Mam.	limb	0.1	F	Indet.	
7754	20	2	0-10	Sm. Mam.	limb	0.4	F	Indet.	
7754	26	2	60-70	Lg. Mam.	limb?	1.3	F/B	Hairpin?	midsec.
7755	29	STP N730 W18	10-20	Mam.	indeterm.	0.1	F	Indet.	
7755	32	STP N730 W18	20-30	Mam.	indeterm.	2.4	F	Indet.	
7755	154	2	10-20	Artiodactyl	metapodial	0.3	F/B	Awl?	tip
7755	155	2	10-20	Lg. Mam.	limb	0.3	F/B	Awl?	midsec.
7755	170	3	60-70	Lg. Mam.	limb	0.3	F/B	Awl?	midsec.
7755	175	4	10-20	Artiodactyl	limb	0.2	F	Awl	tip
7755	177	4	10-20	Lg. Mam.	limb	0.4	F/B	Awl?	tip
7756	149	1	10-20	Mam.	limb	0.2	F/B	Awl?	tip
7756	150	1	10-20	Mam.	limb	0.1	F	Indet.	midsec.
7756	157	2	10-20	Lg. Mam.	limb	0.4	F/B	Awl?	tip
7756	168	4	10-20	Mam.	limb	0.1	F	Pin?	tip
7757	75	1	20-30	Mam.	limb	0.3	F	Pin?	midsec.
7757	81	1	10-20	Mam.	limb	0.2	F/B	Tube?	end

Cond. (Condition): F = fragment; B = burned

The modified bone items came from nine units and one STP excavated at five sites. They were recovered from the first level to as deep as 70 cm, however, most of the fragments (81.3%) came from between 10 and 30 cm. At three sites, more than one fragment came from varying levels of the same STP or unit. At two sites, two fragments that do not appear to be of the same implement were found in the same level of three units. The pieces from the STP may be of the same object, but broken prehistorically.

Modification varies from striations to ground surfaces, and ground surfaces that are polished from use. Tool type for the eleven more diagnostic fragments appears to be utilitarian, primarily perforating tools, either awls or pins. One fragment from SDI-7757, however, may be a portion of a bone tube ornament (Gifford 1940; Type EE) or possibly a whistle fragment. Since most of the fragments are so small, the type of animal could not always be determined but large mammal long bones were typically used for tool manufacture. When large mammal remains are absent in the faunal collection, its presence in the form of modified bone indicates these animals were in fact taken as prey.

The presence of perforating tools indicates the probable manufacture of baskets for which awls were commonly used. Pins could have been used for securing clothing such as woven rabbit skin blankets. The

bone tube suggests the inhabitants had the spare time to spend making ornaments (or possibly musical instruments).

2. Shaped Stone

A small, flat, thin (1 mm) fragment of black slate-like material from site SDI-7757 has an edge rounded by grinding. The platy stone is fractured horizontally and only one face remains which has visible striations abraded parallel to the length of the fragment. The striations would be random if this was a water-smoothed piece of stone. The piece came from the 50-60 cm level of Unit 2 (Table X-4).

Table X-4. Recovered Miscellaneous Items

Site No. CA-SDI-	Cat #	Provenience		Coordinates N/S	Coordinates E/W	Level (cm)	Description or Shape	Mat	Wt (g)	Dimensions (cm) L	W	T
Shaped Stone												
7757	119	Unit	2	N500	E111	50-60	ground tabular piece	SLT	0.7	-	-	-
Modified Crystals												
7756	227	Unit	1	N450	W138	40-50	battered crystal	QTZ	1.8	2.0	1.2	0.5
7756	268	Unit	4	N550	W126	50-60	battered crystal	QTZ	2.2	1.6	1.3	0.8
Asphaltum Residue												
7753	19	STP		S080	E0	50-60	bone with residue		0.7	-	-	-
7753	92	Unit	3	S080	E006	20-30	flake with residue		0.4	-	-	-
Unmodified Manuport Pebbles												
7322	31	STP		S100	W170	0-10	oval	QTE	1.5	1.5	1.0	0.7
7751	59	STP		S080	W020	0-10	oval	QTE	27.2	3.4	2.7	2.1
7753	88	Unit	3	S080	E006	10-20	round	QTE	23.6	3.0	2.9	2.1
7754	58	Unit	2	S030	W010	40-50	egg-shape	GAB	13.0	2.5	2.2	1.7
7755	34	STP		N730	W018	20-30	egg-shape	QTE	102.4	5.2	3.8	3.0
7755	35	STP		N730	W018	20-30	oval	QTE	54.5	4.2	3.4	2.3
7755	107	STP		N760	W080	60-70	round	QTE	55.1	3.7	3.8	2.6
7758	69	Unit	1	N188	W001	60-70	flat elongated oval	UNK	40.4	6.8	3.2	0.7
7759	260	Unit	4	N099	E076	20-30	rectanguloid	QTE	10.6	2.4	2.1	1.3

Mat (material): SLT = slate; QTZ = quartz; QTE = quartzite; GAB = gabbro; VOL = volcanic

3. Modified Crystals

Two small (<2 cm) clear quartz crystals that have battered edges were found in two units at site SDI-7756 (see Table X-4). Only the very edges appear battered and they are somewhat rounded on one specimen. They do not look like rounded river gravel, which would be smoother all over, and are too small to have feasiblely served as a core for flake removal. One possible function could have been as pieces of stone placed inside a rattle to provide noise (some times called “tinklers”). It is not certain, however, if such shaking would produce similar battering on this type of stone.

The larger piece came from the 40-50 cm level of Unit 1 and the more abraded specimen from the 50-60 cm level of Unit 4. Other unmodified quartz crystal fragments were encountered occasionally during excavations, but this mineral occurs naturally in pegmatite dikes in the granitic outcrops so they would not seem to represent an unusual occurrence. Quartz was thought by some southern Californian Native Americans to have great power. For the Quechan in the Colorado Desert, they broke quartz stones “thus releasing the power into their own bodies, enabling them to pray or chant better. The power came from within the quartz stone itself, from within the Earth” (Zwinger 1999).

4. Asphaltum Residue

A black residue resembling asphaltum was identified on two items found in the subsurface deposit of SDI-7753 (see Table X-4). Residue was noted on the surface of a small fragment of large mammal bone recovered from the 50-60 cm level of an STP excavated at the coordinates S80 E0. Sand grains have adhered to the residue indicating the residue was probably soft (wet) when the bone came in contact with dirt. The bone does not appear to be burned. A similar residue was also observed on the cortical platform of a small volcanic flake from the 20-30 cm level of Unit 3. This unit was located just 6 m east of the STP.

Asphaltum, a natural tar-like substance (mineral pitch) that seeps out of the ground in various locations in California, including San Diego coastal areas, was used by Native Americans in a variety of ways. Some groups used it as face paint or chewed it like gum. Utilitarian uses include as an adhesive for binding fibers together as a brush, affixing basket hoppers to stone mortar rims, attaching stone points and feathers to arrow shafts or knife blades into wooden handles, and inlaying ornamental shell onto objects. Holes in abalone shells were also sometimes plugged with asphaltum for the shell to serve as a dish. Asphaltum was also used for water-proofing, or for patching broken implements like clay vessels. Baskets were sometimes made waterproof by swirling hot asphaltum around inside the basket along with pebbles which function to disperse the residue more evenly. The residue remains on the pebbles and could also have been inadvertently spilled onto objects that were nearby during the process of asphaltum application.

C. Unmodified Items

Nine small to medium pebbles were collected during excavations of four STPs and four units at seven sites. All but one are smaller than 5.5 cm and they vary from the size of a pinto bean to a small chicken egg; the longest is a flat, elongated oval stone (see Table X-4 for measurements). While these pebbles may be unmodified natural stones, their presence in site deposits situated away from the creek drainage seemed somewhat suspect so they were classified as possible “manuport” items. The origin of the pebbles may be from different sources. Most are more rounded than flat in profile. Typically, abrasive action on river-tumbled rocks wears down pieces into rounded shapes. Alternatively, flatter cobbles and pebbles are typically created due to back and forth abrasion from wave action on the shore of a large body of water. Obviously the rock type and raw form prior to introduction to an abrasive source would have some affect on the altered shape of the resulting pebble no matter which form of wear action created it.

Flat pebbles have been known to be used for smoothing or burnishing the surface of ceramic vessels or pipes, however, no such use-wear is evident on the flat pebble recovered at SDI-7758. One of the smaller pebbles is quail egg size and appears slightly more polished on the somewhat flatter surface of one face, but the gabbro material is not as regularly smooth as the quartzite stones.

Small rocks that can be hidden in the hand were sometimes used by the shaman during healing ceremonies, to represent the illness removed from the patients body (Crosby 1994:180). Perhaps the pebbles were simply picked up along the creek by children as a curiosity or “pretty” stone. It cannot be determined whether the pebbles recovered at the sites are natural in origin or some how related to human activity in the area, but it seemed prudent to save them even though they are not included as artifacts created by human modification.

XI. FAUNAL REMAINS

A. Introduction

This section contains analyses of two categories of faunal remains; invertebrate or shellfish remains and vertebrate or bone remains. Both types of remains were recovered during STP and unit excavations, however only bone from units was submitted for analysis due to the large quantity recovered. Invertebrate remains were found in significantly less abundance than were vertebrate remains and therefore the material recovered from STPs are included here. The faunal remains recovered consist of both terrestrial and marine species, including the bones of small, medium, and large mammals, fish, reptiles, and birds, and shells of marine mollusks. Horizontal and vertical quantitative distributions of the significantly represented remains of both types are given and intended to aid in distinguishing and delineating differences in site activities. Changes in the types of faunal remains represented, or in the numbers of each type, could indicate changes in subsistence and/or gathering patterns, which could reflect possible environmental changes and/or resource selectivity by the site inhabitants.

The results of the invertebrate analysis, conducted in the Mooney & Associates Cultural Resources Laboratory are presented below. The animal bone assemblage was analyzed by faunal specialist Dr. Thomas Wake of the Cotsen Institute of Archaeology - Zooarchaeology Laboratory at the University of California, Los Angeles (Appendix E) whose findings are summarized in this section.

B. Invertebrate Remains

A small amount of marine shellfish remains was recovered during the current investigations, from eight of the sites. A total weight of only 12.25 grams was recovered and all of the specimens display a high degree of fragmentation and/or disintegration due to weathering or exposure to fire. The small fragments were identified to the most specific taxa when possible. Seven different shellfish taxa were identified in these remains (Table XI-1). With the exception of one chiton end plate, the minimum number of individuals (MNI) could not be specifically established since no hinges or apical pieces were recovered. However, within the entire sample, the superficial minimum pieces of shell represented in the tested areas would be ten.

The shellfish remains were found in seven STPs and three units, and one piece came from the surface of site SDI-7321. The greatest amount, by weight, came from the three STPs excavated at SDI-7322 (Table XI-2). Two badly weathered bits of bivalves (one, possibly oyster) came from two STPs while the third STP produced two larger fragments of *Saxidomus nuttalli* clam, assumably from the same valve (see section XII for radiocarbon date results). SDI-7756 produced the next highest amount, all from one unit, and also yielded the greatest variability in taxa (see Table XI-1). At least two, possibly three, types of bivalves (*Mytilus* sp. and *Tivela stultorum*) and bits of nacreous fragments of abalone (*Haliotis* sp.) came from four levels of excavation. The largest recovered fragment is of the robust thick-shelled Pismo clam (*Tivela*), which came from the deepest level of shell recovery at the site (40-50 cm). The fragment was burned at sometime and upon collection, broke into bits of laminae. A second burned piece of Pismo clam came from unit excavation at SDI-7759. While the two site locations are adjacent, they do not seem close enough for these fragments to represent the same single clam valve. Four other sites produced only one type of shell from a single level of recovery. The only shell found on the site surface came from SDI-7321 and, although weathered, appears to be a fragment of a very large bowl-like clam valve of *Laevicardium*. It might also be a heavily eroded piece of *Trachycardium*.

Table XI-1. Summary of Shellfish Recovery

Site CA-SDI-	Prov.	Coordinates N/S	E/W	Level (cm)	Family	Type	Cond	Cnt	Wt (g)	MNI
7321	Surface			-	Bivalve	Laevicardium?	W	1	0.8	1
7322	STP	S100	W120	0-10	Bivalve	Clam?		1	0.3	
7322	STP	S100	W170	90-100	Bivalve	Saxidomus*		1	3.9	1
7322	STP	S100	W170	110-120	Bivalve	Saxidomus*		1	2.9	
7322	STP	S220	W170	0-10	Bivalve	Ostrea?	W	1	0.1	
7752	STP	N0	E030	0-10	Bivalve?	Indeterm.	W	1	0.05	1
7753	Unit 3	S080	E006	10-20	Chiton	Chiton	W	1	0.2	1
7754	STP	N040	W040	0-10	Indeterminate	Indeterminate		1	0.05	1
7755	Unit 3	N708	E028	90-100	Bivalve	Mytilus?	W	1	0.1	1
7756	Unit 1	N450	W138	0-10	Gastropod	Abalone		1	0.3	1
7756	Unit 1	N450	W138	20-30	Bivalve	Mytilus		1	0.2	1
7756	Unit 1	N450	W138	20-30	Bivalve	Clam	W	2	0.1	
7756	Unit 1	N450	W138	30-40	Gastropod	Abalone		1	0.05	
7756	Unit 1	N450	W138	40-50	Bivalve	Tivela	B	1	2.9	1
7759	STP	N200	E240	0-10	Bivalve	Indeterminate		2	0.2	
7759	Unit 2	N231	E200	0-10	Bivalve	Tivela	B	1	0.1	1

* sample sent for radiocarbon analysis
Cond (condition): W = extremely weathered; B = burned (and weathered)
MNI (min. no. of individuals) is only superficial

Table XI-2. Vertical Distribution of Shellfish by Weight (g)

Level (cm)	Site CA-SDI- 7321	7322	7752	7753	7754	7755	7756	7759	Total	Subsurface Percent
Surface	0.8	-	-	-	-	-	-	-	0.8	
0-10	-	0.4	0.05	-	0.05	-	0.3	0.3	1.1	9.6
10-20	-	-	-	0.2	-	-	-	-	0.2	1.7
20-30	-	-	-	-	-	-	0.3	-	0.3	2.6
30-40	-	-	-	-	-	-	0.05	-	0.05	0.4
40-50	-	-	-	-	-	-	2.9	-	2.9	25.3
90-100	-	3.9	-	-	-	0.1	-	-	4.0	34.9
110-120	-	2.9	-	-	-	-	-	-	2.9	25.3
Total	**0.8**	**7.2**	**0.05**	**0.2**	**0.05**	**0.1**	**3.55**	**0.3**	**12.25**	**93.5**
Site Percent	**6.5**	**58.8**	**0.4**	**1.6**	**0.4**	**0.8**	**29.0**	**2.4**	**100.0**	

The vertical distribution of the shell is variable by site location (see Table XI-2). At four of the shell producing sites, recovery was limited to the upper 20 cm of deposit. At SDI-7322, two STPs only yielded shell from the first level of excavation, while a third STP produced the *Saxidomus* fragments from two levels below 90 cm. The only other shell from such a depth is a piece of mussel that came from 90-100 of Unit 3 at SD-7755. At SDI-7756, shell was distributed through four levels of Unit 1 to a depth of 50 cm. It is very likely that the abalone fragments collected from the first level are part of the same shell also recovered in the 30-40 cm level. The two badly weathered bits of clam found at 20-30 cm may be part of the Pismo clam collected from 20 cm below.

The variety of taxa present, although limited, is interesting for an inland habitation area located some 30 km (19 miles) from the coast. Three of the recovered taxa are large in size and could have functioned as tools or implements such as bowls or scoops. Additionally, the large abalone valves were used for making ornaments out of the colorful mother-of-pearl material. These possible functions do not, however, account for the other types of shell in the assemblage, indicating that marine shellfish were exploited as a food source and transported in the shell to this valley region. The variety of shell types suggest that a larger amount of shellfish food remains were once present at the site, but the remains have been eliminated from the archaeological record due to various factors including decomposition (associated with factors such as soil acidity and the thickness of various shell species) and breakage by previous agricultural activities such as discing (also related to differences in shell thicknesses between species). Obviously thinner-shelled varieties would erode away quicker than the thicker shellfish types.

While the sample is very limited, a diversity of marine habitats are represented by the remains. The four major habitats include: 1) exposed, non-rocky shorelines with no large rock outcroppings and often with sandy beach areas; 2) exposed, rocky shorelines including large rock outcroppings; 3) bays both rocky and non-rocky; and 4) estuaries with marshes, and sand and mud flats (Cerreto 1998). The most direct route to the ocean for the inhabitants of the Santa Maria Valley would probably have been down through San Pasqual Valley following the San Dieguito River drainage west. The portion of the southern central San Diego County coastal area in proximity to this river mouth includes estuaries and/or fresh and saltwater marshes as well as exposed rocky shores and sandy beaches along the open coast. Prehistorically, for at least some period of time, the San Dieguito River mouth undoubtedly contained a more substantial estuary or lagoon than today (referred to here as San Dieguito Lagoon) including fresh and/or saltwater marshes. Along the open coast adjacent to the river mouth, areas of rocky shore and sandy beaches are present. Estuaries are also present nearby at the mouths of Escondido Creek (San Elijo Lagoon) less than two kilometers to the north, and at the Soledad Valley (Peñasquitos Lagoon), four kilometers to the south. San Diego Bay, located 28 kilometers to the south of the San Dieguito River mouth, is the closest open bay environment to this part of the coast.

C. Vertebrate Remains

During the current investigation, dry screening in the field of 427 STPs (sixty-one containing faunal remains) and thirty-five 1 by 1 m units, and the fine-screened processing of seven 20 by 20 by 10-cm column samples produced 15,757 (1269.7 g) culturally affiliated animal skeletal remains. Due to this high frequency, only the unit bone assemblage was analyzed by Dr. Thomas Wake (Appendix E) and was found to be comprised of predominately small fragments of mammal bone with a limited amount of bird, reptile (including turtle), and fish bones. The animal bone recovered from the unit excavations consists of 11,614 pieces, weighing 1,118.4 grams, and the bone recovered from four productive column samples consists of 3,235 pieces weighing 46.4 grams. Due to the differences in recovery methods, the summary of Dr. Wake's results presented here focus on the materials recovered from the units and mentions only those complete identified

pieces from the column sample assemblage that passed through the 1/8-inch mesh and would not have been recovered in dry screening.

The faunal bone assemblage came from fifteen sites that produced from one to 5,409 pieces of bone. By count, the identified pieces consist of predominately small mammal remains (40 percent) along with lesser amounts of large mammal, medium mammal, turtle, other reptile, bird, and fish bones (Table XI-3). Additionally, unidentifiable fragments of the Mammalia family comprise 52.2 percent of the assemblage and 22 pieces (0.2 percent) could not be classified more specifically than being from a vertebrate animal.

Table XI-3. Summary of Unit Bone Animal Type by Site

Site CA-SDI-	No. of Units	Max. Rec. Depth	Animal Type SM	LM	MM	M	Turtle	Reptile	Bird	Fish	Vert.	Total	%
7321	1	30	1	-	-	-	-	-	-	-	-	1	0.0
7322	2	110	92	10	-	640	4	2	-	-	-	748	6.4
7324	1	30	-	5	-	-	-	-	-	-	-	5	0.0
7325	1	60	10	1	-	26	-	-	-	-	-	37	0.3
7751	1	70	44	3	-	121	-	-	-	-	-	168	1.4
7752	1	30	-	-	-	1	-	-	-	-	-	1	0.0
7753	3	90	87	37	-	196	1	1	1	-	2	325	2.8
7754	2	80	24	6	2	34	-	-	-	-	6	72	0.6
7755	4	100	2462	361	61	2486	28	8	2	1	-	5409	46.6
7756	5	90	1326	154	25	765	31	5	2	5	5	2318	20.0
7757	3	60	277	39	1	902	6	-	-	-	3	1228	10.6
7758	1	70	68	14	3	72	-	-	-	-	-	157	1.3
7759	5	110	250	41	18	818	2	-	2	-	6	1137	9.8
7767	1	30	-	-	1	6	-	-	-	-	-	7	0.1
7768	1	50	-	-		1	-	-	-	-	-	1	0.0
	Total		**4641**	**671**	**111**	**6068**	**72**	**16**	**7**	**6**	**22**	**11,614**	**100.0**
	Percent		**40.0**	**5.8**	**1.0**	**52.2**	**0.6**	**0.1**	**0.1**	**0.0**	**0.2**	**100.0**	

Type: SM = small mammal; LM = large mammal; MM = medium mammal; M = Mammalia; Vert. = Vertebrate

The identified recovered taxa are presented in Table XI-4 (see Appendix E for more details). In addition to the animal bone recovered, a single, unburned, human deciduous incisor tooth fragment was found at CA-SDI-7756 (Unit 2, 40-50). The table shows the taxa for the ten sites with significant yields, divided by mammal varieties, non-mammals, and bones that could not be identified other than they were vertebrate remains. The mammal subtotal includes counts of the other five sites that had less than eight pieces each, all unidentifiable as to species of mammal. Of the identified species, the cottontail rabbit is the most common, as is most often the case at inland prehistoric middens. Evidence of this animal was found at all but one of these ten sites. Hare and gopher remains are the next most common animal in the assemblage, both occurring at all but two of the ten sites. Wood rat remains were found at five sites, and a few smaller rodents came from only two sites. Identified large mammal remains were present at all of these sites, in small amounts, and species include the black-tailed deer and sheep (possibly bighorn). Carnivores, such as coyote, bobcat, raccoon, and weasel, are only minimally represented in the project area at five sites. One piece each of *Canis* sp., bobcat, and weasel are burned.

Table XI-4. Identified Vertebrate Remains by Site

Taxon	Common Name	SDI-	7322	7325	7751	7753	7754	7755	7756	7757	7758	7759	Total
MAMMALS													
Artiodactyla	Even-toed Ungulates		2	1	1	7	2	21	13	4	1	2	54
Odocoileus hemionus	black-tailed deer		4	—	1	—	—	11	2	2	—	9	29
Ovis sp.	(bighorn?) sheep		—	—	—	—	—	—	—	—	—	1	1
Carnivora	Carnivores		—	—	—	—	—	7	—	1	—	—	8
Canis sp.	dog/coyote		—	—	—	—	—	2	1	—	—	1	4
Lynx rufus	bobcat		—	—	—	—	—	2	2	—	—	—	4
Procyon lotor	raccoon		—	—	—	—	—	—	—	—	—	1	1
Mustela frenata	long-tailed weasel		1	—	—	—	—	—	—	—	—	—	1
Leporidae	Hares/Rabbits		2	—	—	1	—	81	12	2	—	1	99
Lepus californicus	black-tailed jackrabbit		6	1	—	2	—	25	7	4	2	8	55
Sylvilagus sp	cottontail		12	—	3	9	1	157	249	71	5	46	553
Sylvilagus audubonii	Audubon's cottontail		20	—	—	—	—	—	1	—	—	—	21
Sciuridae	Squirrels		—	—	—	—	—	6	2	—	—	—	8
Spermophilus sp	ground squirrel		—	—	—	—	—	1	—	3	—	—	4
Spermophilus beecheyi	Calif. ground squirrel		5	—	—	5	—	3	13	—	—	—	26
Thomomys bottae	Botta's pocket gopher		13	—	1	4	1	45	32	9	—	39	144
Neotoma sp	wood rat		1	—	1	1	—	9	5	—	—	—	17
Dipodomys sp	kangaroo rat		—	—	—	—	—	—	2	1	—	—	3
Microtus californicus	meadow vole		—	—	—	—	—	—	—	1	—	—	1
Perognathus sp	pocket mouse		—	—	—	—	—	—	—	2	—	—	2
Rodentia	Rodents		—	1	2	6	2	14	26	2	—	—	53
Mammalia	Mammals		640	26	121	196	34	2486	766	902	72	818	6069
Mammalia, lg	Large mammals		4	—	1	30	4	329	138	33	13	29	586
Mammalia, md	Medium mammals		—	—	—	—	2	50	21	—	3	16	93
Mammalia, sm	Small mammals		32	8	37	59	20	2121	977	182	61	156	3654
	Mammal subtotal		*742*	*37*	*168*	*320*	*66*	*5370*	*2270*	*1214*	*157*	*1127*	*11491*
REPTILES, AMPHIBIANS, FISH & BIRDS													
Serpentes	Snakes		1	—	—	—	—	2	1	—	—	—	4
Colubridae	Non-venomous snakes		—	—	—	—	—	2	—	—	—	—	2
Crotalus sp	rattlesnake		—	—	—	—	—	3	2	—	—	—	5
Masticophis flagellum	coachwhip		—	—	—	—	—	—	1	—	—	—	1
Pituophis melanoleucus	gopher snake		—	—	—	—	—	1	—	—	—	—	1
Sceloporus occidentalis	Western fence lizard		1	—	—	1	—	—	1	—	—	—	3
Clemmys marmorata	Western pond turtle		4	—	—	1	—	28	31	6	—	2	72
Actinopterygii	Ray-finned fish		—	—	—	—	—	—	4	—	—	—	4
Paralabrax sp	Bass		—	—	—	—	—	1	—	—	—	—	1
Myliobatis californica	bat ray		—	—	—	—	—	—	1	—	—	—	1
Aves	Birds		—	—	—	—	—	2	1	—	—	1	4
Aves, sm	Small birds		—	—	—	1	—	—	—	—	—	—	1
Accipiter cooperi	Coopers hawk		—	—	—	—	—	—	—	—	—	1	1
Buteo jamaicensis	red-tailed hawk		—	—	—	—	—	—	1	—	—	—	1
	Other subtotal		*6*			*3*		*39*	*43*	*6*		*4*	*101*
VERTEBRATA			—	—	—	2	6	—	5	3	—	6	22
Total			**748**	**37**	**168**	**325**	**72**	**5409**	**2318**	**1228**	**157**	**1137**	**11614**

Total does not include column sample bone (but includes 14 modified bone artifacts)
Not shown, but included in Mammalia totals are 15 bones from sites with only small amounts of unidentifiable fragments:
SDI-7321 (1), 7324 (5), 7752 (1), 7767 (7), & 7768 (1)

Reptile taxa, in the form of snakes and lizards, came from four sites. Turtle bone was present at six of the sites, but interestingly its presence does not correlate to a site's closeness to Santa Maria Creek. The greatest amounts came from SDI-7756 and -7755 (n=31 and 28, respectively), and only small amounts from the other four sites. A minimal amount of fish remains were recovered from two sites, the same sites that yielded the most turtle bone. These sites also had the most fish remains found in their column samples. Seven pieces of bird remains came from four sites. Only two were identifiable as being from a Coopers hawk and a red-tailed hawk. The column sample produced a possible scrub jay fragment also. None of the bird remains show evidence of being burned.

Table XI-5 lists only those whole, identified, specimens from four column samples that are smaller than 1/8-inch mesh, that would have not been recovered during excavation (see Section XII for total recovery). While remains of ray-finned fish, bass, and bat ray came from the unit excavations, the predominate fish remains represented in the column samples are from anchovies and herring, species not found in excavation dry-screening. The specimens listed on Table XI-5 are one whole centrum; one other vertebra fragment was also recovered from sample larger than 1/8-inch. Also recovered in the columns were small, whole bones of rabbit, gopher, wood rat, and an unspecified small bird that most likely went through the larger mesh vertically. While it is unlikely that these very small bones would be recovered during dry screening, they do not add to our knowledge of procured foods as the marine fish remains do.

Table XI-5. Column Sample Whole Specimens from <1/8-inch Sample

	Family Name		**Site CA-SDI-**			
Taxon	**Common Name**	**7322**	**7755**	**7756**	**7759**	**Total**
Mammals						
Sylvilagus audubonii	Audubon's cottontail	—	1	—	—	1
Thomomys bottae	Botta's pocket gopher	—	1	—	—	1
Neotoma sp.	wood rat	—	—	1	—	1
Fish						
Clupeidae	Herrings	1	—	6	—	7
Engraulidae	Anchovies	—	—	1	—	1
Engraulis sp.	anchovy	—	1	—	1	2
Birds						
Aves, sm	Small birds	—	—	1	2	3
Total		**1**	**3**	**9**	**3**	**16**

That the recovered bones represent cultural refuse is strongly indicated by both their fragmentary nature from being purposely broken during food processing, as well as the percentage of burned pieces. Examination of the unit bones indicates nearly one-third of the bones (n=3,275; 364.7 g) are burned to some degree (Table XI-6). These fragments changed color due to various means of exposure to heat either from being cooked in a vessel, over a direct flame, or from being discarded into a fire as waste. Of the mammal bones, nearly half of the large size mammal bone shows evidence of being burned, while less than one-third of the small mammal appears burned and over one-third of the medium mammal. Less than one-third of the turtle, reptile, and fish bones show evidence of exposure to fire, and none of the bird bones or of the fifteen fish bones recovered in the column samples show evidence of burning.

Table XI-6. Unit Bone Type by Condition

	Condition							
	Unburned			Burned				
Animal Type	**Cnt**	**% of Type**	**Wt**	**Cnt**	**% of Type**	**Wt**	**Total Cnt**	**Total Wt**
Sm Mammal	3302	71.1	229.7	1339	28.8	92.6	4641	322.3
Lg Mammal	340	50.7	148.7	331	49.3	132.7	671	281.5
Md Mammal	72	64.9	15.8	39	35.1	7.7	111	23.5
Mammal	4535	74.7	344.3	1533	25.3	127.5	6068	471.8
Turtle	55	76.4	11.9	17	23.6	3.1	72	15.0
Reptile	14	87.5	1.0	2	12.5	0.3	16	1.3
Bird	7	100.0	1.8	-		-	7	1.8
Fish	5	83.3	0.3	1	16.7	0.1	6	0.4
Vertebrate	9	40.9	0.2	13	59.1	0.6	22	0.8
Total	**8339**		**753.7**	**3275**		**364.7**	**11,614**	**1118.4**
Percent	**71.8**		**67.4**	**28.2**		**32.6**	**100.0**	**100.0**

Table XI-7 shows specific taxa that are burned and the percentage this amount represents of the total unit bone assemblage. Forty-four percent of the identified taxa of large mammals are burned as are over half of the unspecified large mammal remains. Hare-rabbit size animals represent twenty-seven percent of sample of identified taxa averages to twenty-seven percent, equivalent to the small mammal family burned bones, however some of these bones may represent smaller rodents as well. Both the rodent family bone and identified rodent bones, with the exception of the kangaroo rat, make up a smaller percentage (less than 15 percent) of the total assemblage suggesting these animals were not a preferred source of food at these sites, yet some were cooked and eaten. Evidence that a quarter or less of the reptile and fish remains were burned was also noted. The percentages for the total column sample bone are included for comparison, and as a means of showing how different sampling procedures can produce noticeably different results in some cases.

Just over three-quarters of the bone pieces (both by count and weight) were recovered from the first 50 cm of deposit, notably between 10 to 50 cm level (Tables XI-8 and XI-9); with the greatest level yield being from 10-20 cm (18.percent of count). At four sites that produced very minimal amounts (n= <6), bone was only recovered from below 20 cm. Eight sites produced bone below 60 cm, three of these to depths below 90 cm. Significant amounts below 60 cm were present only at sites SDI-7755 and -7759. Mammal remains, in some amount, came from all levels of recovery, while reptile and fish were found only above 70 cm (see Table XI-9); and one bird bone came from 70-80 cm. Turtle remains were found from the first level to as deep as 90 cm; 79.4 percent (76.7 percent by weight) came from the upper 50 cm.

Four adjacent sites (SDI-7755, SDI-7756, SDI-7757, and SDI-7759) contributed from 1,137 to 5,409 pieces of bone, with the greatest amount coming from four units at SDI-7755; specifically from Unit 3 that yielded 2,474 pieces in 100 cm of deposit. Units 1 and 4, at this site, each yielded over one thousand pieces. Alternatively, five sites (SDI-7321, SDI-7324, SDI-7752, SDI-7767, and SDI-7768) located in the central portion of the property each produced less than 10 pieces of bone. This frequency correlates with the low recovery of artifacts from the cultural deposits in these areas.

Table XI-7. Burned Vertebrate Remains by Taxa

Family Name / Common Name	Unit Bone Count	Unit Bone Percent*	Column Sample %
Even-toed ungulates	10	18.5	50.0
black-tailed deer	10	34.5	—
Carnivores	5	62.5	—
dog/coyote	1	25.0	—
bobcat	1	25.0	—
long-tailed weasel	1	100.0	—
Hares/Rabbits	30	30.3	—
black-tailed jackrabbit	12	22.2	—
cottontail	144	26.0	36.2
Audubon's cottontail	6	28.6	33.3
Squirrels	—	—	66.7
Calif. ground squirrel	2	7.7	12.5
Botta's pocket gopher	4	2.8	7.1
wood rat	2	11.8	20.0
kangaroo rat	1	33.3	—
Rodents	6	11.5	21.7
Mammals	1533	25.2	33.3
Large mammals	311	53.1	33.3
Medium mammals	32	34.4	—
Small mammals	1131	31.0	27.2
Snakes	1	25.0	—
rattlesnake	1	20.0	—
Western pond turtle	17	23.6	—
Ray-finned fish	1	25.0	—
Small birds	—	—	16.7
Vertebrates	13	59.1	30.1
Total	**3275**	**28.2**	**29.1**

* percent burned of total recovery

Table XI-8. Vertical Distribution of Animal Bone Count by Site

Level (cm)	Site CA-SDI- 7321	7322	7324	7325	7751	7752	7753	7754	7755	7756	7757	7758	7759	7767	7768	Total	Percent
0-10	-	84	-	3	7	-	15	3	341	225	121	11	88	2	-	900	7.7
10-20	-	108	-	9	21	-	64	7	993	573	240	20	155	4	-	2194	18.9
20-30	1	189	5	5	14	1	58	2	804	316	255	9	109	1	-	1775	15.3
30-40	-	171	-	7	67	-	71	12	745	464	273	57	151	-	-	2019	17.4
40-50	-	143	-	12	49	-	34	14	928	440	261	35	213	-	1	2130	18.3
50-60	-	26	-	1	9	-	63	16	656	209	78	20	120	-	-	1198	10.3
60-70	-	15	-	-	1	-	11	10	562	71	-	5	114	-	-	789	6.8
70-80	-	7	-	-	-	-	3	8	276	18	-	-	63	-	-	375	3.2
80-90	-	2	-	-	-	-	6	-	98	2	-	-	103	-	-	211	1.8
90-100	-	2	-	-	-	-	-	-	6	-	-	-	14	-	-	22	0.2
100-110	-	1	-	-	-	-	-	-	-	-	-	-	7	-	-	1	0.1
Total	**1**	**748**	**5**	**37**	**168**	**1**	**325**	**72**	**5409**	**2318**	**1228**	**157**	**1137**	**7**	**1**	**11,614**	**100.0**

Table XI-9. Vertical Distribution of Animal Bone Weight by Type

Level (cm)	Animal Type SM	LM	MM	M	Turtle	Reptile	Bird	Fish	Vert.	Total	Percent
0-10	29.4	44.2	0.3	36.8	1.5	0.0	0.2	-	0.1	112.4	10.0
10-20	60.4	46.9	4.0	82.5	2.1	0.4	0.1	0.1	0.1	196.6	17.6
20-30	51.5	34.8	3.4	75.4	3.7	0.2	-	0.1	0.1	169.2	15.1
30-40	63.2	43.7	5.0	76.4	2.3	0.1	1.4	-	0.0	192.0	17.0
40-50	59.7	47.1	2.7	73.9	1.9	0.2	0.1	0.1	0.2	185.8	17.2
50-60	27.0	36.7	6.8	54.0	1.6	0.3	-	-	0.2	126.5	11.3
60-70	12.7	23.0	-	43.0	1.3	0.2	-	0.1	0.1	80.5	7.2
70-80	6.8	4.8	1.3	23.6	0.3	-	0.1	-	0.0	37.0	3.3
80-90	10.5	0.3	-	2.8	0.3	-	-	-	0.0	13.9	1.2
90-100	1.1	-	-	3.5	-	-	-	-	-	4.6	0.4
100-110	0.1	-	-	-	-	-	-	-	-	0.1	0.0
Total	**322.0**	**281.0**	**24.0**	**472.0**	**15.0**	**1.3**	**1.8**	**0.4**	**0.8**	**1118.4**	**100.0**

Type: SM = small mammal; LM = large mammal; MM = medium mammal; M = Mammalia; Vert = Vertebrate

A “control unit” was excavated outside the obvious site boundaries of three sites (SDI-7758, SDI-7759, and SDI-7755) for use in comparison with the cultural samples recovered from within the site deposits. While some researchers speculate that the natural death of burrowing animals produces a significant amount of bone to be considered intrusive in a cultural collection, the excavation of these units outside the site midden did not yield any bones of such animals. The unit excavated outside of SDI-7758 is the only unit that produced any bone and it consisted of a few pieces of large mammal that came from the first level of excavation.

D. Discussion

The analysis of the unit bone assemblage produced a variety of animals that were procured for consumption, and possibly other uses as well, by the inhabitants of at least 10 of the studied sites. The diversity of vertebrate species represented in these collections reflects access to marine habitats such as estuaries and sandy beaches, local fresh water streams, riparian areas, as well as scrub and chaparral regions. The terrestrial resource focus appears to have been on locally available small mammal species but with a notable representation of large game as well. Marine shellfish remains were also present at eight of the sites, including two that did not produce more than one piece of bone.

XII. SPECIAL STUDIES ANALYSES

A. Introduction

Several special laboratory studies were conducted to provide additional information to aid in evaluating the research potential and ultimately, the significance of the sites on the property. These studies included radiocarbon dating of organic samples to acquire absolute dates for the site, obsidian hydration and sourcing, stone tool protein residue and pollen analysis, column sample pollen analysis, macrobotanical column sample analysis, and column heavy fraction sample analysis. Results of these studies, together with the results from the analyses of the other assemblage elements provide additional context and perspective to better analyze hunter-gatherer mobility and subsistence practices and for comparison of both intra-site and inter-site chronological and spatial relationships.

B. Radiocarbon Dating

1. Introduction

During the current testing program, four radiocarbon dates were obtained from three of the project sites, from samples submitted to Beta Analytic Laboratories of Miami, Florida (Table XII-1; Appendix F). Three of the samples consisted of charcoal and the fourth was marine shell. The samples were selected mainly on the basis of the following criteria listed in order of applicability, (1) an adequate amount of material to produce a reliable date, (2) the source location of the sample (i.e., vertically and/or horizontally within the site), and (3) the contextual conditions of a sample material when recovered. All corrections and calibrations were performed by Beta Analytic.

Table XII-1. Radiocarbon Dating Samples from Project Sites

Site CA-SDI-	Sample	Provenience	Level (cm)	Material	Conventional Age	Corrected Age†	Calibrated‡
7322	Beta-159766	Unit 1 (S97 W168)	30-50	Charcoal	1160±60 B.P.	1160±60 B.P.	1060 B.P. A.D. 890
7322	Beta-159769	STP S100 W170	90-120	*Saxidomus nuttalli*	2410±40 B.P.	2190±50 B.P.	1800 B.P. A.D. 150
7753	Beta-159767	Unit 3 (S80 E6)	30-90	Charcoal	520±50 B.P.	520±50 B.P.	530 B.P. A.D. 1420
7756	Beta-156768	Unit 2 (N342 W279)	30-60	Charcoal	100±40 B.P.	100±40 B.P.	Outside of calibration range

† Includes C^{13}/C^{12} estimated for charcoal samples (and included in Conventional Age), and reservoir effect correction for marine shell sample
‡ Calibration Curve Intercept Point

2. Results

Sample Beta-156766 was obtained on ambient charcoal recovered from site SDI-7322, in the 30 to 40 and 40 to 50 cm levels of Unit 1 (S97 W168) adjacent to Milling Feature 7. The charcoal consisted of small chunks scattered in the soil and was recovered in the field dry screening of the soil excavated from the unit. This sample was chosen in the hope that it might provide a date relevant to the deposit adjacent to Milling Feature 7 and to compare with the date obtained on the *Saxidomus* shell sample (Beta-156769) from a lower level of an adjacent STP. The results indicated a C^{13}/C^{12} corrected age of 1,160±60 RCYBP (radiocarbon years before the present) with a calibrated (CAL intercept) date of 1,060 B.P. (A.D. 890).

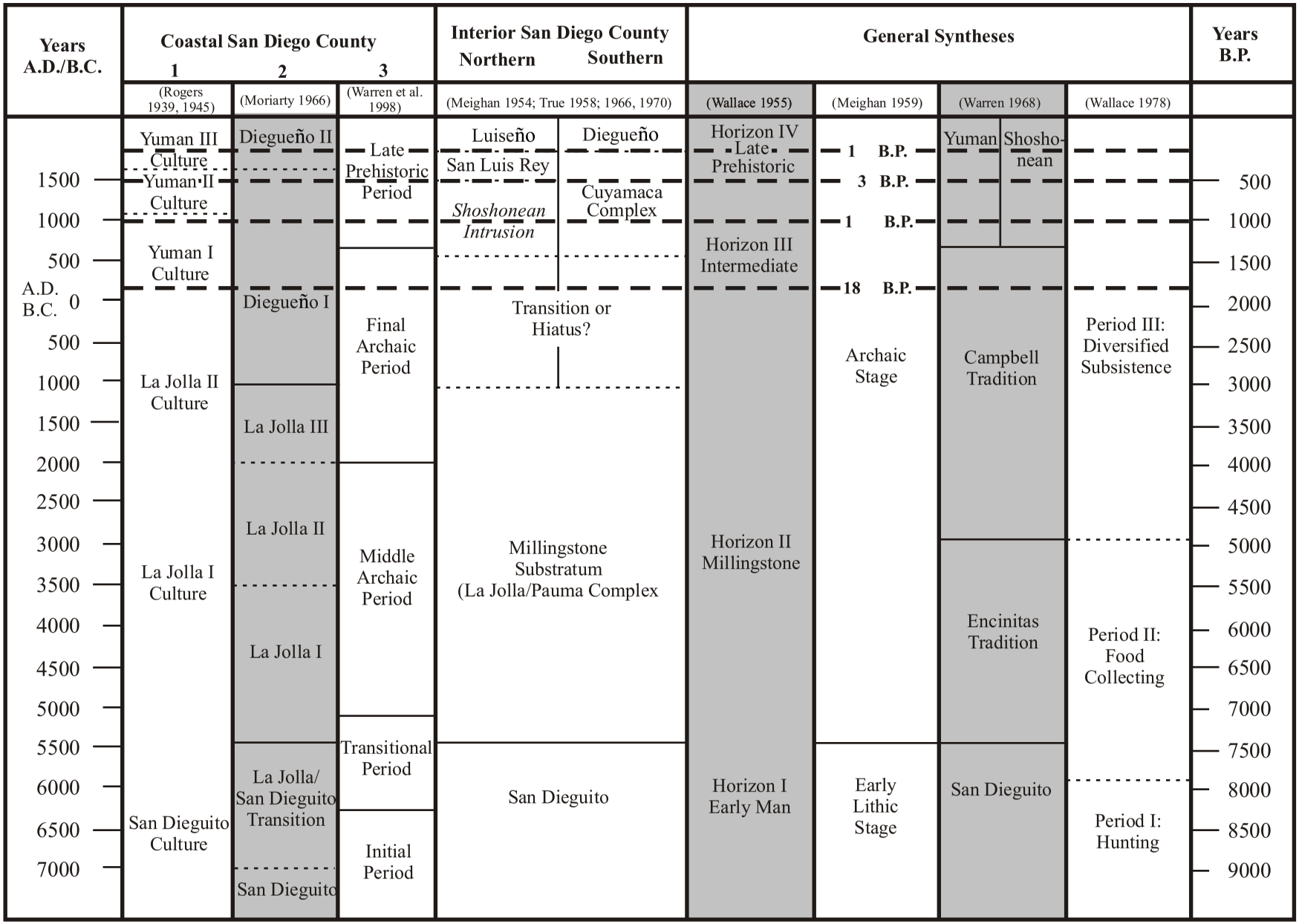
Sample Beta-156769 was obtained from a sample of marine shell consisting of two fragments of *Saxidomus nuttalli* shell also recovered from site SDI-7322, in soil excavated from STP S100 W170, adjacent to Milling Feature 7. The fragments were recovered during dry screening of the soil from the 90-100 and 110-120 cm levels of the STP. This sample was chosen in the hope that it might provide a date relevant to the deposit adjacent to Milling Feature 7 and to compare with the results obtained from sample Beta-156766. The results indicated a C^{13}/C^{12} and reservoir effect corrected age of 2,190±50 RCYBP with a calibrated (CAL intercept) date of 1,800 B.P. (A.D. 150).

Sample Beta-156767 was obtained on ambient charcoal recovered from site SDI-7753 from all levels between 30 and 90 cm of Unit 3 (S80 E6) adjacent to Milling Feature B2. The charcoal consisted of small chunks scattered in the soil and was recovered in the field dry screening of the soil excavated from the unit. This sample was chosen in the hope that it might provide a date relevant to the deposit adjacent to Milling Feature B2. The results indicated a C^{13}/C^{12} and reservoir effect corrected age of 520±50 RCYBP with a calibrated (CAL intercept) date of 530 B.P. (A.D. 1420).

Sample Beta-156768 was obtained on ambient charcoal recovered from site SDI-7756 from all levels between 30 and 60 cm of Unit 2 (N342 W279) adjacent to subsurface Feature 1. The charcoal consisted of small chunks scattered in the soil matrix of the feature and unit, and was recovered in the field dry screening of the soil excavated from the unit. This sample was chosen in the hope that it might provide a date relevant to Feature 1. The results indicated a C^{13}/C^{12} and reservoir effect corrected age of 100±40 RCYBP. This date was too recent to be within calibration range.

3. Discussion

The four dates obtained appeared to represent, and are consistent with, the artifact assemblages recovered from the sites characteristic of the Late Prehistoric Period Yuman tradition (Warren 1968) and Cuyamaca complex (True 1966, 1970). The results, however, do represent a mild surprise. In general, it can be said that the two oldest dates of circa A.D. 150 and 890 extend the occupation of the sites to the earliest part of the Late Period in San Diego, i.e., circa A.D. 500 to 700. Also of interest is the fact that these two dates are sequential in the deposit (Figure XII-1). With a time depth of 1,800+ years it would not be too surprising for factors of disturbance such as rodent activity to have disrupted materials that were deposited more than a thousand years ago. Even though they are not from same specific site areas, these dates lend credence to the time frames often attributed to two and possible three of the projectile styles recovered from project sites SDI-7755 and SDI-7757 and SDI-7756. In the Great Basin, dart point associated Elko Eared and Large Side-notched styles are most often associated with dates no later than circa A.D. 500-600 (O'Connel 1967). Some have been attributed (but disputed), however, to occupations dated to as late as A.D. 1080 and 1350 (Heizer and Hester 1978: 6-7). Large concave based triangular points have been suggested to date as early as A.D. 750 in some areas of the southern coast (Koerper and Drover 1983).



Adapted from Moratto 1984: Figure 4.17

Oak Country Estates

a Country Radiocar on ates u eri osed on Regional rchaeological Chronology nits

Figure II-1

As can seen in Table XII-2, two of the project radiocarbon dates overlap with the majority of the dates obtained (i.e., dating after A.D. 1250) at seven other prehistoric sites investigated within a ten kilometer radius of the Oak Country Estates project. The dates indicate almost exclusively Late Prehistoric Period occupations with all but one of the dates falling after A.D. 1250. Unlike the current sites, these sites did not produce any time sensitive artifacts (e.g. dart size projectile points) that suggested occupation any earlier than the radiocarbon dates obtained. The two project dates of A.D. 890 and A.D. 150, therefore, appear to indicate sites in the area with greater time depth and with the possibility of an earlier cultural assemblage containing distinct technologies and subsistence strategies.

Table XII-2. Radiocarbon Dates from Nearby Sites (within 10 kilometers)

Site	Location/Reference (km from Project)	Sample	STP/Unit	Level (cm)	Material	Conventional Age	Corrected Age†	Calibrated‡
SDI-591	San Dieguito River Valley Cooley et al. 1996 (7.3 NW)	Beta-74540	STP 0 m @110	50-60	Shell	310±60 B.P.	770±70 B.P.	A.D. 1740
SDI-591	San Dieguito River Valley Cooley et al. 1996 (7.3 NW)	Beta-92366	Unit 4	60-70	Charcoal	90±60 B.P.	90±60 B.P.	A.D. 1807*
SDI-8238	San Dieguito River Valley Cooley et al. 1996 (8.8 NW)	Beta-92221	Unit 3	90-100	Charcoal	700±70 B.P.	700±70 B.P.	A.D. 1290
SDI-12,621	San Dieguito River Valley Cooley et al. 1996 (9.0 NW)	Beta-92222	Unit 4	40-50	Charcoal	440±80 B.P.	440±80 B.P.	A.D. 1450
SDI-12,622	San Dieguito River Valley Cooley et al. 1996 (9.0 NW)	Beta-92223	Unit 2	50-60 70 -80	Charcoal	450±70 B.P.	450±70 B.P.	A.D. 1445
SDI-12,622	San Dieguito River Valley Cooley et al. 1996 (9.0 NW)	Beta-92224	Unit 2	100-120	Charcoal	760±50 B.P.	760±50 B.P.	A.D. 1275**
SDI-13,205	San Dieguito River Valley Cooley et al. 1996 (9.7 NW)	Beta-92225	Unit 11	20-60	Charcoal	230±80 B.P.	230±80 B.P.	A.D. 1665
SDI-13,206	San Dieguito River Valley Cooley et al. 1996 (7.5 NW)	Beta-92226	Unit 21B, Feature A1	39-72	Organic Sediment	4490±80 B.P.	4490±80 B.P.	3211 B.C.*
SDI-14,808	San Pasqual Valley Case et al. 2001 (8.6 NW)	Beta-136176	Unit 7	20-30	Charcoal	290±90 B.P.	290±90 B.P.	A.D. 1640 310 B.P.
SDI-14,808	San Pasqual Valley Case et al. 2001 (8.6 NW)	Beta-136177	Unit 11	30-40	Charcoal	410±80 B.P.	410±80 B.P.	A.D. 1455 310 B.P.
SDI-14,808	San Pasqual Valley Case et al. 2001 (8.6 NW)	Beta-136178	Unit 16	50-60	Charcoal	300±40 B.P.	300±40 B.P.	A.D. 1635 315 B.P.
SDI-14,808	San Pasqual Valley Case et al. 2001 (8.6 NW)	Beta-136179	Unit 19	50-60	Charcoal	130±50 B.P.	130±50 B.P.	A.D. 1821* 129 B.P.*
SDI-14,808	San Pasqual Valley Case et al. 2001 (8.6 NW)	Beta-136180	Unit 20	30-40	Charcoal	290±40 B.P.	290±40 B.P.	A.D. 1640 310 B.P.

* Average of multiple intercepts
** AMS date
† Includes C^{13}/C^{12} estimated for charcoal samples (and Included in Conventional Age), and reservoir effect correction for marine shell sample
‡ Calibration curve intercept point

C. Obsidian Sourcing and Hydration Analysis

1. Introduction

The fifty-nine pieces of obsidian were recovered (fifty-two from the excavations, two from the surface, and five very small pieces recovered from four column samples) from six of the thirty-two sites on the project property, SDI-7322 (n=2), SDI-7753 (n=2), SDI-7755 (n=9), SDI-7756 (n=14), SDI-7757 (n=10), and SDI-7759 (n=22). Of these, twenty-seven samples recovered from five of the six sites (SDI-7322, SDI-7755, SDI-7756, SDI-7757, and SDI-7759), were submitted for trace element analysis and hydration band thickness. Because obsidian is not a locally available stone material, it was hoped that the results of the trace element analyses could be used to determine the ultimate origin of the obsidian found at the site, thereby shedding light on possible trade relationships and patterns of exchange in the area during prehistoric times. The hydration results could contribute to a growing local data base of hydration measurements, which it is expected can someday be used as an additional means of dating sites in the area.

The trace element analysis for sourcing was performed by Dr. Steven Shackley of the P. A. Hearst Museum of Anthropology (formerly the Lowie Museum of Anthropology), at the Department of Geology and Geophysics, University of California, Berkeley (Appendix G). The hydration measurement study was performed by Mr. Thomas Origer, Sonoma State University Obsidian Hydration Laboratory (Appendix H). To perform sourcing analysis, an obsidian specimen needs to be at least 7 mm in maximum dimension and thicker than 1 mm. Because of this minimum size requirement, many of the specimens recovered in the 1/8-inch screen were either too small or were marginal in size for sourcing analysis. Consequently, only twenty-seven pieces of obsidian were selected for analysis from the current sample recovery. Of these twenty-seven specimens, one was a fragment of a biface tool. While the size requirement made random specimen selection impossible, no obvious bias potential between the variables “specimen size” and “material source” appear likely. Because of the minimum size requirement, however, the sourcing results may or may not accurately reflect the overall ratio of material sources in the total sample recovery.

2. Sourcing Results

Of twenty-seven submitted pieces submitted, four were determined by Dr. Shackley to be too small for trace element analysis to be performed with acceptable accuracy. Sourcing results, therefore, were obtained on twenty-three of the twenty-seven obsidian samples submitted (Table XII-3). Results of these studies indicated that most of the sourced obsidian (n=15; 55.6 percent) derived from Obsidian Butte, located approximately 120 kilometers (75 miles) east of Ramona, near the Salton Sea in Imperial County, California. Six others (22.2 percent) were sourced to the Coso Volcanic Field, approximately 350 kilometers north of Ramona, near Coso Hot Springs in Inyo County, California, and one piece from Casa Diablo in Mono County, 110 miles (175 km) north of the Coso source in California (Map XII-1). The source for one of the samples submitted from site SDI-7756 is not known, and according to Shackley “it is not any source reported from California, Arizona, Nevada, New Mexico, or northern Mexico” (personal communication to Carol Serr, 2001). While obsidian from Casa Diablo, as well as from sources such as Glass Mountain (Mono County), San Felipe (Mexico), and Mount Hicks (Mineral County, Nevada), has been previously recovered from archaeological sites in San Diego County, the vast majority of obsidian usually derives from two major sources: Obsidian Butte and the Coso Volcanic Field. Taken together, then, these sourcing results with the unusual occurrence of a piece of Casa Diablo obsidian, the recovery of a specimen from an “unknown source” possibly indicative of a new and different source for the area, and the significant, but otherwise not entirely unexpected presence of Coso obsidian, generate interest in regard to trade and patterns of exchange extending to areas well beyond the local area.

Table XII-3. Analyzed Obsidian by Provenience and Source

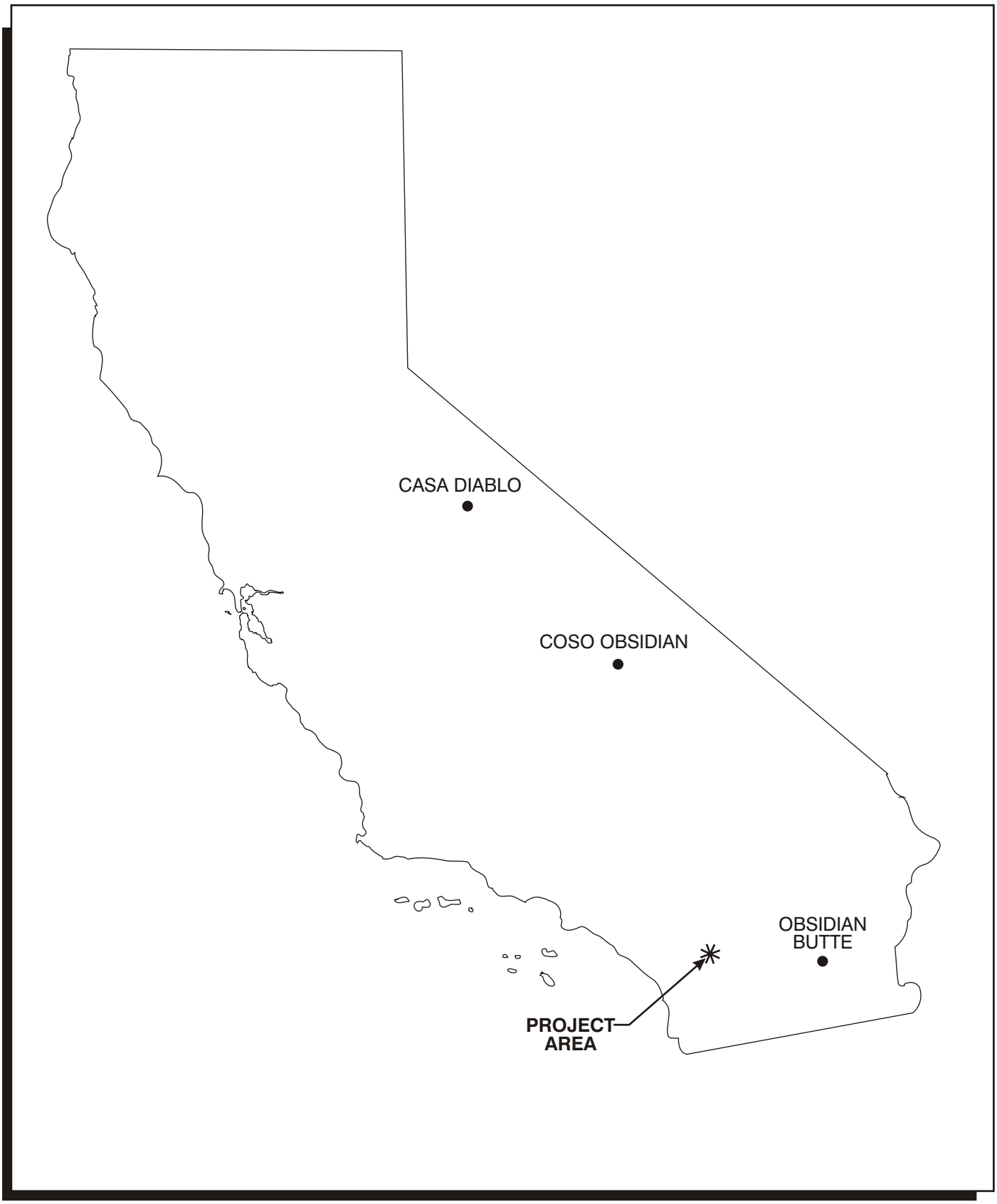
Sample No.	Site No. CA-SDI-	Cat#	Provenience		Coordinates N/S	Coordinates E/W	Level (cm)	Item	Wt (g)	Source
1	7322	127	Unit	2	S140	W175	10-20	Biface Frag	0.6	Coso
S1	7755	13	STP	1	N650	E080	20-30	Debitage	0.1	OB
2	7755	191	Unit	1	N761	W086	10-20	Debitage	0.2	Coso
3	7755	203	Unit	1	N761	W086	60-70	Debitage	0.1	Coso
4	7755	204	Unit	1	N761	W086	60-70	Debitage	0.05	*
5	7755	246	Unit	3	N708	E028	10-20	Debitage	0.1	Casa Diablo
S3	7756	22	STP	3	N395	W270	10-20	Debitage	0.2	Unknown
S6	7756	100	STP	6	N450	W135	30-40	Debitage	0.1	OB
6	7756	179	Unit	1	N450	W138	0-10	Debitage	0.05	OB
7	7756	180	Unit	1	N450	W138	0-10	Debitage	0.5	OB
8	7756	187	Unit	1	N450	W138	10-20	Debitage	0.2	OB
9	7756	196	Unit	1	N450	W138	20-30	Debitage	0.2	OB
10	7756	219	Unit	1	N450	W138	40-50	Debitage	0.1	OB
S7	7757	87	Surface		-	-	-	Debitage	0.4	OB
S8	7757	88	Surface		-	-	-	Debitage	0.4	Coso
11	7757	104A	Unit	2	N500	E111	10-20	Debitage	0.1	Coso
12	7757	105	Unit	2	N500	E111	10-20	Debitage	0.2	OB
13	7757	109	Unit	2	N500	E111	20-30	Debitage	0.2	OB
S4	7759	93	STP	4	N240	E200	10-20	Debitage	0.1	OB
S5	7759	95	STP	5	N240	E200	20-30	Debitage	0.4	OB
14	7759	184A	Unit	1	N319	E192	0-10	Debitage	0.05	*
15	7759	196	Unit	1	N319	E192	20-30	Debitage	0.5	OB
16	7759	204	Unit	1	N319	E192	40-50	Debitage	0.05	OB
17	7759	213A	Unit	1	N319	E192	60-70	Debitage	0.05	*
18	7759	217	Unit	1	N319	E192	80-90	Debitage	0.05	*
19	7759	226	Unit	2	N231	E200	10-20	Debitage	0.5	Coso
20	7759	267	Unit	5	N321	E146	0-10	Debitage	0.5	OB

OB = Obsidian Butte
* specimen too small

3. Hydration Results

As can be seen in Table XII-4, of the twenty-three pieces analyzed from the current project, fifteen pieces derived from Obsidian Butte, six from the Coso Field, one from Casa Diablo, and one derived from an unknown source. Only one specimen (Sample #21), sourced to Obsidian Butte, could not be analyzed due to a diffused hydration rind.

Obsidian Butte obsidian appears to be indicative of occupation almost exclusively after the onset of the Late Period (Hughes and True 1985; Koerper et al. 1986). More specifically, in the San Diego area it has been associated with the period post-A.D. 1210 (Dominici 1984). Obsidian Butte, located near the south end of the Salton Sea, was, in prehistoric times, periodically inundated by a much larger body of water called Lake Cahuilla, created by intermittent flooding of that basin by the Colorado River (Christenson and Russell 1981).



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Oak Country Estates

Obsidian Sources and their Relationship to the Project Area

Map XII-1

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Table XII-4. Oak Country Obsidian Hydration Measurement Means

Site No. CA-SDI-	Lab#	Cat No.	Provenience	Level (cm)	Item	Source	Hydration Mean
7322	1	7322-127	Unit 1	10-20	Biface frag.	Coso	4.6
7755	17	7755-13	STP N650 E080	20-30	Debitage	Obsidian Butte	1.9
7755	2	7755-191	Unit 1	10-20	Debitage	Coso	6.7
7755	3	7755-203	Unit 1	60-70	Debitage	Coso	10.2
7755	4	7755-246	Unit 3	10-20	Debitage	Casa Diablo	4.5
7756	5	7756-179	Unit 1	0-10	Debitage	Obsidian Butte	2.1
7756	6	7756-180	Unit 1	0-10	Debitage	Obsidian Butte	1.1
7756	7	7756-187	Unit 1	10-20	Debitage	Obsidian Butte	1.4
7756	8	7756-196	Unit 1	20-30	Debitage	Obsidian Butte	1.3
7756	9	7756-219	Unit 1	40-50	Debitage	Obsidian Butte	1.7
7756	18	7756-22	STP N395 W270	10-20	Debitage	unknown	4.9
7756	21	7756-100	STP N450 W135	30-40	Debitage	Obsidian Butte	DH*
7757	10	7757-104A	Unit 2	10-20	Debitage	Coso	3.2
7757	11	7757-105	Unit 2	10-20	Debitage	Obsidian Butte	2.4
7757	12	7757-109	Unit 2	20-30	Debitage	Obsidian Butte	2.1
7757	22	7757-87	Surface	-	Debitage	Obsidian Butte	3.1
7757	23	7757-88	Surface	-	Debitage	Coso	7.7
7759	13	7759-196	Unit 1	20-30	Debitage	Obsidian Butte	1.2
7759	14	7759-204	Unit 1	40-50	Debitage	Obsidian Butte	2.2
7759	15	7759-226	Unit 2	10-20	Debitage	Coso	7.2
7759	16	7759-267	Unit 5	0-10	Debitage	Obsidian Butte	3.3
7759	19	7759-93	STP N240 E200	10-20	Debitage	Obsidian Butte	2.6
7759	20	7759-95	STP N240 E200	20-30	Debitage	Obsidian Butte	2.4

* DH = diffused hydration band

According to Dominici (1984:38-40), since A.D. 1, Lake Cahuilla has become desiccated enough that the obsidian source, Obsidian Butte, located on its southeastern shore, became available for quarrying, during four periods of varying lengths. The first was from circa A.D. 1 to A.D. 700; the second was for a brief but unknown period circa A.D. 940; the third was for a brief but unknown period ca. A.D. 1210; and the fourth for the period from circa A.D. 1580 to historic contact, circa A.D. 1760. A fifth brief exposure of this source, as an island possibly connected to the shore, may also have occurred ca. A.D. 1420. While it is possible that obsidian could have been quarried during any of these exposures it appears that most of the material found on coastal sites in San Diego County area derives from after A.D. 1210 (Dominici 1984). Koerper et al. (1986) indicate that in Orange County, it appears that the material derives from after A.D. 1580.

The fourteen Obsidian Butte samples that could be analyzed produced mean band thicknesses ranging from 1.1 to 3.3 microns. Based on Dominici's (1984) linear accumulation rate formula of 78.16 years per micron, these readings would result in extrapolated dating for the use of Obsidian Butte obsidian at the sites ranging from A.D. 1915 to A.D. 1743 (using the date of retrieval, i.e., 2001). This date range appears to be too recent. Another linear rate of 110 years per micron has been tentatively proposed by Koerper et al. (1986:52) for Obsidian Butte obsidian, based on data from southern Orange County. This rate would reflect a dating for the Obsidian Butte materials use at the project sites ranging from A.D. 1880 to A.D. 1638. Using a linear rate of 147 years per micron recently proposed by Laylander (1995), from a site near the Salton Sea, produces the most reasonable dates of A.D. 1839 to A.D. 1516. It would appear, however, that a rate approximating as

much as 175 years per micron for Obsidian Butte obsidian would be most commensurate with the radiocarbon dating for the site.

The six samples sourced to the Coso Volcanic Field produced mean band thicknesses ranging from 3.2 to 10.2 microns with a cluster of three specimens at readings of 6.7, 7.2, and 7.7 microns. Using Ericson's (1978) linear accumulation rate formula for Coso obsidian, of 344 years per micron, these hydration means would indicate an extrapolated dating for use of Coso obsidian at the sites ranging from A.D. 900 to 1508 B.C. with the cluster group ranging from 304 to 648 B.C. Another linear rate of 220 years per micron has been proposed for Coso obsidian by Meighan (1978, 1983) based on samples from Malibu in Los Angeles County. Use of this rate would reflect a dating for Coso obsidian use at the sites ranging from A.D. 1297 to 243 B.C., with the cluster group ranging from A.D. 527 to A.D. 307. Based on a formula developed in the northern Mojave Desert (Cleland 1989) for Coso obsidian, these hydration readings indicate the use of Coso obsidian at the sites ranging from A.D. 1062 to 7544 B.C. The three reading cluster would range from 2117 to 3438 B.C. A formula proposed for Coso obsidian, based on data from several Orange County sites (Koerper et al. 1986), would reflect a dating for Coso obsidian use at the sites ranging from A.D. 1338 to 7783 B.C. With this formula, the three reading cluster would range from 545 to 1739 B.C.

The range, then, for Coso obsidian use at the sites based on mathematical extrapolations from the hydration rind measurements, could be from A.D. 900 to 1508 B.C. using Ericson's formula; from A.D. 1297 to 243 B.C. using the rate proposed by Meighan ; from A.D. 744 to 5935 B.C. using Cleland's formula; and from A.D. 1338 to 7783 B.C. using the Koerper et al. formula. These dates, obviously, vary considerably. They reflect the fact that dating by this method has not as yet been perfected or calibrated adequately to be used alone, to precisely define the temporal context of archaeological sites (cf. Meighan 1983; Koerper et al. 1986:61). When viewed in conjunction with the three earliest radiocarbon dates (CAL intercepts) from the sites of A.D. 1420, A.D. 890, and A.D. 150, it can be surmised that based only on the use of Coso obsidian, that either of the linear formula rates proposed by Ericson and by Meighan yield results most compatible with the parameters indicated by the radiocarbon dating. Also, of potential interest is that none of the formulae indicate use of this material later than A.D. 1338.

As mentioned above, it has been previously suggested by Hughes and True (1985) that the use of Coso obsidian may have occurred earlier in the San Diego coastal area with sparse frequencies occurring at intermediate and earlier sites, "followed by a predominance of Obsidian Butte glass in the interior and along the coast later in time" (1985:332-333). If this scenario is applicable to the project sites, then either of the linear rate Coso date ranges of A.D. 900 to 1508 B.C. (Ericson) or A.D. 1297 to 243 B.C. (Meighan) would be compatible with the two earlier radiocarbon dates of A.D. 890, and A.D. 150 for the sites. Also, as indicated above, none of the formulae indicate use of this material after A.D. 1338. This correlation could be seen as consistent with an earlier use of Coso obsidian at the sites followed by the use of Obsidian Butte obsidian. Laylander and Christenson (1988) have observed, however, that "Coso obsidian probably also continued to reach San Diego County during Late Prehistoric time. This would have been particularly likely when the presence of Lake Cahuilla made the Obsidian Butte source inaccessible, but it is not unlikely that some Coso obsidian reached the region at the same time that Obsidian Butte material was being received (1988:140). This would suggest that the two materials could overlap at the sites, but with only Coso belonging to the earlier occupation, and predominantly, if not exclusively, Obsidian Butte belonging to the latter part of the sites occupation.

The single sample sourced to Casa Diablo produced a mean band thickness 4.5 microns. Ericson's (1978) linear accumulation rate formula for Casa Diablo obsidian, of 110 years per micron would indicate an extrapolated dating for use of this material at the sites of A.D. 1506. Meighan (1983) has indicated that the linear rates for Casa Diablo and Coso are the same, i.e. 220 years per micron. Use of this rate would produce a dating of A.D. 1011. Hall (1984) has proposed a non-linear formula for Casa Diablo obsidian that would

generate a B.P. date of 2021, or circa A.D. 20. While all of these datings fall roughly within the parameters of the radiocarbon dates, like the results from the Coso samples, they vary considerably. As indicated earlier in regard to sourcing, it might be assumed that like Coso obsidian, a similar earlier (i.e., pre-Late Period) time frame would be likely for Casa Diablo obsidian as Koerper et al. have indicated that production from this source dramatically declined after 500 B.C. (1986: 55). Hall (1983, 1984), and Mone and Adams (1988), however, have indicated that production from this source was at its peak 2000 to 1000 years ago (circa 50 B.C. to A.D. 950) and declined dramatically after 1000 years ago. This latter time frame might allow for its presence at the sites within the earliest period bracketed by the radiocarbon dates, i.e. A.D. 890 to A.D. 150. Due to the rarity of this material locally, however, a more precise time association for this material cannot be verified with the current level of information.

D. Tool Protein Residue and Pollen Analyses

1. Introduction

Seven flaked stone and four ground stone tools recovered from five of the sites, were submitted to Dr. Linda Scott Cummings, Paleo Research Laboratories, Golden, Colorado for protein residue analyses (Appendix I). The four ground stone tools were also tested for the presence of plant pollens (Appendix I). Ideally, only artifacts found in situ, in possibly relatively undisturbed circumstances, are selected for these studies. But smaller items such as projectile points are sometimes not recognized in situ and are recovered in the screening process. Several of the tools submitted were recovered in this latter manner. Once such circumstances were recognized in the field, the artifacts were specially protected during recovery and handling was avoided if possible or kept to a minimum in the case of screen recovery. The artifacts were wrapped immediately in aluminum foil and then placed in resealable plastic bags; the items were not washed in the laboratory so that any residues still present would be preserved. Because the protein residue test is very sensitive to small amounts of protein, any animal protein residues present on the artifacts can indicate, through distinct reactions to antigen-antibody tests, which particular animal taxa the tools may have been used to procure or process. Likewise, if microscopic plant pollens, which are both highly resistant to decay and distinctive indicators of plant taxa, survive on tools they can provide valuable clues as to what kinds of plants the tools may have been used to process. Positive results of either of these types of studies, if they can be obtained, can be useful in helping to determine hunting and gathering preferences, as well as, possibly, the food preparation and butchering practices of the prehistoric peoples that inhabited the sites.

2. Results

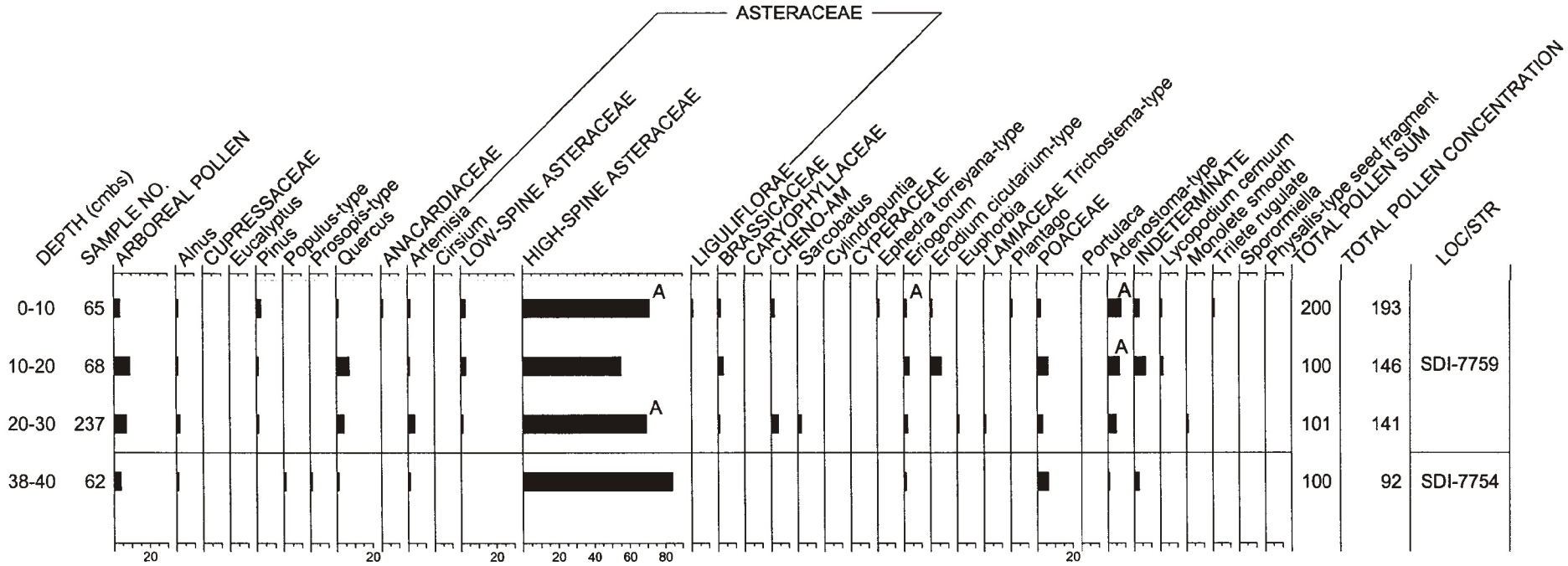
The results of this analysis indicated that six of the eleven tools submitted tested positive for animal and/or human antisera, and all four of the ground stone artifacts tested for plant pollens indicated the presence of pollens, some possibly associated with tool usage (Table XII-5). Of four projectile points submitted, two were negative for protein residues, one (Cat # 7756-223) was positive for both human and guinea pig (probably ground squirrel, *Spermophilus* sp.), and one (Cat # 7759-185) tested positive for deer and human. The specimen (Cat # 7756-223) with human and guinea pig antisera had a soil sample associated, that also tested positive for guinea pig, probably indicating contamination of the artifact by burrowing animals. The presence of human antiserum on five of the artifacts must be assessed as problematic. As indicated above, care was taken by field and laboratory personnel to avoid direct contact with artifacts with potential for protein residue studies. It is not clear, however, whether positive human results on artifacts indicate modern contamination or the actual occurrence of prehistoric human proteins. It may in fact be both, but not necessarily the same in the instance of each artifact. To determine the situation for each artifact, however, is currently not possible. The tools with positive protein residue results that are most likely indicative of prehistoric activity are the three specimens (a chopper, Cat # 7755-56; a “knife” Cat # 7757-94; and a

projectile point Cat # 7759-185) that tested positive for deer antiserum (most likely mule deer *Odocoileus hemionus*). There is little reason for the presence of this antiserum on the tools except as a result of prehistoric tool usage. The range of tool types with deer residues is also interesting; a chopping tool, a knife, and projectile point. While these tool functions are the current interpretations of archaeological analysts, and may not be what they were actually used for prehistorically, it still seems likely that the range of morphological characteristics does indicate different types of functions for these tools.

Table XII-5. Tool Residue Results

Site No. CA-SDI-	Artifact Type (Catalog #)	Soil Sample Submitted	Pollens	Protein Residues
7755	Projectile Point (210)	Yes	Not tested	Negative
7755	Chopper (56)	No	Not tested	Positive for deer and human
7755	Scraper (82)	No	Not tested	Positive for human
7756	Projectile Point (222)	Yes	Not tested	Tool negative; soil positive for guinea pig (probably ground squirrel)
7756	Projectile Point (223)	Yes	Not tested	Positive for human and guinea pig; soil and tool
7757	Knife (94)	Yes	Not tested	Tool positive for deer; soil negative
7754	Mano (62)	No	9 plant taxa	Negative
7759	Mano (65)	No	17 plant taxa	Negative
7759	Mano (68)	No	11 plant taxa	Negative
7759	Mano (237)	No	13 plant taxa	Positive for human
7759	Projectile Point (185)	No	Not tested	Positive for deer and human

The tool pollens analysis also produced results that are somewhat problematic. The artifacts were recovered from sites in circumstances where native plant communities such as grassland, sage scrub, chaparral, and oak woodland are still present. It is not surprising, therefore, that ambient pollens would be present on the artifacts from the plants in these communities. Because of this occurrence of plant pollens from plants that are (and that have been) ubiquitous in the area, the pollens detected cannot, with certainty, always be associated with prehistoric tool use. Interpretations of pollens present on prehistoric tools that may be associated with use, therefore, must often be based on criteria such as unusual or substantial occurrence, the occurrence of known prehistoric plants used as food resources, and/or on a combination of these criteria. As indicated in Table XII-5 and Figure XII-2, the four ground stone artifacts sent for this analysis contained pollen types ranging from nine to seventeen plant taxa. Table XII-6 lists these pollen taxa for each tool. To accurately assess these tool pollen results, it is necessary to compare them with the results from the pollen column samples reported below. The pollen types observed in the soil at four locations in or near the site areas provide comparative data for the occurrence of various types of plant pollens in the area. Comparison with these data indicate, for example, that plant types such as Asteraceae (sunflower family) that are present in abundance on all four tools, and in the environment, cannot with any assurance be associated with tool function, i.e., prehistoric resource processing. Others, however, such as mesquite (*Prosopis* sp.) and Mormon or Indian tea (*Ephedra* sp.), occurring in much smaller quantities on the tools, but representing unusual plants for the area as well as possible food or medicine plants (cf. Anderson et al. 1996), could be considered as tool related. The variety of pollens present on some of the tools is also of interest.



Mooney & Associates

Oak Country Estates

Pollen Diagram for CA-SDI-7759 and CA-SDI-7754 Tool Washes

Figure XII-2

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Table XII-6. Pollen Plant Types Present on Artifacts

Site No. CA-SDI-	Artifact Type (Catalog #)	Pollen Plant Taxa Present
7754	Mano (#62)	*Alnus* sp. (alder) *Populus*-type (cottonwood) *Prosopis*-type (mesquite) *Quercus* sp. (oak) *Artemisia* sp. (California sagebrush) *Erigonum* sp. (buckwheat) *Adenostoma*-type (chamise) Asteraceae (high-spine, sunflower family) Poaceae (grass family)
7759	Mano (#65)	*Alnus* sp. (alder) *Pinus* sp. (pine) *Quercus* sp. (oak) *Artemisia* sp. (California sagebrush) *Erigonum* sp. (buckwheat) *Adenostoma*-type (chamise) *Ephedra* sp. (Mormon tea) *Erodium cicutarium* (filaree) *Lycopodium* sp. (clubmoss) Plantago (plantain) Anacardiaceae (sumac family) Liguliflorae (chicory) Asteraceae (low and high-spine, sunflower family) Poaceae (grass family) Brassicaceae (mustard family) Cheno-Am (Chenopodiaceae, goosefoot-Amaranthaceae, pigweed families) Trilete rugulate (fern)
7759	Mano (#68)	*Alnus* sp. (alder) *Pinus* sp. (pine) *Quercus* sp. (oak) *Artemisia* sp. (California sagebrush) *Erigonum* sp. (buckwheat) *Adenostoma*-type (chamise) *Lycopodium* sp. (clubmoss) Asteraceae (low and high-spine, sunflower family) Poaceae (grass family) Brassicaceae (mustard family) Cheno-Am (Chenopodiaceae, goosefoot-Amaranthaceae, pigweed families)
7759	Mano (#237)	*Alnus* sp. (alder) *Pinus* sp. (pine) *Quercus* sp. (oak) *Artemisia* sp. (California sagebrush) *Erigonum* sp. (buckwheat) *Adenostoma*-type (chamise) Asteraceae (low and high-spine, sunflower family) Poaceae (grass family) Brassicaceae (mustard family) Cheno-Am (Chenopodiaceae, goosefoot; Amaranthaceae, pigweed families) *Sarcobatus* sp. (greasewood) *Euphorbia* sp. (spurge) *Trichostema*-type (vinegar weed, bluecurls)

The nine plant taxa present on the mano from SDI-7754, for instance, consist of alder (*Alnus* sp.), cottonwood (*Populus* sp.), mesquite (*Prosopsis* sp.), oak (*Quercus* sp.), California sagebrush (*Artemisa* sp.), Asteraceae (may includes plant types such as aster, mulefat, tarweed, sunflower, yarrow, broombrush, ragweed, cocklebur, and chicory), buckwheat (*Erigonium* sp.), Poaceae (grasses), and chamise (*Adenostoma* sp.). Several of these plant types, are either not necessarily associated with food, and/or are not currently present on the property. An example of this would be alder. This tree is not currently present on the property, not known to be a food source, and occurs in only one level of the four pollen column samples from the property, and yet, it is present on all four of the manos.

Plants currently present on the property known to have been used prehistorically in the local southern California area for food, or medicinally, are indicated in Table XII-7. Of these plants, those indicated as possibly present in the pollen tool results are buckwheat, oak (acorns), California sagebrush, chamise, Indian (Mormon) tea, Asteraceae (e.g., golden yarrow and gumplant), mesquite, and several types of grasses. While it cannot be determined with absolute certainty, that any or all of these plants were processed (i.e., ground or crushed) with these tools, the presence of pollens from these plants on the tools suggests that they may have been.

As with some of the seed plant taxa (see subsection F), several of the plants identified through pollen are introduced. *Erodium* (filaree), for example, is represented today almost exclusively by the introduced species *E. cicutarium* and *E. botrys*. The only local (San Diego area) native species are *E. macrophyllum* and *E. texanum*, neither of which was identified on the property today. There are ethnographic accounts of use of the introduced species as food (Bean and Saubel 1972; Hedges and Beresford 1986). These accounts only describe use as greens and not the use of the seeds. The greens are described as being gathered just prior to blossoming in the early spring. The seeds, if they were used (the remains recovered were pollens on ground stone), would have been ready to gather in the late spring and through the summer months. Another genus, identified, that is largely represented today only by introduced species is *Plantago* (plantain). Four species were identified on the property today, but only two are native species. Also there is no evidence in the local ethnographic literature to indicate use of either the native or introduced species for food.

E. Pollen Soil Sample Analysis

1. Introduction

Soil samples from four of the 1 by 1 m test units were sent to Dr. Linda Scott Cummings, Paleo Research Laboratories, Golden, Colorado for pollen analysis (Appendix I). Microscopic plant pollens contained in the soil are both, highly resistant to decay and distinctive indicators of plant taxa. They can, if recovered in vertical sequence, sometimes reveal the presence, in prehistoric times, of plant communities and plant species not currently present, or reveal differences in the relative abundance of various plants in the local environment through time. Awareness of plant communities no longer present or abundant, that may have been useful to the prehistoric site inhabitants can contribute additional knowledge of environmental influences affecting local prehistoric settlement patterns. The samples of soil were 200 cm^3 in volume and were taken at 10 cm intervals from a unit wall at each of two archaeological sites and from two off-site control units to attempt to ascertain whether changes have occurred through time in plant communities in the surrounding vicinity of the project sites. These samples were obtained from the same units and unit walls as the column samples described in subsection F, but due to differences required in collection procedures, they were taken separately.

Table XII-7. Ethnobotanical Uses for Plants Found on the Property

Scientific Name	Plant Family	Common Name	Use (Reference)	Season (Reference)
Adenostoma sp.	Rosaceae	chamise	Delfina never used it (S); building material, arrows, firewood for roasting, medicinal wash (B&S)	
Allium sp.	Alliaceae	wild onion	eaten (B&S 37)	late spring to early summer during early flowering (B&S 37)
***Alnus* sp.**	Betulaceae	alder	red dye from bark (E)	
Ambrosia psilostachya	Asteraceae	western ragweed	no known use (B&S 37); to treat dandruff (H&B 13)	
Andenostoma fasiculatum	Rosaceae	chamise	medicinal solution made by boiling leaves and branches used to bathe wounds; building materials, arrows (B&S 30)	
Anemopsis californica	Saururaceae	yerba mansa	various medicinal uses (B&S 38-39); medicinal, exact use not known (H&B 15)	a perennial, the bark gathered in the fall (B&S 38-39)
Arctostaphylos sp.	Ericaceae	manzanita (little apple)	eaten, drunk, medicinal tea for diarrhea or poison oak rash (B&S 40-41); jelly, tea for kidneys (H&B 15)	berries gathered from June to September, early in the season used for beverage-making (B&S 40-41)
Artemisia californica	Asteraceae	California sagebrush	medicinal tea used to induce menstruation, ease childbirth and post-natal recovery; given to newborns to flush out the system, reduce trauma of menopause, cold relief, other medicinal uses (B&S 42); medicinal tea, poultice for ant bites, measles relief, tobacco (S 85)	
Ascelpias eriocarpa	Asclepiadeceae	Indian milkweed	gum, eaten (B&S 43-44)	greens collected from May to June, seeds collected thereafter (B&S 43-44)
Asclepias fascicularis	Asclepiadaceae	narrow-leaf milkweed	gum, eaten (B&S 43-44)	greens collected from May to June, seeds collected thereafter (B&S 43-44)
Avena barbata	Poaceae	slender wild oat	eaten (B&S 46)	
Bromus sp.	Graminae	brome grass	seeds ground for pinole (S); seeds cooked into gruel (B&S);	
Calandrinia ciliata	Portulaceae	red maids	food (E)	late spring-summer
Calochartus splendins	Liliaceae	Mariposa lily	bulbs roasted, steamed (B&S)	late spring-summer (B&S)
***Carex* sp.**	Cyperaceae	sedge	weaving and basketry (E)	
Ceanothus leucodermis	Rhamnaceae	white stemmed ceanothus, wild lilac	itch, sores or impetigo (H&B 15)	
Chaenactis sp.	Asteraceae	pincushion	seeds parched, ground (B&S)	summer (B&S)
Chenopodium sp.	Chenopodiaceae	goosefoot	soap out of mashed root (H&B); seeds ground for pinole, leaves cooked as greens (S); eaten as greens, seeds ground into flour, root made into soap, decoction for stomach, gum from sap (B&S)	
Claytonia perfoliata	Portulaceae	miner's lettuce	eaten as greens (H&B 17)	picked in the spring before flowers appear (H&B 17)
Cneoridium dumosum	Rutaceae	bushrue, spice bush (S)	mouthwash, gargle; used for toothache (S 87)	
Conyza canadensis	Asteraceae	horseweed	medicinal for diarrhea (B&S 56)	leaf annual (B&S 56)
Cucurbita foetidissima	Cucurbitaceae	calabazilla, wild gourd	eaten; soap and bleach; medicinal (B&S 57-58); whiten clothes (H&B 17)	seeds collected in spring (B&S 57-58); ripens during the summer (H&B 17)
Cuscuta californica	Custcutaceae (Convolvulaceae, H&B17)	California dodder	material use only (B&S 59); antidotal tea for black widow bites (H&B 17)	
***Cylindropunita* sp.**	Cactaceae	cholla cactus	buds & fruit eaten (B&S)	spring (B&S)
Daucus pusillus	Apiaceae	wild carrot, rattlesnake weed	medicine for toothaches; tea for fevers (S 88-89)	
Deschampsia sp.	Poaceae	hairgrass	seeds ground into mush (E)	
Distichlis spicata	Poaceae	saltgrass	salt (B&S 66); mouth rinse for sores (S 89)	
***Ephedra* sp.**	Ephedraceae	Mormon tea	tea as tonic for kidneys/blood/appetite (H&B); beverage/medicinal tea, seeds ground for mush (B&S)	branches collected any time of year; stored (H&B); twigs collected in late summer (B&S)
Eremocarpus setigerus	Euphorbiaceae	dove weed, turkey mullein	to heal sores & kill worms on horse's wounds (H&B 20)	
Eriogonum elongatum var. *elongatum*	Polygonaceae	long-stemmed buckwheat	eaten; medicinal drink/wash (B&S 72)	in the desert, limited to moist season (spring and winter); edible shoots available in the desert from February to May and seeds were gathered from June to September (B&S 72)

Scientific Name	Plant Family	Common Name	Use (Reference)	Season (Reference)
Eriogonum fasciculatum	Polygonaceae	California buckwheat	eaten; medicinal drink/wash (B&S 72); tea given to babies to cure diarrhea, tea to "throw up badness in the stomach" (H&B 21); tea for stomach trouble; eaten (S 90)	
Eriogonum gracile	Polygonaceae	slender buckwheat	eaten; medicinal drink/wash (B&S 72)	
Eriophyllum confertiflorum	Asteraceae	golden yarrow	eaten; medicinal (exact use no longer remembered) (B&S 72); pimples (S 90)	seeds gathered from June to November (B&S 72)
Erodium botrys	Geraniaceae	filaree	eaten (B&S 72-73)	gather just before flowering, from January to April (B&S 72-73)
Erodium cicutarium	Geraniaceae	filaree	eaten (B&S 72-73); leaves eaten as greens (H&B 21)	gather just before flowering, from January to April (B&S 72-73); early spring before flowers appear (H&B 21)
Eschscholzia californica	Papaveraceae	California poppy	cosmetic; sedative (B&S 73)	annual or perennial, depending upon species (B&S 73)
Galium angustifolium	Rubiaceae	bedstraw	tea for diarrhea (S 90)	gathered when green and in bloom (S 90)
Grindelia hirsutula var. *hallii*	Asteraceae	gumplant	tea taken as a blood tonic (H&B 23)	any time of year (H&B 23)
Helianthemum scoparium	Cistaceae	rock rose	tea for childbirth (S 91)	
Heliotropium curassavicum	Boraginaceae	salt heliotrope	tea for regulating menstruation (S 91); no known use (B&S 76-77)	
Hemizonia sp.	Asteraceae	tarweed	steam from boiling plant for headache (S); cooked as famine food (B&S)	
Hordeum sp.	Poaceae	wild barley	seeds eaten occasionally (B&S)	
Juncus acutus	Juncaceae	spiny rush	material use (B&S 80-81)	
Lamarckia aurea	Poaceae	goldentop	tea to cure headaches (H&B 23)	
Lathyrus sp.	Leguminosae	wild pea	used as food (B&S)	
Lonicera suspicata	Caprifoliaceae	honeysuckle	wash sores on horses (H&B 24)	
Lotus scoparius	Fabaceae	deerweed	material use only (B&S 87)	
Malosma laurina	Anacardiaceae	Laurel sumac	bark tea used for after birth, and venereal disease (S)	
Malva parviflora	Malvaceae	cheese weed, mallow, malva	eaten (B&S 88); cure for dandruff and to soften hair; enema & wash for babies with fever (H&B 24-25); tea for fever; bathing; eaten (S 93)	seeds available from February to late summer (B&S 88)
Marah macrocarpus	Cucurbitaceae	wild cucumber	makeup; hemorrhoid medicine (S 93)	
Marrubium vulgare	Lamiaceae	horehound	medicinal infusion for the kidneys (B&S 88); tea as a cure for colds and whooping cough; syrup or candy (H&B 25)	
Muhlenbergia rigens	Poaceae	deergrass, bunch grass	material use only (B&S 89-90)(H&B 25)	
Nicotiana glauca	Solanaceae	tobacco tree	smoked, chewed, drunk, medicinal, ritual (B&S 90-94); may have been used as tobacco (H&B 27)	
Opuntia sp.	Cactaceae	coast prickly pear cactus	fruit and pads eaten (H&B); same (S)	fruit ripens in summer
Paeonia californica	Paeoniaceae	California peony, wild peony, peonia	leaves eaten as greens, buds eaten, tea used to treat indigestion (H&B 28)	leaves picked before blossoms appear, roots used any time of the year (H&B 28)
Pellaea mucronata	Pteridaceae	bird's foot fern	drunk as a treatment for hemorrhage (H&B 28)	the rhizome can be gathered anytime (H&B 28)
Phacelia sp.	Hydrophyllaceae	phacelia	no use given	
***Pinus* sp.**	Pinaceae	pine	nuts of pinyon eaten, needles of other pines used for basketry, bark for shelters (H&B); pinyon nuts eaten; needles for baskets, wood for fires, pitch as adhesive & sun block, bark for roofs, nuts used for trading (B&S)	nuts harvested early summer or late August (B&S)
Platanus racemosa	Platanaceae	western sycamore	material use only (B&S 105); a decoction to treat asthma (H&B 30)	
Polypodium californicum	Polypodiaceae	California polypody, fern (S)	internal bleeding (S 94)	
***Populus* sp.**	Salicaceae	poplar, cottonwood	decoction made of leaves for sprain (H&B);mortars from trunks, firewood, poultice of leaves/bark for sprains, cuts, headaches, bark for fiber uses (B&S)	
***Prosopis* sp.**	Fabaceae	mesquite	bean ground into meal cakes, wood used for implements (H&B); blossoms & pods eaten; wood for mortars, bows, rafters, firewood, bark fiber for skirts & diapers; thorns for tatooing, sap as adhesive (B&S)	April-August for food (B&S)

Scientific Name	Plant Family	Common Name	Use (Reference)	Season (Reference)
Prunus ilicifolia	Rosaceae	holly-leafed cherry, wild cherry, islay	eaten, drunk; medicinal (B&S 119); eaten (H&B 32)	gathered in August, season lasted 2-3 months (B&S 119)
Quercus agrifolia var. *agrifolia*	Fagaceae	coast live oak, encina	the acorn a chief source of food (B&S 121-131); the acorn a staple food (H&B 5-9)	annual harvesting season from October to November (B&S 121-131)
Quercus berberidifolia	Fagaceae	scrub oak	acorn used if other varieties not available, branches used for granaries & cradles, insect galls boiled for eyewash (H&B); acorns (least used)(B&S)	
Quercus engelmannii	Fagaceae	Englemann's oak, white oak	gum chewed (H&B 33-34); acorns not often used (H&B 5)	
Rhamnus californica	Ranunculaceae	coffeeberry, cascara	a physic and a cure poison oak (H&B 37)	bark can be used any time of the year, but peels best in the spring (H&B 37)
Rhus integrifolia	Anacardiaceae	lemonadeberry	drunk (B&S 132); to assuage thirst (H&B 37); eaten; medicinal drink for sickness, fever, post childbirth (S 95)	ripe fruit collected from June to September (B&S 132)
Rhus trilobata	Anacardiaceae	squawbush, three leaf sumac, basketweed	eaten, drunk, medicinal (B&S 132); eye wash for babies (H&B 37)	berries collected from May to July (B&S 132)
Rosa californica	Rosaceae	wild rose	eaten; drunk, medicinal; source of vitamin C (B&S 133-134); tea for babies with fever (H&B 39)	the bush blossoms from May to July (B&S 133-134)
Rumex crispus	Polygonaceae	curly dock	eaten (S 96)	
Salix gooddingii	Salicaceae	Goodding's black willow	material use only (B&S 135)	
Salix lasiolepis	Salicaceae	arroyo willow	material use only (H&B 39)	
Salvia apiana	Lamiaceae	white sage	eaten; smoked; ritual; cleansing; cosmetic (B&S 136); eaten; cure for serious cases of poison oak; tea to treat colds (H&B 39-41); eaten; tea for chest colds and coughs; heat/smell for congestion (S 96)	seeds gathered from July to September (B&S 136)
Sambucus mexicana	Caprifoliaceae	elderberry	eaten; drunk; medicinal (B&S 138); eaten; tea to cure fever in babies (H&B 41)	berries gathered from July to August (B&S 138)
Sanicula arguta	Apiaceae	sharp toothed sanicle	eaten; tea for cramps (S 97)	
***Sarcobatus* sp.**	Chenopodiaceae	greasewood	no use given	
Scirpus sp.	Cyperaceae	bulrush	roots ground into flour, seeds eaten, pollen made into cakes; stalks used for mats, weaving & roofs; made into ceremonial images (to be burned)(B&S)	
Selanginella sp.	Selaginellaceae	moss	no use given	
Sphaeralcea sp.	Malvaceae	globemallow	no use given	
Toxicodendron diversiloba	Anacardiaceae	poison oak	eye wash to improve vision (H&B 43)	
Trifolium sp.	Fabaceae	clover	eaten (B&S 141-142); eaten as greens (H&B 43)	leaves and seeds gathered from February through July (B&S 141-142)
Viola pedenculata	Violaceae	johnny jump up, pansy	eaten as greens (H&B 45)	leaves picked in the spring before flowers appear (H&B 45)
Vulpia/Festuca sp.	Poaceae	fescue grass	seeds eaten ("cool-season" grass)(E)	early summer
Washingtonia filifera	Arecaceae	California fan palm	eaten (B&S 145-146)	fruit of the palm gathered from late summer to early autumn (B&S 145-146)
Xylococcus bicolor	Ericaceae	mission manzanita	drunk (S 98)	
Yucca schidigera	Agavaceae	Mojave yucca	eaten (B&S 151-152); material use only (H&B 45); cosmetic; hair wash (S 33); soap; eaten; tea (S 98)	fruit gathered from April to May (B&S 151-152)
Yucca whipplei	Agavaceae	Our Lord's candle, whipple yucca	eaten (B&S 150-151) (H&B 45)	since the plant produced food at three stages, it's gathering season could last weeks or months (B&S 150-151); stalks and unopened blossoms taken in the spring (H&B 45)

Plants in **bold** are not listed on property, but identified in floated material or pollen samples.

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2. Results

The results from the pollen column soil samples were intended, not only to provide information about possibly earlier plant distributions and change in the inventory of plant communities in the area over time, but also, to provided samples with which to compare the results from the tool pollen studies to aid in discerning deviations in the occurrences of plant types on the tools. The tool function result comparisons have already been reported above. The examination of the pollen record to address change of vegetation in the area through time is presented below.

Table XII-8 summarizes the occurrence of the various plant taxa in each column sample. Figures XII-3 thru 6 indicate the plant pollen taxa identified and the relative quantities of pollen by taxa in the four columns. The longest column (120 cm), was taken from off-site Control Unit (CU) 1 (located nearest to sites SDI-7764 and SDI-7755). The results from this unit suggest three basic and distinct periods of vegetation distribution and change for the area as represented at this location (Figure XII-3). The lowest levels of the column indicate the probability of more mesic conditions (slightly wetter) in the earliest times compared to today. This is followed in the middle and upper levels by pollen changes that indicate an increase through time in the presence of a southern mixed chaparral community, and an increased presence of the oak woodland community, and of oak trees in particular, in recent times. The more mesic environment is suggested in the lower levels by the presence of pollens from plant families such as Liguliforae (chicory, possibly *Rafinesquia* sp.), Onagraceae (evening primrose family), and Poaceae (grasses), along with *Quercus*. Subsequently, these plants with the exception of *Quercus*, diminish or disappear in the column and are replaced or augmented by High-spine Asteraceae, *Adenostoma*-type (chamise), as well as possibly *Ceanothus* and *Rhamnus*, all plant types typical of the southern chaparral community. Concurrent with this change is an increase in *Eriogonum* (buckwheat) through time, but it does not appear in this column to have ever become abundant. *Quercus* seems to have been present throughout the period represented by the column, but with a noticeable increase in recent times.

The results from the other off-site unit, CU 2 (located nearest to site SDI-7759), were less definitive, but still produced evidence for change over time. The length of this column was 40 cm, and, as with the other columns, High-spine Asteraceae, along with a lesser amount of *Quercus*, were the dominant plants, in the upper levels (Figure XII-4). In general, the other pollens present in the lower levels of the column included Brassicaceae (mustard), Caryophyllaceae (pink), *Erigonum* (buckwheat), *Adenostoma* (chamise), and *Eriophyllum confertiflorum* (yarrow), reflective of a mixed chaparral community. Also, as with the other columns, *Quercus* pollen shows a noticeable increase in recent times, i.e., in the uppermost levels. A recently introduced plant, *Erodium cicutarium*-type (filaree), is also evident in quantity in the uppermost levels.

The lengths of the columns from units at sites SDI-7756 (Unit 1) and SDI-7755 (Unit 2) were 50 cm and 80 cm, respectively. The upper levels of the columns from these units are reflective of specialized plant communities currently present at these locations, principally, oak woodland. The location of the unit at SDI-7756, for example, was directly below a substantial oak canopy and within one of the densest cultural deposit areas of the site. The column from SDI-7755 was also in cultural deposit and in proximity to several large oak trees. As in the two off-site columns, *Quercus* pollen is present throughout the period represented by the columns at sites SDI-7755 and SDI-7756 with a noticeable increase in recent times. In general, at SDI-7756, *Quercus*, along with High-spine Asteraceae are the dominant plants, in the upper levels, but the presence of *Artemisa* and higher densities of High-spine Asteraceae in lower levels, indicate a less substantial presence of oak woodland plants in the past than at present (see Figure XII-5). As in the CU 1 column, in the lowest levels at SDI-7755, a more mesic environment is suggested by the presence of pollens from plants such a Liguliforae and *Artemisa* sp., along with a lesser presence of *Quercus* sp (see Figure XII-6). Other pollen

types noted within the column at SDI-7755 were Cyperaceae (sedge), *Salix sp.* (willow), and *Phacelia*, indicative of riparian plants in the area, and in the uppermost levels a sharp increase in Brassicaceae (mustard family) pollen was evident indicating an increased recent presence of these plants in the area.

In sum, the analysis of the pollens in the soil samples from the four 1 by 1 m test unit columns produced a picture of variation indicative of incremental change within an overall pattern of relative stability of vegetation growth in the area through time. The change reflected is not substantial but does appear to indicate that climatic conditions and plant communities have altered somewhat, but not substantially, during the indeterminate length of time reflected by the columns. While the length of time is indeterminate, it can be observed that the radiocarbon dates obtained and reported above, even though not derived from the specific units of the pollen soil samples, indicate a time depth of as much as 1,800 years or as little as 140 years could be reflected in the samples.

F. Column Sample Analysis

1. Introduction

Seven column samples of soil, each measuring 20 cm wide, by 20 cm long, by 10 cm deep, were taken from a unit wall at each of four selected archaeological sites and from three off-site control units. These samples were used to conduct two types of studies: macrobotanical floation analysis and heavy fraction analysis. The purposes and results of these studies are described below. The sampled units consisted of Unit 1 at site CA-SDI-7322, Unit 3 at site CA-SDI-7753, Unit 1 at site CA-SDI-7756, and Unit 1 at site CA-SDI-7759. Unit 1 at site CA-SDI-7322 reached a depth of 70 cm, Unit 3 at site CA-SDI-7753 reached a depth of 100 cm, Unit 1 at site CA-SDI-7756 reached a depth of 70 cm, and Unit 1 at site CA-SDI-7759 reached a depth of 110 cm. The three off-site control units were located in areas beyond defined site boundaries, one west of site CA-SDI-7758, one east of site CA-SDI-7759, and one west of site CA-SDI-7755. These latter three samples were taken for use in comparison with the samples taken from the site deposits. The depths at the three off-site control units were 70 cm in the unit west of site CA-SDI-7758, 60 cm in the unit east of site CA-SDI-7759, and 120 cm in the unit west of site CA-SDI-7755. Soils from each level were deposited into sealed bags in the field and taken off-site to be processed.

2. Macrobotanical Analysis Results

a. Introduction

Botanical remains, particularly seeds, if charred in a fire, can survive for long periods of time in site soils. Such materials float on water and can be separated from the soil matrix by submergence of the soil in water. This floated material can then be skimmed off of the water with fine mesh screens and placed on other fine screens for drying. By use of this flotation technique, botanical remains can sometimes be recovered that may be associated with prehistoric food processing activities by the site inhabitants. Each of seven 20 by 20 cm soil columns was processed using this flotation technique. These seven column samples of soil were taken from four selected archaeological sites and from three off-site control units. The three control samples were taken in an attempt to provide data for comparison to the on-site samples to help in distinguishing between naturally occurring charred materials and materials created by prehistoric plant processing activities. The column samples were processed by 10 cm levels and after the botanical materials were floated off, the vegetal samples from each 10 cm level were then dried, packaged, and sent to Dr. Virginia Popper of the Paleoethnobotany Laboratory of the Cotsen Institute of Archaeology, at the University of California at Los Angeles. In the laboratory, charred items were separated out of the other recent vegetal materials in the samples and then identified to the most specific plant taxa possible (Appendix J). The results of this analysis are presented below.

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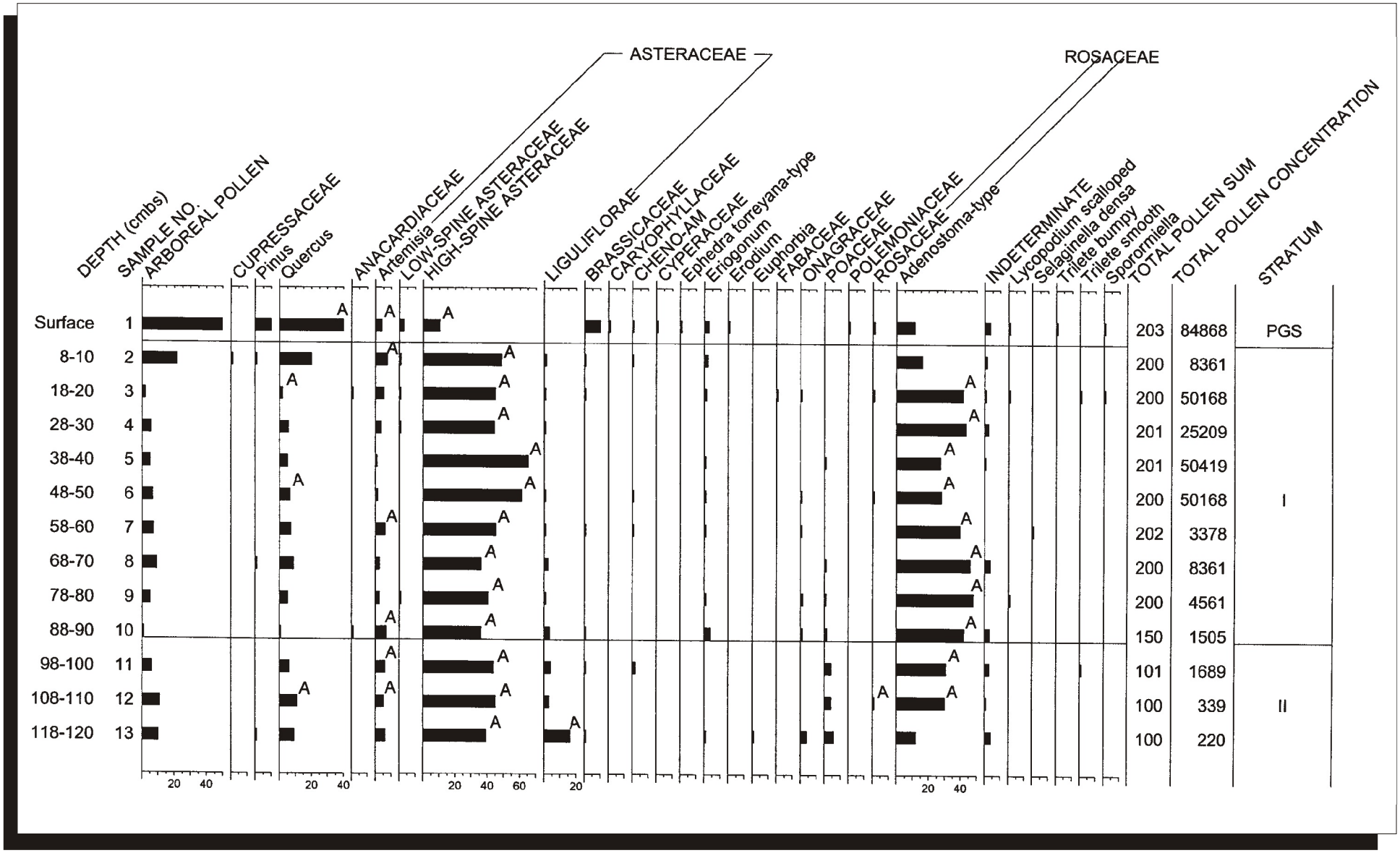

Mooney & Associates

Oak Country Estates

Pollen Diagram for Off-Site Control Unit 1 Column

Figure XII-3

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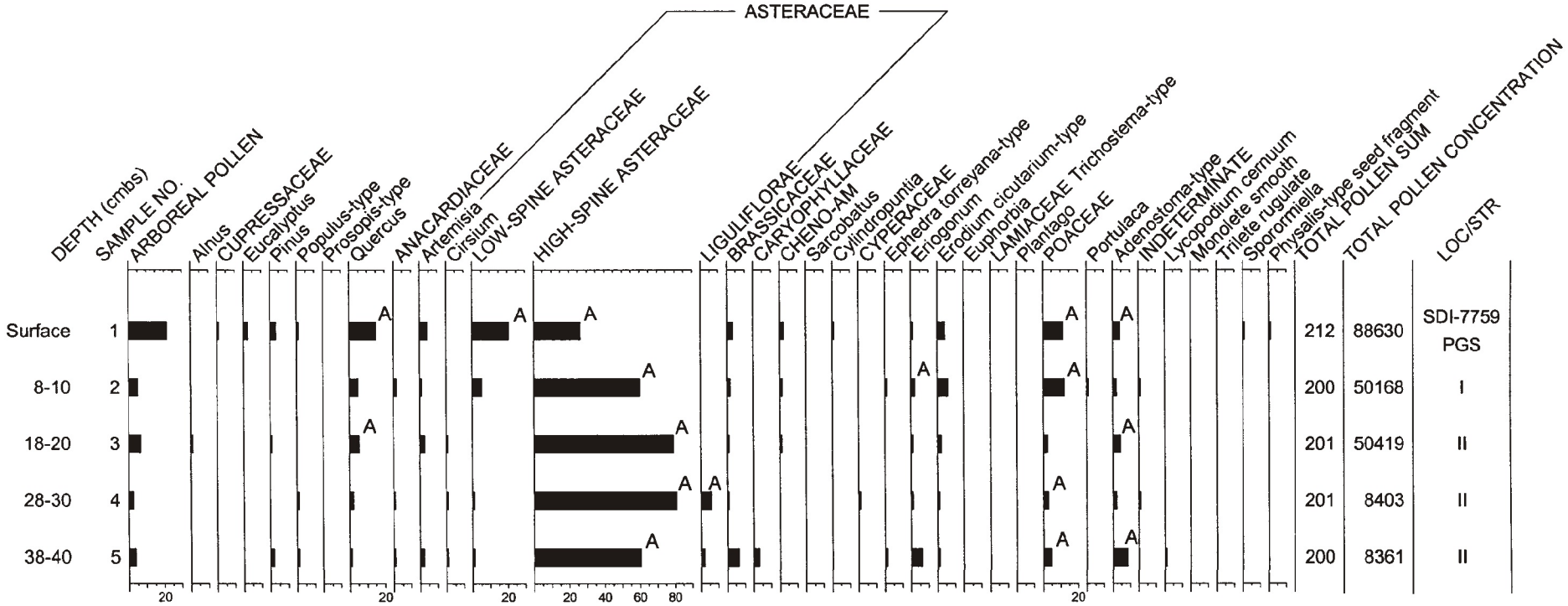

Mooney & Associates

Oak Country Estates

Pollen Diagram for Off-Site Control Unit 2 Column

Figure XII-4

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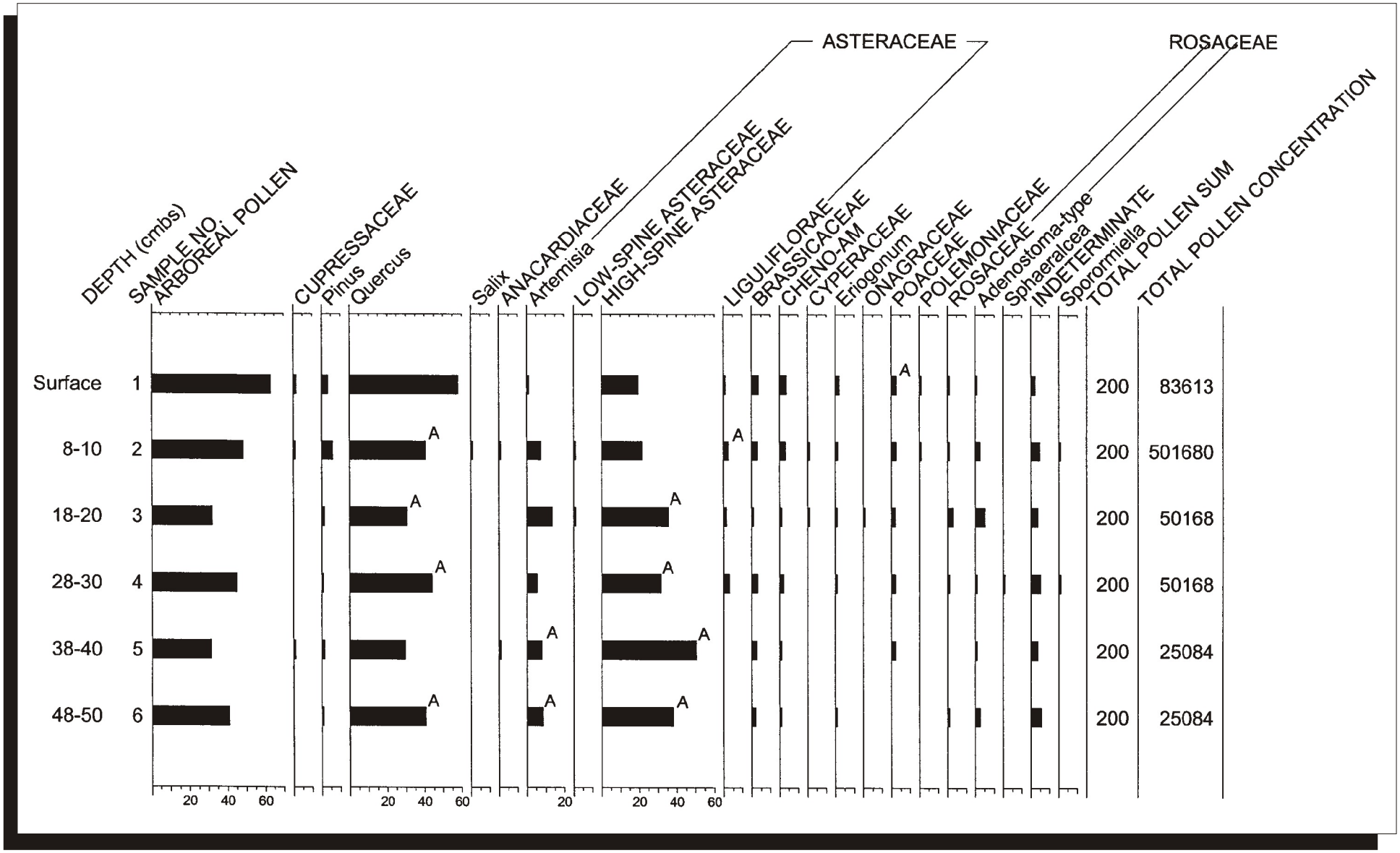

Mooney & Associates

Oak Country Estates

Pollen Diagram for Unit 1 Column, CA-SDI-7756

Figure XII-5

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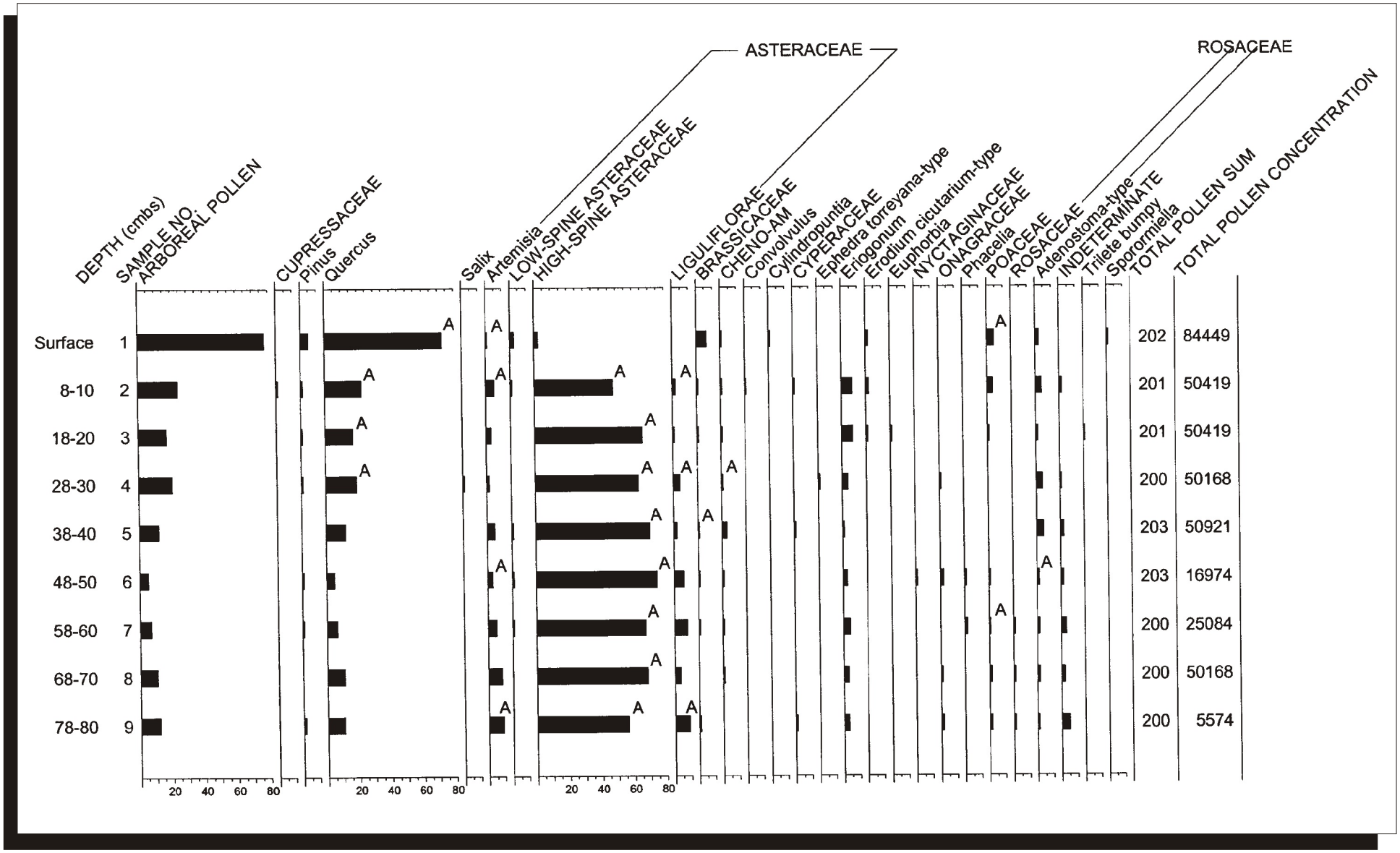

Mooney & Associates

Oak Country Estates

Pollen Diagram for Unit 2 Column, CA-SDI-7755

Figure XII-6

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Table XII-8. Pollen Plants from Oak Country Sites

		Samples			
		Site SDI-		Off-site	
Scientific Name	**Common Name**	**7755**	**7756**	**CU 2**	**CU 1**
Arboreal Pollen:					
Alnus	Alder			x	
Cupressaceae	Cypress family	x	x	x	x
Eucalyptus	Eucalyptus			x	
Pinus	Pine	x	x	x	x
Populus	Poplar/cottonwood			x	
Quercus	Oak	x	x	x	x
Salix	Willow	x	x		
Non-arboreal Pollen:					
Anacardiaceae	Sumac family		x	x	x
Asteraceae:	Sunflower family				
Artemisia	Sagebrush	x	x	x	x
Low-spine	Ragweed, cocklebur, etc.	x	x	x	x
High-spine	Aster, rabbitbrush, snakeweed, sunflower	x	x	x	x
Liguliflorae	Dandelion and chicory	x	x	x	x
Brassicaceae	Mustard family	x	x	x	x
Cylindropuntia	Cholla cactus	x		x	
Caryophyllaceae	Pink family			x	x
Cheno-am	Includes amaranth and pigweed family	x	x	x	x
Cirsium	Thistle			x	
Convolvulus	Bindweed	x			
Cyperaceae	Sedge family	x	x	x	x
Ephedra torreyana cf	Mormon tea	x		x	x
Eriogonum	Wild buckwheat	x	x	x	x
Erodium	Heron-bill			x	x
Erodium cicutarium	Heron-bill, introduced	x			
Euphorbia	Spurge	x			x
Fabaceae	Bean or legume family				x
Nyctaginaceae	Four o'clock family	x			
Onagraceae	Evening primrose family	x	x		x
Phacelia	Phacelia	x			
Poaceae	Grass family	x	x	x	x
Polemoniaceae	Phlox family		x		x
Portulaca	Purslane			x	
Rosaceae:	Rose family	x	x		x
Adenostoma-type	Chamise	x	x	x	x
Sphaeralcea	Globemallow		x		
Indeterminate	Too badly deteriorated to identify	x	x	x	x
Spores:					
Lycopodium cernuum	Clubmoss			x	
Lycopodium scalloped	Clubmoss				x
Selaginella densa	Little clubmoss				x
Trilete bumpy	Fern	x			x
Trilete smooth					x
Sporormiella	Dung fungus	x	x	x	x
Physalis-type seed fragment				x	

b. Results

The results from the analysis indicated that a total of twenty-three plant taxa, classified to at least the family level, were identified in the macrobotanical flotation samples from the on-site columns (Table XII-9). The remains recovered were few, indicating moderate to poor preservation. The samples contained few seeds and most of the seeds recovered were unidentifiable, due principally to two causes. Carbonization often distorts seeds altering diagnostic attributes and fragmentation also places limitations on specific identification. Of those that could be identified a surprising diversity of taxa were found to be present. Taxa identified from seeds include *Bromus* sp. (brome grass), *Chenopodium* sp.(goosefoot), *Deschampsia* sp. (hairgrass), *Hemizonia* sp. (tarweed), *Hordeum* sp., (wild barley), *Lathyrus* sp. (wild pea), *Lotus* sp. (deerweed), *Malosma laurina* (laural sumac), *Marah* sp. (wild cucumber), *Rumex* sp. (dock), *Scirpus* sp. (bulrush/tule), and *Vulpia/Festuca* sp. (fescue grass). Also present and partially identifiable in the samples are carbonized leaves, buds, stems, and wood fragments. Wood types identified include Asteraceae (sunflower family), *Ceanothus* sp. (buckthorn), *Erigonum* sp. (wild buckwheat), *Platanus* sp. (sycamore), *Quercus* sp. (oak), and *Salvia* sp. (sage).

The most common taxon from all the sites was Poaceae (grass family). Seed identifications of grasses include *Vulpia/Festuca* sp. (fescue grass), *Bromus* sp. (brome grass), *Deschampsia* sp. (hairgrass), and *Hordium* sp. (wild barley). Each of these grasses could have derived from a grassland habitat or from freshwater seeps (brome grass), or vernal pool areas within grasslands (hairgrass and wild barley). Other seeds identified that also derive from plants from generally moister habitats are Fabaceae (bean family), *Chenopodium* sp. (goosefoot), *Rumex* sp. (dock), and *Scirpus* sp. (bulrush). Fabaceae and goosefoot could have derived from more than one type of habitat including grassland, riparian or southern chaparral. Goosefoot most frequently occurs in disturbed open soils, that can be located on slopes, flats, or stream banks. Dock grows most frequently in a vernal pool circumstance, and bulrush along a creek or in a stable situation of standing water such as around a seep or spring. Seeds identified that are more certainly from drier habitat circumstances of the proximate oak woodland, southern mixed chaparral, or grassland communities include *Hemizonia* sp. (tarweed), *Malosma laurina* (laural sumac), *Lathyrus* sp. (wild pea), and *Lotus* sp.

The plant most frequently identified as charcoal was *Quercus* sp. (oak). Also identified as charcoal in order of frequency of occurrence are *Ceanothus* sp. (buckthorn), *Erigonum* sp. (buckwheat), Asteraceae (Sunflower family), *Salvia* sp. (sage), and *Platanus* sp. (sycamore). Several possible Asteraceae family plant types could be represented in the charcoal including *Baccharis* sp. (mule fat) and *Artemisa* sp. (California sagebrush). Most of these locally available materials likely represent firewood. Noted by Dr. Popper as puzzling, and unexpected in prehistoric archaeological sites with oaks present and acorn processing tools such as mortars and pestles present in the tool assemblage, was the fact that no charred acorn nutshells were recovered in the flotation sample. She suggests that because acorns ripen in the fall, it might be an indication of seasonal occupation. She considers it more likely, however, that one or more other factors such as that the acorns shells were not thrown in the fire, preservation at the site was poor, and/or that contexts with acorn-processing debris were not sampled, are the reason for this absence.

Comparison between the off-site control units and the on-site units indicated, not surprisingly, that substantially more carbonized plant materials were present in the on-site samples than in the off-site samples. No identifiable plant remains were recovered in the off-site columns, and only a small amount of miscellaneous charred plant material was present between the 20 and 60 cm levels in CU 1. Both the sparsity and circumstances of occurrence in that unit suggest that these materials derived either from run-off from a natural burn or, possibly, from an adjacent site deposit (i.e., SDI-7755). The natural burn possibility

Table XII-9. Flotation Plants Present at Oak Country Sites

	Site SDI-					Off-site Control Units			
Type	**7322**	**7755**	**7756**	**7759**	**Total**	**1**	**2**	**3**	**Total**
Seeds									
Asteraceae cf.	-	-	-	1	1	-	-	-	-
Bromus sp.	-	-	-	1	1	-	-	-	-
Chenopodium sp.	-	1	3	5	9	-	-	-	-
Convolvulaceae	-	-	-	1	1	-	-	-	-
Deschampsia sp.	-	-	1	-	1	-	-	-	-
Fabaceae	-	-	10	8	18	-	-	-	-
Hemizonia sp.	-	-	3	-	3	-	-	-	-
Hordeum sp.	-	-	1	-	1	-	-	-	-
Lamiaceae cf.	-	-	-	2	2	-	-	-	-
Lathyrus sp. cf.	-	-	-	2	2	-	-	-	-
Lotus sp.	-	-	-	1	1	-	-	-	-
Malosma laurina	-	-	1	-	1	-	-	-	-
Marah sp. cf.	-	1	-	-	1	-	-	-	-
Poaceae	-	1	-	2	3	-	-	-	-
Poaceae frag.	-	3	9	13	25	-	-	-	-
Rumex sp.	-	-	3	3	6	-	-	-	-
Scirpus sp.	-	-	-	2	2	-	-	-	-
Solanaceae	-	-	1	-	1	-	-	-	-
Vulpia/Festuca	-	-	-	3	3	-	-	-	-
Unidentifiable seeds	4	19	37	58	118	33	2	0	35
Seed Total[a]	**4**	**25**	**69**	**102**	**200**	**33**	**2**	**0**	**35**
Plant Parts									
Wood[b]	0.22	0.94	4.06	0.74	5.96	0.189	-	-	-
Amorphous[b]	-	0.19	1.54	0.27	2	0.013	-	-	-
Parallel sided	-	3	-	-	3	-	-	-	-
Leaf	1	-	-	-	1	6	-	-	-
Misc plant parts	-	-	1	-	1	9	-	-	-
Wood Charcoal									
Asteraceae cf.	-	-	-	21	21	-	-	-	-
Ceanothus sp.	3	22	5	4	34	-	-	-	-
Eriogonum sp. cf.	-	-	6	1	7	-	-	-	-
Platanus sp.	-	1	-	-	1	-	-	-	-
Quercus sp.	8	11	114	29	162	-	-	-	-
Salvia sp.	-	-	3	1	4	-	-	-	-
Type A	1	10	-	1	12	-	-	-	-
Amorphous	3	2	7	3	15	-	-	-	-
Bark	-	1	-	-	1	-	-	-	-
Diffuse	-	-	1	5	6	-	-	-	-
Indeterminate	16	38	16	30	100	-	-	-	-
Charcoal Total count	**31**	**85**	**152**	**95**	**353**	**-**	**-**	**-**	**-**

a Seed total includes unidentifiable seeds and fragments
b Weight in grams

is considered the most likely due to the presence of only miscellaneous carbonized plant parts rather than, primarily, culturally useful seeds, fruits, tubers or wood. These results are important in that they give additional credence to the origin of the charred materials recovered in the on-site units as deriving from prehistoric cultural activities. The near absence of charred materials, especially seeds, in the off-site units provides additional verification of the cultural association of these materials.

While qualitatively the occurrences of the these materials within each of the site areas varied to some degree, the differences did not appear to be substantive. Of the differences observed, the presence of sycamore and wild cucumber *(Marah* sp.) and a dominance of buckthorn charcoal (versus oak) at site SDI-7755 may be indicative of a localized preference for these materials at this site location. Quantitatively, sites SDI-7322 and SDI-7755 contained the least material and sites SDI-7756 and SDI-7759 the most. Site SDI-7755 had only slightly more material than SDI-7322. Reasons given for the low quantities of material at site SDI-7322 were that preservation may have been poor, possibly related to a greater antiquity of the deposit, or that minimal plant processing occurred at the site, or that the vagaries of sampling resulted in an inaccurate representation of the site content. This site also had only oak and buckthorn charcoal present, the densest materials, that may also be an indicator of poor preservation. Sites SDI-7756 and SDI-7759 not only contained the most materials but also had a greater diversity of materials with nine taxa present at SDI-7756 and twelve at SDI-7759. Interestingly, of these taxa, only four - *Chenopodium* sp., Fabaceae (*Lotus* sp.), Poaceae, and *Rumex* sp. - are common to both sites. Of the seeds recovered, at these two sites, 55.6 percent were not identifiable.

Three general plant groups, grasses, beans/peas, and goosefoot, constituted the majority of the identifiable seeds recovered in the site samples. Table XII-7 above (in the pollen section) indicates the plants that are known to have been used prehistorically for food, medicines, and other purposes. The table also indicates the season of the year of their availability and likely procurement. Seeds from most of the plants identified in the samples were likely gathered during the spring and summer months.

Two of the three taxa recovered in some quantity (i.e., more than one seed),are Fabaceae (Pea Family), and *Chenopodium* sp. (goosefoot). In addition to those identified only at the family level, two members of pea family, *Lathyrus* sp. and *Lotus* sp., were identified to the genus level. Two species of the genus *Lotus* were identified growing on the property, *L.otus strigosis* and *Lotus scoparius,* but no species of *Lathyrus. Lathyrus laetiflorus* was indicated by Bean and Saubel [1972:84] to have been used by the Cahuilla for food, but no local accounts were found for *Lotus* sp. Locally, another food candidate in the pea family, according to ethnographic accounts is clover *Trifolium* sp., that may be represented by the seeds identified only as Fabaceae. *Lathyrus* sp. would probably reflect a summer collecting period. *Trifolium* sp. would reflect a late winter and spring collecting period (Bean and Saubel 1972: 141-142). Locally, the most likely candidate for food for the genus *Chenopodium* is *C. californicum*. *C. californicum* would most likely reflect a late spring and summer collecting period. Of those taxa recovered in small quantities, *Vulpia/Festuca* sp. (fescue grass) would reflect an early summer seed collecting period (Ebeling 1986:466), *Scirpus* sp. (bulrush) seeds (and pollen) would be ready to collect by late spring and through the summer; *Hemizonia* sp. (probably *fasciculatum*), while eaten, was only consumed during time of scarcity, and as the entire plant was cooked and eaten, this would most likely have occurred during the spring; and Poaceae (grasses), in general, most grass seeds would be ready to collect by late spring and through the summer months. Specifically identified grasses such as *Hordium* sp., *Deschampsia* sp., and *Vulpia/Festuca* sp. are likely to be harvested, more specifically, in late summer to early fall.

Several of the genera identified are represented in the area today mostly by introduced species, but native species for these genera do exist in the area. *Rumex* sp. (polygonum family), for example, is represented today exclusively by the introduced species *R. crispus* and *R. pulcher*. The only local native species in the San Diego area are *R. salcifolius* (varieties California dock and willow dock) and *R. hymenosepalus* (desert

rhubarb), neither of which was identified on the property. The ethnographic accounts indicate use of the introduced species as food, both the seeds and as greens (Shipek 1991; Ebeling 1986). Ebeling (1986:220) indicates that *R. salcifolius* was used by some groups, primarily for its seeds. The accounts do not describe the gathering period, but if the greens were gathered just prior to blossoming, for the native species that would have been in the late spring. The seeds, if they were used, would have been ready to gather in the late summer through early fall.

3. Heavy Fraction Sample Analysis Results

a. Introduction

The soil from the seven 20 by 20 cm column samples was washed through a series of graduated meshed screens. These column samples were processed by 10 cm levels and after the botanical materials were floated off, each 10 cm level was sifted through 1/4-inch and 1/8-inch mesh, with the smallest residue retained by window screen mesh. The material remaining in the three sizes of screens, called the heavy fraction, was examined for cultural material that consisted of prehistoric artifacts and faunal remains. The cultural materials retained were sorted by the same methods as the unit materials, except for being separated into the three increment sample portions. Subsequent to this sorting, the two samples larger than 1/8-inch were combined as one sample since they were not determined to be significantly different. The faunal bone remains were submitted to the faunal specialist for identification of the diagnostic elements, specifically those not found in the unit excavation assemblages. The use of count for bone mostly reflects the number of fragments a piece of bone broke into, however bone weight is not the best variable to compare since different sizes of animals have varying weights of bone even as small fragments. Other than whole elements, there does not seem to be any definitive way to compare faunal collections, but weight was used here. While the sample from one site contained shellfish remains, the pieces are so small and weathered that these materials were not included in the analysis here.

b. Results

Cultural materials recovered in the heavy fraction were recovered from only the four units located within the site boundaries. This material consists of flaked stone debitage, an arrow point fragment, a few ceramic vessel sherds, faunal bone, and shell remains (Table XII-10). Since the ceramic sherds all are larger than 1/4-inch in size and the point tip from SDI-7756 is the only item of this type, these items were not used for comparisons of the size samples.

Table XII-10. Column Sample Summary Recovery by Site

Site	Item								
				Bone		Shell		Total	
CA-SDI-	Debitage	Point	Sherds	N	Wt (g)	N	Wt (g)	Artifacts	Percent
7322	38	-	1	276	5.6	-		39	9.6
7755	136	-	1	998	11.3	-		137	33.9
7756	99	1	2	1105	15.4	15	0.3	102	25.2
7759	126	-	-	856	14.1	-		126	31.2
Total	**399**	**1**	**4**	**3235**	**46.4**	**15**	**0.3**	**404**	**100.0**

Of the 399 pieces of debitage recovered, 38.3 percent (n=153) was retained by the 1/8-inch mesh while 61.7 percent (n=246) was small enough to pass through the mesh (Table XII-11). Six types of materials were recovered from these column samples. The predominant type (60.9 percent) is quartz, followed by SPV

metavolcanic (30.8 percent) and much more limited amounts of quartzite (2.8 percent), varieties of chert (2.0 percent), obsidian (1.2 percent), and the distinct Piedra de Lumbre chert (0.2 percent) (Table XII-12). This sample contains fewer varieties of material than found in the 16 unit excavations at these four sites and the frequency is somewhat different. Excavations produced limited quantities of six other materials and nearly equal numbers of volcanic and quartz debitage. More obsidian and chert materials were recovered proportionately in the column samples.

Table XII-11. Column Sample Debitage and Bone Distribution by Sample Size

Site	Sample Size							
	>1/8-inch				<1/8-inch			
	Debitage		Bone		Debitage		Bone	
CA-SDI-	N	S %	g	S %	N	S %	g	S %
7322	20	52.6	3.8	67.9	18	47.4	1.7	27.9
7755	52	38.2	6.8	60.2	84	61.8	4.5	38.1
7756	29	29.3	9.9	64.3	70	70.7	5.5	33.1
7759	52	41.3	8.8	62.0	74	58.7	5.3	39.3
Total	**153**	**38.3**	**29.3**	**63.1**	**246**	**61.7**	**17.1**	**36.9**

S % = sample size percent
The point fragment and ceramic sherds all were larger than 1/8-inch;
Shell is present in an insignificant amount in the >1/8" (0.1 g) and <1/8" (0.2 g) samples from only SDI-7756, so was not included in this tabulation

Table XII-12. Column Sample Debitage Distribution by Lithic Material

Sample Size	Material Type													
	Metavolcanic		Quartz		Quartzite		Chert*		Obsidian		PDL Chert		Total	
	N	S %	N	S %	N	S %	N	S %	N	S %	N	S %	N	%
>1/8"	57	37.2	84	54.9	8	5.2	2	1.3	1	0.6	1	0.6	153	38.3
<1/8"	66	26.8	167	67.9	3	1.2	6	2.4	4	1.6	-		246	61.7
Total	123	30.8	251	62.9	11	2.8	8	2.0	5	1.2	1	0.2	399	100.0
Unit Excavation Material (for comparison)														
Total	2909	49.2	2578	43.7	256	4.3	46	0.8	41	0.7	17	0.3	5901	99.0†

S % = sample size percent
* Column sample chert includes six pieces of two jasper varieties at SDI-7756
† Percent of six material types out of total recovery (other materials include: metasedimentary, chalcedony, Eocene volcanic cobble, granitic, gabbro, and unidentified)

Between the two sample sizes from the column sample debitage, quartz contributed somewhat more to the <1/8-inch sample, as did chert and obsidian, while quartzite was more common in the larger size sample (see Table XII-12). The SPV material was somewhat more prevalent in the larger size sort also.

Overall, the vertical distribution of the column sample material is dispersed somewhat differently than the debitage recovery from excavation of these four units (Table XII-13). The excavation recovery, which had more large-size items than would be expected in the small column samples, had the greatest amount of

material from the second level, followed by a gradual decrease with depth (see shaded column). Alternatively, the column sample items were most prevalent in the 30-40 cm level, although the 20-30 cm level produced nearly the same frequency. The disbursement by size in the column sample collection varies however. The artifacts larger than 1/8-inch were more prevalent in the upper four levels, especially 30-40 cm. The smaller artifacts that passed thru this mesh were more common between 20-50 cm, with the greatest amount from 20-30 cm. These smaller artifacts were recovered in greater numbers from lower depths. This would suggest some degree of size sorting of materials in correlation to depth.

Table XII-13. Column Sample Vertical Distribution by Sample Size

	Debitage							Bone						
	Sample Size (in.)				Col. Sample		Unit	Sample Size (in.)				Col. Sample		Unit
Level	>1/8		<1/8		Total	Percent	Debitage	>1/8		<1/8		Total	Percent	Bone
(cm)	N	%	N	%			Percent	g	%	g	%			Percent
0-10	26	16.5	18	7.3	44	10.9	20.4	1.2	6.1	0.6	3.5	1.8	3.9	10.4
10-20	26	16.5	21	8.5	47	11.6	23.7	3.8	12.9	1.8	10.5	5.6	12.1	17.1
20-30	22	13.9	46	18.7	68	16.8	13.9	5.0	18.7	2.8	16.4	7.8	16.8	14.1
30-40	29	18.3	41	16.7	70	17.3	12.6	5.1	16.6	3.1	18.1	8.2	17.7	16.1
40-50	15	9.5	43	17.5	58	14.4	10.2	4.8	15.3	2.7	15.8	7.5	16.2	16.1
50-60	17	10.8	29	11.8	46	11.4	6.0	3.5	12.0	2.3	13.4	5.8	12.5	11.7
60-70	11	7.0	20	8.1	31	7.7	5.8	1.6	4.9	2.0	11.7	3.6	7.8	8.5
70-80	6	3.8	9	3.7	15	3.7	3.7	2.5	6.7	0.8	4.7	3.3	7.1	4.1
80-90	5	3.2	12	4.9	17	4.2	2.5	1.2	4.0	0.6	3.5	1.9	4.1	1.5
90-100	1	0.6	6	2.4	7	1.7	0.8	0.2	0.9	0.2	1.2	0.4	0.9	0.5
100-110	-		1	0.4	1	0.2	0.2	0.4	1.5	0.1	0.6	0.5	1.1	0.0
Total	**158**	**39.1**	**246**	**60.9**	**404**	**100.00**	**(6,262)**	**29.3**	**65.6**	**17.1**	**34.4**	**46.4**	**100.0**	**(329.3 g)**

The bone distribution is somewhat different than the heavier debitage. While a greater amount of small bone fragments (80 percent) fell through the 1/8-inch mesh in comparison to the debitage (62 percent), the vertical distribution by bone count or weight are essentially the same, so weight was used for this comparison. While the 10-20 cm level yielded the greatest amount of bone in the four units, the subsequent three levels produced significantly higher amounts than levels below 50 cm (see shaded column). In the fine-screened column samples of bone the highest yield, by level, came from between 20-50 cm (see Table XII-13). However, as with the debitage, the collection size distribution varies some but is the reverse in frequency of the lithic material. Larger pieces of bone were found in greater quantities in the 20-30 cm level, while the bones that passed through 1/8-inch mesh were more prevalent in the 30-40 cm level. In both materials there is a noticeable drop-off in quantity after 60 cm, suggesting an artificial distribution of these items below the higher midden soils, presumably due to rodent burrowing activity.

Forty-two of the recovered artifacts are whole flakes of which the majority (n=38; 90.4 percent) are smaller than 1 cm in dimension; only four whole flakes are larger, between 1-2 cm in size (Table XII-14). Of the smaller flakes, eighteen passed through the 1/8-inch mesh while twenty were retained above this mesh. In the entire whole flake sample, the maximum length of twenty-four are smaller than 5 mm; seven of these remained above the 1/8-inch mesh however, while seventeen easily passed through this mesh. The sample of these smallest flakes has more variability in material. Obsidian and jasper were only recovered from the fine-mesh sample. The four largest whole flakes are of quartz and metavolcanic material. In contrast, the sample of whole flakes from excavation units at these four sites has the most variability in material types in the 1-2 cm size sample (see Table VII-13).

Table XII-14. Column Sample Whole Flake Size and Material Variability

Material	Size (cm) 0-0.5	0.5-1	1-2	Total	Percent
>1/8-inch sample					
SPV	6	6	2	14	58.3
QTZ	1	4	2	7	29.2
QTE	-	2	-	2	8.3
PDL	-	1	-	1	4.2
Subtotal	7	13	4	24	57.1
	29.2	54.2	16.7		
<1/8-inch sample					
SPV	11	-	-	11	61.1
QTZ	3	1	-	4	22.2
OBS	2	-	-	2	11.1
JAS	1	-	-	1	5.6
Subtotal	17	1	0	18	42.9
	94.4	5.6			
Total	24	14	4	42	100.0
Percent	57.1	33.3	9.5	100.0	

Material: SPV = metavolcanic; QTZ = quartz; QTE = quartzite;
OBS = obsidian; JAS = jasper; PDL =Piedra De Lumbre chert

Size alone would suggest the little flakes were produced from pressure flaking procedures performed either during the final trimming of a tool like an arrow point or during edge resharpening. Platforms on the flakes are variable including broad ones on convergent flakes and minute ones on expanding/contracting flakes. Some amount of small flakes are also created during percussion phases of reduction. According to Shackley et al. (1989:116), debitage created by both soft hammer and pressure reduction is primarily less than 5 mm in maximum size.

As mentioned in Section XI, certain species of small bony (teleost) fish (anchovies and herring) were recovered only in the fine-mesh screening of the column sample soils. A single bone of a deer mouse was also found only in the bone pieces that fell through the 1/8-inch mesh. The column sampling process also added to the snake and bird bone assemblage totals that had been collected during the dry screening process in the field. The results of this column sample study indicates the value of the fine mesh processing for the recovery of these species and small debitage that would otherwise go undetected. These materials provide important additional information about subsistence practices and tool sharpening activities at the site.

XIII. INTERPRETATION/DISCUSSION

A. Introduction

1. Research Approach

The research approach (see Section III for details) proposed for the Phase I testing and the Phase II evaluation program was both general and particular. In general it indicates a hypothesized dispersed village settlement pattern with several sites forming the central habitation area of the village with other less extensive sites comprising dispersed loci of activity and/or temporary habitation from the main village area. The Phase I inventory and survey identified thirty previously recorded and eight newly discovered prehistoric cultural resource sites within the proposed project alternative. As a result of the Extended Phase 1 subsurface boundary testing program conducted, twelve of the previously recorded thirty sites were combined to form four sites, resulting in a revised total (including the ten new sites) of thirty-two prehistoric sites within the 769-acre project property. The Extended Phase I testing program also determined that fifteen of the these thirty-two sites did not have a subsurface deposit present consisting only of surface artifacts and or bedrock milling features. Phase II evaluation for site significance was subsequently proposed and conducted for the remaining seventeen sites. The results from the Extended Phase I and Phase II testing programs (Tables XIII-1 and XIII-2) indicated that the artifact assemblages at the thirty-two sites resemble the hypothesized settlement pattern of a dispersed village settlement with several sites forming the central habitation area of the village and other less extensive sites comprising dispersed loci of activity and/or temporary habitation away from the main village area. Phase II testing at the seventeen sites with subsurface deposits appeared to indicate that these sites consisted either of main habitation locations with associated milling features, or of milling stations with temporary campsites or smaller habitation areas associated with them. The fifteen sites without deposits represent milling stations without habitation areas associated with them.

With this range of prehistoric site types, four rather broad research hypotheses were formulated to guide the significance evaluation analysis. While other research topics and avenues of analysis could have been proposed, the research topic realms selected appeared the most relevant for the types of sites apparently present and were representative of topics that would be appropriate for the project area. In general these topics involved: 1) site function (temporary settlement versus seasonal village), as noted above, it is assumed that this set of sites may form a portion of the *ranchería* of *Pa'mu*, a bipolar settlement inhabited by the *shrichak* clan, and others, of Mesa Grande in the winter; 2) period of occupation, including possible multicomponent aspects of the site(s) (Late Prehistoric versus late Archaic) based on the presence of pre-bow and arrow type points, and with artifacts recovered from the surface and from STPs indicating a Late Prehistoric occupation, also it is known from ethnographic and ethnohistoric accounts that the settlement of Pamo was occupied well into the early 1800s; 3) food and lithic resource procurement, including determining the diet of the occupants, which may correspond to winter foodstuffs, and determining whether lithic raw materials were procured locally and/or were brought to the valley from nearby environmental settings; and 4) ascertaining trade patterns, at a minimum, introduction of obsidian, presumably from Obsidian Butte in the Imperial Valley and Piedra de Lumbre chert, possibly obtained by exchange from the Camp Pendleton area in northwesternmost San Diego County. The results of the current testing programs are discussed below in terms of the specific research questions posed within each of these general research realms.

Table XIII-1. Recovery Density at the Thirty-Two sites Tested in the Extended Phase I and Phase II Programs

Site CA-SDI-	Volume (m^3)*	No. of STPs	Max Depth	No. of Units**	Max Depth	Artifact Total†	Artifact Density‡	Bone Total	Bone Density
7317	0.38	5	50	0	-	-		-	-
7318	0.23	3	50	0	-	-		-	-
7319	0.15	2	50	0	-	-		-	-
7320	1.10	8	55	1	50	27	24.55	-	-
7321	2.65	26	80	1	80	32	12.08	1	0.38
7322	4.55	31	135	2	70-120	538	118.24	747	164.18
7324	1.68	14	70	1	60	137	81.55	5	2.98
7325	1.23	7	75	1	70	193	156.91	36	29.27
7326	2.18	16	75	1	90	157	72.02	-	-
7751	3.42	22	85	2	80	424	123.98	167	48.83
7752	2.13	16	80	1	100	55	25.82	1	0.47
7753	4.62	32	90	3	40-100	639	138.31	328	71.00
7754	3.47	24	70	2	90	249	71.76	68	19.60
7755	7.76	45	95	4	90-110	2259	291.11	5329	686.73
7756	7.27	49	100	5	50-70	1409	193.81	2322	319.39
7757	2.86	14	110	3	60	1078	376.92	1500	524.48
7758	2.04	15	90	1	70	354	173.53	160	78.43
7759	7.35	45	80	5	50-110	2073	282.04	1155	157.14
7760	0.33	4	80	0	-	5	15.15	-	-
7764	0.23	3	50	0	-	-		-	-
7767	1.51	9	90	1	80	31	20.53	3	1.99
7768	1.41	11	60	1	60	10	6.38	1	0.71
15979	0.20	3	50	0	-	-		-	-
15980	0.31	3	100	0	-	-		-	-
15981	0.19	3	50	0	-	-		-	-
15982	0.06	3	50	0	-	-		-	-
16076	0.21	3	50	0	-	1	4.76	-	-
16077	0.18	2	70	0	-	2	11.11	-	-
16078	0.13	2	50	0	-	-		-	-
16079	0.21	3	50	0	-	1	4.76	-	-
16080	0.15	2	50	0	-	-		-	-
16081	0.16	2	50	0	-	-		-	-
Total		**427**		**35**		**9674**		**11,823**	

* Volume excavated includes both STPs and units
** Sites with units represent Phase II investigated sites
† Prehistoric artifacts
‡ Density is number of artifacts per cubic meter

Table XIII-2. Subsurface Artifacts by Volume Excavated† and Percent Recovered in Phase I and Phase II Testing

	Cores & Flaked Stone Tools			Debitage			Milling Tools			Sherds			All Prehistoric Artifacts		
Site	**No.**	**#/m³**	**%**	**No.**	**#/m³**	**%**	**No.**	**#/m³**	**%**	**No.**	**#/m³**	**%**	**No.**	**#/m³**	**%**
7317	-			-			-			-			-		
7318	-			-			-			-			-		
7319	-			-			-			-			-		
7320	-			27	24.5	0.3	-			-			27	24.55	0.3
7321	-			31	11.7	0.3	1	0.38	0.8	-			32	12.08	0.3
7322	7	1.54	4.4	513	112.7	5.6	10	2.20	7.9	8	1.76	3.1	538	118.24	5.6
7324	2	1.19	1.3	133	79.2	1.5	2	1.19	1.6	-			137	81.55	1.4
7325	5	4.07	3.2	186	151.2	2.0	2	1.63	1.6	-			193	156.91	2.0
7326	1	0.46	0.6	155	71.1	1.7	1	0.46	0.8	-			157	72.02	1.6
7751	10	2.92	6.3	400	117.0	4.4	14	4.09	11.1	-			424	123.98	4.4
7752	5	2.35	3.2	49	23.0	0.5	1	0.47	0.8	-			55	25.82	0.6
7753	10	2.16	6.3	571	123.6	6.3	8	1.73	6.3	48	10.39	18.9	639	138.31	6.6
7754	6	1.73	3.8	226	65.1	2.5	6	1.73	4.8	10	2.88	3.9	249	71.76	2.6
7755	35	4.51	22.2	2163	278.7	23.7	21	2.71	16.7	31	3.99	12.2	2259	291.11	23.4
7756	31	4.26	19.6	1211	166.6	13.3	25	3.44	19.8	136	18.71	53.5	1409	193.81	14.6
7757	11	3.85	7.0	1050	367.1	11.5	6	2.10	4.8	8	2.80	3.1	1078	376.92	11.1
7758	11	5.39	7.0	336	164.7	3.7	7	3.43	5.6				354	173.53	3.7
7759	23	3.13	14.6	2014	274.0	22.1	21	2.86	16.7	13	1.77	5.1	2073	282.04	21.4
7760	-			5	15.2	0.1	-			-			5	15.15	0.1
7764	-			-			-			-			-		
7767	1	0.66	0.6	30	19.9	0.3	-			-			31	20.53	0.3
7768	-			9	6.4	0.1	1	0.71	0.80	-			10	6.38	0.1
15979	-			-			-			-			-		
15980	-			-			-			-			-		
15981	-			-			-			-			-		
15982	-			-			-			-			-		
16076	-			1	4.8	0.0	-			-			1	4.76	0.0
16077	-			2	11.1	0.0	-			-			2	11.11	0.0
16078	-			-			-			-			-		
16079	-			1	4.8	0.0	-			-			1	4.76	0.0
16080	-			-			-			-			-		
16081	-			-			-			-			-		
Total	**158**		**1.6**	**9113**		**94.2**	**126**		**1.3**	**254**		**2.6**	**9674**		**100.0**

† Density (#/m³) is number of items per cubic meter from both units and STPs

B. Test Results Applied to the Research Questions

1. Site (Settlement) Function

Introduction

It is hypothesized that the aggregate of sites within the study area, and probably several beyond the study area, represent a large, dispersed semi-permanent Late Prehistoric settlement as distinct from a series of large temporary camps. White has called such occupation sites *rancherías* and stresses that they can extend over large tracts of land, are fluid in their internal structure over long periods of occupations, and reflect a wide range of human activities.

Question 1:

Does the artifact record at the sites, or at some sites, reflect a wide range of human activities indicative of intensive occupation and use and do those activities speak to both genders participating in the activities practiced there?

Implications:

The implication of a wide range of artifacts and features within the sites is that the activities conducted there may be associated with semi-permanent occupation and use. The further implication is that analysis and study of the sites may allow for a better understanding of the cultural patterns within the settlement as a whole and at the intrasite level.

Data Sets Required:

While not strictly a quantitative question, sample sets of at least fifty specimens would seem to indicate that a given activity (milling, pottery use, cooking, tool sharpening) was actually being practiced on a routine basis and not as an occasional, or infrequent event. The types of data sets would include pottery, milling equipment, pounding equipment, lithic debris from maintaining and sharpening tools, and scraping and fleshing tools. For the pottery to represent more than casual use, or indicative of a single function (cooking, water storage, cremation) there should be a variety of vessel forms and stylistic variations.

Results from the Testing Programs

Results of the initial testing indicated that the artifact assemblages at the thirty-two sites resemble the hypothesized settlement pattern of a dispersed village settlement with several sites forming the central habitation area of the village and other less extensive sites comprising dispersed loci of activity and/or temporary habitation away from the main village area. The fifteen sites without deposits appeared to represent only milling stations with fewer or no other activities evident. Large and deep areas of midden deposit were delineated at nine sites, CA-SDI-7322, CA-SDI-7325, CA-SDI-7751, CA-SDI-7753, CA-SDI-7755, CA-SDI-7756, CA-SDI-7757, CA-SDI-7758, and CA-SDI-7759, with less extensive, but still intensive, areas of deposit identified at two others (CA-SDI-7324 and CA-SDI-7754). At the remaining six sites (CA-SDI-7320, CA-SDI-7321, CA-SDI-7326, CA-SDI-7752, CA-SDI-7767, and CA-SDI-7768) smaller subsurface deposits of a less intensive nature were identified. Results from the Phase II testing (see Tables XIII-1 and XIII-2) indicate that each of the seventeen sites tested had subsurface densities indicative of the relative intensities suggested in the results of the Extended Phase I testing program. The nine sites listed above were verified as having large and deep areas of midden deposit with high densities of cultural materials such as cores and flaked stone tools, chipped stone debitage, prehistoric ceramics, milling tools, faunal bone,

as well as associated milling features. The two sites with less extensive deposit areas, generally, had less but still moderate densities of subsurface materials.

In general, the eleven sites with deposits have more diversified assemblages than the other twenty-one sites on the property indicating a range of human activities occurring in these site areas. Also apparent is that the activities would involve the participation both genders. Sites SDI-7755, SDI-7756, and SDI-7757, in particular, have highly diverse artifact and ecofact assemblages with both hunting equipment and milling tools present. Milling equipment included both manos and metates/milling slicks and basins, and mortars and pestles. The manos and metates/slicks/basins would obviously serve to process grass and/or shrub seed resources. The presence of mortars and pestles would suggest that some processing of locally and/or non-locally procured or stored acorns also occurred. Also present are fragments of ceramic vessels, fire-affected rock, and faunal remains. The presence of pottery would most likely be for the temporary storage of water or vegetal foodstuffs, probably seeds or acorns harvested either from sage scrub plants (e.g., chia) or from various grasses. This diversity would seem to indicate living areas where people of both genders spent extended periods of time and carried out a range of day-to-day activities such as food processing and preparation, tool manufacture and maintenance, and, perhaps, including living structure preparation and maintenance. Some site areas, overall, however, do manifest higher concentrations of particular artifact and/or ecofact types indicating a greater intensity of a particular activity at the site. Site SDI-7755, for example, clearly has a higher density of faunal bone, site SDI-7751 a higher density of ground stone tools, and site SDI-7756 a higher density of pottery than the other sites. These concentrations of particular tool types or ecofactual remains, may be indicative of particular activities carried out there to a greater extent than other activities at the site. It might be expected that in a dispersed village arrangement, certain activities would predominate at one location versus another.

Question 2:

It is hypothesized that the site complex at Oak Country was occupied as part of a seasonal settlement pattern associated with a second village (Tekemuk) at Mesa Grande. Is there evidence to support the contention that Oak Country, as an element of the *rancheria* of *Pa'mu*, was occupied at least during the winter months when Mesa Grande would have been abandoned, and probably during the subsequent spring and early summer months?

Implication:

The implication for a positive answer to the question of seasonal settlement would be to better document the seasonal round of the Ipai. A second, and perhaps more significant implication would be that the village of Pa'mu, or at least a portion of the village may have been archaeologically identified.

Data Sets Required:

The data sets required to address this question could include: radiocarbon dates that correspond to the Late Prehistoric period; an inventory of the food plants available in site vicinity and their inferred season of procurement to provide baseline data; preserved culturally associated macrobotanical remains and/or faunal remains with seasonal implications; and identified tool residue and pollens associated with food procurement and processing associated with a particular time of the year.

Results from the Testing Programs

Food plants available in the site vicinity that are associated with procurement during the months of October through December (fall) are not abundant within the Oak Country project area. For instance, of 21 important to moderately important plant food sources extant within the project, only two, *Quercus agrifolia* (coast live oak) and *Erigphyllum conferia* (golden yarrow) are harvested in the late summer and fall. This lack of important fall food resources corresponds to the hypothesis that the occupants would have been at Mesa

Grande where a far larger number of food resources would have been available. Because of the nature of a question that concerns the timing of site occupation, what was not found in the macrobotanical study of charred plant remains from the sites, and from the pollens present on several ground stone tools from the sites can also be informative. For example, neither charred remains nor pollens from the two plant types indicated above (coast live oak and golden yarrow) were recovered from the macrobotanical and tool pollens samples analyzed from the sites.

The positive results from the macrobotanical and from the ground stone tool pollens studies, while limited, do contribute some evidence to address this question. As described in Section XII, most of the culturally associated plant remains recovered and identified, could either not be sufficiently identified to a level that could provide reliable seasonal availability information, or they were not recovered in sufficient quantities to be confirmed food materials. Of the eighteen plant taxa identified for seeds, nine were identified from a single seed specimen. Of the sixty-one occurrences of twenty-two pollen taxa identified on the four manos analyzed, twenty-nine were identified on basis of only one or two pollen casings. Also complicating the analysis was the fact that some of the taxa identified are today represented on the property only by introduced plants (e.g., *Bromus* sp. and *Erodium* sp.)

For the sake of argument, if the premise is accepted that the plant taxa under discussion were derived from prehistoric pollens present on the ground stone tools from the sites and from prehistoric carbonized seeds retrieved from the site column samples, then they have an implied possible food or medicinal association with the prehistoric inhabitants of the sites. Therefore, attempting to delineate the likely time during the year when they may have been collected could be informative of the period of the year that the sites were inhabited. For several plant genera, however, such as *Artemisia*, the ethnographic literature does not specify the species currently present on the property as a food source, but does indicate that other species of the genus in other areas were used as food. Because the plant taxa categories identified are often general and/or the ethnographic literature is vague or does not contain information about the timing of gathering practices, it was necessary to also consult the botanical literature in order to ascertain the optimal time of the year that seeds from the plants identified would be gathered. Table XIII-3 presents the recovered plant taxa indicated by the pollens found on the ground stone tools and by the carbonized seeds retrieved from the macrobotanical column samples taken from two of the site areas. The results of an analysis of a combination of information contained in the local ethnographic and/or in the botanical literature concerning prehistoric gathering practices in the former, and of the most opportune times of the year for gathering plants or plant seeds from the latter, area also indicated for these plant taxa in Table XIII-3. The results suggest that procurement of the represented vegetal resources, by the inhabitants of the project sites, would have been most productive during late winter through to the beginning of fall, i.e., from approximately January or February to September.

Results from the faunal materials analysis, also limited in information about seasonality, suggest a late winter, spring, and summer occupation of the project sites. This is based on the presence three juvenile bones from deer, that are normally born during this period, and from the presence of pond turtle, that would be in hibernation during the coldest winter months (i.e., December and January) but available the rest of the year.

2. Procurement of Lithic Resources

Introduction

Preliminary analysis of the flaked lithic materials from the surface of the sites as well as from the shovel test pits indicated that, while metavolcanics and milky quartz may have served as the most heavily used lithic material, several other varieties served the prehistoric community. Analysis of these lithic materials

Table XIII-3. Seasonality of Mano Pollen and Flotation Seed Taxa

	Season							
Taxa	**Winter**		**Spring**		**Summer**		**Fall**	
Mano Pollens								
Alnus sp. (alder)	----	----	----	----	----	----	----	----
Pinus sp. (pine)								
Populus-type (cottonwood)	----	----	----	----	----	----	----	----
Prosopis-type (mesquite)								
Quercus sp. (oak)								
Artemisia sp. (California sagebrush)								
Erigonum sp. (buckwheat)								
Adenostoma-type (chamise)	----	----	----	----	----	----	----	----
Ephedra sp. (Mormon tea)								
Erodium cicutarium (filaree)								
Lycopodium sp. (clubmoss)	----	----	----	----	----	----	----	----
Plantago (plantain)	----	----	----	----	----	----	----	----
Anacardiaceae (sumac family)								
Liguliflorae (chicory) (*Rafinesquia* sp.?)								
Asteraceae (low /high-spine, sunflower family)	----	----	----	----	----	----	----	----
Poaceae (grass family)								
Brassicaceae (mustard family) (native specie)								
Cheno-Am (goosefoot-pigweed)								
Sarcobatus sp. (greasewood)	----	----	----	----	----	----	----	----
Euphorbia sp. (spurge)	----	----	----	----	----	----	----	----
Trichostema-type (vinegar weed, bluecurls)								
Trilete rugulate (fern)	----	----	----	----	----	----	----	----
Floation Seeds								
Bromus sp. (brome grass) (native species)								
Chenopodium sp. (goosefoot)								
Convolvulaceae (morning-glory)	----	----	----	----	----	----	----	----
Deschampsia sp. (hair grass)								
Fabaceae (pea family) (*Trifolium* sp.?)								
Lathyrus sp. cf. (wild pea)								
Lotus sp.	----	----	----	----	----	----	----	----
Hemizonia sp. (tarweed)								
Hordeum sp. (barley)								
Lamiaceae cf. (mint family)	----	----	----	----	----	----	----	----
Malosma laurina (laural sumac)	----	----	----	----	----	----	----	----
Marah sp. cf. (wild cucumber)								
Rumex sp. (dock)								
Scirpus sp. (bulrush)								
Solanaceae (datura, nightshade, tobacco)	----	----	----	----	----	----	----	----
Vulpia/Festuca (fescue grass)								

Dashes indicate either that there is no evidence of use or that the category contains too many candidates to delineate a collecting period.

(obsidian, Piedra de Lumbre [PDL] chert, metasedimentary, and several other miscellaneous, fine-grained, siliceous rocks) can lead to a better understanding of lithic procurement techniques and strategies to include trading for such materials and traveling to lithic resources to procure them.

The importance to prehistoric hunter-gatherers, of flaked stone tools cannot be overemphasized because they represented such a large percentage of their subsistence tools. Consequently, their influence within, and upon, the hunter-gatherer mobility system is substantial. The prehistoric importance of the procurement of the fine-grained lithic raw materials with the property of conchoidal fracture, from which these tools were made, also cannot be overemphasized. They were absolutely essential to prehistoric hunter-gatherers because they represented the basic material from which this large percentage of their tools were made. In modern terms they were to their tool industry as iron, steel, and plastic are to us today.

Such lithic materials, especially those of the best quality, were also, frequently, relatively rare and often restricted in accessability in the natural environment. It was essential, therefore, for prehistoric hunter-gatherers to know very well what materials were available in their local environment and where to find them. As a consequence of this importance, the procurement of these raw materials in the local environment usually became an "embedded" element of their subsistence and mobility strategies (Binford 1979) with such invaluable knowledge undoubtedly handed down and taught from parent to child. Because of their frequently restricted accessability, hunter-gatherer groups had to plan for, and incorporate, the procurement of these resources into their subsistence and mobility strategies. For example, these strategies could include 1) procurement within the immediate (one day) gathering range of a settlement, 2) procurement within a more extended but still short, range (one to three days), procurement within a greater range requiring travel (perhaps a week), or procurement by trade with local groups. Recognition of this causal or influential factor in the mobility and procurement ranges and, therefore, the settlement and subsistence patterns of mobile hunter-gatherers is essential.

Question 1:

Did the occupants of the settlement make use of outcroppings of the Bedford Canyon Formation metasediments and/or the more distant outcroppings of the same metasediments at Mesa Grande 35 miles to the east? Can it be assumed that if the occupants made use of the nearby source that the lithic debris will reflect primary as well as secondary phases of stone reduction? And that as a corollary, if the more distant source was used, then the tools would have been roughed out at the occupation site at Mesa Grande and the lithic debris at these sites would reflect maintenance and sharpening of the already completed tools (secondary and tertiary lithic production).

Implications:

The implication of this question is that it could document the use by the site inhabitants of particular lithic raw materials with which they were familiar and to provide a better understanding of the exploitation of such resources by these highly mobile people. Further, if it can be determined that the Mesa Grande source was used, this could be additional evidence that the people form this settlement traveled to Mesa Grande on some basis, perhaps seasonally.

Data Sets Required:

Identification of the local (nearby) source and sufficient specimens of Bedford Canyon Formation lithics within the sites. Because this question is not necessarily based on quantitative data, no set threshold can be set. However, the presence of a given lithic, in this case metasediments, should not be a singular or rare occurrence.

Results from the Testing Programs

Fifty-seven pieces of metasedimentary material were identified at twelve of the sites: SDI-7321 (n=1), SDI-7322 (n=4), SDI-7324 (n=1), SDI-7325 (n=3), SDI-7326 (n=1), SDI-7751 (n=3), SDI-7753 (n=4), SDI-7754 (n=3), SDI-7755 (n=2), SDI-7756 (n=3), SDI-7757 (n=1), and SDI-7759 (n=31). Five tools were made of this material, a scraper plane, a scraper, a chopper, a non-diagnostic biface blank fragment, and a modified/utilized flake. The remaining pieces all consist of flaked stone debitage. In the debitage, only six pieces were identified as having cortex present and only five whole flakes were three centimeters or larger. An attempt was made to locate a nearby source (approximately 1.5 kilometers to the southeast of the project area), indicated on a geologic map published in Weber (1963). The area of the outcrop was examined, but the results were negative for this material. While no specific outcrop was identified in proximity to the project sites, it appears likely that based on its previous geologic identification in the valley that this stone material is available in the area, and could have been locally procured. Some initial reduction at the procurement location, appears like to have occurred with the products then carried back to the sites for further working and/or use. The proposed non-site preliminary reduction is based on the paucity of large size and cortical debitage identified at the sites.

In regard, specifically, to the research question posed, it would appear that the occupants of the settlement did make use of local outcroppings of Bedford Canyon Formation metasediments and/or made use of the more distant outcroppings of the same metasediments at Mesa Grande. Which, or whether both of these sources were used, however, remains a question. The lithic debris does reflect primary as well as secondary phases of stone reduction, but secondary reduction does seem to predominate. This result may indicate that tools or cores were roughed out at the occupation site at Mesa Grande and the lithic debris at these sites reflects mostly maintenance and sharpening of the already completed tools (secondary and tertiary lithic production). It could also indicate, as noted above, that the initial reduction occurred at a nearby procurement location with the products then carried to the sites for further working and/or use.

Question 2:

Is the obsidian on the sites from Obsidian Butte seventy-five miles (120 km) to the east in the Imperial Desert, as is most typically the case in Late Period sites, or did some/all of the obsidian originate at other more distant sources such as Coso to the north or San Felipe within Baja California? Likewise, is the Piedra de Lumbre (PDL) chert on the sites also a candidate for procurement by exchange, as the source is located more than thirty-nine miles (60 km) to the northwest of the project area?

Implications:

The implications for obsidian from any source are that these relatively exotic lithic materials were either brought to the site as a result of trade or through travel to the sources and direct procurement. If the source is Obsidian Butte, the occupants of this settlement could have conducted trade with the Yuman-speaking, Kamia allies to the east or perhaps made forays into the desert and directly procured the resources. While still not exactly certain, Obsidian Butte material would have been available by 1000 A.D. To the south in Baja California, San Felipe is situated in an area occupied by Yuman-speaking people often labeled the Cochimi. Trade with, or travel to, this region would have been practical and culturally viable.

By contrast, the presence of Coso obsidian would more likely indicate trade over a long distance (circa 300 miles) rather than direct procurement. This assumption is based on the sheer distance and, more importantly, the location of Coso in Shoshonean-speaking territory, a territory occupied by linguistically and cultural differing people. Given these differences, the source, or sources, for the obsidian at the Santa Maria

settlement could reflect long distance trading with other similar or disparate cultures, travel into culturally familiar or "exotic" territory, or combinations of these efforts.

As with Obsidian Butte obsidian, the implications for PDL chert, from the only known source thirty-nine miles to the northwest on Camp Pendleton, are that these relatively exotic lithic materials were either brought to the site as a result of trade or through travel to the sources and direct procurement. The occupants of this settlement would have had to have conducted trade with the Shoshonean-speaking, Luiseño or Juaneño or, perhaps, made forays into the north county area and directly procured the resource. Trade with, or travel to, this region could, possibly, have been dangerous and/or not culturally viable.

Data Sets Required:

Because the questions do not address chronological questions, possible changes over time, or relative frequencies, the data set can be relatively small. The presence of obsidian from any or all of the known sources will serve to verify the existence of either trade or travel. The presence of PDL chert from the only known source will serve to verify the existence of either trade with, or travel into the area of a people other than Yuman-speaking groups.

Results from the Testing Programs

Fifty-nine pieces of obsidian were recovered, five of which were very small pieces recovered from four column samples (see Section XII). All fifty-nine pieces were derived from six sites, SDI-7322 (n=2), SDI-7753 (n=2), SDI-7755 (n=9), SDI-7756 (n=14), SDI-7757 (n=10), and SDI-7759 (n=22). Of these pieces, sourcing results were obtained on twenty-three samples from five of the six sites. Results of these studies indicated that most of the sourced obsidian (n=15; 55.6%) derived from Obsidian Butte. Six others (22.2%) were sourced to the Coso Volcanic Field, approximately 350 kilometers north of Ramona, near Coso Hot Springs in Inyo County, California, and one piece from Casa Diablo in Mono County, 110 miles (175 km) north of the Coso source in California, found at site SDI-7755. The source for one of the samples submitted from site SDI-7756 was not known, and according to Dr. Steven Shackley "it is not any source reported from California, Arizona, Nevada, New Mexico, or northern Mexico" (personal communication to Carol Serr).

In the ethnographic territories as defined by Kroeber (1925), Obsidian Butte would have been located in the area defined for the Kamia. During the period from post A.D. 1210 to historic contact (circa A.D. 1760), the specific culture group who occupied and controlled the source (Obsidian Butte) and adjacent area is uncertain, but it is assumed that the trade pattern for Obsidian Butte obsidian included the Kamia, Cahuilla, Chemehuevi, and Kumeyaay (Diegueño), who shared and exchanged this resource (Ericson 1978). No conclusive ethnographic or ethnohistoric record of obsidian procurement or exchange, however, has been found (Davis 1961:20; Gifford 1931:17, 23), although it is suggested by Hoenthal (1950:11, 2001) and assumed by Heizer and Treganza (1972). For the project sites, Obsidian Butte obsidian was either procured directly by the Kumeyaay or through exchange with the Kamia in whose territory it was probably located (Dominici 1984; Shackley 1981; Koerper et al. 1986).

Obsidian from Coso is also found on Late Period sites, but far less frequently than Obsidian Butte. When found to be the dominant or a significant material represented at archaeological sites in the coastal areas of Orange and San Diego Counties, Coso obsidian appears to often (but not always) be indicative of occupation prior to the onset of the Late Period, i.e., before circa 1300 years B.P. (Hughes and True 1985; Koerper et al. 1986). Use of this material, then, would fall within the time period encompassed by the Millingstone and Intermediate horizons, and of the Encinitas tradition. The Encinitas tradition is postulated to span the period from circa 2,000 to 7,500 years ago in the San Diego area (Warren 1968:12) where it is associated, locally, with the La Jolla complex. Hughes and True (1985:333-334) have also posited that Coso obsidian may have

been conveyed to the coastal Orange and San Diego counties area by way of coastal trade routes, as evidenced by the greater frequency of Coso obsidian along the coast when compared to inland sites. Koerper et al., however, have proposed a more inland route through the northern Mojave Desert and Cajon Pass and then southwest into Orange County (1986:57). Whether this latter route would also be a conduit into the San Diego coastal area is unclear.

Due largely to its rarity, less is known about how and when Casa Diablo obsidian made its way into the local area. Neither a definite route of exchange nor the time of entry for Casa Diablo obsidian into the San Diego area has been determined. It might be assumed that this material would follow a route similar to Coso obsidian given the direction and locations of each of these sources relative to the San Diego area. It might also be assumed that a similar earlier (i.e., pre-Late Period) time frame would also be likely as Koerper et al. have indicated that production from this source dramatically declined after 500 B.C. (1986: 55). Neither of these assumptions, however, can be verified with the current level of information.

In regard to PDL chert, thirty-five pieces were recovered including a very small piece recovered in a column sample. The thirty-five pieces were derived from nine sites, SDI-7322 (n=2), SDI-7325 (n=1), SDI-7326 (n=1), SDI-7753 (n=2), SDI-7755 (n=6), SDI-7756 (4), SDI-7757 (n=1), SDI-7758 (n=12), and SDI-7759 (n=6). Six of these sites are the same sites that contain obsidian. The site with the most PDL chert, however, is a site at which no obsidian was recovered, site SDI-7758. The import of this latter occurrence is not immediately known. Only one tool was made of this material, a small non-diagnostic biface fragment. The remaining pieces all consist of flaked stone debitage. In this debitage, two pieces were identified as biface reduction flakes. As indicated above, the occupants of the overall settlement that these nine sites represent would have had to have either conducted trade with the Shoshonean-speaking, Luiseño or Juaneño or, perhaps, made forays into the north county area and directly procured this resource. Trade with, or travel to, this region, however, could possibly have been dangerous and/or not culturally viable. Pigniolo (1992:285) has indicated that this material was obtained primarily if not exclusively through direct procurement and not by exchange. He concludes that cultural and territorial constraints on such procurement such as might be postulated to have existed between Shoshonean and Yuman speaking peoples (i.e., between the Luiseño/Juaneño and the Kumeyaay) would not have inhibited direct procurement by the Kumeyaay of a resource located in Luiseño/Juaneño territory. Also of interest is the fact that more obsidian (a more distant material) was recovered in these test investigations than was PDL chert.

Question 3:

The STP data suggests that the two lithic raw materials most frequently used at the sites for flaked stone tool manufacture were Santiago Peak metavolcanics and milky quartz. Do the relative proportions of these particular types, as well as of other of lithic raw materials present at the sites, reflect the ease of gathering of these various materials?

Implications:

As indicated above, lithic materials, especially those of the best quality, were often relatively rare and restricted in accessability in the natural environment. It was, therefore, essential for prehistoric hunter-gatherers to know very well what materials were available in their environment and where to find them. The importance of these resources and their frequently restricted accessability, required hunter-gatherer groups to plan for, and incorporate, the procurement of these resources into their subsistence and mobility strategies. Recognition of this causal or influential factor in the mobility and procurement ranges and therefore, the settlement and subsistence patterns is important in assessing the relative mobility a particular hunter-gatherer group.

Data Sets Required:

Identification of the lithic material types of the flaked stone tools and debitage recovered from the sites and comparison of the relative quantities of these materials. Identification of potential sources of these materials relative to the project sites.

Results from the Testing Programs

The pattern of selection and use of certain rock materials for flaked stone tools was evident in the testing results. With the exception of PDL chert and obsidian, all of the flaked stone lithic raw materials recovered, would probably have only required a minimal amount of travel or other effort to acquire. Quartz and metavolcanics were almost exclusively (92.9%) the stone materials used for flaked stone tool making at all of the sites investigated. These materials were almost certainly derived from locally occurring cobbles and/or in the case of quartz, possibly by quarrying it from numerous pegmatite dikes (see Section VII) present in the local granitic bedrock in the area (cf. Saunders 1993:55-56). Metavolcanics were used for both larger core tools such as scraper planes and choppers as well as for smaller tools such as projectile points, scrapers and utilized flakes. Quartz on the other hand, was used primarily for smaller tools such as bifaces and small scrapers. An exception for quartz was its use for hammerstones.

The more limited use of other local materials such as quartzite, and metasedimentary rocks (as discussed above) appears to have been for making both formal and expedient tools. It appears most likely, that since all of these stone materials are available nearby in the area, they would procure them locally, perhaps perform some initial reduction at the procurement location, and then carry the products back to the sites for further working and/or use. This proposed non-site preliminary reduction is based on the low percentage of large size and cortical debitage identified for these materials at the sites. For quartz, only 1.8 percent of the debitage had cortex present, while 5.5 percent of the metavolcanic debitage had cortex present. A somewhat surprising 4.7 percent of the whole flakes in the quartz debitage were three centimeters or larger, while a more expected 7.3 percent of the whole flakes in metavolcanic debitage were three centimeters or larger. The number of larger quartz flakes may be indicative of the production of biface blanks for arrow point manufacture considering the large number (n=45) of fragmentary preforms and amorphous biface fragments recovered from the sites, the majority (75.6%) of which were quartz.

3. Temporal Setting for the Site (Settlement)

Introduction

It has been suggested by one of the report authors (Carrico) that the sites under study represent the prehistoric/ethnohistoric period settlement of Pa'mu (Pamo). This hypothesis is based on a synthesis of historic documents, on the surface features and artifacts, and on the location of the sites within the Santa Maria Valley. The general artifact assemblage, the bedrock mortars, and other indices clearly reflect a cultural component associated with the Late Prehistoric circa post 2,000 years ago. If the site was occupied during the early historic period (probably circa 1769-1790) and was moved further to the north and east into what is now known as Pamo Valley, the occupants would have had an opportunity to trade with Spanish or Mexican settlers and may be the *ranchería* noted as Pamo in historical documents.

Question 1:

Do the sites reflect a temporal setting that places them within the late Prehistoric period circa 2,000 years ago to the time of Spanish contact circa 1769 A.D.? Is there any evidence that the sites were occupied subsequent to the intrusion of the Spaniards and, therefore, a contact period settlement?

Implication:

Relatively few of the known sites in the Santa Maria Valley and western Ramona area assumed to be from the Late Prehistoric period have been accurately dated. Dating of these sites and tying the cultural materials into a chronological framework would verify that the valley was settled by Kumeyaay people of this time period, and in conjunction with other research questions, may indicate that these sites were in fact a Late Prehistoric to Contact Period *ranchería*, possibly *Pa'mu*.

Data Sets Required:

Questions of chronology can be addressed through the recovery of organic materials for radiocarbon dating, through obsidian hydration and sourcing, and through the recovery of temporally diagnostic artifacts such as desert side notched or Cottonwood triangular arrow points, ceramics, and historic materials.

Results from the Testing Programs

Results from the current test investigations produced data to support the presence of a Late Archaic as well as a Late Prehistoric occupation of the sites. Four radiocarbon dates indicate an antiquity extending back to 1800 B.P. (CAL intercept of 1800 B.P. or A.D. 150) with three other dates of 1060 B.P. (CAL intercept of 1060 B.P. or A.D. 890), 530 B.P. (CAL intercept of 530 B.P. or A.D. 1420), and 100±40 RCYBP (uncalibrated). These dates indicate that the sites have nearly 2,000 years of time depth and with individual dates of circa 1,000, 500, and 100 years, they suggest recurrent occupations of the sites over this period of time from the late Archaic through the Late Prehistoric and into early historic times.

Obsidian sourcing and hydration data also appear to support the presence of a late Final Archaic occupation, and are consistent, therefore, in this regard with the results from the radiocarbon study. Twenty-three samples of obsidian, from various levels of the sites deposits from top to bottom, were analyzed for sourcing and hydration. Fourteen of the samples were determined as deriving from Obsidian Butte, a material considered diagnostic of the Late Prehistoric period, and six from the Coso Field, considered by some researchers as diagnostic on the coast of an Archaic occupation (Hughes and True 1985). Also recovered was a, locally, rare piece of obsidian from the Casa Diablo source, which could also be indicative of an early Late Prehistoric or a late Archaic period occupation of the sites.

The fourteen Obsidian Butte samples produced mean band thicknesses ranging from 1.1 to 3.3 microns. Based on Dominici's (1984) linear accumulation rate formula of 78.16 years per micron, these readings would result in extrapolated dating for the use of Obsidian Butte obsidian at the sites ranging from A.D. 1915 to A.D. 1743. Using a linear rate proposed by Koerper et al. (1986) for Orange County sites, of 110 years per micron produces dates of A.D. 1880 to A.D. 1638. Using a linear rate of 147 years per micron recently proposed by Laylander (1995), from a site near the Salton Sea, produces the most reasonable dates of A.D. 1839 to A.D. 1516. The range for Coso obsidian use at the sites, could be from A.D. 900 to 1508 B.C. using Ericson's (1978) linear rate of 344 years per micron; from A.D. 1297 to 243 B.C. using the linear rate of 220 years proposed by Meighan (1983); from A.D. 744 to 5935 B.C. using Cleland's non-linear formula (1989); and from A.D. 1338 to 7783 B.C. using the Koerper et al. non-linear formula (1986). These dates, obviously, also vary considerably. When viewed in conjunction with the three earliest radiocarbon dates (CAL intercepts) from the sites of A.D. 1420, A.D. 890, and A.D. 150, it can be surmised that for the use of Coso obsidian, either of the linear formula rates proposed by Ericson and by Meighan yield results most compatible with the parameters indicated by the radiocarbon dating. Also, of potential interest is the fact that none of the formulae indicate use of the Coso material later than A.D. 1338.

These obsidian studies results not only verify a Late Prehistoric occupation at the sites, but also suggest the presence of an older, probably Archaic, occupation represented at the sites based on several proposed rates for Coso obsidian. A note of caution, however, has recently been introduced concerning hydration rates for Coso obsidian found on local coastal and near coastal sites. Demcak (1994) working on an apparently exclusively Late Prehistoric site in Luiseño territory, CA-RIV-2229, near Murrieta Hot Springs (approximately 60 kilometers north from the project sites), recovered only Coso obsidian at the site. A suite of six radiocarbon dates from the site appeared to confirm a site assemblage that was strictly Late Prehistoric in composition. The six radiocarbon dates ranged from A.D. 930±80 to A.D. 1650±60 with four of the six dates concentrated between A.D. 1340 and A.D. 1450. The hydration rinds on twelve Coso obsidian samples ranged from 10.8 to 3.2 microns with a mean value of 6.0 microns. Based on these results, Demcak rejected rates such as those indicated above as being inconsistent (too old) with the site assemblage. She indicated that based on matched pairs of obsidian samples and radiocarbon dates from the site that a linear rate of approximately 78 years per micron would be more consistent with the site assemblage and radiocarbon dates. She then successfully applied the rate to a second site nearby, CA-RIV-722, with a similar obsidian composition and radiocarbon dating, again producing dates more consistent with the Late Prehistoric artifact assemblage recovered from the site (Demcak 1994).

Applied to the project sites, this rate would result in a date range for Coso obsidian of from A.D. 1275 to A.D. 1751. Such a range would obviously be consistent with the Late Prehistoric aspect of the site but would remove this material as an indicator of an earlier Archaic occupation. The presence of radiocarbon dates at the sites consistent with an older occupation, however, would still seem to indicate the viability for an Archaic association for Coso obsidian. None-the-less, Demcak's results do introduce an element of caution in assuming that Coso obsidian found on local coastal sites with rind thicknesses exceeding 4.0 microns is a definite indicator of Archaic occupation of a site.

Additional evidence of temporal placement includes the presence of 254 pieces of Brown Ware pottery occurring at seven of the sites: SDI-7322 (n=8), SDI-7753 (n=48), SDI-7754 (n=10), SDI-7755 (n=31), SDI-7756 (136), SDI-7757 (n=8), and SDI-7759 (n=13), also an indicator of a Late Prehistoric occupation of the sites. Generally, the introduction of ceramics in San Diego County is thought to have occurred in the Late Prehistoric Period, after, circa A.D. 1,000 (May 1976), but earlier dates have been proposed of circa A.D. 700 to 800 (cf. Moriarty 1966:27; Carrico and Taylor 1983:147-148). Flaked stone projectile points are also temporal indicators. The presence of Cottonwood Series arrow points at four sites: SDI-7753 (n=2), SDI-7755 (n=2), SDI-7756 (n=6), and SDI-7759 (n=2), is a temporal indicator of the Late Prehistoric Period. According to McDonald and Eighmey (1998), an approximate date of A.D. 1000 is currently accepted for the initial occurrence of small arrow points in southern California, but they note that Koerper et al. (1996:271) have recently proposed an earlier date of from A.D. 400 to 800. Also found were two larger projectile points at sites SDI-7755 and SDI-7757, possibly indicative of an earlier occupation of the sites. These points may represent the Elko Eared style of dart point indicative of a Final Archaic/early Late Prehistoric temporal association circa 2,000 B.C. to A.D. 700 (Warren et al. 1998). Also possibly suggestive an earlier occupation of the sites was the recovery of a few large highly patinated formal tools such as bifaces and scrapers.

In regard to the first part of the research question posed:"do the sites reflect a temporal setting that places them within the late Prehistoric period circa 2,000 years ago to the time of Spanish contact circa 1769 A.D.?," the presence of Cottonwood Series projectile points, ceramics, and Late Prehistoric Period Obsidian Butte obsidian with appropriate hydration readings, and late radiocarbon dates, indicate that the project sites were mainly occupied during the Late Prehistoric period (post A.D. 900), up to the contact period in the early 1800s. The presence, however, of an A.D. 150 radiocarbon date; one, and possibly two, Elko Eared biface fragments; Coso obsidian with appropriate hydration readings, well as the recovery in the excavations of a few highly patinated artifacts may suggest that an earlier Final Archaic occupation (i.e., circa 2000 B.C. to A.D. 700) may be present at the sites.

Regarding the second part of the question "is there any evidence that the sites were occupied subsequent to the intrusion of the Spaniards and, therefore, a contact period settlement?," evidence recovered is limited. Only two types of evidence to suggest this possibility were produced, 1) an artifact, a small flake struck from a piece of blue transfer ware crockery, was recovered from site SDI-7753; and 2) a radiocarbon date of 100±40 B.P. was obtained on charcoal from the vicinity of subsurface Feature 1 at site SDI-7756. This date, which could not be calibrated, would indicate a time of circa A.D. 1850. Also, while not reliable enough to be considered as definite evidence for a post contact occupation, all of the obsidian hydration formulae listed above would produce post 1769 dates on the thinnest rind measurements for Obsidian Butte obsidian from several sites (see Question 2 above).

4. Technological and/or Environmental Change

Introduction

It has been suggested that a severe drought took place during the 1250-1290 A.D. era of the late Holocene. In the Southwest this drought is well documented and led to a decrease in agriculture and a decline in the populations and cultures of that region. The degree to which southern California and San Diego County cultures were affected is uncertain. Collectors and foragers, as well as people with incipient agriculture may not have been as affected by the drought as agricultural people to the east.

It has also been suggested that the period circa A.D. 0-700 may have been a time of technological change when a hunting technology, the dart and atlatl, that had been use for several millenia, was replaced by a new and superior hunting technology, the bow and arrow (McDonald and Eighmey 1998:III-23). Discussion amongst researchers involves specifically when and how quickly this change occurred and what artifacts (principally projectile points) are indicative of one technology versus the other (cf. Raven-Jennings and Smith 1999). Questions regarding both the size and style of these artifacts continue to be debated with the answers lying in sites which contain both the pertinent diagnostic artifacts and time depth; the latter being verifiable by radiometric dating.

Question 1:

Can a drought of circa 1250-1290 A.D. be documented at the Oak Country site? If so, are there any discernible changes in artifact types, faunal remains, or pollens that might reflect vegetation changes, or intensity of occupation?

Implication:

If there is evidence of a drought and indications that the Ipai adapted to the drought, the implication would be that the drought can be documented in southern California and that the adaptive measures taken by the prehistoric people can be compared and contrasted locally and regionally. If, on the other hand, the Ipai withstood the drought without significant cultural and technological change, this could indicate that Collectors, versus sedentary agriculturalists, were less affected by the drought and may have been more malleable in their food procurement and processing techniques.

Data Sets Required:

The data sets required to address this question could include pollens from stratified natural and cultural deposits, radiocarbon dates that correspond to the A.D. 1200-1300 period, and or faunal remains/artifacts associated with food procurement and processing.

Results from the Testing Programs

None of the radiocarbon dates obtained in the testing correspond to the period A.D. 1200-1300. Two of the radiocarbon dates do, however, bracket the period in question, i.e., Cal A.D. 790-970 (1 Sigma) and A.D. 1400-1430 (1 Sigma). Whether the absence of dates during the purported drought period indicates an absence of habitation at the project sites during this time or is just happenstance cannot be determined with present data. While the small samples produced in the testing program did not produce specific information to substantially address this question, site SDI-7322 did produce two radiocarbon dates that predate A.D. 1200-1300, and site, SDI-7755, while not producing radiocarbon dates, did contain a time sensitive artifact that could indicate that it also predates A.D. 1200-1300. These results indicate that these sites possess sufficient time depth to, in future research, potentially provide information about this drought period.

The analysis of the pollens in the soil samples from four 1 by 1 m test unit columns produced a picture of variation indicative of incremental change in vegetation communities within an overall pattern of relative stability of vegetation growth in the area through time. These results are typified in the longest column (120 cm), taken from an off-site unit (Control Unit 1) which depicted three basic and distinct periods of vegetation distribution and change for the area as represented at this location. The lowest levels of the column indicated the probability of more mesic conditions in the earliest times compared to today. This is followed in the middle and upper levels by pollen changes that indicate an increase through time in the presence of a southern mixed chaparral community, and an increased presence of the oak woodland community, and of oak trees in particular, in recent times.

The more mesic environment is suggested in the lower levels by the presence of pollens from plant families such as Liguliflorae, Onagraceae, and Poaceae, along with *Quercus*. Subsequently, these plants with the exception of *Quercus*, diminish or disappear in the column and are replaced or are augmented by High-spine Asteraceae, *Adenostoma*-type (chamise), as well as possibly Ceanothus and Rhamnus, all plant types typical of the southern chaparral community. Concurrent with this change is an increase in *Eriogonum* (buckwheat) through time, but it does not appear in this column to have ever become abundant. *Quercus* seems to have been present throughout the period represented by the column, but with a noticeable increase in recent times.

While the change reflected in this and the other columns is not substantial, it does appear to indicate that climatic conditions and plant communities have altered somewhat, but not substantially, during the indeterminate length time reflected by the columns. One occurrence, the increase in oaks, in what appears to be very recent times, could perhaps be suggestive of an increase in moisture during the period subsequent to 1250-1290 A.D. In regard to the drought hypothesis, however, the results from the pollen study must be considered conclusive. This is, principally, because the length of time expressed in the pollen columns is indeterminate. It can only be observed that the radiocarbon dates obtained on the project, which are not derived from the specific units of the pollen soil samples, indicate a time depth of as much as 1800 years or as little as 140 years could be reflected in the pollen samples. Without a more specific control of time, distinguishing a specific drought period of circa 1250-1290 A.D. at the Oak Country site is not feasible. The changes in the record described do suggest an incremental change from wetter to drier climatic conditions, except during the most recent times, but overall the pattern has been one of relative stability with minor change in the vegetation the in area through time

Question 2:

Can the period circa A.D. 0-700 be documented at the Oak Country sites? If so, are there any discernible changes in projectile point artifact types diagnostic of either dart and atlatl or the bow and arrow indicative of technological change?

Implication:

If such time depth and artifact types can be documented, the implication would be that the sites may have been occupied, either by more than one cultural group using distinct hunting technologies, or by the same cultural group for many generations during which a significant new subsistence technology was acquired or developed.

Data Sets Required:

The data sets required to address this question include radiocarbon dates and diagnostic artifacts indicative of both of these types of hunting technologies.

Results from the Testing Programs

As already indicated above under Topic Realm 3, results from the current test investigations produced data to support the presence of a late Final Archaic as well as a Late Prehistoric occupation of the sites. Four radiocarbon dates indicate an antiquity extending back to 1800 B.P. (CAL intercept of 1800 B.P. or A.D. 150) with three other dates of 1060 B.P. (CAL intercept of 1060 B.P. or A.D. 890), 530 B.P. (CAL intercept of 530 B.P. or A.D. 1420), and 100±40 RCYBP (uncalibrated). These dates indicate that the sites have nearly 2,000 years of time depth and with individual dates of circa 1,000, 500, and 100 years, they suggest recurrent occupations of the sites over this period of time from the late Archaic through the Late Prehistoric and into early historic times.

Sixty-seven whole, and fragments of, biface artifacts were recovered from eleven of the thirty-two Oak Country sites. These artifacts consisted of small arrow point related bifaces, a few possible dart points, and a large number of mostly fragmentary larger size bifaces. The former group consists mostly of Cottonwood Series triangular shaped arrow points, and small biface preforms likely connected with their manufacture. Included in the second group are larger biface projectile point (dart?) types and some special function biface tools, i.e., reamers/perforators. The last group of bifaces consist mostly of largely amorphous, non-diagnostic biface fragments (e.g., tips and edge fragments), apparently derived from both larger and smaller biface tool manufacture.

Two, and possibly three of the bifaces recovered from three of the Oak Country sites (SDI-7755, SDI-7756, and SDI-7757) may provide a basis for addressing the possible presence of “transitional” arrow point types and/or dart points. The introduction of the bow and arrow in the Great Basin has been postulated to have occurred circa A.D. 500 (Koerper et al. 1996:261). With the time depth indicated by the radiocarbon dates at the project sites (i.e., to circa 1800 B.P. or A.D. 150), and the dates indicating continuing, at least intermittent, occupation of the sites over this nearly 1800 year period, it appears plausible that the incipient use of the bow and arrow could be expressed in the biface assemblage of the sites. Two of the large projectile point bifaces recovered may represent examples of early transitional dart to arrow points. One specimen could possibly be considered as a manifestation of these transitional point types due to its relatively small size (i.e., less than 3.5 grams [cf. Fenenga 1955]), and to a degree, its minimal stylistic resemblance to some Great Basin transitional types (e.g., Thomas’ Large Side-notched points [1981:18-19). The second biface fragment (approximately 60% of the original point with a fragment weight of 2.3 grams), is an Elko Eared style point,

with an original weight of at least 3.8 grams when whole. This would seem to indicate that it functioned as a dart point unless the breakage represents attempts to rework it into a new form. With this basal morphology however, it does not seem likely that it could have functioned effectively as an arrow point even after it was reworked. A third possible candidate is Cottonwood Series in style with only its large size (fragment weight 2.5 grams, whole weight extrapolated to be greater than 3 grams) making it doubtful as an arrow point. While the function and temporal association of this point is unclear, Koerper and Drover (1983) have speculated that similar points found in coastal Orange County may date to as early as A.D. 750 and may have functioned as small dart points.

C. Discussion/Summary

The thirty-two sites on the property contained 350 bedrock features including 1,317 slicks, 243 basins, and fifty-eight mortars, and produced 172 flaked stone tools and cores with 9,115 pieces of debitage, 255 ground stone tools, sixteen pieces of modified bone, 255 prehistoric ceramic sherds, and 14,846 pieces of faunal bone and eighteen pieces of shellfish shell. Six rock rooms and three other surface rock features were also recorded. Fifteen of the thirty-two sites did not have a subsurface deposit present consisting only of surface artifacts and/or bedrock milling features. The artifact assemblages at the thirty-two sites were primarily Late Prehistoric in age and their distribution on the property resembled an hypothesized settlement pattern of a dispersed village settlement with several sites forming the central habitation area of the village and other less extensive sites comprising dispersed loci of activity and/or temporary habitation away from the main village area. Phase II testing at the seventeen sites with subsurface deposits appeared to indicate that these sites consisted either of main habitation locations with associated milling features, or of milling stations with temporary campsites or smaller habitation areas associated with them. The fifteen sites without deposits represent food processing areas without associated habitation areas.

A diversity of use-wear and tool functions among the formal flaked stone tool types and the utilized flakes/chunk tools demonstrate that a considerable amount of industry was carried on at the sites. Hammerstones are essential for the manufacture and maintenance of both flaked stone and ground stone tools. Chopping tools, scrapers and scraper planes are tools used to both procure and process materials such as wood or cane for the manufacture of shafts for arrows and spears or for the handles of knives. They can also be used to butcher animals and to process animal hides and sinew. This combination of task diversity and intensity demonstrates the degree of habitation associated with the sites. The other tool types recovered, such as bifaces associated with hunting, and ground stone tools associated with vegetal processing, the categories of formal flaked stone tools and utilized flakes/chunks undoubtedly represent augmenting tools for the manufacture and maintenance of these tools as well as for the procurement and/or the processing of resources associated with these other tool types.

Additional evidence of tool function and usage was obtained from the results of the tool pollen and protein residue studies. Three specimens tested positive for deer antiserum (likely mule deer *Odocoileus hemionus*). These results are most likely indicative of prehistoric tool use as there are few other reasons possible for the presence of this antiserum on the tools. The range of tool types with deer residues is also interesting; a chopping tool, a knife, and projectile point. While these tool functions are the current interpretations of archaeological analysts, and may not be what they were actually used for prehistorically, it seems likely that the range of morphological characteristics does indicate different types of functions for these tools, i.e., prehistoric food procurement and processing. Positive human protein residue results on five artifacts may also indicate prehistoric human tool use, or it may represent modern contamination or both. It is not currently possible, however, to determine the correct situation for each artifact.

Plant pollens present on four manos from plants known to have been used prehistorically in the local southern California area for food or medicine, include buckwheat, oak (acorns), California sagebrush, chamise, Indian

(Mormon) tea, golden yarrow, gumplant, mesquite, and several types of grasses. Because neither mesquite (*Prosopis* sp.) nor Mormon (Indian) tea (*Ephedra* sp.) currently represent plants found on the property, but both are well known locally as possible food or medicine plants (cf. Anderson et al. 1996), they have enhanced credibility as possibly tool related. While it cannot be determined with absolute certainty, that any or all of these plants were processed with the tools, prehistorically (i.e., ground or crushed), the presence of pollens from these plants on the tools suggests that they were. These results from the tool pollen and protein residue studies indicate a range of local food procurement and processing activities that verify at least some of the diversity of prehistoric activity at the sites suggested by the artifact typological analysis.

Sources for flaked lithic raw materials at the project sites were considered as a research focus of the project. The two flaked lithic raw materials most frequently used (92.9%), were varieties of metavolcanics from the Santiago Peak Volcanics (SPV) Formation (50.6%) and milky quartz (42.3%). All of the other materials, combined, constituted only 7.1 percent of the flaked stone materials. The nearest bedrock outcrops of the SPV metavolcanics are approximately 12 kilometers to the west along the San Dieguito River Valley, exposed beginning at Lake Hodges and extending west. Having existed since Jurassic times, they have, however, contributed substantial amounts of rock in cobble form to several of the later Cenezoic sedimentary formations present in the coastal San Diego County area. These have then been re-eroded into drainages and are now present in some drainages as secondary depositions. The amount of this material available from this secondary source, locally (in the Ramona area), however, is unknown. The source(s) of milky quartz, the second most utilized flaked stone raw material, is, along with quartzite, probably the most immediately local. Milky quartz can derive, primarily, from two possible local geologic sources: from the numerous pegmatite dikes exposed in the granitic bedrock on the property and elsewhere in the vicinity, and from local sedimentary formations containing cobbles such as are present in the southern project area.

Crystalline quartz was observed to be present in some of the larger dikes in the granodiorite outcrops in and around several of the project sites. Two project sites had exposed and fragmented dikes that may have been quarried. Numerous cobbles of milky quartz were observed to be present amongst scatters of cobbles on the surface in the southern project area. Quartzite, the third most popular flaked stone material at the project sites is also readily available in proximity to the sites. Quartzite occurs as cobbles in the same local sedimentary formations in the southern project area that also contain numerous cobbles of milky quartz. Quartzite cobbles, however, were much more numerous amongst scatters of cobbles on the surface in this area. Metasedimentary materials, most likely from the Bedford Canyon Formation, may have been picked up, either in the Santa Maria Creek drainage, or were procured directly from a few small outcrops present in the Santa Maria Valley

A small but significant amount of non-local exotic lithic materials was also recovered from several of the sites. The presence of these materials indicates non-local resource procurement either through trade or through extra-local travel. Fifty-nine pieces of obsidian were recovered, all from just six of the thirty-two sites. These materials represent 0.6 percent and Piedra de Lumbre chert 0.2 percent of the tools and debitage at the sites. It appears from sourcing and hand specimen identification that a majority of the obsidian was procured from Obsidian Butte, a source in southeastern California. The remaining pieces derived from the either the Coso Volcanic Field or from Casa Diablo, both in east central California, with one piece from an unknown source. This presence of obsidian probably indicates trade, while Piedra de Lumbre chert could indicate either trade or travel.

Results from the current test investigations also produced data to support the presence of a late Archaic as well as a Late Prehistoric occupation of the sites. Four radiocarbon dates of circa 1,800, 1,000, 500, and 100 years before the present, not only provide an indication of the maximum extent of occupation but also suggest recurrent occupations of the sites over this period of time from the late Archaic through the Late Prehistoric and into early historic times. Obsidian sourcing and hydration data also appear to support the presence of a late Final Archaic occupation, and are consistent, therefore, in this regard with the results from the

radiocarbon study. Sourcing results indicated the substantial presence of Obsidian Butte obsidian, verifying a Late Prehistoric occupation at the sites, and hydration results also appeared to suggest the presence of an older probably Archaic occupation based on several proposed rates for Coso obsidian. Additional evidence for a Late Prehistoric temporal placement is the presence of 254 pieces of Brown Ware pottery occurring at seven of the sites. Two, and possibly three of the bifaces recovered from three of the Oak Country sites may also provide a basis for addressing the "transition" from dart and atlatl to bow and arrow hunting technologies during the late Final Archaic and early Late Prehistoric periods in the area.

The faunal remains recovered in some quantity from the sites include both locally available animals (i.e., on the property and in contiguous areas) such as rabbit, deer, squirrel, pond turtle, and lizard, as well as animals that would have required travel and/or trade to procure such as marine fish and shellfish. The quantity and types of faunal remains present at the sites, together with the variety of flaked stone tools and the large number and variety of milling features present attests to both the intensity and diversity of resource procurement and processing activity associated with the sites. The testing results indicate that tasks such as hunting, butchering and the processing/working of the hides and bones of animals, the production of staple vegetal foods derived from various seed types including grasses, buckwheat, yarrow, and acorns, and possibly, the processing of fibrous plants such as yucca or bulrush were all being accomplished at the sites. Such a variety of activity would be necessary to produce meat and grain for food; animal sinew to create binding straps for a variety of purposes; and bone to make awls or soft hammer billets; as well as to process fiber to make twine for cordage for nets, or traps and snares and thatch for structure construction. All of these tasks are consistent with the tool protein residue and pollen results and with the use-wear observed on milling feature elements and ground stone tools and on many of the formal flaked tools as well as on the utilized flake/chunk tools.

Additional to this diversity of resource processing at the sites is the presence of several aspects that may distinguish them as a residential site including a ceramic pipe fragment and rock enclosures. These latter aspects suggest that the sites may have had additional significance in the settlement system of the inhabitants. Together, these results indicate a level of habitation intensity consistent with a village occupation at the sites. The results of an analysis of a combination of floral and faunal information suggest that procurement of some of the represented plant and animal resources by the inhabitants of the project sites, would have been most productive during late winter through to the beginning of fall, i.e., from approximately January or February to September. Consequently, it appears likely that the sites represent a village level occupation that occurred during these months.

As an outgrowth of the results from some of the various research conducted for the project, a special environmental circumstance of some potential archaeological significance emerged. This scenario involved a possible local microenvironment that could be associated with both the presence and the particular locations of the most substantial site loci. As part of the environmental studies conducted for this project, botanists compiled a complete list of the plants present on the property (Nordby and Robbins 2001). Using this list and the pollen record generated in the pollen studies completed as part of this testing program (Appendix I), a number of plant types were distinguished that could be associated with a standing water environment such as a fresh water marsh (Table XIII-4). Such an environment could have been generated by, and be present around, a spring or seep. Freshwater seep vegetation consists mostly of perennial herbs, especially sedges and grasses, which usually form a complete cover (Holland 1986). Conditions include permanently moist or wet soil around freshwater seeps, often with associated grasslands or meadows. On the property today this habitat, including both native and introduced species, is associated with the tributaries and meadows adjacent to Santa Maria Creek (see Table XIII-4). Dominant plants include sedges (*Carex* spp.), spike rush (*Elocharis marginata*), and Mexican rush (*Juncus mexicanus*). Other plants observed include saltgrass (*Distichlis spicata*), foxtail *(Bromus madritensis*), wild rye (*Leymus triticoides*), slender wild oat *(Avena barbata*), and rip-gut (*Bromus diandrus*).

On historic maps of the area (U.S. Surveyor General 1870; 1875), one, and possibly two springs, are indicated to be present on the property or within proximity to it (Map XIII-1). While, due to map scale and age, the exact location of these springs remains somewhat vague, one appears to have been situated on the property within the cluster of the large site loci (SDI-7755, SDI-7756, SDI-7757, and SDI-7759) along the west side

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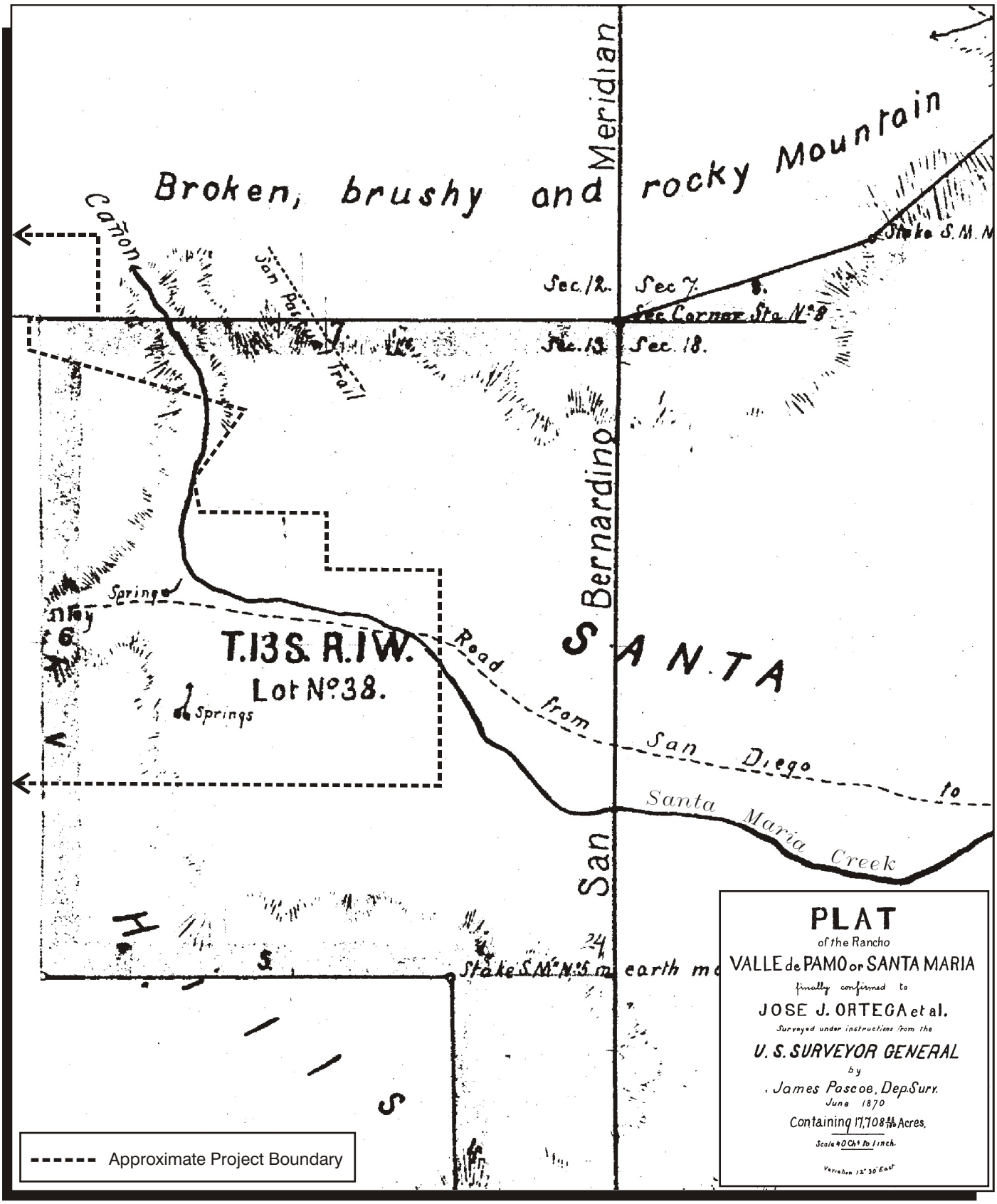

Mooney & Associates

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Oak Country Estates

Springs Shown on 1870 Historic PLAT Map

Map XIII-1

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Map XIII-2. Present Day Location of Seep and Other Pertinent Vegetation Communities

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Table XIII-4. Present Day Seep-associated Vegetation on Property

Scientific Name	Common Name
ASCLEPIADACEAE Milkweed Family	
Asclepias eriocarpa	Indian milkweed
Asclepias fascicularis	narrow-leaf milkweed
ASTERACEAE Sunflower Family	
Cotula cornopifolia	brass-buttons
Deinandra faciculata	fascicled tarweed
Centromadia parryi ssp. *australis*	southern tarweed
Psilocarphus brevissimus	wooly marbles
Psilocarphus tennellus	slender wooly marbles
BORAGINACEAE Borage Family	
Heliotropium curassavicum	salt heliotrope
CALLITRICHACEAE Water-starwort Family	
Callitriche heterophylla var. *bolanderi*	water-starwart
CARYOPHYLLACEAE Pink Family	
Spergularia sp.	spurrey
CONVOLVULACEAE Morning Glory Family	
Cressa truxillensis	alkali weed
CRASSULACEAE Stonecrop Family	
Crassula conata	pygmy weed
Crassula aquatica	water pygmy weed
LYTHRACEAE Loosestrife Family	
Lythrum hyssopifolium	grass poly
PLANTAGINACEAE Plantain Family	
Plantago elongata	California alkali plantain
Plantago lanceolata	English plantain
Plantago major	common plantain
POLYGONACEAE Buckwheat Family	
Rumex crispus	curly dock
Rumex pulcher	fiddle dock
RANUNCULACEAE Buttercup Family	
Ranunculus aquaticus	hairleaf water buttercup
Ranunculus californicus	California buttercup
SAURURACEAE Lizard's Tail Family	
Anemopsis californica	yerba mansa
ALLIACEAE Onion Family	
Allium sp.	onion
CYPERACEAE Sedge Family	
Carex sp.	sedge
Cyperus niger	brown umbrella sedge
Eleocharis sp.	spikerush
Eleocharis macrostachya	pygmy spikerush
JUNCACEAE Rush Family	
Juncus acutus	spiny rush
Juncus balticus	Baltic rush
Juncus bufonius	toad rush
Juncus dubius	rush
Juncus mexicanus	Mexican rush
JUNCAGINACEAE Arrow Grass Family	
Lilaea scilloides	flowering quill wort
POACEAE Grass Family	
Deschampsia danthonioides	annual hair grass
Distichlis spicata	saltgrass
Leymus triticoides	wild rye
Polypogon monspeliensis	annual beard grass
THEMIDACEAE Brodiaea Family	
Muilla maritima	common muilla

of Santa Maria Creek. The other spring may either have been on the property along the southern edge, or just off the property to the south. The current botanical studies have defined four areas, containing seep vegetation on the basis of current plant types (Map XIII-2). Two of these areas are situated along a small unnamed tributary near the confluence with Santa Maria Creek in the west central area of the property. This drainage extends through the large site loci cluster of on the west side of the creek. The lower portion of the drainage is a relatively flat area that extends up along the drainage from the creek to a point at which, today, there is a pond. This pond was artificially created circa 1950-60, by the construction of an earth dam on the tributary. It appears likely that this dam now impounds water from the original spring or seep. One of the two seep vegetation areas along the drainage is located above the pond. It is probable that this area of seep vegetation may be present today as a result of the artificial impoundment of the spring water farther up the drainage than was so in the past. Prior to the creation of the dam, the spring water would have flowed out onto the low flat area along the lower portion of the drainage above the creek. As can be seen in Map XIII-2 the other seep vegetation area along this drainage is along this lower portion of the drainage, and is situated centrally to knolls on both sides upon which sites SDI-7755, SDI-7756, SDI-7757, and SDI-7759 are located.

The third area of seep vegetation is situated just south of the this drainage and north of another unnamed tributary that enters the property from the south. This third area, which is situated just east of sites SDI-7759 and SDI-7325, could be associated with either of the two possible spring sources. The fourth area is located in the northwest corner of the property along the upper reaches of an unnamed tributary of Santa Maria Creek that enters the creek off the property to east. No historic or currently known spring or seep could be identified as the source for this vegetation occurrence. This seep vegetation area is also not associated with any substantial sites are located on the property. It seems likely that it extends off of the property to the east, suggesting that habitation locations exist adjacent to Santa Maria Creek in unsurveyed areas off the property to the north and east.

Judging by the location of both the current pond and of the archaeological site cluster, and by the plotted location of the two springs on the plat maps from the late 1800s (U.S. Surveyor General 1870; 1875), it seems most likely that, prehistorically (at least in Late Period times), the location of the more northerly spring would have been along the drainage at the edge of the northern delineated boundary of site SDI-7756, i.e., just below the present day pond. The area of associated standing water or marsh that is postulated would have been, principally, the area delineated as seep vegetation area 2, indicated on Map XIII-2. This area is surrounded by four site loci SDI-7755, SDI-7756, SDI-7757, and SDI-7759. Seep vegetation area 3, situated east of sites SDI-7759 and SDI-7325, and in between the two putative spring locations, may be associated with either the southerly spring or with the northern one, or with both.

It can be hypothesized that such an environment would, likely have provided not only a more reliable source of fresh water than Santa Maria Creek, but also a possibly more reliable source of food resources such as pond turtles, as well as other aquatic animals such as birds and fish. The faunal evidence recovered from the sites, however, only partially correlates with this hypothesis. There does seem to be a relatively large quantity of pond turtle remains in the sample, but no remains of aquatic birds or remains identified as fresh water fish were recovered in the samples. The quantity of pond turtle does seem to suggest that more were available for capture than would likely have been the case from Santa Maria Creek alone. The plant lists compiled from both the current property survey and from the pollen record demonstrate that a standing water-oriented plant community is, and has been, present within the proximity of these major site loci. Table XIII-4 listed the taxa that have been identified currently within the seep areas. Additional plant taxa were identified in the pollen studies but not currently on the property, from soil samples taken in adjacent areas, which could also be considered to have possibly been associated with this type of environment. These plant types include ferns and mosses as well as rushes, sedges, hair grass, and native brome grass.

Another plant distribution on the property of some potential interest is the Buckwheat Scrub community. As shown in Map XIII-2, distribution of this community appears to coincide to a considerable degree, either to the locations, or in proximity to the locations of the main site loci along the west side of Santa Maria Creek. Sites SDI-7325, SDI-7753, SDI-7754, SDI-7755, SDI-7756, SDI-7757,SDI-7758, and SDI-7759 are all located within or in proximity to somewhat discretely proscribed stands of this vegetation community. Other discrete stands appear to also be possibly associated with smaller site locations, as sites SDI-7326, SDI-7767, and SDI-15,980 are located in proximity to small stands of this community. As to why this community might coincide with the sites, a couple of speculations can be made. If the seeds of the California Buckwheat were being gathered for food, then site locations near stands would be convenient. On the other hand, it could be that the gathering of this seed and its processing at the sites may have resulted in some seeds being lost in the site areas and then subsequently growing in and around those areas. Another possibility, purposeful propagation of the seeds, would, of course, be possible. Lastly, it is possible that this apparent coincidence is just happenstance. It is also interesting to note that if an association is real, it is curious that there are no stands of this vegetation around any of the assumably associated sites on the eastern side of the creek.

The somewhat speculative discussions above were presented in an attempt to provide some additional context, as well as possible environmental evidence, for the presence of a dispersed village settlement at this location in Late prehistoric times. It does seem possible that the presence of a spring or springs and their possible additional associated resources, and of other plant food resources perhaps coinciding with the dispersed village pattern of sites is more than simple coincidence.

The information that has already been derived from the sites and is presented and discussed above, as well as what is indicated as still likely to remain undiscovered for future research at a number of the sites, is of considerable interest and value for a better understanding of the local prehistory and history of the Ramona Valley in particular as well as for the entire San Diego region.

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XIV. RESOURCE SIGNIFICANCE EVALUATIONS

A. Introduction

The Phase I inventory and survey identified thirty-two previously recorded and ten newly discovered prehistoric cultural resource sites within the proposed project alternative. As a result of the Extended Phase one subsurface boundary testing program conducted, twelve of the previously recorded thirty sites were combined to form four sites, resulting in a revised total (including the ten new sites) of thirty-two prehistoric within the proposed project alternative (see Map V-1). The Extended Phase I testing program also determined that fifteen of the these thirty-two sites did not have a subsurface deposit present consisting only of surface artifacts and or bedrock milling features. These sites were determined as not significant resources and the milling features were recorded (Table XIV-1). No Phase II testing was conducted at these sites. Phase II evaluation for site significance was subsequently conducted for the remaining seventeen sites (see Table XIV-1). The research approach (see Section III for detail) proposed for the Phase II evaluation program was both general and particular. In general it indicates a hypothesized dispersed village settlement pattern with several sites forming the central habitation area of the village with other less extensive sites comprising dispersed loci of activity and/or temporary habitation from the main village area.

The results from the Extended Phase I testing program indicated that the artifact assemblages at the thirty-two sites resembled the hypothesized settlement pattern of a dispersed village settlement with several sites forming the central habitation area of the village and other less extensive sites comprising dispersed loci of activity and/or temporary habitation away from the main village area. The fifteen sites without deposits appeared to represent only milling stations with little or no other activities evident. Large and deep areas of midden deposit were delineated at nine of the sites (CA-SDI-7322, CA-SDI-7325, CA-SDI-7751, CA-SDI-7753, CA-SDI-7755, CA-SDI-7756, CA-SDI-7757, CA-SDI-7758, and CA-SDI-7759) with less extensive, but still intensive areas of deposit identified at two others (CA-SDI-7324 and CA-SDI-7754). At the remaining six sites (CA-SDI-7320, CA-SDI-7321, CA-SDI-7326, CA-SDI-7752, CA-SDI-7767, and CA-SDI-7768) smaller subsurface deposits of a less intensive nature were identified.

The record search data, and field survey and testing results, also indicated that portions of sites SDI-7754 and SDI-7768 may extend outside and beyond the Oak Country Estates property boundary. The portion of site SDI-7754 within the project property appears likely to be the major part of the site. The portion of site SDI-7768 on the project property, however, may in fact be a portion of an extensive site (SDI-7770), located on the adjacent property.

B. Research Potential Evaluation

The results of the analysis of the archaeological data gained from the Phase II testing were discussed previously in Section XIII. As discussed, the results indicated that twelve of the seventeen sites tested contained substantial potential for providing insight into both the archaeological and historical record for the Late Prehistoric period and early historic period of western San Diego County. Both ethnographic and archeological research conducted indicates that these sites may represent the remnants of an ethnohistoric village occupied by the Kumeyaay at the time of earliest Spanish settlement of the area after circa 1769. The archaeological analysis indicated that the sites varied in terms of both content and diversity, probably reflecting different activities and functions. Sites with the greatest diversity and density of content were interpreted as the areas of most intense habitation and where, consequently, the greatest variety activities occurred.

Table XIV-1. Extended Phase I Testing Results

Site No.	No. of Pos. STPs	Total Artifacts	Total Bone	STP Total Density* (Artifacts and Bone)	Sites Determined Not Significant In Extended Phase I	Sites Further Tested for Significance in Phase II
SDI-7317	0	0	—	—	X	—
SDI-7318	0	0	—	—	X	—
SDI-7319	0	0	—	—	X	—
SDI-7320	3	10	—	3.3	—	X
SDI-7321	11*	19	4	2.1	—	X
SDI-7322	21	145	181	15.7	—	X
SDI-7324	8	66	2	8.5	—	X
SDI-7325	4	27	1	7.0	—	X
SDI-7326	11	36	—	3.3	—	X
SDI-7751	15	139	52	12.7	—	X
SDI-7752	9	26	—	3.0	—	X
SDI-7753	16	148	28	11.0	—	X
SDI-7754	16*	29	10	2.5	—	X
SDI-7755	24*	338	354	28.8	—	X
SDI-7756	30	248	174	14.1	—	X
SDI-7757	11*	157	47	18.5	—	X
SDI-7758	9	71	35	11.8	—	X
SDI-7759	33	243	16	7.9	—	X
SDI-7760	2	5	1	3.0	X	—
SDI-7764	0	0	—	—	X	—
SDI-7767	4	9	2	2.7	X	X
SDI-7768	3	3	1	1.3	X	X
SDI-15,979	0	0	—	—	—	—
SDI-15,980	0	0	—	—	—	—
SDI-15,981	0	0	—	—	X	—
SDI-15,982	0	0	—	—	X	—
SDI-16,076	1	1	—	1.0	X	—
SDI-16,077	1	2	—	0.5	X	—
SDI-16,078	0	0	—	—	X	—
SDI-16,079	1	1	—	1.0	X	—
SDI-16,080	0	0	—	—	X	—
SDI-16,081	0	0	—	—	X	—
Total	**233**	**1723**	**908**		**15**	**17**

* Density = Items per STP excavated
** One STP has only bone at this site (these STPs were not used for Artifact Density)

Using primarily (but not exclusively) the results from the Phase II testing program, evaluation for significance of the seventeen tested sites was conducted using several types of comparative criteria. In Table XIV-2, the sites were compared relative to the presence and volume or numbers of six categories of archaeological data generated in the testing, 1) cores and flake tools, 2) flaked stone debitage, 3) milling tools, 4) pottery sherds, 5) faunal bone, and 6) milling features. Each site was then ranked from one (for highest density or number) to seventeen (for fewest), or to whatever number of sites contained these artifacts or features (ties received the same rank number). An overall score was then generated by averaging the rankings of these six categories. A final ranking was then achieved based on the order of these overall scores from one to

seventeen (again, with ties receiving the same rank number). Additional evaluation of these seventeen sites involved comparison relative to seven attributes considered as commonly present in significant sites (Table XIV-2). The minimal presence or the absence of these listed attributes forms the basis for a finding of a limited potential of the sites to address research questions. Lastly, Table XIV-3 summarizes the results of a comparison of the seventeen sites in regard to how they may be able to help answer questions specifically posed in the Research Plan (Section III) for the program.

As can be seen in Table XIV-2, the comparison indicates that the nine sites with large and deep areas of midden deposit, SDI-7322, SDI-7325, SDI-7751, SDI-7753, SDI-7755, SDI-7756, SDI-7757, SDI-7758, and SDI-7759, contain the most archaeological materials and milling features to provide data for future scientific analysis. Indicated as well is that sites, SDI-7324 and SDI-7754, also contain considerable potential for providing significant information of local prehistory. Sites SDI-7320, SDI-7321, SDI-7326, SDI-7752, SDI-7767, and SDI-7768 can be seen to contain the least potential, based on volume or quantity of cultural materials and features, to provide such information. While the portion of site SDI-7754 within the project property was assessed as containing potential for providing significant information, the portion of site CA-SDI-7768 on the property was not. As this latter site, however, may in fact be a portion of site SDI-7770, located on the adjacent property that may be a significant site, it is judged that site CA-SDI-7768 should be considered as containing potential for providing significant information as a portion of this larger site.

Table XIV-2. Phase II Site Rankings by Artifacts and Faunal Bone Per Cubic Meter and Number of Associated Milling Features

Sites	Cores & Flaked Stone Tools	Debitage	Milling Tools	Pottery Sherds	Faunal Bone	Milling Features	Average Rank Score	Overall Rank by Average Rank Score
SDI-7320	15	13	15	8	16	11	13.0	15
SDI-7321	15	16	14	8	15	5	12.2	13[a]
SDI-7322	11	9	6	7	4	4	6.8	7
SDI-7324	12	10	10	8	11	7	9.7	11
SDI-7325	4	6	9	8	9	9	7.5	9
SDI-7326	14	11	13	8	16	11	12.2	13[b]
SDI-7751	7	8	1	8	8	11	7.2	8
SDI-7752	8	14	11	8	14	10	10.8	12
SDI-7753	9	6	9	2	7	6	6.5	6
SDI-7754	10	12	8	4	10	7	8.5	10
SDI-7755	2	2	5	3	1	2	2.5	2
SDI-7756	3	4	2	1	3	1	2.3	1
SDI-7757	5	1	7	5	2	3	3.8	3
SDI-7758	1	5	3	8	6	9	5.3	5
SDI-7759	6	3	4	6	5	4	4.7	4
SDI-7767	13	15	15	8	12	10	12.2	13[c]
SDI-7768	15	18	12	8	13	8	12.3	14*

* Possibly associated with potentially significant site SDI-7770

Table XIV-3. Site Attribute Summary

Site Attributes	Site SDI-CA- 7320	7321	7322	7324	7325	7326	7751	7752	7753	7754	7755	7756	7757	7758	7759	7767	7768
(1) moderate* to high density subsurface deposits;	No	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No[1]
(2) datable materials;	No	No	Yes	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No[1]
(3) subsurface features**;	Yes	No	Yes	No	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No[1]
(4) multiple time periods;	No	No	Yes	No	No	No	No	No	No	No	Yes?	No	Yes?	No	No	No	No[1]
(5) presence of exotic trade materials†;	No	No	Yes	No	No	Yes	No	No	Yes	No	Yes	Yes	Yes	Yes	Yes	No	No[1]
(6) good site integrity;	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
(7) presence of faunal remains‡	No	No	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No[1]
Score (Maximum Possible Score 7)	**2**	**1**	**7**	**3**	**4**	**3**	**4**	**2**	**6**	**5**	**7**	**7**	**7**	**5**	**6**	**2**	**1**[1]

* 33 artifacts or more per m^3
** Based on the presence of a subsurface feature or fire affected/cracked rocks
† Obsidian and/or PDL chert
‡ Greater than 1 piece of bone per m^3
[1] Possibly associated with potentially significant site SDI -7770

When the test results and the seven important site attributes are compared in Table XIV-3, it can be seen that of the six sites listed above as ranking the lowest in terms of volume or numbers of artifacts and features, all six have three or fewer of these seven attributes. Sites SDI-7324 and SDI-7326 also demonstrated only three of the seven attributes in the test results, while sites SDI-7322, SDI-7325, SDI-7751, SDI-7753, SDI-7755, SDI-7756, SDI-7757, SDI-7758, and SDI-7759 have four or more. Having fewer than half of these attributes may indicate a lower research potential. Lastly, as can be seen in Table XIV-4, when the Phase II test results from the seventeen sites are compared to the research topic questions, sites SDI-7320, SDI-7752 and SDI-7768 lack the data sets to address any of the questions, and sites SDI-7321, SDI-7326, and SDI-7767, six of the nine questions. Sites SDI-7324, SDI-7326, SDI-7751, and SDI-7758 have data sets to address three of the nine questions; site SDI-7325, four of the nine; site SDI-7759, six of the nine; sites SDI-7753, and SDI-7757, seven of the nine; and sites SDI-7322, SDI-7755, and SDI-7756 have data sets to address eight of the nine questions. Site CA-SDI-7768, while not scoring well in either the site attribute or research question assessments, should be considered as containing potential for providing significant information as a portion of the larger site SDI-7770 located on the adjacent property.

Table XIV-4. Topic Realm/Research Question Summary
Ability of the Project Sites to Provide Data to Address the Research Questions?

Topic Realm and Research Question	Site CA-SDI- 7320	7321	7322	7324	7325	7326	7751	7752	7753	7754	7755	7756	7757	7758	7759	7767	7768
Topic Realm 1 Site (Settlement) Function																	
(1) Does the artifact record at the site reflect a wide range of human activities indicative of intensive occupation and use and do those activities speak to both genders participating in the activities practiced there?	No	No	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No*
Topic Realm 2 Procurement of Lithic Resources																	
(1) Did the occupants of the settlement make use of outcroppings of the Bedford Canyon Formation metasediments and/or the more distant outcroppings of the same metasediments at Mesa Grande 35 miles to the east? Can it be assumed that if the occupants made use of the nearby source that the lithic debris will reflect primary as well as secondary phases of stone reduction? And that, as a corollary, if the more distant source was used, then the tools would have been roughed outat the occupation site at Mesa Grande and the lithic debris at these sites would reflect maintenance and sharpening of the already completed tools (secondary and tertiary lithic production).	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No*
(2a) Is the obsidian on the site from Obsidian Butte 85 miles (135 km) to the east in the Imperial Desert, as is most typically the case in Late Period sites, or did some/all of the obsidian originate at other more distant sources such as Coso to the north or San Felipe within Baja California?	No	No	Yes	No	Yes	Yes	No	No	Yes	No	Yes	Yes	Yes	Yes	Yes	No	No*
(2b) Likewise, is the Piedra de Lumbre chert on the sites also a candidate for procurement by exchange, as the source is located more than 60 kilometers to the northwest of the project area?	No	No	Yes	No	Yes	Yes	No	No	Yes	No	Yes	Yes	Yes	Yes	Yes	No	No*
(3) The STP data suggests that the two lithic raw materials most frequently used at the sites for flaked stone tool manufacture were Santiago Peak metavolcanics and milky quartz. Do the relative proportions of these particular types, as well as of other of lithic raw materials present at the sites, reflect the ease of gathering of these various materials?	No	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No*
Topic Realm 3: Temporal Setting for the Site (Settlement)																	
(1a) Do the sites reflect a temporal setting that places them within the Late Prehistoric period circa 2,000 years ago to the time of Spanish contact circa 1769 A.D.?	No	No	Yes	No	No	No	No	No	Yes	No	Yes	Yes	Yes	No	Yes	Yes	No*
(1b) Is there any evidence that the sites were occupied subsequent to the intrusion of the Spaniards and, therefore, a contact period settlement?	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	No	No*

Topic Realm and Research Question	Site CA-SDI- 7320	7321	7322	7324	7325	7326	7751	7752	7753	7754	7755	7756	7757	7758	7759	7767	7768
Topic Realm 4: Technological and/or Environmental Change																	
(1) Can a drought of circa A.D. 1250-1290 be documented at the Oak Country site? If so, are there any discernible changes in artifact types, faunal remains, or pollens that might reflect vegetation changes, or intensity of occupation?	No	No	Yes	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No
(2) Can the period circa A.D. 0-700 be documented at the Oak Country sites? If so, are there any discernible changes in projectile point artifact types diagnostic of either dart and atlatl or the bow and arrow indicative of technological change?	No	No	Yes	No	No	No	No	No	No	No	Yes	Yes	Yes	No	No	No	No
Score (Maximum Possible Score 9)	**0**	**1**	**8**	**3**	**4**	**3**	**3**	**0**	**7**	**3**	**8**	**8**	**7**	**3**	**6**	**1**	**0***

Yes = Can provide data to address this question
No = Unlikely to provide data to address this question
***** Possibly associated with potentially significant site SDI-7770

XV. MANAGEMENT RECOMMENDATIONS

A. Introduction

The current project falls under both county and state legislative jurisdiction. The lead reviewing agency is the County of San Diego. California state law regarding cultural resources is primarily embodied in Section 15064.5 of the California Environmental Quality Act (CEQA), as amended. CEQA establishes principles for cultural resource preservation and criteria for the identification of important resources. Local implementation of CEQA is accomplished by County ordinances including Section 396.7 of the San Diego County Administrative Code establishing the San Diego County Local Register of Historical Resources, and through the County of San Diego Resource Protection Ordinance, a compilation of ordinances nos. 7968, 7739, and 7631.

B. California Environmental Quality Act (CEQA) Criteria

According to Section 15064.5(a)(3) of CEQA "historical resources" include:

(1) Resources listed in, or determined to be eligible by the State Historical Resources Commission, for listing in the California Register of Historical Resources (Pub. Res. Code §5024.1, Title 14 CCR, Section 4850 et seq.)

(2) A resource included as defined in a local register of historical resources, as defined in section 5020.1(k) of the Public Resources Code or identified as significant in an historical resource survey meeting the requirements section 5024.1(g) of the Public Resources Code, shall be presumed to be historically or culturally significant. Public agencies must treat any such resource as significant unless the preponderance of evidence demonstrates that it is not historically or culturally significant.

(3) Any object, building, structure, site, area, place, record, or manuscript which... meets the criteria for listing on the California Register of Historical Resources (Pub. Res. Code SS5024.1, Title 14 CCR, Section 4852) including the following:

(A) Is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage;

(B) Is associated with the lives of persons important in our past;

(C) Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values; or

(D) Has yielded, or may be likely to yield, information important in prehistory or history.

Subsection (b) states that "A project with an effect that may cause a substantial adverse change in the significance of an historical resource is a project that may have a significant effect on the environment." In accordance with item (4) of this subsection, if a substantial adverse change in the significance of an historical resource is identified, then:

> A lead agency shall identify potentially feasible measures to mitigate significant changes in the significance of an historical resource. The lead agency shall ensure that any adopted

> measures to mitigate or avoid significant adverse changes are fully enforceable through permit conditions, agreements, or other measures.

Subsection (c) specifies that " CEPA applies to effects on archaeological sites" while subsections (d) and (e) provide policy and procedures for the treatment of human remains and associated artifacts. Lastly, subsection (f) stipulates that:

> ... a lead agency should make provisions for historical or unique archaeological resources accidentally discovered during construction. These provisions should include an immediate evaluation of the find by a qualified archaeologist. If the find is determined to be an historical or unique archaeological resource, contingency funding and a time allotment sufficient to allow for implementation of avoidance measures or appropriate mitigation should be available. Work could continue on other parts of the building site while historical or unique archaeological resource mitigation takes place.

To summarize, projects having an effect on archaeological sites fall under the provisions of CEPA (subparagraph (c)). The site is then evaluated to determine if it meets the criteria for listing on the California Register of Historical Resources (subparagraph (a)). If a site qualifies as a unique archaeological resource, then it must be determined if the proposed project might cause a substantial adverse change in the significance of the resource, i.e., a significant effect on the environment (subparagraph (b)). When a significant effect has been identified, then the lead agency shall propose feasible mitigation measures and shall ensure that all adopted measures are fully enforceable (subparagraph (b)(4).

C. San Diego County Local Register of Historical Resources (Local Register)

Section 396.7 of the San Diego County Administrative Code establishes the San Diego County Local Register of Historical Resources. In Section II the stated purpose of "The Local Register is an authoritative listing and guide to be used by local agencies, private groups, and citizens in identifying historical resources within the County. In addition, the listing shall also be used as a management tool for planning, and to indicate which resources deserve to be protected, to the extent prudent and feasible, from substantial adverse change".

The term historical resources is used in the Local Register for all types of individual cultural resources and historic district for a collectively related group of historical resources within a contiguous geographic area.

It specifies under Section V, subsection (b), the following criteria for evaluating the significance of historical resources. A historical resource must be significant at the local level under one or more of the following four criteria:

1. Is associated with events that have made a significant contribution to the broad patterns of San Diego County's history and culture heritage;

2. Is associated with the lives of persons important to the history of San Diego County or its communities;

3. Embodies the distinctive characteristics of a type, period, San Diego County region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values; or

4. Has yielded or may be likely to yield, information important in prehistory or history.

Under subsection Section V, (c) resource integrity is addressed. Integrity is the authenticity of an historical resource's physical identity evidenced by the survival of characteristics that existed during the resource's period of significance.

D. Resource Protection Ordinance (RPO)

Under the County of San Diego Resource Protection Ordinance (compilation of ordinances nos. 7968, 7739, and 7631), significant resources are defined as follows:

> *Significant Prehistoric or Historic sites*: Location of past intense human occupation where buried deposits can provide information regarding important scientific research questions about prehistoric or historic activities that have scientific, religious, or other ethnic value of local, regional, State, Federal importance. Such locations shall include, but not be limited to: any prehistoric or historic district, site, interrelated collection of features or artifacts, building, structure, or object included in or eligible for inclusion in the National Register of Historic Places or the State Landmark Register; or included or eligible for inclusion, but not previously rejected, for the San Diego County Historical Site Board List; any area of past human occupation located on public or private land where important prehistoric or historic activities and/or events occurred; and any location of past or current sacred religious or ceremonial observances protected under Public Law 95-341, such as burial(s), pictographs, petroglyphs, solstice observatory sites, sacred shrines, religious ground figures, and natural rocks or places which are of ritual, ceremonial, or sacred value to any prehistoric or historic ethnic group.

For prehistoric or historic sites identified as significant under RPO criteria, restrictions to use include:

> Development, trenching, grading, clearing and grubbing, or any other activity or use damaging to significant prehistoric or historic site lands shall be prohibited, except for scientific investigations with and approved research design prepared by an archaeologist certified by the Society of Professional Archaeologists.

If a prehistoric or historic resource is identified as RPO significant, then the following may be required as a condition of approval of the discretionary permit:

1. Apply open space easements to portions of the project site that contain sensitive lands;
2. Rezone the entire project site through the application of a special area designator for sensitive lands; or
3. Other actions as determined by the decision-making body.

Recognizing that cultural resources often contain information that archival research cannot answer, there exists the potential for each resource to provide important information relevant to several theoretical and regional research questions. As part of the test plan, research questions concerning chronology, lithic technology, food procurement strategy, and trade and travel were addressed. Testing provided the necessary information to determine site size, depth, content, integrity, and potential to address important research questions.

E. Thresholds for Determining Significance

A project will have potentially significant environmental impacts if:

1. As identified by CEPA Appendix G, it:

    a. Causes a substantial adverse change in the significance of a historical resource as defined in §15064.5 of the CEPA Guidelines.
    b. Causes a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5 of the CEPA Guidelines.
    c. Disturb any human remains, including those interred outside of formal cemeteries.

2. The project, as designed, and without conducting mitigating measures, causes adverse effects to historical resources defined as eligible for nomination to the Local Register under criteria as described within the San Diego County Local Register of Historical Resources Ordinance.

3. The project, as designed, and without conducting mitigating measures, causes adverse effects to significant cultural resource sites defined under criteria as described within the County Resource Protection Ordinance.

F. Site Significance Evaluation Results

Based on the results of the site evaluations presented in Section XIV, the thirty-two cultural sites were analyzed for basic value as embodied in the Criteria A and D of CEPA listed above, the San Diego County Local Register of Historical Resources (Local Register), and in the County Resource Protection Ordinance (RPO), i.e., integrity, uniqueness, research potential, and Native American concerns. Table XV-1 provides a numerical evaluation of the sites present in the project area. The sites were ranked high, medium or low according to integrity of the site, type and uniqueness of the site, value to the Native American community, scientific research potential, whether the site is or is not located in a proposed parcel or development area, and the sites research potential. Ten sites are high value, two sites are medium value, and twenty sites are low value.

For site integrity, test results assessed the degree to which disturbance of the context at a site will result in less potential for the cultural materials contained within it to provide meaningful information. A rating of "1" would reflect substantial disturbance, a "2" moderate disturbance, and a "3" minimal disturbance. For site uniqueness a "1" indicates that many previously investigated and documented sites contain similar information, a "2" would indicate that some investigated and documented sites have the attributes of the resource evaluated, and a "3" that few if any sites that have been investigated and documented have the attributes of the resource evaluated. For Native American concerns a "1" indicates a site contains a very limited amount of evidence of prehistoric Native American activity, and does not contain any potential for the presence of sacred or ceremonial materials. A "2" would indicate that more evidence of prehistoric Native American activities is present including habitation and/or artifacts that could be considered as important or sensitive to Native American concerns. A "3" indicates the presence of the most sensitive site elements, including but not restricted to, human remains and/or sacred items or features. The category of research potential is intended to reflect the breadth of research issues that a site can address. Sites, for example, that contain few artifacts, and have no subsurface deposit, such as single purpose bedrock milling station, have much less research potential than would a site that has these attributes. Sites that contain certain types of artifacts such as obsidian or other exotic materials, or other kinds of cultural materials such as faunal remains, have much greater research potential because these materials provide analytical opportunities to

Table XV-1. Site Significance Assessment Criteria

Seq. No.	Site No.	Integrity	Uniqueness	Native American Concerns	Research Potential	Composite Score	Value
Maximum Score		**3**	**3**	**3**	**5**	**14**	**H/M/L**
1	CA-SDI-7317	Y-2	Y-1	Y-1	Y-1	5	L
2	CA-SDI-7318	Y-2	Y-1	Y-1	Y-1	5	L
3	CA-SDI-7319	Y-2	Y-1	Y-1	Y-1	5	L
4	CA-SDI-7320	Y-2	Y-2	Y-1	Y-1	6	L
5	CA-SDI-7321	Y-2	Y-1	Y-1	Y-2	6	L
6	CA-SDI-7322	Y-2	Y-3	Y-3	Y-5	13	H
7	CA-SDI-7324	Y-2	Y-2	Y-2	Y-3	8	M
8	CA-SDI-7325	Y-2	Y-2	Y-2	Y-4	10	H
9	CA-SDI-7326	Y-2	Y-1	Y-1	Y-1	5	L
10	CA-SDI-7751	Y-2	Y-2	Y-2	Y-4	10	H
11	CA-SDI-7752	Y-2	Y-1	Y-1	Y-2	6	L
12	CA-SDI-7753	Y-2	Y-3	Y-2	Y-4	11	H
13	CA-SDI-7754	Y-2	Y-2	Y-2	Y-3	9	M
14	CA-SDI-7755	Y-2	Y-3	Y-3	Y-5	13	H
15	CA-SDI-7756	Y-2	Y-3	Y-3	Y-5	13	H
16	CA-SDI-7757	Y-2	Y-3	Y-3	Y-5	13	H
17	CA-SDI-7758	Y-2	Y-2	Y-3	Y-3	10	H
18	CA-SDI-7759	Y-2	Y-2	Y-3	Y-4	11	H
19	CA-SDI-7760	Y-2	Y-2	Y-1	Y-1	6	L
20	CA-SDI-7764	Y-2	Y-1	Y-1	Y-1	5	L
21	CA-SDI-7767	Y-2	Y-1	Y-1	Y-2	6	L
22	CA-SDI-7768	Y-2	Y-1	Y-3*	Y-4*	10*	H*
23	CA-SDI-15,979	Y-2	Y-2	Y-1	Y-1	6	L
24	CA-SDI-15,980	Y-2	Y-1	Y-1	Y-1	5	L
25	CA-SDI-15,981	Y-2	Y-1	Y-1	Y-1	5	L
26	CA-SDI-15,982	Y-2	Y-1	Y-1	Y-1	5	L
27	CA-SDI-16,076	Y-2	Y-1	Y-1	Y-1	5	L
28	CA-SDI-16,077	Y-2	Y-1	Y-1	Y-1	5	L
29	CA-SDI-16,078	Y-2	Y-1	Y-1	Y-1	5	L
30	CA-SDI-16,079	Y-2	Y-1	Y-1	Y-1	5	L
31	CA-SDI-16,080	Y-2	Y-1	Y-1	Y-1	5	L
32	CA-SDI-16,081	Y-2	Y-1	Y-1	Y-1	5	L

Site Quality Values: high (H)=14-10; medium (M)=9-7; low (L)=6-0
* Possible association with off-property site CA-SDI-7770

answer questions of particular interest in local and regional archaeology. For research potential, ratings are from 1 to 5 in an attempt to proportionally reflect the research issues that a site can address, i.e., .a rating of "1" would reflect that a site can address less than 20 percent of the research issues of interest in the area; a "2" from 20 to 40 percent; a "3", from 40 to 60 percent, etc., to approaching 100 percent.

1. Determination of Significance

Based on the results of the Phase I archaeological survey and boundary testing program, and on the results of the Phase II, site significance testing program, sites CA-SDI-7317, CA-SDI-7318, CA-SDI-7319, CA-SDI-7320, CA-SDI-7321, CA-SDI-7326, CA-SDI-7752, CA-SDI-7760, CA-SDI-7764, CA-SDI-7767, CA-SDI-15,979, CA-SDI-15,980, CA-SDI-15,981, CA-SDI-15,982, CA-SDI-16,076, CA-SDI-16,077, CA-SDI-16,078, CA-SDI-16,079, CA-SDI-16,080, and CA-SDI-16,081 were found not to be significant cultural resources. This finding is based on the relatively low research potential of these sites and the minimal data sets available for study at the sites. Given this finding, impacts (direct and indirect) would and, therefore, impacts will not be significant under CEPA or local Register criteria. For these twenty low value resources, no further consideration is warranted.

Using the results of the Phase II site significance testing program, deposit areas of twelve sites, CA-SDI-7322, CA-SDI-7324, CA-SDI-7325, CA-SDI-7751, CA-SDI-7753, CA-SDI-7754, CA-SDI-7755, CA-SDI-7756, CA-SDI-7757, CA-SDI-7758, CA-SDI-7759, and CA-SDI-7768, were found to be significant cultural resources of medium to high value under CEPA (Map XV-1). These sites possess the data and research potential to yield important information and to further our understanding of prehistory in the Santa Maria Valley. In-field interviews with Kumeyaay elders also indicated that these sites are of particular value to living Natives Americans. Project impacts, to these resources, therefore, if unmitigated, would be significant. Of these sites, ten, CA-SDI-7322, CA-SDI-7325, CA-SDI-7751, CA-SDI-7753, CA-SDI-7755, CA-SDI-7756, CA-SDI-7757, CA-SDI-7758, CA-SDI-7759, and CA-SDI-7768, considered to be high value, have also been found to be significant under criteria stipulated in the County of San Diego Resource Protection Ordinance (RPO).

Archaeological mapping information shows that portions of sites CA-SDI-7754 and SDI-7768 may extend outside and beyond the Oak Country Estates property boundary. The portion of site CA-SDI-7754 within the project property was assessed as significant, while the portion of site CA-SDI-7768 on the property was assessed as not significant. As this latter site, however, may in fact be a portion of a site located on the adjacent property that may be a significant site, it is judged that site CA-SDI-7768 should be considered as potentially significant as a portion of this larger site.

G. Potential Impacts

1. Introduction

As a result of test evaluation, ten prehistoric archaeological sites within the Oak Country Estates project area have been identified as being of particular interest for their value individually and as elements of a settlement pattern that likely represents a prehistoric village. These ten sites, CA-SDI-7322 and CA-SDI-7751, CA-SDI-7325, CA-SDI-7753, CA-SDI -755, CA-SDI-7756, CA-SDI-7757, CA-SDI-7758, CA-SDI-7759, and CA-SDI-7768 have been identified as RPO significant cultural resources, for which potential impacts are not mitigable through additional testing or data recovery. These warrant long-term preservation by incorporation into open space preserve. Two other prehistoric archaeological sites, CA-SDI-7324 and CA-SDI-7754, were determined after test evaluation to be significant resources under CEPA criteria, but not to an RPO level of significance. Avoidance (preservation) is the preferred mitigation for these two resources, options.

Map XV-1. All Project Sites with Areas of Preservation

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2. Proposed Project

The Proposed Project, as currently planned, will not significantly directly impact significant cultural resource sites. Of the twelve significant sites described above, none will be directly affected by development. The greatest potential for direct impacts would be the construction of Oak Country Road adjacent to RPO sites CA-SDI-7755, -7756, -7757, 7758, and 7759. Grading and landform alteration for this road will destroy marginal, non-significant, non-RPO portions of these five sites.

In the proposed Oak Country Estates development plan, the RPO and CEPA significant prehistoric archaeological sites are located within the Open Space areas outside of, but in proximity to, the development areas (Map XV-2). These sites may be indirectly impacted by increased pedestrian and equestrian traffic on trails. Some of these sites may be visually prominent from new homes and roadways, making them vulnerable to impacts from increased residential population. The indirect impact is potentially significant. Consequently, the proposed Oak Country Estates development plan could have indirect impacts to significant archaeological sites or portions of significant sites adjacent to the plan's boundaries from alteration of the current land use from agricultural/grazing to residential if steps are not taken to limit the access to these significant archaeological resources. Appropriate mitigating measures are described below.

3. Alternatives 1, 2, 3, and 4

With the exception of Alternative 4, potential impacts to archaeological sites under the four alternative development plans are the same as those under the Proposed Project. These alternative plans will not significantly directly impact significant cultural resource sites. Of the twelve significant sites described above, none will be directly affected by development. The greatest potential for direct impacts would be the construction of Oak Country Road adjacent to RPO sites CA-SDI-7755, -7756, -7757, -7758, and -7759. In Alternative 4, a section of this road will traverse an RPO portion of site CA-SDI-7756 (Map XV-2a). Along this section, impacts to the site will be avoided by capping. As with the Proposed Plan, grading and landform alteration for this road will destroy marginal, non-significant, non-RPO portions of these five sites under all of these alternatives.

Table XV-2. Potential Impacts to Archaeological Sites by Alternative

Site	Proposed Project and Alternative Plans 1, 2, 3, and 4
SDI-7754	Indirect (outside subdivision area)
SDI-7753	Indirect (outside subdivision area)
SDI-7755	Indirect (outside subdivision area)
SDI-7756	Indirect (outside subdivision area)
SDI-7757	Indirect (outside subdivision area)
SDI-7758	Indirect (outside subdivision area)
SDI-7759	Indirect (outside subdivision area)
SDI-7325	Indirect (outside subdivision area)
SDI-7768	Indirect (outside subdivision area)
SDI-7322	Indirect (outside subdivision area)
SDI-7751	Indirect (outside subdivision area)
SDI-7324	Indirect (outside subdivision area)

In the Oak Country Estates development alternative plans 1 through 4, the RPO and CEPA significant prehistoric archaeological sites are located within the Open Space areas outside of, but in proximity to, the development areas. These sites may be indirectly impacted by increased pedestrian and equestrian traffic on

trails. Some of these sites may be visually prominent from new homes and roadways, making them vulnerable to impacts from increased residential population. The indirect impact is potentially significant. Consequently, the Oak Country Estates alternative development plans 1 through 4 could have indirect impacts to significant archaeological sites or portions of significant sites adjacent to the plan's boundaries from alteration of the current land use from agricultural/grazing to residential if steps are not taken to limit the access to these significant archaeological resources. Appropriate mitigating measures are described below.

4. Cumulative Impacts

Cumulative impacts to archaeological sites are very difficult to assess because of the incomplete data base that exists for much of San Diego County in general and for Ramona in particular. However, because it is assumed that the aggregate of sites within the Oak Country development represents a single Late Prehistoric settlement, probably the ranchería of *Pa'mu* (Pamo), impacts to other Late Prehistoric sites, and specifically resources associated with the village of Pa'mu or other Late Period villages, could have a cumulative effect if not mitigated to a level of non-significance. This finding is based on the fact that the significant sites at Oak Country are unique; there are no other known ranchería sites in the immediate Ramona area.

Other nearby rancherías within a ten mile radius of the project site, include one 10 miles to the east in Ballena Valley, one in San Pasqual Valley 8 miles to the northwest, one currently under San Vicente Reservoir 6 miles south, and one in Poway (*Pawii*). The status of these other four settlements is problematic; the village of *Pawii* (Poway) has largely been destroyed by development, looting, and landform alteration; the unnamed village at the San Vicente Reservoir exists along the banks of the lake and to an unknown extent beneath the water; the village of San Pasqual still exists as remnants within the Wild Animal Park and in the agricultural fields of the valley; Ballena, the most intact besides the sites at Oak Country is largely intact within grazing lands and farms.

For the purposes of this cumulative analysis, seventeen projects in the Oak Country sphere of influence are used to address cumulative impacts. The list of seventeen projects is consistent with those addressed in the overall EIR and by other technical disciplines such as biology. As shown on Table XV-3, according to County documents and the results as presented in various cultural resources reports, none of the seventeen projects will cause adverse effects to significant cultural resource sites.

Cumulatively, unless mitigated to a level of less than significant, the loss of important portions of the ranchería core at Oak Country (Pa'mu) would result in the loss of significant scientific and cultural data from one of five known village sites in the region. Gauging cumulative impacts for a prehistoric/contact period settlement, such as the one at Oak Country, and at nearby sites, must consider the loss of the data base expected to be found at similar sites in terms of chronology and function. In terms of preservation of similar Late Period prehistoric sites in the Ramona area, it should be noted that sites within Montecito Ranch, Esquilago, the Highlanders, and the Ramona Airport, which may be directly related to the sites and the village core at Oak Country, are in open space easements and will be preserved.

To address the question of whether or not the current project contributes to, or causes the loss of significant resources within a local and regional context, the answer is clearly no. There are no direct adverse impacts to significant resources within the Oak Country project. Taken as a whole, and in a cumulative sense, Oak Country, Montecito Ranch, Esquilago, the Highlanders, and the Ramona Airport, have preserved, or will through the appropriate actions of the developer and the County of San Diego, preserve those sites, or portions of sites that constitute significant resources under CEPA and RPO. Further, if one assumes that the resources within these projects are associated with the village of Pa'mu, then the cumulative effect is not significant, collectively, these projects are, perhaps more than for any other village in the region, preserving a large portion of a singularly important Kumeyaay settlement.

Map XV-2. Oak Country Estates Preserved Archaeological Sites and Proposed Project
(a 1:200 scale map is also included in the map pocket)

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Map XV-2a. Oak Country Estates Preserved Archaeological Sites and Alternative 4
(a 1:200 scale map is also included in the map pocket)

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Table XV-3. Comparison of Projects Used for Cumulative Effects

Project	Number of Sites	Site Types	Site Components	Evaluation	Mitigation
Ramona Airport Expansion	37	Special use; milling and food preparation. Late Prehistoric	Largely small Bedrock milling sites. Eight sites with artifacts	15 sites tested; 22 not tested	Only one site (14161) found to be significant. It and nine others in Open Space. Impacts less than significant
Stonecrest	4	Multi-use camp or village outlier Late Prehistoric	Bedrock milling Bifaces, cores	All sites tested; Data recovery	Achieved through data recovery
Borysewicz	0	N/A	N/A	N/A	N/A
Montecito Ranch	39	Multi use camp or village outlier; milling and food preparation. Part of Pa=mu? Late Prehistoric	Largely small bedrock milling sites. Twenty sites with ceramics, flakes, stone tools, milling tools.	Testing and data recovery	Fifteen sites were determined to be significant. And placed in Open Space Easements. Impacts less than significant
Salvation Army Camp	4	Special use; milling and food preparation. Period Unknown	One lithic scatter and 3 bedrock milling features	Testing and data recovery	Achieved through data recovery. Impacts less than significant
Monte Vista Oaks	5	Special use; tool production and camping? Late Prehistoric Period	Debitage, flakes, bedrock milling, and ceramic sherds.	Testing and data recovery	Achieved through data recovery. Impacts less than significant
Rancho Esquilago	6	Multi use camp or village outlier; milling and food preparation. Part of Pa=mu? Late Prehistoric Period	Milling features, stone tools, ceramic sherds, bifaces, milling tools, flakes.	Testing and Data recovery.	Two sites were determined to be significant; placed in Open Space. Impacts less than significant
Leulf Ranch TM 4862	1	Special use; milling and food preparation. Period Unknown	Debitage, flakes, bedrock milling and small midden	Testing and data recovery	Achieved through data recovery? Impacts less than significant
TM 20318	1	Possible ritual or ceremonial site. Period Unknown	Possible female fertility rock	Survey only	Site placed in Open Space Easement Impacts less than significant
TPM 20370	6	Multi use camp or dispersed camp; milling and food preparation. Late Prehistoric Period	Milling features, stone tools, ceramic sherds, bifaces, milling tools, flakes.	Testing and data recovery	Achieved through data recovery and placement of two sites in Open Space Easement. Impacts less than significant
TPM 20401	0	No archaeological study completed	N/A	N/A	N/A
TPM 20496	0	No archaeological study completed	N/A	N/A	N/A
TPM 20402	6	Multi use camp or dispersed camp; milling and food preparation. Late Prehistoric period	Milling features, stone tools, ceramic sherds, bifaces, milling tools, flakes.	Testing and Data recovery	Achieved through data recovery and placement of two sites in Open Space Easement. Impacts less than significant
Cummings Ranch PAA 03-002					
Boundary Avenue School	1	Isolated Milling Bedrock Features Period Unknown	Two bedrock milling slicks	Survey only; significance undetermined	Based on current plans site will be avoided.
Olive Peirce Middle School amd Ramona High School Expansion	0	N/A	N/A	N/A	N/A

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H. Mitigation Measures

Mitigation measures that apply to the Proposed Project and alternatives plans 1 through 4 include: (1) prior to the submittal of the Final EIR, precise demarcation and recording in the field, by archaeologists and licensed project surveyors, shall be conducted of all Open Space easements and significant site boundaries within and adjacent to open space easements, and the archaeological mapping of all milling features not previously recorded in the site evaluation programs; (2) prior to the start of construction, temporary or permanent fencing and signage along roads, equestrian trails, and/or Open Space easement boundaries shall be erected as delineated by the Proposed Biological and Archaeological Open Space Fencing and Signage Plan (EIR Appendix L) and depicted on Map XV-2; (3) the archaeological monitoring plan prepared for the project (Appendix L in EIR Appendix A, Volume II) shall be implemented with an archaeological monitor present on-site during project construction, to observe any clearing, grubbing, grading, trenching, drilling, or other earth moving activities to insure impacts to sensitive resources are avoided; and (4) all archaeological materials already recovered, and any recovered during future monitoring activities, including field notes, and other data shall be curated at the San Diego Archaeological Center. Because of the presence of sensitive vegetation and of bedrock as a dominant feature of the landscape, the natural contour of the hills, and the nature of the sites, capping or filling on top of the sites is not recommended as viable mitigation (Table XV-4).

Also common to all of the plans is that because the sites may be visually prominent from the new homes and roadways, they may be vulnerable to impacts from the increased residential population. This proximity to the development may and the construction of trails may result in indirect impacts by increased pedestrian and equestrian traffic on the trails. This indirect impact is potentially significant. Mitigation would require design of trails to avoid affecting the sites entirely, fencing of trails, and in some instances by fencing and signage along the edges of accessible and visible sites.

1. Proposed Project

Mitigation can typically be achieved by preservation and avoidance of sensitive archaeological resources. Avoidance of the ten RPO significant sites and the two CEPA significant sites by the Proposed Project has been achieved by design. None of the significant portions of these twelve sites lie within the Proposed Project development subdivision or infrastructure areas. Successful avoidance further involves dedication of the significant portions of these sites into adjacent open space easement areas with recorded restrictions on use and fencing (compatible with the development design) to restrict access to the sites. The planned avoidance, and the creation of dedicated open space areas for the preservation of all significant portions of the twelve significant cultural resources by the Proposed Project plan is expected to reduce the levels of impacts to below a level of significance.

While the Proposed Project will not directly impact the significant portions of the twelve significant cultural resource sites, some potential for direct impacts could occur during the construction of Oak Country Road adjacent to RPO sites CA-SDI-7755, -7756, -7757, 7758, and 7759. Grading and landform alteration for this road will also destroy marginal, non-RPO portions of these five sites. Mitigation will require temporary or permanent protective fencing during construction activities, and by permanent fencing and signage along some roads, and along trails, and Open Space boundaries, compatible with the development design (see Map XV-2).

Table XV-4. Treatment of Cultural Resources in the Proposed Project

Site No.	Boundary Tested	Phase II Tested	Milling Features Mapped	Rank	Mitigation
CA-SDI-7317	X	N	X	L	TM
CA-SDI-7318	X	N	X	L	TM
CA-SDI-7319	X	N	X	L	TM
CA-SDI-7320	X	X	X	L	TM
CA-SDI-7321	X	X	X	L	TM
CA-SDI-7322*	X	X	N	H	A/P
CA-SDI-7324	X	X	X	M	A/P
CA-SDI-7325*	X	X	N	H	A/P
CA-SDI-7326	X	X	X	L	TM
CA-SDI-7751*	X	X	N	H	A/P
CA-SDI-7752	X	X	X	L	TM
CA-SDI-7753*	X	X	N	H	A/P
CA-SDI-7754	X	X	N	M	A/P
CA-SDI-7755*	X	X	N	H	A/P
CA-SDI-7756*	X	X	N	H	A/P
CA-SDI-7757*	X	X	N	H	A/P
CA-SDI-7758*	X	X	N	H	A/P
CA-SDI-7759*	X	X	N	H	A/P
CA-SDI-7760	X	N	X	L	TM
CA-SDI-7764	X	N	X	L	TM
CA-SDI-7767	X	X	X	L	TM
CA-SDI-7768*	X	X	X	H**	A/P**
CA-SDI-15979	X	N	X	L	TM
CA-SDI-15980	X	N	X	L	TM
CA-SDI-15981	X	N	X	L	TM
CA-SDI-15982	X	N	X	L	TM
CA-SDI-16076	X	N	X	L	TM
CA-SDI-16077	X	N	X	L	TM
CA-SDI-16078	X	N	X	L	TM
CA-SDI-16079	X	N	X	L	TM
CA-SDI-16080	X	N	X	L	TM
CA-SDI-16081	X	N	X	L	TM

Legend:
X = Yes; N = No; L = Low; M = Medium; H = High
A = Avoid - Beyond Project; NR = None Required; TM = Testing/Recording has mitigated impacts;
T = Test; P = Preservation
* RPO eligible site
** Possible association with off-property site CA-SDI-7770

Specific mitigation measures include:

- Prior to submittal of the Final EIR, all open space easements and site boundaries within and adjacent to easements shall be surveyed by licensed surveyors and precisely demarcated in the field. This measure will ensure that the archaeological sites are accurately placed on engineering maps, so that subsequent fencing (as required) can be provided in the appropriate locations, and that any future encroachment into the open space easements can be prohibited. The bedrock milling features at sites CA-SDI-7322, CD-SDI-7325, CD-SDI-7751 CA-SDI-7753, CA-SDI-7754, CA-SDI-7755, CA-SDI-7756, CA-SDI-7757, CA-SDI-7758, and CD-SDI-7759 were not mapped and recorded at this phase of study. The accurate recordation of these features must be accomplished prior to submittal of the Final EIR and provided in the revised, Final Technical report.

- All artifacts and associated records that have or will in the future be discovered (e.g. during monitoring) will be curated at San Diego Archaeological Center, to be accompanied by the payment of fees necessary for permanent curation.

- Prior to the start of construction, temporary or permanent preventive fencing (at the option of the applicant), with signage, shall be erected according to the Proposed Biological and Archaeological Open Space Fencing and Signage Plan (EIR Appendix L) for the project (see Map XV-2). This fencing is required to prevent inadvertent impacts to cultural resources during construction and to discourage incursion into the significant site areas from either side of the riding and hiking trail, from lower Oak Country Road, and/or from the adjacent housing areas. Specifically the fencing shall be placed:

  along both sides of the trail where it borders the western housing boundary and the dedicated biological open space containing the significant archaeological site areas.

  along both sides of the trail where it lies within portions of the dedicated biological open space containing the significant archaeological site areas.

  along both sides of the north-south portion of lower Oak Country Road within the dedicated biological open space containing the significant archaeological site areas.

  along the boundary of the dedicated biological open space in all other dedicated biological open space areas containing the significant archaeological site areas not traversed by either the trail and/or Oak Country Road.

- Because of the presence and proximity of sensitive (RPO and CEPA significant) cultural resources to the Proposed Project development areas and because Native Americans, consulted with on the project, have requested it, all ground disturbing development activities must be monitored by a qualified archaeological monitor. Therefore, prior to issuance of a grading permit or the recordation of the Final map, whichever occurs first, the archaeological monitoring plan prepared for the project (Appendix L) shall be implemented and during any earth disturbing activities including, but not restricted to, grading, drilling, trenching, grubbing, or clearing, on the project site, an archaeological monitor shall be on site to insure impacts to sensitive resources are avoided. This monitoring process will include:

  Pre-Construction Meetings

  Prior to commencement of construction excavation, trenching, or other landform alteration associated with road construction, placement of utilities, further geotechnical borings, or other land disturbing activities, the archaeological monitor shall attend pre-construction meetings with the contractors and receive a set of grading and/or construction plans. The

contractor shall be made aware of the sensitive resources in the project and made fully aware of the constraints to staging, parking, brush removal, and grading. Required flagging and/or fencing-off of sensitive archaeological areas will be confirmed by the monitor with appropriate construction personnel. Further, the contractor shall be informed of the role of the archaeological monitor and of the potential for the temporarily halting of grading and trenching in the event of the discovery of potentially sensitive archaeological materials.

Field Monitoring

A qualified archaeological monitor or monitors shall be present during initial grading, including a 50 ft buffer, when grading, trenching, or landform alteration comes within 50 ft of a significant cultural resource site as defined in the cultural resources technical report and EIR for Oak Country. These sites are situated within proposed open space easements and their location will be clearly shown on the appropriate maps. The field monitor will keep daily logs of the monitoring process and these logs will be available for County of San Diego inspection. In the event of the discovery of an important or potentially important resource, the County contact will be notified within 24 hours of the discovery. The County will be kept informed of the construction schedule and will be notified of any non-compliance on the part of the contractors or their agents.

The archaeological monitor shall have the authority to temporarily halt excavation if resources are encountered during excavation or trenching. As a standard procedure, the area of sensitivity will be flagged off to include a buffer of approximately five meters. All potentially important resources will be evaluated by applying CEPA and County of San Diego criteria and through assessment of the resources' ability to yield important information. The potential data sets and cultural information that could be provided by each discovered resource will be assessed in light of the research questions posed for the complex of sites under study. If required, evaluation may include excavation of controlled units, surface scrapes, extension of trenching, clearer definition of features, or other measures as required. In all cases, the evaluation will follow the field techniques and methods proscribed by the County.

In the event of the discovery of human remains, the County Coroner, the Native American Heritage Commission, and the Most Likely Descendent, as identified by the San Pasqual and Mesa Grande Bands of Mission Indians, will be immediately notified. The terms and stipulations of legal compliance and regulation will be fully implemented and it is assumed that reburial of the remains will occur on site.

Monitoring Report Preparation

Upon conclusion of the monitoring program, the consultant shall, within ninety days of leaving the field, prepare and submit a comprehensive monitoring report. All cultural materials, field notes, and other data must be curated at the San Diego Archaeological Center. Upon completion and approval of the Monitoring Report by the County, mitigation of impacts to archaeological resources deriving from grading, trenching, and landform alteration will have been achieved.

2. Alternatives 1, 2, 3, and 4

Withe exception of Alternative 4, avoidance of direct and indirect impacts in alternatives 1 through 4 will be achieved by the same measures as described above for the Proposed Project Plan, as the plans are the same in regard to cultural resource impact potential. In Alternative 4, a section of Oak Country Road will traverse an RPO portion of site CA-SDI-7756. This road section will be placed on top of a fill cap within the RPO area of the site. This cap, and monitoring of the road construction, will prevent direct impacts to this RPO

portion of the site under this alternative. Under all of the plans, grading and landform alteration for this road will destroy marginal, non-significant, non-RPO portions of these five sites. Mitigation will require temporary or permanent protective fencing during construction activities, and by permanent fencing and signage along some roads, and along trails, and Open Space boundaries, compatible with the development design [see Map XV-2a (Alternative 4)].

Potential impacts to cultural resources associated with Alternative 4 would be similar to the proposed project design. Alternative 4 would result in the capping of a narrow strip of CA-SDI-7756, a RPO-eligible site. Capping of a narrow portion of the eastern segment of the site for road construction would not result in damage to cultural resources because capping protocols designed to prevent damage to cultural resources will be strictly followed. The two abutments needed to construct the bridge over the wetland and wetland buffer would be hand-excavated in a controlled manner by qualified archaeologists as part of a testing program. An archaeological monitor shall be on site during capping and construction. No damage would likely occur to cultural resources because the proposed abutments are located within a portion of the site where it is highly unlikely that artifacts are located. The construction monitoring will assure that unanticipated disturbances and activities will not occur on this site as well as the other sites on the project. The proposed road and capped area would extend over an area a maximum of 100 feet wide and 500 feet long (50,000 square feet or 1.15 acres). This constitutes approximately 10% of the referenced site and approximately 1.4% of the approximately 72.0 acres of archaeological open space easements proposed for the entire project site.

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