The Temporal Dating and Analysis of the Archaeological Assemblage Recovered from a Portion of Prehistoric Site, *"Satos Rini Rumaytak"* (At the Hill Above the River Site) CA-SCR-12

A Project Report

Presented to

The Faculty of the Department of Anthropology

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In Partial Fulfillment

of the Requirements for the Degree

Masters of Arts

By

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Abstract

In 1986, the Department of Anthropology at San Jose State University conducted an archaeological field school excavation project on a portion of prehistoric site CA-SC-12. This project was initiated by the cultural resource management firm, Archeological Consulting and Research Services Inc. (ACRS) of Santa Cruz, Ca., as a mitigation alternative for offsetting the potential impact to CA-SCR-12, by a proposed residential development project. A total of 15,100 elements were recovered from the site by the SJSU field school team and an additional 1292 elements were recovered from the site by ACRS. All materials were later accessioned into the San Jose State University Department of Anthropology Repository.

This project report details the inventorying and analysis of the SJSU CA-SCR-12 assemblage. In addition, I frame three basic research questions about the nature of the site and I turn to AMS dating, XRF sourcing, and obsidian hydration studies to obtain data which may aid in answering those questions.

Acknowledgments

I would like to thank my mother, wife, and my three daughters for their love, patience, and support during my research and writing of this project report. I am also greatly indebted to many people who provided suggestions and assistance when needed: Dr. Eric Bartelink, Mathew Diez, John Schlagheck, Deniz Enverova, Jean Geary, Melynda Atwood, Deep Choudhari, Joshua Garcia, Michael Wescoat, Leon Manou, and Alana Daigneault. I would also like to thank my Graduate Committee beginning with my Committee Chair Dr. Meniketti for encouraging me to apply to the Master's Program in Applied Anthropology, Dr. Sunseri for her guidance and advice and Mr. Alan Leventhal who introduced me to the prehistoric Muwekma Ohlone site CA-SCR-12, which became the focus of my research. This project would have been impossible without their assistance. Finally, I thank the Muwekma Ohlone Tribe of the San Francisco Bay Area for their support in my efforts to learn more about this ancestral heritage site. It was an honor to work with the cultural materials from prehistoric site, "Satos Rini Rumaytak" (At the Hill Above the River Site) CA-SCR-12 and I thank you for that privilege.

The Undersigned Graduate Committee Approves the Project Report Titled

The Temporal Dating and Analysis of the Archaeological Assemblage Recovered from a Portion of Prehistoric Site, Satos Rini Rumaytak (at the Hill Above the River Site) CA-SCR-12

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The Temporal Dating and Analysis of the Archaeological Assemblage Recovered from a Portion of Prehistoric Site, "*Satos Rini Rumaytak*" (At the Hill Above the River Site) CA-SCR-12

Chapter 1: Introduction and Project Overview

Introduction

This project report details the fieldwork and resultant analysis of two prehistoric archaeological assemblages that were recovered from a portion of an Early Period Ancestral Ohlone / Costanoan site "*Satos Rini Rumaytak*" (At the Hill Above the River Site) CA-SCR-12, located at 912 Third Street, in the City of Santa Cruz, California. One assemblage was recovered in July 1986 by the cultural resource management firm, Archaeological Consulting and Research Services Inc. of Santa Cruz, Ca. The other assemblage was recovered in the Fall 1986 by a San Jose State University Department of Anthropology field school class. All cultural materials recovered from the ACRS test excavations (1 archive box) were included with those materials recovered by the SJSU field school class (23 boxes) and were later accessioned into the San Jose State University Anthropological Facility.

This project report presents information on the results of the Archival Literature search and the previous archaeological work that has been conducted at the site in Chapter 2; analysis of the flaked, pecked and battered stone assemblages and other artifacts recovered from CA-SCR-12 in Chapter 3; analysis of several species of bay and marine shellfish that were identified within the SJSU shell assemblage in Chapter 4; analysis of specific terrestrial and marine mammal remains that were identified within the faunal bone assemblages in Chapter 5; analysis of bone and shell artifacts in Chapter 6; cursory description and numeration of the historic artifact assemblages in Chapter 7; burial descriptions and skeletal biology in Chapter 8; and the dating and chronological placement of prehistoric site CA-SCR-12 in Chapter 9.

In Chapter 10, I address the three research questions that were put forward in the beginning phases of this project study. I then discuss the implications of my research and I offer recommendations for the future analyses of the prehistoric ancestral Ohlone / Costanoan CA-SCR-12 archaeological assemblage.

SJSU Research Grant

This Master's project study was partially funded by the San Jose State University, College of Social Sciences Research Foundation in the amount of $1995.00, for the purposes of: 1) conducting Accelerator Mass Spectrometry (AMS) radiocarbon dating studies on several organic materials (human bone, terrestrial and marine mammal bone, and *Mytilus* shell), 2) sourcing obsidian artifacts via non-destructive Energy Dispersive X-Ray Fluorescence (EDXRF), and 3) conducting obsidian hydration studies. The Muwekma Ohlone Tribe, which is very interested in learning about its ancestral past, submitted a letter to the San Jose State University Department of Anthropology, which served as a statement of full support for the specialized studies that are presented in this archaeological project report.

Background Information

ACRS Field Excavation at CA-CR-12

In May 1986, Mr. Tom O' Neill contacted the cultural resource management firm, Archaeological Consulting and Research Services Inc. (ACRS) and requested a preliminary archaeological reconnaissance and a program of archaeological test augerings on a parcel of land that lay within the recorded boundary of the prehistoric site CA-SCR-12. The subject parcel consists of less than one acre of land and is located at 912 Third Street in the City of Santa Cruz, California. The Assessor's Parcel Number (APN) is 005-183-06 and the Universal Transverse Mercator Grid (UTMG) coordinates for the approximate center point of the project area are:

Datum: NAD 27 / Zone: 10 / Easting: 586950 / Northing: 4091646 on the U.S.G.S. 7.5 minute Santa Cruz Quadrangle (see Map 1). Mr. O' Neill owned this particular parcel of land

Map 1: Location of CA-SCR-12 on U.S.G.S. Santa Cruz 7.5' Quadrangle 1: 24 000

and had submitted a proposal to the City of Santa Cruz for a planned residential development project. The proposed residential project included the demolition of an existing historic structure and the construction of two townhomes, a carport, parking facility, walkways, and a resurfacing of the existing driveway (Dietz 1986). In addition, new landscaping was to be installed.

CA-SCR-12 is an Early Period Ancestral Ohlone / Costanoan site that is located less than one quarter mile north of the Santa Cruz Beach Boardwalk and it sits on a bluff just above the southern edge of the San Lorenzo River (Baker 1980). The elevation of the site is approximately 80 feet above mean sea level (AMSL) and the nearest source of fresh water drainage is the San Lorenzo River, which is located approximately 150 feet to the northeast of the site. Other fresh water sources in the area include: marshes, lagoons, and other perennial, intermittent, and ephemeral creeks and drainages (Pulcheon et, al 2006).

A review of all Northwest Information Center detail records, archaeological site records, maps, and project files associated with CA-SCR-12 indicate that the site's boundary zone resembles a large oval. The oval extends from the San Lorenzo River levee near the north end of Cliff Street on the northeast, to the south side of Pacific Avenue near the east end of West Cliff Drive on the west, and to a point on Main Street midway between 2nd and 3rd Streets (Cartier 2003). CA-SCR-12 is a massive site and measures approximately 1200 x 600 feet in area (see Map 2).

Map 2: CA-SCR-12 and Current Surroundings (Source: Google Earth)

Archaeological Consulting and Research Services (ACRS) principal investigator, Mr. Steven Dietz and other ACRS investigative personnel reconnoitered and augered the subject parcel per Mr. O' Neill's request. A total of eleven test borings were completed within the subject area and the results of that augering program indicated that: 1) a large portion of the subject parcel contained cultural deposits associated with CA-SCR-12, and 2) cultural deposits which lay in the middle and front portions of the parcel appear to be undisturbed and intact. A limited program of archaeological test excavations were recommended in order to determine the significance of that portion of the site CA-SCR-12 which was found to be situated within the subject parcel (Dietz 1986).

In July 1986, ACRS returned to the subject area (912 Third Street) and completed a program of archaeological test excavations near the middle and front portions of that parcel. A total of three rapid recovery 1x1 meter square excavation Test Units were completed. All three Test Units were excavated in a succession of separate arbitrary 20 cm levels to depths ranging from 80-100 cm BS. Cultural deposits were recovered from the test excavations and these included: thermally altered rock, faunal bone, four *Olivella* shell beads (types A1b, A1c, and one G2 or G6 series bead saucer), lithic debitage, ground stone fragments, bone tools, biface fragments, choppers and ground stone artifacts, and one side-notched Green Franciscan Chert projectile point. These artifacts are described by Mr. Dietz in his final report titled, "Archaeological Test Excavations of a Portion of Prehistoric Site CA-SCr-12 Located at 912 Third Street, Santa Cruz, California" (see Appendix A). In addition, all cultural materials recovered from the ACRS test excavations (1 archive box) were later accessioned into the collections of the San Jose State Anthropological Facility.

Upon completion of the ACRS data recovery program at 912 Third Street, Mr. Dietz concluded that the proposed development project would cause a disturbance to that portion of the site CA-SCR-12, which was found to be situated within the project parcel. Archaeological Consulting and Research Services (ACRS) prepared a mitigation plan which detailed the provisions of how construction should proceed and that plan included the following provision:

> "Excavation of a portion of the site within the project parcel by an archaeological field class from San Jose State University. Discussions undertaken at the completion of the test excavations resulted in the permission for the investigation of CA-SCR-12 on the property by a field class from S.J.S.U. as part of the projects mitigation plan. The field class excavations began in September and are in progress. The property owner has offered to provide funds for two radiocarbon dates in the event that the S.J.S.U. excavations recover any suitable materials for dating. A report of any work completed by professional archaeologists will be prepared as part of their involvement. Excavations completed by S.J.S.U. will be summarized in a report prepared by the class. The materials obtained during ACRS's test excavation (1 archive box) will be included with those recovered by the S.J.S.U. field class and accessioned into the collections of the San Jose State Anthropology facility. Sourcing and hydration dating of the obsidian debitage included in the ACRS test collection will be undertaken as part of the S.J.S.U. field class studies (Dietz 1986, 18-19)."

SJSU Field Excavation at CA-SCR-12

On August 30th 1986, a team of students and staff from the San Jose State University Department of Anthropology began an eleven-week archaeological field school excavation project on that parcel of land located at 912 Third Street, under the direction of Anthropology instructor Dr. Tom Jackson (Student Field Notes 1986). The names of the field school students, staff, and faculty are listed below and the source of this information comes from the San Jose State University Anthropology 195 class roster and the site attendance records from the 1986 calendar year. The investigative personnel included:

- **Anthropology 195 students**

Joan Coulson	Tammy Bloom	Stephen Kidder
Mette Fordan	Heather Turner	Dara Cohen
Patricia Lomas-Wolfe	Bennet Willey	Stephen Kidder
Jill Matsumoto	Bob Darcy	Laurie Macfee
Cynthia Mazzei	Brian Wesenberg	

- **S.J.S.U. Staff:** Mr. Alan Leventhal
- **S.J.S.U. Faculty:** Dr. Tom Jackson

Field Methods

The excavation phase of the SJSU field school project began in the front and along the side yard of a circa 1850s cottage style home which was located within the project area (see Figure 1).

Figure 1: 912 Third Street Cottage at the Time of the Excavation

A total of eleven excavation units were established within the residential parcel (see Figure 2). The CA-SCR-12 assemblage was recovered from seven controlled 1 x 2 meter excavation units and four 1.5 x 1.5 meter trench units**.** All units were excavated using the unit-level methodology. Here, the technique was to dig each excavation unit down vertically in discreet arbitrary levels, defined by the lines of a grid system. This system of control, which originates from a site datum, aids in the recording of the exact provenience of all material recovered from an archaeological site (Hester, Shafer and Feder 2009).

Nine of these test units were excavated in a succession of separate arbitrary 10 cm levels to depths ranging from 80-100 cm BS. Test Unit 3A and Test Unit 3B were not included in the initial research design. However, a thin veneer of baked earth/clay was discovered in Unit 3 at a depth of 70 cm BS (Student Field Notes 1986). The discovery of that feature triggered the opening of two additional Test Units (Unit 3A and Unit 3B) on the east and west side of Unit 3.

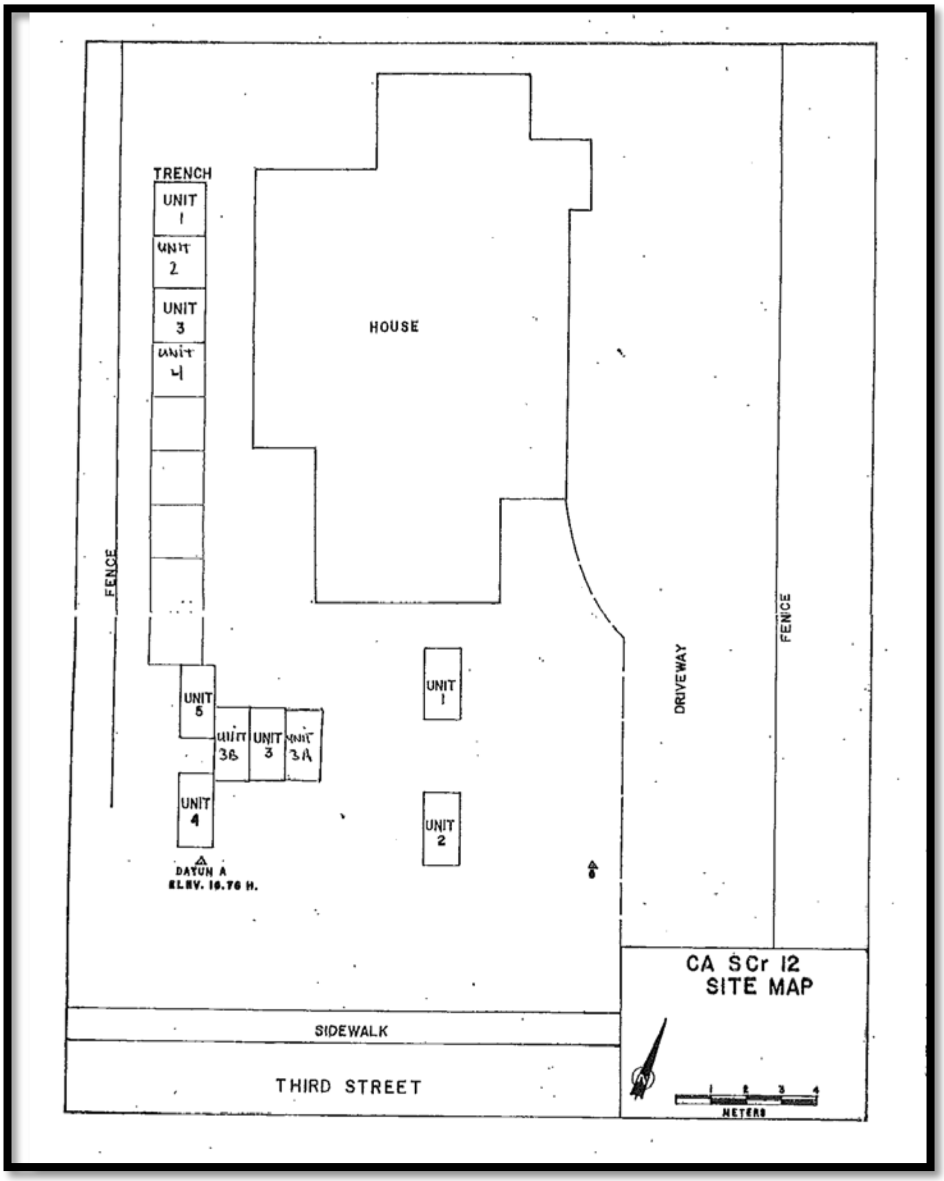


Figure 2: Site Map Showing Location of Test Excavations

Unit 3A was excavated on the east side of Unit 3, in 30 cm levels to a depth of 60 cm BS. The excavation of that unit then continued in 15 cm levels to a depth of 90 cm BS. Unit 3B was excavated on the west side of Unit 3, in 30 cm levels to a depth of 60 cm BS. The excavation of Unit 3B then continued in 10 cm levels to a depth of 70 cm BS (see Table 1 for the arbitrary levels of excavation and the depth of each level). The feature itself appears to have been defined, however, no samples (e.g., floatation, charcoal, or soil) were found in the curated SJSU

Table 1: Arbitrary Levels of Excavation and Depth of Each Level

Depth 10 cm Levels	Unit 1	Unit 2	Unit 3A	Unit 3	Unit 3B	Unit 4	Unit 5	TRU 1	TRU 2	TRU 3	TRU 4
0-10											
10--20											
20-30											
30-40											
40-50											
50-60											
60-70											
70-80			(75)								
80-90											
90-100											

collection. All cultural materials recovered from the excavation units were screened using ¼ inch mesh and placed into plastic unit level bags (Student Field Notes 1986). Those bags were labeled with the site number, unit number, and a reference number and they were placed in unit level bags, which contained information that include: site number, unit number, unit level, excavator(s) name, date, and a reference number.

When the excavation phase of the project was near completion, the field school students drew stratigraphic profiles illustrating the west wall of Test Unit 1, the east wall of Test Unit 4, and the east wall of Test Unit 5. In addition, the students illustrated the baked earth/clay feature which was present both in Test Units 3 and 3A. Once the final stages of stratigraphic recording were completed, all excavated earth was then backfilled into the excavation units.

On November 8th 1986, the excavation phase of the SJSU field school project concluded. All recovered cultural materials (totaling 23 boxes) were transported back to the San Jose State University Department of Anthropology Laboratory for further processing, analysis and classification. The recovered assemblages included: flaked stone, shell, faunal bone, human remains, historic materials, and midden soil samples.

Assessment of the SJSU and ACRS Archeological Collections

The SJSU Archaeological Catalog (Phase 1)

In May 2012, I began the present study by conducting a three week preliminary review and assessment of all available documentation (maps, field / excavation notes, archeological catalogs) and cultural materials (24 boxes: SJSU n = 23, ACRS n = 1) associated with both the SJSU and ACRS excavations at CA-SCR-12. As a result, some serious issues began to emerge. First and foremost, despite having located the SJSU preliminary CA-SCR-12 artifact catalog, it was evident that this catalog was an incomplete “rough draft” rather than representing a final artifact inventory. While the “preliminary” or “draft” catalog may be a standard practice in the process of cataloging any archaeological collection, this particular inventory was missing vital contextual data associated with the San Jose State University field school excavation at CA-SCR-12. For example, all catalog sheets and their respective data specifically derived from Test Units #’s 1, 2, 3, 3A, 3B, 4, and 5, as well as from Trench Unit # 1 were either previously misplaced or lost.

The archaeological catalog functions as a permanent record reflecting all cultural materials recovered from an excavation project (Sutton and Arkush 2009). Furthermore, it contains vital information such as: the project name, the site’s trinomial designation, accession numbers / catalog numbers, and unit and other provenience information. Catalogues may also include scaled drawings, material descriptions, classifications, quantities, weights, and a remarks section. Therefore, the catalog is one of the most important administrative documents associated with the analysis of any archaeological project. With that said, the conditions of the SJSU CA-SCR-12 catalog and the administrative archive were such, that it was virtually impossible to reference them when trying to frame basic research questions about the nature of the site, based upon the recovered assemblages. Due to the paucity of documentation in the administrative archive (i.e., archaeological catalog, unit logs, and other contextual data), I realized that the next phase of work included laying out the entire assemblage by unit and level in order to obtain a preliminary understanding of what cultural elements (artifacts, faunal bone, shell, flaked and ground stone tools, human remains, and historic materials) were present in this particular collection.

The SJSU CA-SCR-12 Assemblage (Phase II)

In June 2012, I began Phase II which included the process of laying out and accessing the CA-SCR-12 assemblage by unit and level in the San Jose State University Department of Anthropology Laboratory and as a result, additional issues began to emerge. For example, a large portion of all cultural materials (artifacts, faunal bone, shell, lithics, human remains and historic materials) recovered from Test Units # 1 through # 5, and Trench Units # 1 and # 2 had only been subjected to a preliminary sort and cursory review. In other words, the SJSU field school faculty and students never completed the processing of these materials. Furthermore, all cultural materials recovered from Trench Unit # 3 and Trench Unit # 4 had never been processed at all. Although this originally posed a very serious dilemma for me, after reviewing the entire SJSU CA-SCR-12 assemblage (which consisted of approximately 15,100 elements), I discovered that a large percentage of all materials recovered from the site were never completely processed or classified.

The ACRS Administrative Archive and Archaeological Assemblage

As a result of my preliminary review of the SJSU CA-SCR-12 collection, I identified a total of thirty-six unit level bags containing cultural materials recovered from the 912 Third Street location within the site, however, they were dated July 1986. This was somewhat confusing to me, because the SJSU field school excavation project at 912 Third Street did not begin until August 30th 1986. In addition, all thirty-six unit level bags were recovered from Test Units that were excavated in a succession of separate arbitrary 20 cm levels, yet none of the SJSU Test or Trench Units were excavated using that methodology. It became evident that there was some mixing of the boxed cultural materials between the ACRS and SJSU CA-SCR-12 excavations.

In order to resolve this issue, I went into the San Jose State University Department of Anthropology Repository and located one box which was labeled, "ACRS: Dietz / CA-SCR-12 Excavation Project - 912 Third Street / July 1986." Unfortunately, that box did not contain any administrative paperwork, field notes, or an archaeological catalog either. Once I laid out that assemblage by unit and level, it became apparent that approximately 1,292 artifactual and ecofactual materials required separate processing and further classification before including them in my study.

The Archaeological Report -The Dissemination of Information (Phase III)

In July 2012, I made three trips to the Northwest Information Center at Sonoma State University in Rohnert Park to try to access all relevant archival records, maps, and project files associated with previous archaeological work conducted on site CA-SCR-12. A total of twenty-two associated detail records were currently on file at this location. One of those records identified as (S-8703) was titled, “Final Report Archaeological Test Excavations of a Portion of Prehistoric Site CA-Scr-12, Located at 912 Third Street, Santa Cruz, California. October 1, 1986.” That report was prepared by Stephen Dietz of Archaeological Consulting and Research Services Inc. and it detailed the ACRS data recovery program conducted at the 912 Third Street address in July 1986. Unfortunately, I did not locate any archival records or a project report which detailed the SJSU data recovery program conducted at 912 Third Street that same year.

Once I had completed the review of the Northwest Information Center archival records, the SJSU CA-SCR-12 administrative archive, and the SJSU CA-SCR-12 archaeological collection, it became apparent that the SJSU archaeological team did not generate a preliminary project report detailing their August 1986 data recovery program at the 912 Third Street residence. Perhaps this was because the preliminary analyses and final classification of the CA-SCR-12 assemblages were never completed. It now seemed reasonable to conclude that the CA-SCR-12 archaeological collection sat on a repository shelf for twenty-seven years and its contents remain unanalyzed and a mystery to the archaeological community and other interested publics.

Ethically, we are taught, that when an archaeologist goes into the field and engages in an excavation project, he or she must generate a preliminary or final project report once the project has been completed. This report, which illuminates the archaeological data, is then disseminated to the archaeological community, interested public, and if mindful, to the local Native American tribe whose ancestors left that archaeological record. Unreported field information or laboratory analyses that go unfinished may represent a tragic loss of irreplaceable data (Hester, Shafer, and Feder 2009).

Project Overview

The Evolution of a Master's Project

The SJSU CA-SCR-12 archaeological collection may contain a potential "treasure trove" of information regarding Ancestral Ohlone/ Costanoan paleo-environmental adaptation and exploitation strategies during the Middle/Late Holocene. A period that has been recently sub-divided into the Early (3500 B.C. - 600 B.C.), Middle (600 B.C. - A.D. 1000), Middle-Late Transition (A.D. 1000 - 1250) and Late (A.D. 1250 - 1769) cultural periods (Jones et al 2007). However, the condition of the collection was, for lack of a better word, "problematic." I surmised that it would require a minimum of one year to resolve those issues which hindered my ability to move forward with my study of the assemblage. I also considered the notion of just walking away from the CA-SCR-12 archaeological collection altogether, because the lack of records and the poor condition of the collection was such, that working with them may not be worth the effort. Instead, I decided to embrace the challenge and focus on establishing order to the collection simply because this was the responsible and professional thing to do as a graduate student in anthropology.

The Proposed Project in Three Phases

Establishing a sense of order to the San Jose State University CA-SCR-12 archaeological collection will open up paths for further comprehensive analyses and the temporal placement of the CA-SCR-12 assemblages. In order to accomplish this phase of work, the entire assemblage (which comprised approximately 16,392 cultural elements between the two excavations (SJSU n = 15,100, ACRS n = 1292) had to be laid out by unit and level, analyzed, inventoried and organized, in meaningful constructs. As I mentioned earlier, four significant issues emerged during my review and assessment of the collections: 1) a major portion of the SJSU archaeological catalog had been removed from the binder and was either misplaced or lost and the ACRS administrative archive did not have an archaeological catalog at all, 2) preliminary analyses and final classification of the excavated materials from CA-SCR-12 were never completed, 3) there was some mixing of unprocessed cultural materials derived from both archaeological collections, and 4) neither a preliminary nor a final project report was ever written by San Jose State University and disseminated to the archaeological community.

Phase I

The objectives for Phase I of this project included:

- Assessment of all cultural and ecofactual materials recovered from the San Jose State University excavation at CA-SCR-12 and complete a preliminary and final classification of those materials (approximately 15,100 elements).

- Assessment of all cultural and ecofactual materials recovered from the Archaeological Consulting and Research Services (ACRS) data recovery program at CA-SCR-12 and complete a preliminary and final classification of those materials (approximately 1292 elements).

- Generate two archaeological catalogs, which will function as permanent records of all materials recovered from CA-SCR-12 by S.J.S.U and Archaeological Consulting and Research Services (ACRS).

Methods

In June 2012, the processing and analyses of the San Jose State University and the Archaeological Consulting and Research Services (ACRS) CA-SCR-12 archaeological collections commenced in the SJSU Department of Anthropology Laboratory. Over the course of eight months, I laid out both assemblages by unit and level and conducted a comprehensive review, analysis, inventory and classification of those assemblages in meaningful constructs.

The tools and equipment employed for the analysis of the archaeological materials included:

- Mitutoyo model CD-6 electronic digital calipers
- Ohaus Series 700 2610g triple beam scale
- Bausch & Lomb AS245 variable 10.5 – 45x variable stereoscopic microscope
- Incandescent lamp – 150 watt
- Plastic bags 2mm - qty: 3,000
- Raytech Gem Saw
- Sharpie marking pens
- Panasonic DMC-FS3 35mm digital camera
- AWS-201 digital scale – (0.01g) accuracy
- Digital tape recorder
- ¼ -inch mesh screen on a sawhorse screen stand

The artifact processing phase involved washing, cleaning, sorting, measuring, weighing, and labeling materials to preserve provenience and contextual information (Hester, Shafer, and Feder 2009). Subsequently, as the archaeological materials were sorted into categories, the process of classification began. I separated all of the recovered materials into generalized categories which included flaked stone tools and debris, ground stone, cobble stone tools, other stone (i.e., manuports), faunal bone, bone tools, shellfish remains, shell beads and ornaments, human remains, and historic materials. Some of the variables which influenced my decision making during this classification phase included: material type, weight, shape, typology and size (Sutter and Arkush 2009). These classes were then further subdivided into types, based on several criteria including: degree and type of modification (manufacturing and/or use-wear patterns), and measurements of attributes (Thomas 1989). All preliminary and final material classifications were independently verified by Anthropology instructor Alan Leventhal.

In April 2013, I completed both preliminary and final classifications of all cultural and ecofactual materials recovered from the excavations conducted by SJSU and by ACRS. All unit and provenience data, along with typologies, material quantities, descriptions, measurements, and weights were recorded into two newly generated CA-SCR-12 archaeological catalogs. One catalog is titled, “SJSU: August 1986 Excavation - CA-SCR-12.” The other catalog is titled, “ACRS: July 1986 Excavation - CA-SCR-12.”

Phase II

A review of all CA-SCR-12 archival records on file at the Northwest Information Center **i**ndicated that cultural deposits (including human remains, shell fish, terrestrial and marine faunal bone, and flaked and ground stone tools) were reported to have been recovered from the site beginning in 1950. Yet, no attempts were ever made to conduct AMS dating on any organic materials such as the human remains, shell fish remains, shell beads, or faunal bone (terrestrial and marine) previously recovered from the various test excavations conducted on CA-SCR-12 prior to 1986. In addition, no attempts were ever made to source any of the obsidian flaked stone artifact materials through XRF or perform hydration studies on the obsidian flaked stone artifacts. Although all of the above materials have been reported as being recovered from CA-SCR-12 from previous excavations, the location of these recovered collections are basically unknown. However, the SJSU CA-SCR-12 collection did reveal that the assemblage does indeed contain all of the above cultural materials for specialized studies. With the archival review aspect of Phase II complete, I framed some basic research questions about the nature of the site. The following research questions were put forward:

Research Question # 1: What types of activity sets did CA-SCR-12 possess?

Analysis The proposed analysis needed to address this question included: 1) Analysis of the flaked, pecked, and battered stone assemblages and other artifacts recovered from CA-SCR-12; 2) Analysis of the terrestrial and marine faunal bone assemblages; 3) Analysis of the shellfish assemblage; 4) Review of all project files currently archived at the NWIC; and 5) Analysis of the human burials that were recovered from the site.

Research Question # 2: What are the sources of the flaked stone materials (obsidian) and what can XRF sourcing tell us about Ancestral Ohlone / Costanoan trade networks?

Analysis: - The proposed analysis needed to address this question included: 1.) Submission of 85 obsidian artifacts to Dr. Richard Hughes of Geochemical Research Laboratory for a sourcing study via non-destructive Energy Dispersive X-Ray Fluorescence (EDXRF).

Research Question # 3: What are the temporal components represented at the site?

Analysis: The proposed analysis needed to address this question included: 1) Accelerator Mass Spectrometry (AMS) dating of a small quantity of identified human bone (Burial # 1: Left Diaphysis- Adult); 2) AMS dating of *Mytilus* shell from the basement layer of the site; 3) AMS dating of terrestrial faunal bone (2nd cervical vertebra from a Roosevelt Tule Elk); 4) AMS dating of sea mammal bone (right ulna of California Sea Lion); 5) Obsidian hydration studies (SJSU Obsidian Laboratory and Tom Origer and Associates) conducted on twenty-four out of the eighty - five obsidian artifacts that were recovered from the site; 6) measurement and typology of a cut *Olivella* bead (based on Bennyhoff and Hughes 1987 temporal dating scheme B1); and 7) Comparison of the metric attributes of a side-notched Green Franciscan Chert projectile point to other small side notched projectile points recovered in the Monterey Bay Area (Dietz 1986).

The objectives for Phase II of this project included:

1.) Writing and submission of a grant proposal to the San Jose State University, College of Social Sciences Research Foundation for $2,000.00 for purposes of conducting radiometric accelerator mass spectrometry (AMS) dating of several organic materials and for the XRF sourcing of the obsidian artifacts. In December of 2012, I was awarded $1995.00 to pursue these proposed specialized studies (see Appendix B).

2.) Per the terms of the Grant Agreement and with permission of both the Department of Anthropology and the Muwekma Ohlone Tribe (see Appendix C), I submitted a small sample of identified human bone from Burial # 1 (from the mid-section of the left diaphysis of an adult femur) to Beta Analytic Inc. in Miami Florida, for an accelerator mass spectrometry (AMS) radiocarbon dating study and isotopic analysis. Burial # 1 (Ref. # 51-1) was recovered from Unit 3A at a depth of 60-75 cm BS (see Appendix D for the AMS dating results).

3.) Submission of a sample of mussel shell (*Mytilus californianus*) to Beta Analytic Inc. in Miami Florida, for an accelerator mass spectrometry (AMS) radiocarbon date. The specimen was recovered from Trench Unit 1 at a depth of 80-90 cm BS (see Appendix D for the dating results).

4.) Submission of a sample of bone from a 2nd cervical vertebra from a Roosevelt Elk to Beta Analytic Inc., for an accelerator mass spectrometry (AMS) radiocarbon date. The specimen (Ref. # 67-10) was recovered from Unit 3A at a depth of 30-60 cm BS.

5.) Submission of a sample of bone from a right ulna from a California Sea Lion to Beta Analytic Inc., for an accelerator mass spectrometry (AMS) radiocarbon date. This marine faunal bone sample (Ref. # 59-11**)** was recovered from Test Unit 1 at a depth of 60-70 cm BS (see Appendix D for the dating results).

6.) Submission of eighty-five samples of obsidian to Dr. Richard Hughes of Geochemical Research Laboratory, Portola Valley, California, for sourcing obsidian artifacts via non-destructive Energy Dispersive X-Ray Fluorescence (EDXRF) (see Appendix E for the EDXRF report).

7.) Submission of twenty-four obsidian samples to San Jose State University alum John Schlagheck to conduct obsidian hydration studies in the SJSU Obsidian Hydration Lab. The results of the hydration studies were independently verified by Tom Origer from Origer & Associates in Rohnert Park, Ca. (see Appendix F for the obsidian hydration report).

8.) Submission of approximately 20 lbs (82 sample bags) of shell fragments to Frank Perry of Museum Services in Santa Cruz, Ca., for a speciation study of the various shell fish recovered from the site (see Appendix G for the speciation report).

9.) Submission of forty-five terrestrial faunal bone specimens to Jean Geary from San Jose State University, for a species identification study (see Chapter 5).

Summary

AMS studies were conducted on all four of the above samples (human, terrestrial, marine, and shell). The results of these studies are discussed in Chapter 9. In addition, the human bone sample from Burial # 1 was later the subject of an isotopic analysis study (see Appendix H for the stable isotope analysis report). Furthermore, all eighty-five obsidian specimens were sourced via XRF and twenty-four of those specimens were the subject of an obsidian hydration study. The results of XRF study are discussed in Chapter 3 and the results of the obsidian hydration study are discussed in Chapter 9.

All shell fragments (82 sample bags) were examined and thirty-six taxa of shellfish were identified. The results of the shell speciation study are discussed in Chapter 4. A total of forty-five faunal bone elements were examined and seven species of terrestrial and marine mammals were identified. The results of the faunal bone analysis are discussed in Chapter 5.

Phase III

The Archaeological Report

The objective for Phase III of this study is to generate an archaeological project report that details the field work and resultant analysis of both the SJSU and the ARCS CA-SCR-12 archaeological collections. This report will serve as a permanent record of all materials recovered by both excavation projects (SJSU: August 1986 and ACRS: July 1986) that were conducted at 912 Third Street, in Santa Cruz, Ca. The CA-SCR-12 archaeological collection is currently located in the SJSU Department of Anthropology Curational Repository.

Chapter 2

Archival Literature Search from the Northwest Information Center

As mentioned in the project overview**,** the background research for this study included making three trips to the Northwest Information Center (NWIC) of the California Site Inventory at Sonoma State University, Rohnert Park, California to view all archived archaeological site records, maps, and project files associated with CA-SCR-12. The Northwest Information Center and other regional centers were established by the California Office of Historic Preservation as a local repository for all archaeological reports that are prepared under cultural resource regulations (California Environmental Quality Act) (CEQA) 1970; (Doane and Haversat 2002).

To date, there are twenty-two associated CA-SCR-12 detail records identified by the NWIC as: S-003760, S-00378, S-003905, S-003911, S-003965, S-003966, S-00389, S-004033, S-004034, S-004044, S-004082, S-004096, S-004138, S-005537, S-008701, S-008702, S008703, S-024884, S-026275,S-0027089, S-033259, S-035250 that are on file. In addition, I made one trip to Cabrillo College in Santa Cruz, Ca. to view all CA-SCR-12 project files and artifacts curated in the Cabrillo College Department of Anthropology Repository.

Previous Investigations at CA-SCR-12

CA-SCR-12 was first recorded in 1950 by a U.C. Berkeley archaeological survey team during the construction of the Laura Lee Court Motel, located at 820 Third Street. The site was described as a “shell midden” with a depth of three to four feet (DWL and WJW 1950). According to the site survey record, human burials and other artifacts were uncovered by bulldozer and then reburied.

In 1954, human burials and other artifacts were uncovered once again during the construction of a four unit addition to the El View Motel located at 810 Third Street. George Atwood, a plumbing contractor who worked on the four unit addition submitted a letter which stated:

> "I was the plumbing contractor on the 4 unit addition on the western edge of the lot that the motel is on. As we proceeded north to south with the addition of these units, we uncovered what in my estimation was an Indian burial site approximately the distance of the City street width from the southern edge of the existing structure shown in the photograph. We picked up numerous artifacts, shells, beads, and some bones. All of these objects were recovered from a depth of three feet or less and appeared to be concentrated within an area not more than 50 to 60 feet in diameter.
>
> At that time, my uncle, William Atwood, was an amateur archaeologist and he confirmed that this was indeed a burial site. Additionally, he explained, and it fitted the circumstances that the Native American people that inhabited this area would bury their dead in a rectangular or circular mound on a high point. This seems to be the case here. After passing that point, we uncovered no other artifacts or bones (Atwood 1979)."

In 1972, Don and Jean Stafford along with Starr Gurcke conducted a surface reconnaissance on a vacant lot located on the east side of Cliff Street, adjacent to 504 Cliff Street. According to the Archaeological Field Inventory Record, forty-nine cultural and ecofactual specimens were recovered from that reconnaissance and those materials included: shell fragments, utilized chert flakes, waste chert flakes, chert core fragments, one chert point fragment, one quartzite flake, *Olivella* shells, one barnacle shell fragment, and an obsidian pebble fragment. A review of the Northwest Information Center files indicated that this collection is stored at the Santa Cruz City Museum (Rob Edwards 1975).

Although CA-SCR-12 was first recorded in 1950 and designated as a Native American archeological site, it along with other sites in the area did not become the subject of many archaeological studies until the passing of new federal and state legislation during the mid 1960s and early 1970s. Legislation such as: the National Historic Preservation Act of 1966, the National Environmental Protection Act of 1969, Executive Order 11593 in 1971, Section 106 of the National Historic Preservation Act in 1974, the Archaeological and Historical Preservation Act of 1974, and the California Environmental Quality Act (CEQA) in 1970 resulted in a boom in Cultural Resource Management (CRM) archaeology (King et al. 1977). With the advent of cultural resource management archaeology, CA-SCR-12 became the focus of several archaeological mitigation studies (Dietz 1986).

In 1974, Dr. Margaret C. Fritz (San Jose State University) and Dr. John M. Fritz (University of California, Santa Cruz) performed test excavations on a parcel of land located at 514 Cliff Street for Stevens and Calender, A.I.A. Phase 1 of their field work included a surface survey and sampling of that extant portion of CA-SCR-12, so as to approximate site boundaries and to determine the extent and nature of the disturbed resources (Roop and Flynn 1976). Seven mechanical test bores and four 1 x 1 meter excavation units were completed within the project area. Cultural deposits were recovered from depths ranging between 20 and 90 cm Below Surface (BS) and they included: shell (*Mollusca*), bone, stone flakes, flaked tools, bifacial stone tools, projectile points, milling stone, bone tool fragments, needles, awls, shell beads, and thermally altered rock (Fritz and Fritz 1974).

In their final report titled, “Archaeological Evaluation of a Portion of 4-SCR-12 (“Beach Hill Site”), Located on the Lands of Ronald Lee Trupp,” Drs. Margaret and John Fritz concluded that: 1) the archaeological resources present at 514 Cliff Street represent a remnant of a much larger site that extended several hundred yards westward along the north side of Beach Hill, and 2) while large portions of the site had been severely disturbed by residential and utility construction during the past century, other portions remained intact. In addition, Fritz and Fritz proposed that future data recovery programs at CA-SCR-12 should include at least two accelerator mass spectrometry (AMS) radiocarbon dating studies, in order to establish the temporal range of the site.

The following year, in August 1975, Rob Edwards performed a records search and an archaeological surface reconnaissance on a parcel of land situated on a knoll above the southern edge of the San Lorenzo River, between 912 and 924 Third Street. The focus of that field investigation included: 1) assessing the significance of the site, 2) evaluating the impact of proposed development on of the site, 3) suggesting possible mitigation procedures, and 4) determining the boundaries of the site.

Cultural materials were recovered from Edwards' surface reconnaissance and these included: possible human bone fragments, prehistoric refuse, and historic artifacts (Edwards 1975). In Mr. Edwards' final report to Nittler & Nittler Realtors, he stated that "human remains had been found in the process of excavating a utilities trench in 1969-70 at 912 Third Street (immediately adjacent to the subject parcel)" (Edwards 1975: 2). Edwards also estimated the site to be "at least one thousand years and perhaps as much as two to four thousand years old" (Edwards 1975: 2). Subsurface testing was recommended to determine the significance of the cultural resources present within that particular project parcel.

In January 1976, William Roop and Katherine Flynn of Archaeological Resource Service completed a series of test borings and excavations on that same parcel of land located between

912 and 924 Third Street. The focus of that data recovery program included: 1) determining the nature of the subsurface materials present in that particular portion of the site, 2) further sampling the disturbed nature of the site, 3) determining the site's boundaries, 4) recovering suitable artifactual and ecofactual data which could help date CA-SCR-12, and 5) assessing whether or not this particular portion of CA-SCR-12 will be adversely impacted by the proposed residential construction project (Roop and Flynn 1976).

Twelve auger bore holes and three excavation Test Units were completed within the project area. A total of fourteen genera of shellfish were recovered from the auger bore holes. The five principal taxa are listed in Table 2**.**

Table 2: Five Principal Taxa Recovered From Test Borings

Genus	# of Samples	% of Sample
Mytilus sp. (Mussel)	358	65.7
Protothaca Staminea (Pacific Littleneck Clam)	91	16.7
Tegula funebralis (Black Turban Snail)	24	4.4
Balanus sp. (Barnacle)	21	3.9
Saxidomus nuttalli (California Butter Clam)	9	1.6

Eighteen genera of shellfish were recovered from the three excavation Test Units. The six principal taxa are listed in Table 3.

Table 3: Six Principal Taxa Recovered From Test Units

Genus	# of Samples	% of Sample
Mytilus sp. (Mussel)	2419	63.5
Protothaca Staminea (Pacific Littleneck Clam)	770	20.2
Balanus sp. (Barnacle)	159	4.2
Macoma nasuta (Bent-Nose Macoma)	104	2.7
Tegula funebralis (Black Turban Snail	89	2.3
Clinocardium sp. (Clam)	45	1.2

The recovered artifactual materials included: pestles, mortar fragments, mano fragments, two obsidian projectile point fragments, scrapers, awls, bone spatulates, needles, deer bone hair pins, and bird bone beads (Roop and Flynn 1976). Small quantities of faunal bone were recovered and they included: black tailed deer, grey squirrel, and rabbit. In addition, lithic debitage were recovered and those materials included: chert, feldspar, siltstone, quartzite, and quartz.

In their final report titled, "Archaeological Testing of a Portion of 4-SCr-12, between 912 and 924 Third Street, Santa Cruz, California," Roop and Flynn stated that "the site is quite large, extending from the east of Cliff Street (Fritz and Fritz 1974) to the west of Main Street, and south across Third Street to some degree (Edwards 1975) (Roop and Flynn, 7-8)." Additional data recovery programs were recommended if the development project continued as planned.

In January 1977, Katherine Flynn of Archaeological Resource Service undertook a subsurface excavation on a parcel of land located at 1031 Third Street. The focus of the study included determining the presence or absence of a peripheral edge of CA-SCR-12. A total of twelve hand auger borings were completed at staggered twelve meter intervals along three baselines to depths ranging between 50 and 109 cm BS (Flynn 1977). In addition, two 1 x 1 meter square units were opened up and excavated in a succession of separate arbitrary 10 cm levels to depths ranging between 40-60 cm BS.

In Flynn's final report titled, "Archaeological Test Excavations of an Alleged Portion of 4-SCr-12, Located within Property at 1031 Third Street, Beach Hill, Santa Cruz," she stated that "the twelve auger borings and the excavation of two units revealed almost a complete lack of aboriginal artifacts in the soil matrix. Any aboriginal deposits present most likely came from the disturbed periphery of the site" (Flynn 1977: 1). Flynn further elaborated that the southern periphery of CA-SCR-12 may be represented by the presence of dark soil and broken shell fragments exposed in the yard of the house located at 924 Third Street.

In June 1977, Katherine Flynn, William Roop, and Leo Barker of Archaeological Resource Service performed a preliminary archaeological reconnaissance on three parcels located on Beach Hill in Santa Cruz, Ca. (Flynn and Barker 1977). Two of these parcels were located at the southeast corner of Cliff Street and Third Street and the third parcel fronted Third Street just west of Cliff Street (Deitz 1986). Cultural materials were recovered from all three parcels during the surface reconnaissance and those materials included: midden, chert, flaked tools, ground stone implements, faunal bone, shell, and human remains.

On July 2, 1977, Katherine Flynn sent a letter to the property owner, Mr. Dick Feurtado recommending test excavations due to the proven sensitivity of the area. In that letter, Flynn noted that CA-SCR-12 had been the subject of several surveys and data recovery programs since 1974 and the data generated from those programs helped to establish the northern and western boundaries of the site (Fritz and Fritz 1974; Edwards 1975). Flynn further elaborated that all three parcels in question may represent the southern and eastern peripheries of CA-SCR-12.

Two months later, Archaeological Resource Service established five 1 x1 meter square excavation units within the project area. Two Test Units were placed within the parcel located at the southeast corner of Cliff Street and Third Street (i.e., the corner lot). The other three Test Units were placed within the parcel that fronted Third Street just west of Cliff Street (i.e., the garden lot). All units were excavated in arbitrary 10 cm levels to a depth of 70 cm BS.

Cultural materials were recovered from the "corner lot" and some of those materials included: twenty-three species of shellfish, lithic debitage, utilized flakes, faunal bone, modified tools (knives, scrapers, and projectile points), fragmented bone tools, and *Olivella* shell bead manufacturing debitage. The cultural materials recovered from the "garden lot" included: twenty-three species of shellfish, lithic debitage, utilized flakes, modified flakes, faunal bone, *Olivella* shell beads, polished bone fragments, and thirty-six human bone fragments.

In their final report titled, "Archaeological Test Excavations on the Lands of Feurtado, Third and Cliff Street," Flynn and Barker present the first map of the site detailing the estimated size of CA-SCR-12 along with an estimation of the disturbed size of the site. In that report, they also suggested that CA-SCR-12 may have possessed four different activity areas that included: food processing, mortuary practice, stone tool manufacturing, and specialized bead manufacturing

In April 1978, San Jose State University professor Dr. Anne Woosely completed a shovel test pit survey on a parcel of land located at 327 Main Street in Santa Cruz, Ca. The first test pit was excavated to a depth of 30 cm BS and produced only historic materials. The second test pit yielded a mix of shell fragments, chert flakes, animal bone, and historic artifacts. Limited subsurface testing and monitoring were recommended as part of Dr. Woosely's mitigation plan.

The following year, in September 1979, Suzanne Baker of Archaeological Consultants completed a preliminary archaeological surface reconnaissance on a vacant lot located at the southwest corner of Third and Younger Street (131-133 Younger Street). Prehistoric and historic cultural materials were recovered from that reconnaissance and some of those materials included: lithic materials, shell, and glass fragments. Ms. Baker recommended subsurface testing as part of her mitigation plan due to the lot's close proximity to known deposits of prehistoric archaeological material (Baker 1979).

Following Bakers' preliminary reconnaissance, that same lot located at the southwest corner of Third and Younger Street (131-133 Younger Street) was subject to auger testing by Archaeological Consultants in November 1979. Seven auger holes were completed on the southern side of the lot where construction was contemplated (Baker 1979). All borings ranged from 40 to 60 cm BS and yielded no midden or aboriginal materials. Subsurface testing was recommended if construction was contemplated on the northern portion of the lot.

In September of that year, Alan Mart of Hilltop Properties, requested that Archaeological Consultants complete a salvage excavation program on a parcel of land located at 514 Cliff Street (Baker 1979). Certain portions of that parcel were previously tested by Fritz and Fritz in 1974 and it was noted that "while large portions of the site have been severely disturbed by residential and utility construction during the past century, two small areas of undisturbed midden remained intact " (Baker 1979: 1). Archaeological Consultants prepared a mitigation plan which detailed the provisions of how construction was to proceed (Breschini and Haversat 1978). In March 1979, terms of that plan were finalized (Breschini and Haversat 1979) and the salvage excavation program began in those undisturbed areas of midden that would be impacted by construction. The focus of that data recovery program included: 1) collecting faunal and floral material to learn more about aboriginal resource procurement strategies, 2) recovering obsidian deposits for XRF sourcing, 3) assessing the significance of the site, and 4) recovering data to determine whether the site was occupied at the time of Spanish contact or during the Mission period (Baker 1979).

Two 2 x 2 meter square excavation Test Units and two 2 x 1 meter square excavation Test Units were opened up on the west side of the parcel, adjacent to Cliff Street (Dietz 1986). All four Test Units were excavated in a succession of separate arbitrary 10 cm levels to a depth of 70 cm BS. The recovered cultural materials included: shell fragments, floral materials, faunal remains, lithic debitage, historic material, flaked stone tools (Monterey Chert projectile points, utilized flakes, and biface fragments), ground stone tools (manos, metates, pestles, and pecked stones), a small amount of obsidian, and human remains.

Human bone fragments were recovered from all four Test Units. In addition, a nearly complete flexed human burial was uncovered from Test Unit # 1 at a depth between 45 and 75 cm BS. The burial was sexed as an adult female in her mid to late twenties. Grave goods associated with the burial included: ochre, unmodified *Olivella* shell beads, a chert biface, and a necklace made of 412 spire-lopped and spire-ground whole *Olivella* shell beads (Baker 1979). The burial and the grave goods were given to the Ohlone Indian Cultural Association for reburial at an Indian cemetery in Watsonville, California.

In her final report titled, "Report on the Archaeology of 514 Cliff St., CA-SCR-12, Santa Cruz, California," Baker stated:

> "without suitable materials for radiocarbon dating, no definitive dates can be attributed to the portion of SCr-12 which was excavated in this project. The most that can be said is that these materials are probably Middle to Late Horizon in context. Hopefully, additional work will one day be conducted at SCr-12 which will provide dates for the site" (Baker 1980: 61).

In May 1986, Mr. Tom O' Neill (owner of a land parcel located at 912 Third Street) requested Archaeological Consulting and Research Services (ACRS) to complete a preliminary reconnaissance and a program of archaeological test augerings on a certain portion of CA-SCR-

12, located at 912 Third Street, in Santa Cruz, Ca. According to the Northwest Information Center files, that particular parcel of land was situated within what was considered to be the most intact portion of CA-SCR-12 (Dietz 1986). The project's principal investigator, Stephen Dietz, noted that several burials had been discovered over the years near or within the lot at 912 Third Street (Edwards 1975; Flynn and Barker 1977).

As mentioned in the Introduction and Project Overview section of this report, ACRS completed a program of archaeological test augerings at 912 Third Street in June 1986 and a program of rapid recovery test excavations in July 1986. Upon completion of the ACRS data recovery program at 912 Third Street, Mr. Dietz concluded that the proposed construction project would cause a disturbance to that portion of the site CA-SCR-12, which was found to be situated within the project parcel. Archaeological Consulting and Research Services (ACRS) prepared a mitigation plan which detailed the provisions of how construction should proceed and that plan included two mitigation alternatives for offsetting the potential impacts to CA-SCR-12 by the proposed residential development project. Mitigation alternative # 2 called for the excavation of a portion of the site within the project parcel by an archaeological field class from San Jose State University.

In the Discussion Section of his final report titled, "Archaeological Test Excavations of a Portion of Prehistoric Site CA-SCr-12, Located at 912 Third Street, Santa Cruz, California," Dietz addresses many topics, some of which include:

- The scientific significance of the site
- Sourcing obsidian to reconstruct patterns of prehistoric trade and exchange relationships
- Hydration studies to develop an understanding of how and why those relationships may have changed over time

Dietz also stated that: “we would estimate that CA-SCR-12 functioned as a permanent or seasonal residential base (village) during the period beginning ca. 2500 to 1250 B.P” (Dietz 1986: 16). That estimation was based on comparison with data obtained from other sites excavated in the Monterey Bay Area.

On August 30, 1986 a team of students and staff from the San Jose State University Department of Anthropology began an eleven-week archaeological field school excavation project on that certain portion of prehistoric site CA-SCR-12, located at 912 Third Street. Under the direction of Anthropology instructor Dr. Tom Jackson, the field school team completed a program of archaeological test excavations near the middle and front portions of that parcel.

A parcel of land located at 1903 Third Street, in Santa Cruz, Ca. was subject to a surface reconnaissance and augering program on December 31, 2001 by Mary Doane of Archaeological Consulting. Doane observed small fragments of Mytilus and *Haliotis* shell during her reconnaissance. A total of eight soil test borings were completed within the parcel, none of which revealed prehistoric cultural materials. However, since the project parcel lay within the recorded boundary of archaeological site CA-SCR-12, it was recommended that a qualified archaeologist monitor any planned excavations into the soil.

In May 2003, a parcel of land located at 331 Main Street, in Santa Cruz, Ca. was subject to a general surface reconnaissance by Dr. Robert Cartier of Archaeological Resource Management. No prehistoric cultural resources were observed during the surface reconnaissance. However, since the proposed development project parcel lay within the recorded boundary of archaeological site CA-SCR-12, it was recommended that a qualified archaeologist monitor any planned excavations into the soil.

Discussion

Until the commencement of the present study, all previous cultural resource management (CRM) data recovery programs completed at CA-SCR-12 were primarily focused on assessing the potential impact of proposed development on the cultural deposits that lie within the boundaries of the site. Subsequently, in most of the archaeological reports on file, the various authors make suggestions and offer tentative speculations with regard to certain aspects of the site. For example:

1.) In their final report titled, "Archaeological Evaluation of a Portion of 4-SCR-12 ("Beach Hill Site"), Located on the Lands of Ronald Lee Trupp," Margaret and John Fritz suggest that future data recovery programs should include at least two Accelerator Mass Spectrometry (AMS) radiocarbon dating studies, in order to establish the temporal range of the site.

2.) In his final report to Nittler & Nittler Realtors, Rob Edwards hypothesized the site to be at least one thousand and perhaps as much as two to four thousand years old.

3.) In her final report titled, "Report on the Archaeology of 514 Cliff St, CA-SCR-12. Santa Cruz, California," Susan Baker stated: "without suitable materials for radiocarbon dating, no definitive dates can be attributed to the portion of SCr-12 which was excavated in this project. The most that can be said is that these materials are probably Middle to late Horizon in context. Hopefully, additional work will one day be conducted at SCr-12 which will provide dates for the site."

4.) In his final report titled, "Archaeological Test Excavations of a Portion of Prehistoric site CA-SCr-12, Located at 912 Third Street, Santa Cruz, California," Dietz recommends obsidian sourcing and hydration studies to learn more about patterns of prehistoric trade and exchange and to develop an understanding of how and why those relationships may have changed over time. Mr. Dietz also hypothesized that CA-SCR-12 may have functioned as a permanent or seasonal residential base (village) during the period beginning ca. 2500 to 1250 B.P.

A review of all detail records associated with previous archaeological work conducted on site CA-SCR-12 demonstrates that there are still many questions that have gone unanswered with regard to understanding the various aspects and temporal components represented at this site. One of the goals of this research project is to provide data which will help to answer those unanswered questions.

Chapter 3

Analysis of Flaked, Pecked, and Battered Stone from CA-SCR-12

Introduction

This chapter reports on the analysis of the flaked stone and pecked and battered stone tool assemblages that were recovered from 912 Third Street by San Jose State University in August 1986 and by Archaeological Consulting and Research Services (ACRS) in July 1986. The SJSU flaked stone assemblage was recovered from two distinct contexts: 1) seven controlled hand excavated Test Units and screen recovery, and 2) four controlled hand excavated Trench Units and screen recovery. A total of 10,746 lithic elements were recovered from both excavation contexts: Test Units n = 5,432 and Trench Units n = 5,314. The ACRS flaked stone assemblage was recovered from three hand controlled rapid recovery test excavation units and screen recovery (Dietz 1986). A total of 974 lithic elements were recovered from this context.

Methods

In August 2012, all flaked stone materials were removed from their original unit level bags and washed and placed onto sorting trays in the San Jose State University Department of Anthropology Laboratory. The materials were then examined and sorted by material type, state of completeness, stage of reduction and modification, and overall form. All final material classifications were independently verified by Anthropology instructor Mr. Alan Leventhal. Once all of the flaked, pecked, and battered stone materials were classified, counted, measured, and weighed, they were placed into new unit level bags. The unit level bags were then labeled with the site number, unit number, unit level number, and reference number. All unit and material provenience data along with material quantities, descriptions and weights were recorded into the new CA-SCR-12 archaeological catalogs. The tools and equipment employed in the stone analysis included:

- Bausch & Lomb AS24 10.5x – 45x variable stereoscopic microscope
- Ohaus Series 700 2610g triple beam balance scale
- 150 watt incandescent lamp
- Mitutoyo Model CD-6 electronic digital caliper
- AWS-201 digital scale - (0.01g) accuracy

The following attributes were employed for classifying formed tools, informal tools and waste flake / debitage (after Leventhal et al. 2009):

1. Material type

2. Type of flake (flaking debris) based on the following criteria:

    (a) Probable mode of production (e.g., bipolar, freehand hard hammer, soft hammer, or pressure flaking)
    (b) Condition of flake (e.g., complete, fragmented, shattered, thermally spalled etc.)
    (c) Size and shape (e.g., orientation of the platform and bulb of percussion, expanding)
    (d) Overall thickness of the flake
    (e) Presence, absence and percentage of cortex present on the dorsal and /or platform

3. Informal tools (e.g., utilized flakes, modified flakes), based on:
    (a) Degree of edge modification
    (b) Observed type of use/wear patterns and edge damage

4. Formed (formally flaked) tools, based on:
    (a) Overall morphology and degree of modification
    (b) Presence of use/wear patterns or edge damage (e.g., polish, nibbling, impact fractures)
    (c) Evidence of reworking and reuse

Based on the above attributes, a total of nine formed (formal) and informal tools as well as thirteen debitage / waste flake categories were identified and are listed below:

<u>Formed (Formal) and Informal Tools</u>

1. Cores, Core Fragments, Assayed Cobbles and Assayed Pebbles (6 sub-types)
   (111 specimens) SJSU: n = 91 ACRS: n = 20
2. Utilized Flakes (93 specimens) SJSU: n = 91 ACRS: n = 2

3. Modified Flakes (50 specimens) SJSU: n = 45 ACRS: n = 5
4. Projectile Points / Biface (52 specimens) SJSU: n = 48 ACRS: n = 4
5. Backed knifes (9 specimens) SJSU: n = 9
6. Scrapers (2 specimens) SJSU: n = 2
7. Choppers (5 specimens) SJSU: n = 3 ACRS: n = 2
8. Borers (2 specimens) SJSU: n = 2
9. Groundstone (3 specimens) ACRS: Mano n = 2 / Metate n = 1

Debitage / Waste Flakes

1. Cortical Flakes (1193 specimens) SJSU: n = 1,110 ACRS: n = 83
2. Primary Flakes (6033 specimens) SJSU: n = 5,680 ACRS: n = 353
3. Thinning Flakes (2195 specimens) SJSU: n = 1,854 ACRS: n = 341
4. Pressure Flakes (23 specimens) SJSU: n = 23
5. Bipolar Cortical Flakes (235 specimens) SJSU: n = 217 ACRS: n = 18
6. Shatter (351 specimens) SJSU: n = 316 ACRS: n = 35
7. Thermal Spalls (857 specimens) SJSU: n = 818 ACRS: n = 39
8. Bipolar Wedge (4 specimens) SJSU: n = 4
9. Bipolar Flakes (461 specimens) SJSU: n = 396 ACRS: n = 65
10. Resharpening Flakes (25 specimens) SJSU: n = 25
11. Bipolar Shatter (3 specimens) SJSU: n = 3
12. Core Rejuvenation Flakes (3 specimens) SJSU: n = 3
13. Cortical Shatter (10 specimens) SJSU: n = 6 ACRS: n = 4

These formed (formal) and informal tools along with thirteen flaked stone debitage classes fall into twenty identified material types which are:

1. Red Francisican Chert (RFC)
2. Green Franciscan Chert (GFC)
3. Yellow Franciscan Chert (YFC)
4. Monterey Chert (MC)
5. Chalcedony (Chal)
6. Obsidian (Obs)
7. Andesite (And)
8. Chert/other (Co)
9. Rhyolite (Rhy)
10. Basalt (Ba)
11. Siltstone (Slt)
12. Sandstone (San)
13. Quartzite (Qtzite)
14. Quartz (Qtz)
15. Green Stone / Pillow Basalt (Gspb)
16. White Franciscan Chert (WFC)
17. Jasper (J)
18. Gray Franciscan Chert (GrFC)
19. Schist (Sch)
20. Steatite (St)

Flaked Stone Artifact Descriptions

Cores, Core Fragments, Assayed Cobbles and Assayed Pebbles

Cores are made on pebbles, cobbles, and other knappable stone materials to produce lithic elements: 1.) products (cores, bifaces, primary flakes, and etc.) and 2.) by-products (flakes, blades, and debitage). Cores from this collection fall into six types:

Type 1 - Cobble cores	(12 specimens) SJSU: n = 6	ACRS: n = 6
Type 2 - Pebble cores	(19 specimens) SJSU: n = 15	ACRS: n = 4
Type 3 - Exhausted cores	(27 specimens) SJSU: n = 22	ACRS: n = 5
Type 4 - Bipolar pebble / cobble cores	(10 specimens) SJSU: n = 9	ACRS: n = 1
Type 5 - Core Fragments	(34 specimens) SJSU: n = 32	ACRS: n = 2
Type 6 - Assayed pebble /cobbles	(9 specimens) SJSU: n = 7	ACRS: n = 2

A total of ninety-one specimens were classified as cores or assayed pebbles from the SJSU assemblage (see Table 4: Distribution of Core Types). A total of twenty specimens were classified as cores or assayed pebbles from the ACRS assemblage. I will employ definitions proposed by Leventhal et al. 2009 (Pp 11-7 – 11-11) to define the different core types.

Type 1: Cobble cores generally consist of fist sized rounded cobbles (originally larger than 3 inches) of various lithic materials which display a limited amount of flake detachment along one edge. They retain much of their original cortex and size, thus distinguishing them from the smaller pebble cores.

Type 2: Pebble cores share the same basic characteristics as cobble cores, except that they tend to be less than 3 inches in original overall maximum length.

Type 3: Exhausted cores tend to be too small or difficult for further reduction, hence the usefulness has become exhausted.

Type 4: Bipolar cores are made on either cobble or pebble-sized lithic material and display distinctive bulbar expressions that are characteristic of hard hammer and anvil reduction techniques.

Type 5: **Core fragments** are cores that still retain a portion of their original flake scar detachment and striking platforms, but were either shattered or fragmented during the reduction process.

Type 6: **Assayed pebbles /cobbles** are different from cores in that they exhibit only one or possibly, at most, two flake scars. Although the raw materials may be of knappable quality, they tend to have been struck once, evaluated or “assayed,” and then discarded for some unknown reason.

Table 4: Distribution of Core Types: SJSU Assemblage

Specimen #	Type	Provenience / CM	Material Type	Weight
16-15	Type 1 Cobble Core	TU# 2 40-50	Quartzite	169.1g
29-11	Type 1 Cobble Core	TU# 3 40-50	Quartzite	258.1g
38-4	Type 1 Cobble Core	TRU# 3 20-30	Quartzite	288.8g
79-12	Type 1 Cobble Core	TRU# 4 40-50	Andesite	300.1g
72-14	Type 1 Cobble Core	TRU# 2 80-90	Schist	271.1g
45-26	Type 1 Cobble Core	TRU# 3 60-70	Sandstone	5 lbs
36-81	Type 2 Pebble Core	TU# 1 50-60	Monterey Chert	42.0g
15-12	Type 2 Pebble Core	TU# 2 30-40	Monterey Chert	66.7g
61-26	Type 2 Pebble Core	TU# 3A 0-30	Monterey Chert	43.1g
56-11	Type 2 Pebble Core	TU# 3A 75-90	Monterey Chert	43.5g
77-2	Type 2 Pebble Core	TU# 3B 30-60	Monterey Chert	33.8g
35-1	Type 2 Pebble Core	TU# 4 50-60	Monterey Chert	69.0g
52-2	Type 2 Pebble Core	TRU# 2 20-30	Monterey Chert	37.5g
64-46	Type 2 Pebble Core	TRU# 2 50-60	Monterey Chert	149.2g
65-15	Type 2 Pebble Core	TRU# 2 70-80	Monterey Chert	28.1g
65-1	Type 2 Pebble Core	TRU# 2 70-80	Rhyolite	108.0g
38-18	Type 2 Pebble Core	TRU# 3 20-30	Monterey Chert	18.4g
38-37	Type 2 Pebble Core	TRU# 3 20-30	Monterey Chert	26.2g
43-41	Type 2 Pebble Core	TRU# 3 50-60	Monterey Chert	47.8g
49-19	Type 2 Pebble Core	TRU# 3 70-80	Monterey Chert	63.8g
50-12	Type 2 Pebble Core	TRU# 3 90-100	Monterey Chert	31.1g
21-3	Type 3 Exhausted Core	TU# 1 30-40	Monterey Chert	28.4g
74-1	Type 3 Exhausted Core	TU# 1 80-90	Monterey Chert	15.0g
13-17	Type 3 Exhausted Core	TU# 2 20-30	Monterey Chert	32.3g
16-18	Type 3 Exhausted Core	TU# 2 40-50	Monterey Chert	30.3g
16-19	Type 3 Exhausted Core	TU# 2 40-50	Monterey Chert	18.3g
22-6	Type 3 Exhausted Core	TU# 2 70-80	Monterey Chert	17.1g
77-1	Type 3 Exhausted Core	TU# 3B 30-60	Monterey Chert	35.2g
10-30	Type 3 Exhausted Core	TU# 4 30-40	Monterey Chert	20.3g
32-34	Type 3 Exhausted Core	TU# 4 40-50	Monterey Chert	26.1g
27-2	Type 3 Exhausted Core	TRU# 1 10-20	Monterey Chert	43.1g
54-14	Type 3 Exhausted Core	TRU# 1 70-80	Monterey Chert	20.1g
54-15	Type 3 Exhausted Core	TRU# 1 70-80	Monterey Chert	42.1g
68-18	Type 3 Exhausted Core	TRU# 2 40-50	Monterey Chert	27.1g
43-35	Type 3 Exhausted Core	TRU# 3 50-60	Monterey Chert	15.4g
43-37	Type 3 Exhausted Core	TRU# 3 50-60	Monterey Chert	45.2g
43-39	Type 3 Exhausted Core	TRU# 3 50-60	Monterey Chert	28.2g
43-40	Type 3 Exhausted Core	TRU# 3 50-60	Monterey Chert	25.7g
45-19	Type 3 Exhausted Core	TRU# 3 60-70	Monterey Chert	32.9g
85-20	Type 3 Exhausted Core	TRU# 4 20-30	Monterey Chert	24.5g
85-21	Type 3 Exhausted Core	TRU# 4 20-30	Monterey Chert	24.1g
85-23	Type 3 Exhausted Core	TRU# 4 20-30	Monterey Chert	52.4g
82-6	Type 3 Exhausted Core	TRU# 4 80-90	Monterey Chert	14.0g
3-20	Type 4 Bipolar Core	TU# 1 0-10	Monterey Chert	50.3g
21-2	Type 4 Bipolar Core	TU# 1 30-40	Monterey Chert	25.5g
36-13	Type 4 Bipolar Core	TU# 1 50-60	Monterey Chert	30.1g
39-30	Type 4 Bipolar Core	TRU# 1 30-40	Monterey Chert	42.7g
25-33	Type 4 Bipolar Core	TRU# 3 10-20	Monterey Chert	54.5g
25-36	Type 4 Bipolar Core	TRU# 3 10-20	Monterey Chert	48.1g
79-28	Type 4 Bipolar Core	TRU# 4 40-50	Monterey Chert	35.8g
80-10	Type 4 Bipolar Core	TRU# 4 50-60	Monterey Chert	48.2g
84-14	Type 4 Bipolar Core	TRU# 4 60-70	Monterey Chert	21.8g
36-80	Type 5 Core Fragment	TU# 1 50-60	Monterey Chert	48.0g
36-82	Type 5 Core Fragment	TU# 1 50-60	Monterey Chert	15.0g
59-15	Type 5 Core Fragment	TU# 1 60-70	Monterey Chert	46.2g

Table 4: Distribution of Core Types: SJSU Assemblage (continued)

73-1	Type 5 Core Fragment	TU# 1	70-80	Monterey Chert	68.2g
11-11	Type 5 Core Fragment	TU# 2	0-10	Monterey Chert	96.7g
23-30	Type 5 Core Fragment	TU# 3	20-30	Red Franciscan	21.8g
71-20	Type 5 Core Fragment	TU# 3	60-70	Monterey Chert	37.2g
75-6	Type 5 Core Fragment	TU# 3	70-80	Monterey Chert	13.7g
56-12	Type 5 Core Fragment	TU# 3A	75-90	Monterey Chert	21.5g
76-17	Type 5 Core Fragment	TU# 3B	0-30	Monterey Chert	11.3g
71-29	Type 5 Core Fragment	TU# 3B	30-60	Quartzite	75.5g
78-1	Type 5 Core Fragment	TU# 3B	60-70	Monterey Chert	53.1g
32-38	Type 5 Core Fragment	TU# 4	40-50	Rhyolite	98.3g
35-24	Type 5 Core Fragment	TU# 4	50-60	Andesite	77.3g
12-2	Type 5 Core Fragment	TU# 5	10-20	Monterey Chert	36.3g
24-2	Type 5 Core Fragment	TU# 5	30-40	Monterey Chert	102.1g
31-19	Type 5 Core Fragment	TU# 5	40-50	Quartzite	58.1g
31-30	Type 5 Core Fragment	TU# 5	40-50	Monterey Chert	20.3g
34-19	Type 5 Core Fragment	TU# 5	50-64	Monterey Chert	29.1g
34-20	Type 5 Core Fragment	TU# 5	50-64	Monterey Chert	30.8g
26-28	Type 5 Core Fragment	TRU# 1	0-10	Monterey Chert	33.4g
26-29	Type 5 Core Fragment	TRU# 1	0-10	Monterey Chert	40.5g
33-20	Type 5 Core Fragment	TRU# 1	20-30	Monterey Chert	17.3g
46-29	Type 5 Core Fragment	TRU# 1	50-60	Monterey Chert	15.7g
46-37	Type 5 Core Fragment	TRU# 1	50-60	Monterey Chert	44.4g
42-13	Type 5 Core Fragment	TRU# 2	0-10	Rhyolite	50.7g
47-19	Type 5 Core Fragment	TRU# 2	10-20	Monterey Chert	16.2g
52-18	Type 5 Core Fragment	TRU# 2	20-30	Quartzite	99.9g
52-32	Type 5 Core Fragment	TRU# 2	20-30	Monterey Chert	31.3g
62-16	Type 5 Core Fragment	TRU# 2	30-40	Andesite	136.3g
64-10	Type 5 Core Fragment	TRU# 2	50-60	Sandstone	288.5g
37-24	Type 5 Core Fragment	TRU# 3	30-40	Monterey Chert	1.8g
73-2	Type 6 Asssayed Pebble	TU# 1	70-80	Monterey Chert	68.2g
22-5	Type 6 Asssayed Pebble	TU# 2	70-80	Andesite	40.9g
29-32	Type 6 Asssayed Pebble	TU# 3	40-50	Monterey Chert	24.5g
78-2	Type 6 Asssayed Pebble	TU# 3B	60-70	Monterey Chert	65.3g
10-29	Type 6 Asssayed Pebble	TU# 4	30-40	Monterey Chert	90.0g
68-25	Type 6 Asssayed Pebble	TRU# 2	40-50	Siltstone	110.2g
41-18	Type 6 Asssayed Pebble	TRU# 3	40-50	Monterey Chert	21.9g

Utilized Flakes

Utilized flakes are informal or generalized tools that have been employed for a task involving cutting, scraping, and shaving and then discarded. Utilized flakes show little or no purposeful detachment modification other than that caused by the work they have performed. In order for a flake to be classified as utilized, a flake must have one or more edges or Edge Units (E.U.s) exhibiting evidence of use/wear patterns.

A total of ninety-one flaked stone elements have been classified as “Utilized Flakes” from the SJSU assemblage and a total of two flaked stone elements were classified as “Utilized

Flakes” from the ACRS assemblage The distribution and context from which these utilized flakes were recovered is as follows:

SJSU Assemblage

- Unit # 1 13 specimens (RFC n = 1, And n = 2, MC n = 10)
- Unit # 2 6 specimens (RFC n = 1, Slt n = 1, MC n = 4)
- Unit # 3 6 specimens (And n = 1, Rhy n = 1, Qtzite n = 1, MC n = 3)
- Unit # 3A 10 specimens (RFC n = 1, And n = 1, Rhy n = 1, Qtzite n = 1, MC n = 6)
- Unit # 3B 7 specimens (RFC n = 3, MC n = 4)
- Unit # 4 8 specimens (MC n = 6, Qtzite n = 2)
- Unit # 5 10 specimens (MC n = 7, Chalc n = 1, Gspb n = 1, Qtzite n = 1)
- TRU# 1 21 specimens (MC n = 11, Qtzite n = 7, Ba n = 1, Rhy n = 1, And n = 1)
- TRU# 2 2 specimens (And n = 1, GFC n = 1)
- TRU# 3 7 specimens (And n = 4, MC n = 1, Rhy n = 1, Qtzite n = 1)
- TRU# 4 1 specimen (MC n = 1)

ACRS Assemblage

Unit # 1 1 specimen (And n = 1)
Unit # 2 1 specimen (Qtzite n = 1)

Modified Flakes

Modified flakes are considered informal tools. Most modified flakes represent incomplete stages of manufacture, meaning that after some initial reduction the artifact is abandoned for some reason (Hylkema 1985). Modified flakes may also, in some cases, represent resharpened tools such as utilized flakes that were not deployed again after modification (Leventhal et al. 2009).

A total of forty-five flaked stone elements have been classified as “Modified Flakes” from the SJSU assemblage, and a total of five flaked stone elements were classified as “Modified Flakes” from the ACRS assemblage. The distribution and context from which these modified flakes were recovered is as follows:

SJSU Assemblage

- Unit # 1 2 specimens (MC n = 2)
- Unit # 2 2 specimens (MC n = 2)
- Unit # 3 4 specimens (MC n = 4)
- Unit # 3A 3 specimens (MC n = 3)
- Unit # 3B 1 specimen (MC n = 1)
- Unit # 4 1 specimen (MC n = 1)
- Unit # 5 5 specimens (MC n = 5)
- TRU # 1 11 specimens (MC n = 11)
- TRU # 2 9 specimens (MC n = 8, Qtzite n = 1)
- TRU # 3 3 specimens (MC n = 2, And n = 1)
- TRU # 4 4 specimens (MC n = 4)

ACRS Assemblage

- Unit # 1 3 specimens (MC n = 3)
- Unit # 3 2 specimens (MC n = 2)

Projectile Points / Bifaces

Projectile points are usually bifacially flaked tools that are attached to lances, darts, spears or arrows for the purpose of hunting game and warfare. A total of forty-eight projectile point / biface specimens were recovered by SJSU from the site and a total of four projectile point / biface specimens were recovered by ACRS. The distribution and context from which these projectile points / bifaces were recovered is as follows (see Table 5). The attributes of twenty of the fifty-two projectile points / bifaces specimens are described below.

Table 5: Distribution and Context of Projectile Point / Biface Types

Specimen #	Material Type	Provenience	Description	Weight
7-25	MC	Unit# 1 20-30	Biface Fragment	4.0g
21-5	MC	Unit# 1 30-40	Biface Fragment	2.5g
14-1	Obs	Unit# 2 10-20	Projectile Pt. Fragment	3.0g
14-30	MC	Unit# 2 10-20	Biface Fragment	2.2g
15-2	Obs	Unit# 2 30-40	Projectile Pt. Tip	3.9g
15-3	Obs	Unit# 2 30-40	Projectile Pt. Fragment	0.7g
16-11	Obs	Unit# 2 40-50	Projectile Pt. Fragment	0.2g
17-22	Obs	Unit# 2 50-60	Impact Fracture Flake	0.5g
20-1	RFC	Unit# 3 10-20	Projectile Pt. Base	4.1g
23-1	GFC	Unit# 3 20-30	Projectile Pt. Midsection	4.9g
28-1	MC	Unit# 3 30-40	Biface Fragment	3.8g
60-2	RFC	Unit# 3 50-60	Biface Fragment	13.9g
71-8	MC	Unit# 3 60-70	Projectile Pt. Midsection	2.3g
71-21	MC	Unit# 3 60-70	Projectile Pt. Base	2.9g
61-1	Obs	Unit# 3A 0-30	Projectile Pt. Base	0.7g
61-28	MC	Unit# 3A 0-30	Biface Fragment	16.0g
61-39	MC	Unit# 3A 0-30	Biface Edge Fragment	1.2g
61-47	MC	Unit# 3A 0-30	Biface Fragment	3.8g
61-5	Obs	Unit# 3A 0-30	Biface Fragment	0.5g
67-1	MC	Unit# 3A 30-60	Biface Fragment	1.6g
51-2	MC	Unit# 3A 60-75	Biface Fragment	8.1g
31-3	MC	Unit# 5 40-50	Projectile Pt. Midsection	4.3g
26-1	J	TRU# 1 0-10	Projectile Pt. Midsection	3.0g
27-33	MC	TRU# 1 10-20	Projectile Pt. Tip	0.7g
53-22	MC	TRU# 1 60-70	Biface Fragment	3.7g
47-1	Obs	TRU# 2 10-20	Projectile Pt. Fragment	0.5g
41-22	MC	TRU# 2 10-20	Biface Fragment	1.4g
62-26	MC	TRU# 2 30-40	Projectile Pt. Fragment	2.0g
62-31	MC	TRU# 2 30-40	Biface Fragments (qty:2)	21.5g
68-19	MC	TRU# 2 40-50	Biface Fragment	11.0g
68-5	Obs	TRU# 2 40-50	Impact Fracture Flake	1.0g
64-2	MC	TRU# 2 50-60	Projectile Pt. Fragment	2.5g
66-3	MC	TRU# 2 60-70	Biface Fragment	12.9g
65-9	MC	TRU# 2 70-80	Biface Midsection	11.2g
65-11	MC	TRU# 2 70-80	Projectile Pt. Midsection	6.0g
72-3	Obs	TRU# 2 80-90	Impact Fracture Flake	0.1g
8-3	Obs	TRU# 3 0-10	Projectile Pt. Midsection	2.3g
25-2	Obs	TRU# 3 10-20	Projectile Pt. Fragment	3.7g
25-37	MC	TRU# 3 10-20	Projectile Pt. Base fragment	6.8g
41-2	Obs	TRU# 3 40-50	Projectile Pt. Midsection	2.0g
43-1	MC	TRU# 3 50-60	Biface Fragment	19.3g
43-2	MC	TRU# 3 50-60	Biface Fragment	14.0g
70-1	RFC	TRU# 4 0-10	Projectile Pt. Midsection	4.9g
70-23	MC	TRU# 4 0-10	Biface Fragment	16.5g
85-2	MC	TRU# 4 20-30	Projectile Pt. Midsection	8.0g
79-30	MC	TRU# 4 40-50	Base off a Biface	4.5g
80-20	MC	TRU# 4 50-60	Projectile Pt. Fragment	2.4g
D-100-16	Obs	Unit# 1 0-20	Projectile Pt. Fragment	2.5g
D-104-1	MC	Unit# 3 0-20	Projectile Pt. Tip	2.7g
D-12-17	GFC	Unit# 3 60-80	Projectile Point	3.5g
64-2	MC	TRU# 2 50-60	Projectile Point Biface	2.6 g
N/A	MC	Unit# 1 20-40	Biface Fragment	2.5 g

Specimen # 7-25 is a biface fragment of a partially flaked small leaf-shaped projectile point of Monterey Chert that was subjected to thermal alteration (see Figure 3). It may represent a pre-stage to a small dart point, or a poorly finished product. The tip has been snapped off, suggesting that the specimen has been spent. The specimen also exhibits thermal spalls and is discolored due to exposure to heat. Max. length = 29.5 x 17.1 x 7.3 mm. Wt. 4.0 g.

Figure 3: Biface Fragment (Monterey Chert) – Ref. # 7-25

Specimen # 14-1 appears to be a biface dart point made on a rather thick flake of obsidian (see Figures 4 and 5). The specimen may be a contracting stem or leaf shaped point. Toward the distal end, there is a snap that is perpendicular to the axial length. There is also an impact fracture that is parallel to the axial length. Both edges exhibit remnants of soft hammer percussion and pressure flaking for the final edge treatment along the existing lateral edge. Max. length = 24.6 x 14.2 x 8.1 mm. Wt. 2.7 g.

Figure 4: Biface Dart Point Fragment (Obsidian) – Ref. # 14-1 (Illustrated)

Figure 5: Biface Dart Point Fragment (Obsidian) – Ref. # 14-1

Specimen # 20-1 is a base of either a leaf shaped or a contracting stem dart point made of Red Franciscan Chert (see Figure 6). The upper portion "distal end" exhibits a snapped impact fracture perpendicular to the axial length of the projectile point. Max. length = 22.8 x 22.2 x 8.7 mm.Wt. 4.1 g.

Figure 6: Dart Point Fragment (Red Franciscan Chert) – Ref. # 20-1

Specimen # 23-1 is a biface midsection most likely from a large and thick dart point of Green Franciscan Chert. The basal "proximal end" exhibits an oblique 45 degree impact fracture. The distal end exhibits an impact fracture perpendicular to the axial length. Several pot lids are present on the surface indicating exposure to fire. Max. length = 30.4 x 15.4 x 12.2 mm. Wt. 4.9 g (see Figure 7).

Figure 7: Dart Point Fragment (Green Franciscan Chert) – Ref. # 23-1

Specimen # 71-8 appears to be a midsection of a large dart point of Monterey Chert (see Figure 8). The proximal end exhibits an oblique impact fracture that appears to include the remnant of a notch or halfting element. The distal end has an impact fracture perpendicular to the axial length. One edge exhibits some gloss suggesting that it may have been also employed in a knife-like cutting activity. Max. length = 33.1 x 24.1 x 10.1 mm. Wt. 8.9 g.

Figure 8: Midsection Fragment (Monterey Chert) – Ref. # 71-8

Specimen # 71-21 is a base of a probable contracting stem dart point of Monterey Chert (see Figure 9). The distal end exhibits a snapped fracture perpendicular to the long access which suggests a possible impact fracture rather than an end shock break due to manufacturing. Max. length = 17.9 x 21.5 x 7.3 mm. Wt. 2.9 g.

Figure 9: Base Fragment (Monterey Chert) – Ref. # 71-21

Specimen # **61-1** appears to be a basal portion of a small and thin projectile point made on a primary flake of Obsidian (see Figures 10 and 11). The lateral margins are carefully pressure flaked, although the central portions of both faces do not appear to be flaked at all. There is a remnant of a possible halfting element present on one of the lateral edges. It appears that this specimen was not a well manufactured projectile point. Due to the specimen's size and neck width, it might actually be an arrow point. Max. length = 16.6 x 16.9 x 4.1 mm. Wt. 1.3 g.

Figure 10: Basal Fragment – Ref. # 61-1 (Illustrated)

Figure 11: Basal Fragment – Ref. # 61-1

Specimen # **31-3** is a midsection and base of a large contracting stem dart point made of Monterey Chert (see Figure 12). The specimen exhibits an impact fracture perpendicular to the base and an oblique fracture from the midsection on the distal end. The edges exhibit careful pressure flaking. Max. length = 31.2 x 19.4 x 10.0 mm. Wt.4.3 g.

Figure 12: Midsection and Base Fragment of Dart Point (Monterey Chert) – Ref. # 31-3

Specimen # 26-1 is a midsection of a dart projectile point made from Red Franciscan Chert (see Figure 13). Both the distal and the proximal ends exhibit perpendicular snaps to the axial length of the point. The edges exhibit careful pressure flaking scars. Max. length = 14.6 x 17.1 x 8.8 mm. Wt. 3.0 g.

Figure 13: Midsection Fragment of Dart Point (Red Franciscan Chert) – Ref. # 26-1

Specimen # **27-33** appears to be an impact spall of a tip of a projectile point, possibly a dart point of Monterey Chert (see Figure 14). The tip exhibits careful pressure flake scars and the body appears to have been spalled off due to impact of the actual point itself. Max. length = 22.6 x 10.6 x 3.9 mm. Wt. 0.7 g.

Figure 14: Impact Spall (Monterey Chert) – Ref. # 27-33

Specimen # **47-1** appears to be a remnant of a corner notched / earred projectile point base made from Obsidian (see Figures 15 and 16). The specimen appears to have been basally notched and exhibits very careful pressure flaking along the margins. There is a truncation somewhat perpendicular to the axial length of the ear. Wt. .54 g.

Figure 15: Earred Fragment of Projectile Point Base (Illustrated) – Ref. # 47-1

Figure 16: Earred Fragment of Projectile Point Base (Obsidian) – Ref. # 47-1

Specimen # 62-2 is an upper tip portion of a Monterey Chert dart point that exhibits remnants of soft hammer percussion and pressure flaking as part of the final edge treatment (see Figure 17).The specimen exhibits evidence of being exposed to fire with one pot-lid present toward the center of one face. The exposure to fire appears to be after the projectile point was spent. Max. length = 20.2 x 19.9 x 6.6 mm. Wt. 2.0 g.

Figure 17: Upper Portion of Dart Point (Monterey Chert) – Ref. # 62-26

Specimen # 8-3 appears to be a biface projectile point made from Obsidian (see Figures 18 and 19). The specimen has several impact fractures on it. It was probably a large dart point based on its overall size. The specimen has remnants of both soft hammer percussion and pressure flaking. The orientation is difficult to determine. However, it appears that a major impact fracture is located towards the base of the point that had been hinged off, and there is a perpendicular impact fracture toward the midsection of the point. Max. length = 23.0 x 18.2 x 7.6 mm. Wt. 2.2 g.

Figure 18: Biface Fragment (Obsidian) – Ref. # 8-3

Figure 19: Biface Fragment (Obsidian) – Ref. # 8-3 (Illustrated)

Specimen # 25-2 is a remnant of a resharpened corner-notched point made of obsidian (see Figures 20 and 21). The base has been snapped as a result of an impact fracture. Two remnant corners of the notches are present. The lateral edge margins of the projectile point appear to have been resharpened after usage thus making the dart point appear stubby. DSA and PSA on one of the notches can be obtained. Max. length = 25.1 x 22.6 x 6.6 mm. Wt. 3.7 g.

Figure 20: Projectile Point Remnant (Obsidian) – Ref. # 25-2

Figure 21: Projectile Point Remnant (Obsidian) – Ref. # 25-2 (Illustrated)

Specimen # 25-37 is a base of either a finished Monterey Chert projectile point or a perform stage just before being finalized as a dart point (see Figure 22). The base is either from a long leaf shaped point or a contracting stem point. It retains evidence of an impact fracture rather than a break due to manufacturing failure. Max. length = 32.1 x 19.8 x 11.3 mm. Wt. 6.8 g.

Figure 22: Base Fragment (Monterey Chert) – Ref. # 25-37

Specimen # 41-2 is a midsection of a bifacial projectile point made of obsidian (see Figure 23). The size of the specimen indicates that it was probably a dart point. Only one edge is intact and the specimen exhibits both soft hammer percussion and pressure flake scars. Both the proximal and distal ends have perpendicular truncations to the axial length of the point. One of the lateral edges exhibits a burin-like impact fracture, thus removing the remnant of that entire edge. After breakage, the specimen may have been used as a utilized edge. There is some slight nicking and retouch along the existing original edge. Max. length = 14.2 x 18.5 x 6.1 mm. Wt. 1.8 g.

Figure 23: Midsection Fragment of Projectile Point (Obsidian) – Ref. # 41-2

Specimen # **43-2** is a base of a nearly finished perform leaf shaped biface of Monterey Chert (see Figure 24). The final edge treatment is mostly soft hammer percussion flake scars. There is a truncation perpendicular to the axial length of the artifact, which may suggest that it was used as a large dart point projectile point. Max. length = 45.7 x 27.3 x 13.9 mm. Wt. 14.0 g.

Figure 24: Base Fragment (Monterey Chert) – Ref. # 43-2

Specimen # **D-100-16** is a tip of a midsize dart point made from Obsidian. Both the right and lateral edges exhibit remnants of soft hammer percussion (see Figures 25 and 26). All the edges have been pressure flaked along the margins. The specimen may have been resharpened at some previous state. It may have been part of a larger projectile point, because there is a snap perpendicular to the axial length of the specimen. Max. length = 25.1 x 16.6 x 6.6 mm. Wt. 2.5 g.

Figure 25: Tip Fragment of Projectile Point (Obsidian) – Ref. # D-100-16

Figure 26: Tip Fragment of Projectile Point (Obsidian) – Ref. # D-100-16 (Illustrated)

Specimen # D-12-17 is a side-notched projectile point made from Green Franciscan Chert (see Figures 27 and 28). The specimen was recovered by ACRS from Test Unit # 3 at a depth of the 60-80 cm BS. The projectile point attributes are listed below (Dietz 1986):

Max. length = 32 mm.	PSA = 130 and 140 degrees
Max. width or basal width = 20.6 mm.	DSA = 200 and 210 degrees
Blade width = 19.6 mm.	Length / width ratio = 1.58 mm.
Neck width = 13.7 mm.	Basal indentation ratio = 1.0
Thickness = 7.2 mm.	Wt. = 3.5g.

Figure 27: Side Notched Projectile Point (Green Franciscan Chert) – Ref. # D-12-17

Figure 28: Side Notched Projectile Point (Green Franciscan Chert) – Ref. # D-12-17 (Illustrated)

Specimen # 64-2 is a dart point made from Monterey Chert (see Figures 29 and 30). The distal end "tip" exhibits an impact fracture and so does the base along one of the lateral edges. The basal impact fracture exhibits evidence of being snapped. Therefore, it is speculated that this point was successfully embedded in some large mammal. The overall quality of the stone is grey in color and exhibits thermal spalls on one face and crazing on both faces, which suggests uniform exposure to heat. The impression here is that this dart point was still embedded within the meat source while it was being cooked in a fairly hot fire, thus affecting the overall uniform coloring and quality of this dart point. Max. length = 35.1 x 14.2 x 4.8 mm. Wt. 2.6 g.

Figure 29: Thermally Affected Dart Point Fragment (Monterey Chert) – Ref. # 64-2

Figure 30: Thermally Affected Dart Point Fragment (Monterey Chert) – Ref. # 64-2 (Illustrated)

<u>Backed Knives / Utilized Flakes</u> <u>(9 specimens: SJSU n= 9)</u>

Backed knives (trajectory) are tools that have a distinctive morphology. These tools appear to have been manufactured on relatively large primary or cortical flakes. The working edges appear to have been either unifacially or bifacially modified or used “as is” and then in some cases employed in a cutting or scraping activity. The opposite edges have a flattened or truncated “backed” aspect to them, thus giving the impression that these were the areas by which the tools were gripped. I am employing the term trajectory because several of these specimens appear to be in various stages of manufacturing from perform to a finished product. A total of nine backed knife specimens were recovered from the site and they are described below.

Specimen # 18-3 is a small proto backed knife made on a thick primary modified flake of Monterey Chert (see Figure 31). The edge opposite the flattened “backed area” exhibits both soft hammer percussion and pressure flaking along both faces of the edge. No clearly defined use wear was detected under the microscope. The specimen was recovered from Test Unit # 2 at a depth of 60-70 cm BS. Max. length = 44.8 x 27.2 x 13.5 mm. Wt. 14.1 g.

Figure 31: Proto Backed Knife (Monterey Chert) – Ref. # 18-3

Specimen # 14-3 is a utilized flake made on a thick primary flake of Red Franciscan Chert (see Figures 32 and 33). The utilized edge exhibits crushing and slight gloss along the edge. The edge is straight and measures 34.5 mm and is located opposite the flattened "backed area." The edge is located along the right lateral edge (ventral view) and the "backed edge" is located on the left lateral edge (ventral view).The specimen was recovered from Test Unit # 2 at a depth of 10-20 cm BS. Max. length = 58.8 x 37.1 x 24.7 mm. Wt. 40.0 g.

Figure 32: Backed Knife "Utilized Edge" (Red Franciscan Chert) – Ref. # 14-3

Figure 33: Truncated "backed" Aspect (Red Franciscan Chert) – Ref. # 14-3

Specimen # 29-23 is a “backed” expanding flake made of Rhyolite (see Figure 34). The edge exhibits some possible nicking due to use. The “backed” edge is located on the striking platform area (ventral view). The opposite edge with the nicking is located on the distal edge (ventral view). No other wear patterns were observed. The right lateral edge may have been employed and exhibits slight rounding possibly due to use. The specimen was recovered from Test Unit #3 at a depth of 40-50 cm BS. Max. length = 62.3 x 41.4 x 19.7 mm. Wt. 44.4 g.

Figure 34: Backed Expanding Flake (Rhyolite) – Ref. # 29-23

Specimen # 39-35 is a “backed” utilized flake made on a primary flake of Quartzite (see Figure 35). The backed edge is located on the left lateral edge (ventral view). The utilized edge is located along the lower right distal edge (ventral view) opposite the backed edge. The edge unit is convexed and appears to have been first modified through either pressure flaking or a soft hammer technique. Some of the high facets retain evidence of rounding, gloss, and a slight polish. The edge unit is 23.5 mm and the damaged edge angle (DEA) ranges from 53 to 71 degrees. The specimen was recovered from Trench Unit # 1 at 30-40 cm BS. Max. length = 47.7 x 24.6 x 9.8 mm. Wt. 17.5 g.

Figure 35: Backed "Utilized" Flake (Quartzite) – Ref. # 29-35

Specimen # 12-1 is a "backed" utilized flake made on a large cortical flake of Quartzite (see Figure 36). The backed edge is part of the cortex along the left lateral edge (dorsal view), while the utilized edge is located along the right lateral edge (dorsal view). The edge unit is straight to slightly concave and measures 50.5 mm. The edge unit exhibits evidence of rounding, gloss, and slight polish along the high facets, thus suggesting that it may have been used with a moderately resistant material, such as rawhide. The specimen was recovered from Test Unit # 5 at a depth of 10-20 cm BS. Max. length = 81.4 x 29.3 x 21.3 mm. Wt. 40.9 g.


Figure 36: Backed Cortical Flake (Quartzite) – Ref. # 12-1

Specimen # 39-36 is a “backed” utilized flake made on a thick primary expanding flake of white Quartzite (see Figure 37). The backed edge is located on the left lateral edge (dorsal view). The utilized edge is on the right lateral edge (dorsal view). The edge unit exhibits nicking, slight gloss, and rounding. The edge unit is mostly straight to slightly convexed and measures 51.8 mm. The damaged edge angle (DEA) ranges from 50 to 54 degrees. The specimen was recovered from Trench Unit # 1 at a depth of 30-40 cm BS. Max. length = 79.9 x 48.3 x 19.4 mm. Wt. 76.5 g.

Figure 37: Backed “Utilized” Flake (Quartzite) – Ref. # 39-36

Specimen # 59-27 is a “backed” utilized flake made on a primary flake of Andesite (see Figure 38). The backed edge is located along the right lateral edge (ventral view). The high facets exhibit evidence of rounding, gloss and nicking. The edge unit is principally straight and measures 29.9 mm and the damaged edge angle (DEA) ranges from 32 to 38 degrees. The specimen was recovered from Test Unit # 1 at a depth of 60-70 cm BS. Max. length = 45.6 x 28.1 x 12.5 mm. Wt. 15.3 g.

Figure 38: Backed "Utilized" Flake (Andesite) – Ref. # 59-27

Specimen # 39-34 is a backed utilized flake made on an "orange wedge" off of a large Monterey Chert cobble (see Figure 39). The backed portion of the artifact constitutes the original rounded cobble cortex. The opposite edge, which could be viewed as the right lateral edge (ventral view) exhibits slight gloss and nicking, along the high facets. The edge is principally straight and the edge unit measures 66.1 mm. The damaged edge angle (DEA) measures 32 to 39 degrees. The specimen was recovered from Trench Unit # 1 at s depth of 30-40 cm BS. Max length = 83.2 x 32.3 x 18.1 mm. Wt. 89.0 g.

Figure 39: Backed "Utilized" Flake (Monterey Chert) – Ref. # 39-34

Specimen # 26-34 is a utilized flake made on an expanding flake of Quartzite (see Figure 40). The backed edge consists of the original cortex of the cobble and is located on the right lateral edge (ventral view). The utilized edge exhibits slight gloss and rounding along the distal edge opposite the striking platform. The edge unit is straight and measures 45.2 mm and the damaged edge angle (DEA) ranges from 36 to 38 degrees. The specimen was recovered from Trench Unit # 1 at a depth of 0-10 cm BS. Max. length = 53.1 x 31.9 x 13.6 mm. Wt. 20.1 g.

Figure 40: Backed "Utilized" Flake (Quartzite) – Ref. # 26-3

<u>**Scrapers** (2 specimens: SJSU n = 2)</u>

Scrapers tend to be large unifacially modified primary or cortical flakes that generally have steep Edge Units (EU's). In some cases, scrapers may also display bifacial modifications. However, wear patterns tend to be perpendicular to the worked edges, thus suggesting that the tool was employed in a scraping-like fashion. A total of two scraper specimens were recovered from the site and they are described below.

Specimen # 52-13 is a utilized flake of Andesite which was recovered from Trench Unit # 2 at a depth of 20-30 cm BS level (see Figure 41). The left lateral edge “dorsal view” exhibits evidence of crushing along the edge, slight grounding, and polish on the high facets, which suggests that it was used in a scraper like fashion against a moderately resistant material such as rawhide. The edge unit is slightly convexed and measures 47.9 mm. The damaged edge angle (DEA) ranges from 62 to 73 degrees. Max. length = 59.02 x 29.67 x 14.03 mm. Wt. 25.3 g.

Figure 41: Scraper (Andesite) – Ref. # 52-13

Specimen # 36-85 appears to be a unifacial tool made on a thick flake of Quartzite (see Figure 42). The specimen was recovered from Test Unit # 1 at a depth of 50-60 cm BS. The utilized edge is located along the left lateral edge (dorsal view) and exhibits rounding and slight gloss on the high facets. The specimen looks as if it were used in a unidirectional fashion scraping toward the ventral side. Max. length = 47.1 x 41.5 x 15.5 mm. Wt. 30.2 g.

Figure 42: Scraper (Quartzite) – Ref. # 36-85

Choppers (5 Specimens: SJSU n = 3, ACRS n = 2)

Choppers are cobbles that had flakes detached by hard hammer percussion, thus creating an edge which could be used to chop or split material. These tools were generally wedge shaped in cross section and the prepared edges frequently exhibited polish and crushing from use (Hylkema 1991). A total of five chopper specimens were recovered from the site. The three chopper specimens that were recovered by SJSU are described below.

Specimen # **16-15** is an edge modified cobble fragment made on a rounded cobble of Quartzite (see Figure 43). The remnant edge exhibits rounding, crushing and spalling, suggesting that it was used in a chopper-like fashion. The edge unit is convexed and measures approximately 78.9 mm. The specimen was recovered from Test Unit # 2 at a depth of 40-50 cm BS. Max. length = 71.5 x 61.1 x 27.7 mm. Wt. 169.1 g.

Figure 43: Chopper Fragment (Quartzite) – Ref. # 16-15

Note: Possibly backed - the backed area is opposite the utilized edge.

Specimen # 77-9 is a "backed" chopper-like tool made on a large and thick primary flake of Quartzite (see Figure 44). The specimen exhibits two edge units. Edge Unit # 1 is on the proximal striking platform end, which has been crushed, spalled, and rounded. This may be the result of heavy platform preparation above the dorsal arris. The edge unit is slightly convexed. Edge Unit #2 is located on the right lateral edge (ventral view). This edge unit is straight and exhibits crushing and spalling. Opposite this edge, along the left lateral edge, is a "backed" platform area. The length of Edge Unit # 1 is 50.1 mm and the length of Edge Unit # 2 is 32.3 mm. The specimen was recovered from Test Unit# 3B at a depth of 30-60 cm BS.
Max. length = 63.4 x 50.7 x 30.0 mm. Wt. 109.0 g.

Figure 44: Chopper (Quartzite) – Ref. # 77-9

Specimen # 39-7 is a remnant of a rounded cobble of Quartzite with one edge exhibiting slight crushing and spalling, thus suggesting that it may have been used in a chopper-like fashion (see Figure 45). The Edge Unit is principally straight to slightly convexed. The specimen was recovered from Trench Unit # 1 at a depth of 30-40 cm BS. Max. length = 53.4 x 43.3 x 37.4 mm. Wt. 95.5 g.

Figure 45: Possible Chopper (Quartzite) – Ref. # 39-7

<u>**Borers** (2 Specimens: SJSU n = 2)</u>

Borers are tools which were used to bore holes into wood, bone, shell or stone (Cartier 1993).The drill bits tend to exhibit wear patterns in the form of crushing, rounding, nicking, polish, and gloss, on the edges and tips. Two borer specimens were identified and they are described below

Specimen # 76-26 appears to be a thick triangular cross section of a primary flake of Monterey Chert (see Figure 46). The tapered end bit appears to have been employed in boring a semi-resistant material such as wood. The tip appears to exhibit slight crushing along two of the three edges, suggesting that it was used for boring. The third edge appears to have snapped. No wear patterns are displayed on that edge. The specimen was recovered from Test Unit #3B at a depth of 0-30 cm BS. Max. length = 35.3 x 21.2 mm x 12.2 mm. Wt. 6.5 g.

Figure 46: Borer Specimen (Monterey Chert) – Ref. # 76-26

Specimen # 20-5 appears to be a borer, made on an elongated primary flake of Andesite that is triangular in cross section (see Figure 47). The tapered tip bit exhibits edge nicking on two of the edges. The specimen was recovered from Test Unit # 3 at a depth of 10-20 cm BS. Max. length = 55.6 x 21.7 x 18.9 mm. Wt. 19.6 g.

Figure 47: Borer Specimen (Andesite) – Ref. # 20-5

Debitage / Waste Flakes

A total of 10,455 flaked stone elements have been classified as "Debitage / Waste Flakes" from the SJSU lithic assemblage and an additional 938 flaked stone elements have been classified as "Debitage Waste Flakes" from the ACRS lithic assemblage. The distribution and context from which these debitage / waste flakes were recovered is as follows:

- **SJSU**: N = 5,381 lithic specimens recovered from four hand-controlled excavation test units (Test Units 1 through 5).
- **SJSU**: N = 5,074 lithic specimens recovered from the four hand-controlled excavation trench units (Trench Units 1 through 4).
- **ACRS**: N = 938 lithic specimens recovered from three (3) the hand-controlled excavation Test Units.

Debitage

This category consists of flaking debris produced during the manufacture of stone tools. The debitage and waste flakes from this assemblage were classified based on the probable mode of production. A total of thirteen debitage / waste flake categories have been identified from this collection. I employed definitions proposed by Leventhal et al. 2009 (Pp 11-14 and 11-15) for defining Debitage / Waste Flake classes in this study.

1. **Cortical Flakes** (**1,193** specimens: SJSU: n = **1,110**, ACRS: = **83**) are usually produced by freehand hard and/or soft hammer percussion techniques. Cortical flakes represent the first of a series of flake detachment processes and these flakes retain at least 50% or more of their cortex.

2. **Primary Flakes (6,033** specimens: SJSU: n = **5,680**, ACRS n = **353**) are removed from a core or quarry blank by either hard hammer percussion, or if from a primary blank, by both hard hammer and/or soft hammer percussion techniques. Primary flakes as opposed to cortical flakes, retain less than 50% of the cortex. However, cortex may still be present on the striking platform. If the primary flakes were derived from a primary flake blank, neither cortex or previous flake scars would necessarily be present on the dorsal face.

3. **Thinning Flakes** (**2,195** specimens: SJSU: n = **1,854**, ACRS: n = **341**) are usually produced by soft hammer or antler baton percussion. These flakes tend to be much thinner than primary flakes with smaller striking platforms and less pronounced bulbs of percussion. They usually retain two or more previously detached flake scars on their dorsal surfaces. These flakes often appear to be byproducts of the production of formed tools, such as bifaces and /or projectile points, rather than the result of initial core reduction. Some thinning flakes are typically longer than they are wide (sometimes referred to as bladelets). These thinning flakes are distinctive and are the result of the last stages of perform/bifacial tool production.

4. **Pressure Flakes** (**23** specimens: SJSU n = **23)** are usually derived from pressing an antler tine, a resharpened bone, or a hafted tooth against the edge of a flake or stone tool, resulting in this distinctively tiny flake. These flakes are usually representative of the very last stages of tool manufacture. The process is also referred to as final edge treatment. Pressure flakes may also be produced as a result of resharpening the edge of a worn tool.

5. **Bipolar Cortical Flakes** (**235** specimens: SJSU: n = **217**, ACRS: n = **18**) are produced by an anvil and hard hammer reduction technique rather than by freehand hard hammer. These flakes are distinguished by three bulbar types: a) flat or sheared, b) salient, and c) diffused. They retain cortex on their dorsal surface.

6. **Shatter** (**351** specimens: SJSU: n = **316**, ACRS: n = **35**) refers to usually angular, irregular shaped detritus that are most probably flake fragments and / or failed “shattered” material derived from assayed cobbles, cores and / or tools. Since these specimens have lost almost all of their flake attributes and characteristics they cannot reliably be placed in any of the other lithic classes.

7. **Thermal Spalls** (**857** specimens: SJSU: n = **818**, ACRS: n = **39**) fall into a separate category because they are unintentional byproducts due to exposure to intense heat.

8. **Bipolar Wedges** (**4** specimens: SJSU: n = **4**) have cortex running from proximal to distal end along one dorsal margin. Bipolar wedge shaped flakes are usually produced on small rounded cobble and pebble cores. In some cases, however, some wedges do not have cortex present on the dorsal margins.

9. **Bipolar Flakes** (**461** specimens: SJSU: n = **396**, ACRS: n = **65**) are produced by hammer and anvil technique and have the same distinguishing traits as bipolar cortical flakes, but retain less than 50% cortex.

10. **Resharpening Flakes (25** specimens: SJSU: n = **25**) are usually small flakes removed from the edges of chipped-stone cutting or scraping tools to rejuvenate the effectiveness of the edge.

11. **Bipolar Shatter** (**3** specimens: SJSU: n = **3**) is the same as the "Shatter" class of debitage except that these fragments based upon remnant attributes, were more than likely produced as a result of a bipolar hard hammer and anvil technique.

12. **Core Rejuvenation Flakes** (**3** specimens: SJSU: n = **3**) are really a rare form of primary flakes. These flakes were deliberately removed as a large flake that usually retains part of the original crushed or damaged striking platform area of the core, thus classifying these large flakes as neither a core or a fragment.

13. **Cortical Shatter** (**10** specimens: SJSU: n = **6**, ACSR: n = **4**) is the same as the "Shatter" class of debitage, except these fragments retain 50% or more cortex.

<u>Material Summary</u>

A combined total of 11,393 (SJSU n = 10,455, ACRS n = 938) flaked stone materials were classified under the Debitage / Waste Flake category. In order of dominance they are as follows:

SJSU Debitage / Waste Flake Assemblage (N = 10,455)

1.) **Monterey Chert** represented the most predominant material type in this assemblage accounting for 89% (n = 9,329) of all debitage / waste flakes recovered from the site.

2.) **Volcanic materials** accounted for 5.4% (n = 562) of the total. In order of prevalence they are: **Andesite** (n = 313 or 3%), **Rhyolite** (n = 239 or 2.3%), and **Basalt** (n = 10 or .09 %).

3.) **Quartzite** represented 3.9% (n = 404) of the total.

4.) **Obsidian** accounted for 0.7% (n = 71) of the total.

5.) **Franciscan Cherts** accounted for 0.5 % (n = 57) of the total. In order of prevalence they are: Red (n = 32), Green (n = 21), White (n = 2), Yellow (n = 1), and Gray (n = 1).

The remaining six other material types have very few specimens represented and account for 0.3% of the total assemblage In order of prevalence they are: Siltstone (n = 22), Chert / other (n = 4), Quartz (n = 3), Chalcedony (n = 1), Jasper (n = 1) and Schist (n = 1).

ACRS Debitage / Waste Flake Assemblage (N = 938)

1.) **Monterey Chert** represented the most predominant material type in this assemblage accounting for 97.1% (n = 911) of all debitage / waste flakes recovered from the site.

2.) **Volcanic materials** accounted for 1.5% (n = 14) of the total. In order of prevalence they are: **Andesite** (n = 12 or 1.3%), and **Rhyolite** (n = 2 or 0.2 %).

3.) **Quartzite** accounted for .64% (n = 6) of the total.

4.) **Obsidian** accounted for .53% (n = 5) of the total.

5.) **Green Franciscan Chert** accounted for .21 % (n = 2) of the total.

Groundstone (3 specimens: ACRS n = 3)

A total of two mano fragments and one possible metate fragment were recovered from the site by ACRS. See Appendix A for a comprehensive description of these artifacts.

Pecked And Battered Stone Tools (8 specimens: SJSU n = 8)

A total of eight pecked stone and battered stone tools were recovered from CA-SCR-12. These tools fall into two categories: 1.) pecked cobbles, and 2.) battered stones / hammer stones.

Pecked Stone Cobbles (2 specimens: SJSU: n = 2)

Pecked stone cobbles are artifacts that exhibit varying degrees of pecking on the cobble surface (Cartier 2003). These informal tools may have been employed as an anvil stone or nutting stone, for the purposes of processing nuts, seeds, grains and other materials (Fogelson and Sturtevant 2004). Two pecked stone cobble specimens were recovered from the SJSU excavations and they are described below:

Specimen # 43-21 is a cylindrical split cobble of Sandstone (see Figure 48). It has some slight pecking on the surface, suggesting that it may have been used as a possible pestle. The cobble also exhibits some blackening as a result of being exposed to fire. The specimen was recovered from Trench Unit # 3 at a depth of 50-60 cm BS. Max. Length = 87.8 x 57.3 x 26.6 mm.

Wt. 169.2 g.

Figure 48: Split Sandstone Cobble – Ref. # 43-21

Specimen # 45-26 is a slightly pecked mostly intact large cobble of fine grained Sandstone (see Figure 49). The two faces have been subjected to surface pecking and slight grinding. The high facets in the pecked area are ground on one face. The stone looks as if it were possibly used as an anvil for bipolar percussion as well. The specimen was recovered from Trench Unit # 3 at a depth of 60-70 cm. Max. length = 145.4 x 132.4 x 96.2 mm. Wt. 5 lbs.

Figure 49: Large Pecked Sandstone Cobble – Ref. # 45-26

Note: Max. length of convex face = 53.4 x 58.4 mm.
Max. length of flat face = 72.9 x 93.4 mm.

Hammer Stones (Battered Stones) (6 specimens: SJSU n = 6)

Hammer stones are cobbles that are employed in a hammer-like fashion. Based on the observed battered use/wear patterns (spalling, crushing, battering, and rounding) certain activities can be inferred. A total of six hammer stone specimens were recovered from the SJSU excavations and they are described below:

Specimen # 49-8 is a remnant of either an edge battered or a chopper made on a cobble of Rhyolite (see Figure 50). The employed edge exhibits characteristic crushing, rounding and some slight spalling. The specimen may have also been used for processing rawhide. The specimen was recovered from Trench Unit # 3 at a depth of 80-90 cm BS. Max. length = 39.9 x 30.7 x 22.9 mm. Wt. 31.3 g.

Figure 50: Edge Battered Cobble (Rhyolite) – Ref. # 49-8

Specimen # 64-48 is a slightly end battered small cobble of Sandstone (see Figure 51). Battering appears on one particular end and there is a spall on the opposite end. The specimen was recovered from Trench Unit # 2 at a depth of 50-60 cm BS. Max. length = 74.3 x 59.7 x 29.5 mm. Wt. 191.5 g.

Figure 51: End Battered Cobble (Sandstone) – Ref. # 64-48

Specimen # 83-16 is an intact chopper / hammer stone possibly made on a core of Andesite (see Figure 52). After the specimen was flaked as a core, three edges were employed in a chopper-like fashion and exhibit rounding, edge crushing, and spalling. Two of the prominent points exhibit battering, thus suggesting that it was also used as a hammer stone. The specimen was recovered from Trench Unit # 4 at a depth 30-40 cm BS. Max. Length = 75.8 x 53.3 x 38.4 mm. Wt. 202.1g.

Figure 52: Chopper / Hammerstone (Andesite) – Ref. # 83-16

Specimen # 44-16 is a cobble of Rhyolite that exhibits slight battering and crushing on one prominence and along one edge there is a hint of slight battering (see Figure 53). This specimen was not heavily employed as a hammer stone but was used as a tool. The specimen was recovered from Trench Unit # 1 at a depth of 40-50 cm BS. Max Length = 79.2 x 57.8 x 49.5. Wt. 254.1 g.

Figure 53: Cobble (Rhyolite) – Ref. # 44-16

Specimen # 29-11 is a hammer stone made on a rounded cobble of Quartzite (see Figure 54). Two edges exhibit rounding, spalling, and battering. One end exhibits battering and rounding. The specimen was possibly used as both a hammer stone and a chopper. The specimen was recovered from Test Unit # 3 at a depth of 40-50 cm BS. Max Length = 75.6 x 55.6 x 35.8 mm Wt. 258.1g.

Figure 54: Hammerstone Cobble (Quartzite) – Ref. # 29-1

Specimen # 52-3 is a multifunctional tool made on a rounded cobble of Andesite (see Figure 55). It was originally reduced as a core. There are multiple flake scars along one face. The existing end exhibits battering and some crushing, suggesting that it was also used as a hammer stone. The specimen was recovered from Trench Unit # 2 at a depth of 20-30 cm BS. Max. Length = 66.4 x 88.3 x 71.7 mm. Wt. 475.1 g.

Figure 55: Rounded Cobble (Andesite) – Ref. # 52-3

Ornamental Stone (2 specimens: SJSU n = 2)

A total of two polished ornamental stones were recovered from the site. These Steatite specimens were possibly used as nose or ear ornaments (see Figure 56). They appear as cylindrical rods or pencil shapes of uniform width and are described below.

Figure 56: Possible Steatite Ornaments (Ref. # 38-1: Left & Ref. # 23-29: Right)

Specimen # 38-1 is a cylindrical or pencil shaped rod made from Steatite (see Figure 57). The specimen is highly polished and has striations along the body from the manufacturing process. Both ends have been tapered to a point. The specimen was recovered from Trench Unit # 3 at a depth of 20-30 cm BS. Max. length = 45.7 mm x 5.3 mm. Wt. 3.1 g.

Figure 57: Possible Ornaments (Steatite) – Ref. # 38-1 (Illustrated)

Specimen # 23-29 is a cylindrical or pencil shaped rod made from Steatite (see Figure 58). The specimen is highly polished and has striations along the body from the manufacturing process. One end has been tapered to a point and the other end in blunted. The specimen was recovered from Test Unit # 3 at a depth of 20-30 cm BS. Max. length = 35.5 mm x 5.14 mm. Wt. 2.3 g.

Figure 58: Possible Ornaments (Steatite) – Ref. # 23-29 (Illustrated)

Miscellaneous Manuports (15 specimens: SJSU n = 11, ACRS n = 4)

Manuports are usually unmodified materials (e.g., rocks) that were carried onto a site but not modified in any way (Sutton and Arkush 2009). A total of fifteen manuport cobbles / pebbles were recovered from the site. These specimens do not fit into any particular lithic category, however, their presence at the site is culturally significant. The distribution and context from which these manuports were recovered is as follows:

SJSU Manuport Assemblage: (11 Specimens)

1) **Ref. # 21-19** is an intact and unmodified siltstone cobble recovered from Test Unit # 1 at 30-40 cm BS. Wt. 164.8 g.

2) **Ref. # 26-35** is an unmodified Monterey Chert pebble recovered from Trench Unit # 1 at 0-10 cm BS. Wt. 0.7 g.
3) **Ref. # 52-4** is an intact and unmodified Monterey Chert cobble recovered from Trench Unit # 2 at 20-30 cm BS. Wt. 254.2 g.
4) **Ref. # 52-26** is an unmodified Monterey Chert pebble recovered from Trench Unit # 2 at 20-30 cm BS. Wt. 2.1 g.
5) **Ref. # 38-25** is a split pebble of Andesite recovered from Trench Unit # 3 at 20-30 cm BS. Wt. 110 g.
6) **Ref. # 43-14** is a split cobble of Andesite recovered from Trench Unit # 3 at 50-60 cm BS. Wt. 39.6 g.
7) **Ref. # 45-5** is a water worn Monterey Chert pebble recovered from Trench Unit # 3 at 60-70 cm BS. Wt. 1.9 g.
8) **Ref. # 85-7** is an unmodified sandstone cobble recovered from Trench Unit # 4 at 20-30 cm BS. Wt. 74.0 g.
9) **Ref. # 85-12** is an unmodified Red Franciscan Chert pebble recovered from Trench Unit # 4 at 20-30 cm BS. Wt 16.0 g.
10) **Ref. # 79-25** consists of **two (2)** unmodified Monterey Chert pebbles recovered from Trench Unit # 4 at 40-50 cm BS. Wt. 10.3 g.

ACRS Manuport Assemblage (4 Specimens)

1) **Ref. # 100-9** is an unmodified cobble of Siltstone recovered from Test Unit # 1 at 0-20 cm BS. Wt. 73.0 g.
2) **Ref. # 100-10** is an unmodified Monterey Chert pebble recovered from Test Unit # 1 at 0-20 cm BS. Wt. 17.0 g.
3) **Ref. # 3-7** is an unmodified Monterey Chert pebble recovered from Test Unit # 1 at 40-60 cm BS. Wt. 5.7 g.
4) **Ref. # 11-9** is an unmodified cobble of Siltstone recovered from Test Unit # 3 at 40-60 cm BS. Wt. 87.6 g.

Obsidian (85 specimens: SJSU: n = 80, ACRS: n = 5)

A total of eighty-five obsidian specimens were recovered from the site (see Figure 59).

Seventy-one of those specimens were classified as Waste Flake / Debitage:

- Pressure Flakes n = 20
- Thinning Flakes n = 48
- Shatter n = 2
- Cortical Flakes n = 1

The remaining fourteen specimens were classified as:

- Biface Projectile Point Fragments n = 3
- Projectile Point Midsections n = 2
- Projectile Point Fragments n = 3

- Impact Fracture Flakes n = 3
- Projectile Point Base n = 1
- Biface Fragments n = 2

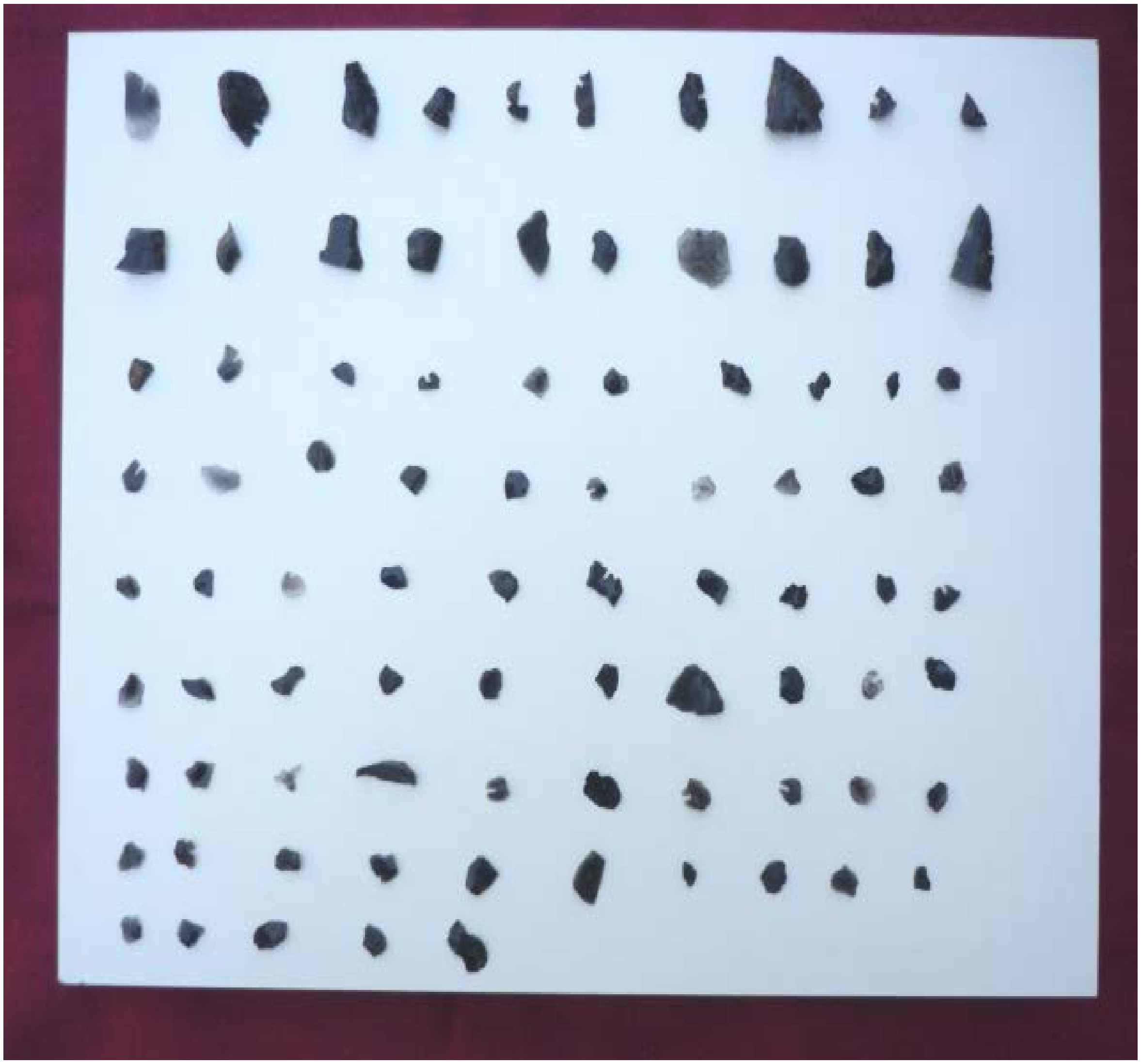


Figure 59: Eighty-Five (85) Obsidian Specimens Recovered from 912 Third Street

The distribution and context from which these specimens were recovered is as follows: (see Table 6 for SJSU provenience data and Table 7 for ACRS provenience data).

Table 6: SJSU Obsidian Provenience Data (80 Specimens)

Depth in cm	Test Unit 1	Test Unit 2	Test Unit 3	Test Unit 3A	Test Unit 3B	Test Unit 4	Test Unit 5	Trench Unit 1	Trench Unit 2	Trench Unit 3	Trench Unit 4
0-10			TF(1)	PF(1) PPB(1) BF(1)	TF(3)			PF (3)		TF (2) MPP(1)	
10-20	TF (2) PF (2)	TF(1) BPPF(1)					TF(2)	TF(1)	TF (2) PPF(1)	PPF(1)	
20-30		TF(1)	TF(2)			TF(1)	TF(1)	PF (2)		TF (2)	TF (3) PF (2)
30-40	TF(1) PF (2)	TF(1) BPPF(1)	TF(1)		TF(1)			PF (2) BF(1)	TF(1)	TF(1)	TF(1)
40-50	TF (3)	BPPF(1)					SH(1)		IFF(1)	MPP(1)	
50-60		CF(1) IFF(1)						PF(1)	PF (2)		
60-70		TF (2)	TF(1)	TF(1) (75cm)				TF (2)	TF (2) PF(1)		
70-80										PF(1)	TF(1)
80-90	TF(1)							PF(1)	IFF(1)		
90-100											

Table 7: ACRS Obsidian Provenience Data (5 Specimens)

Depth in Cm	Test Unit 1	Test Unit 2	Test Unit 3
0-20 cm	TF (1) PPF (1)		
20-40 cm		SH (1) TF (1)	
40-60 cm			
60-80 cm		TF (1)	
80-100 cm			

As a result of the present analysis the following is a breakdown of the typology of obsidian specimens recovered from the CA-SCR-12 excavations:

Thinning Flakes (TF)	n = 48
Pressure Flakes (PF)	n = 20
Cortical Flake (CF)	n = 1
Shatter (SH)	n = 2
Biface Projectile Point Fragments (BPPF)	n = 3
Midsection of Projectile Point (MPP)	n = 2
Projectile Point Fragment (PPF)	n = 3
Projectile Point Base(PPB)	n = 1
Biface Fragment (BF)	n = 2
Impact Fracture Flake (IFF)	n = 3

Obsidian Studies - Sourcing and Hydration

Obsidian Sourcing

On January 9, 2013, a total of eighty-five obsidian specimens were submitted to Dr. Richard Hughes of Geochemical Research Laboratory in Portola Valley, Ca., to identify geological and geographical sources of the "finger print" trace elements found in the obsidian artifacts (see Appendix E). Twenty out of the eighty-five specimens were deemed large enough (ca. > 9 -10 mm in diameter and > ca. 1.5 mm thick) to generate reliable quantitative composition estimates (Hughes 2013, 2). Dr. Hughes reported trace element measurements in quantitative units (i.e. ppm) and made artifact-to-source attributions on the basis of correspondences in diagnostic trace element concentration values on those twenty specimens (see Table 8).

Table 8: Obsidian Specimens Sourced Via Energy Dispersive X-Ray Fluorescence

Specimen #	Description	Unit #	Depth / CM	Qty.	Wt. Grams	Source (Chemical Type)
5-51	Thinning Flake	Unit # 1	10-20 cm	1	.71 g	Bodie Hills
8-3	Projectile Pt. Midsection	TRU# 3	0-10 cm	1	2.2 g	Napa Valley
14-1	Biface Projectile Pt. Fragment	Unit # 2	10-20 cm	1	2.67 g	Napa Valley
15-3	Biface Projectile Pt. Fragment	Unit # 2	30-40 cm	1	.83 g	Napa Valley
16-11	Biface Projectile Pt. Fragment	Unit # 2	40-50 cm	1	.35 g	Lookout Mtn Casa Diablo area
17-8	Cortical Flake	Unit # 2	50-60 cm	1	.36 g	Napa Valley
17-22	Impact Fracture Flake	Unit # 2	50-60 cm	1	.54 g	Napa valley
25-2	Projectile Pt. Fragment	TRU# 3	10-20 cm	1	3.61 g	Lookout Mtn Casa Diablo area
31-5	Shatter	Unit # 5	40-50 cm	1	.39 g	Sawmill Ridge Casa Diablo area
39-31	Pressure Flake	TRU# 1	30-40 cm	1	.36 g	Napa Valley
41-2	Projectile Pt. Midsection	TRU# 3	40-50 cm	1	1.81 g	Napa Valley
47-1	Projectile Pt. Fragment	TRU# 2	10-20 cm	1	.54 g	Lookout Mtn Casa Diablo area
61-1	Projectile Pt. Base	Unit # 3A	0-30 cm	1	1.26 g	Napa Valley
68-5	Impact Fracture flake	TRU# 2	40-50 cm	1	1.01 g	Napa Valley
74-16	Thinning Flake	Unit # 1	80-90 cm	1	.56 g	Napa Valley
76-51	Thinning Flake	Unit # 3B	0-30 cm	1	.39 g	Napa Valley
77-20	Thinning Flake	Unit # 3B	30-60 cm	1	1.16 g	Bodie Hills
85-4	Thinning Flake	TRU# 4	20-30 cm	1	.87 g	Napa Valley
D-100-2	Shatter	Unit # 2	20-40 cm	1	.68 g	Napa Valley
D-100-16	Projectile Pt. Fragment	Unit # 1	0-20 cm	1	2.48 g	Bodie Hills

Based upon this particular (EDXRF) study, 65% (n = 13) specimens were identified as being manufactured from obsidian of the Napa Valley chemical type, 20% (n = 4) specimens were manufactured from Casa Diablo area obsidians (Lookout Mountain, n = 3; Sawmill ridge, n = 1, and 15% (n = 3) specimens were fashioned from Bodie Hills volcanic glass (Hughes 2013, 2).

Dr. Hughes concluded that the other sixty-five obsidian specimens “were too small and thin to generate x-ray counting statistics adequate for proper conversion from background-correcting intensities to quantitative concentration estimates.” Instead, sourcing was based on “integrated net count (intensity) data for the elements Rb, Sr, Y,Zr, Nb, Fe, and Mn” (Hughes 2013, 2). Using this technique for source assignment, Dr Hughes identified forty-one out of the sixty-five specimens as matching the profile of obsidians from the North Coast Ranges (Napa Valley, n =37; Annadel, n = 4). The remaining twenty-four specimens were identified as being manufactured from obsidians from the Mono Basin / western Great Basin area (Casa Diablo area, n = 17; Bodie Hills, n = 5; Mt. Hicks, n = 2) chemical type (Hughes 2013, 3).

In summary, combining quantitative composition estimates with integrated net count data indicated that 64% (n =54) of the eighty-five obsidian specimens analyzed from CA-SCR-12 were manufactured from North Coast Ranges obsidian (Napa Valley, n = 50; Annadel, n = 4). The other 36% (n =31) obsidian specimens were made from Mono Basin / western Great Basin volcanic glasses (Casa Diablo area, n= 21; Bodie Hills, n = 8, and Mt. Hicks, n = 2). See Figures 60 and 61 below.

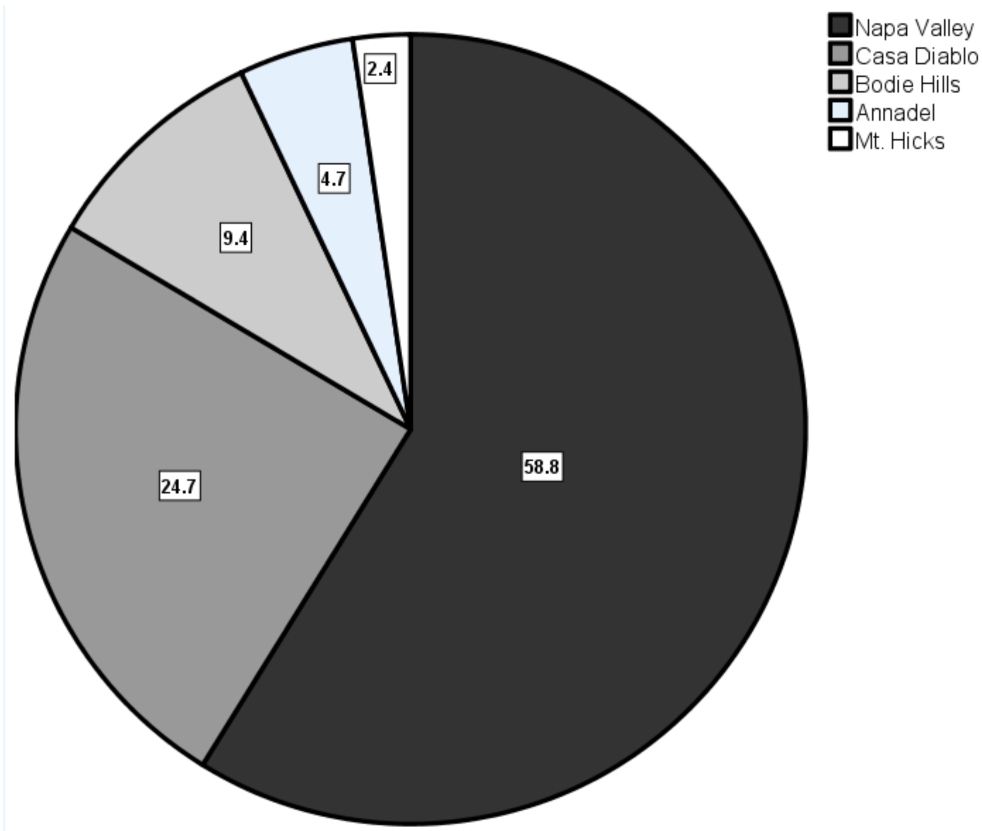


Figure 60: CA-SCR-12 Obsidian Sources Via Quantitative Composition Estimates and Integrated Net Count Data

Frequencies

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Annadel	4	4.7	4.7	4.7
	Casa Diablo	21	24.7	24.7	29.4
	Mt. Hicks	2	2.4	2.4	31.8
	Napa Valley	50	58.8	58.8	90.6
	Bodie Hills	8	9.4	9.4	100.0
	Total	85	100.0	100.0	

Figure 61: CA-SCR-12 Obsidian Sources - Frequency and Percent

Obsidian Hydration Study

Today, there are several geochemical techniques used for dating an archaeological site: neutron activation (INNA), x-ray fluorescence (XRF), proton induced x-ray emission (PIXE), thermal ionization mass spectrometry (TIMS), among others (Glascock 2002). Although obsidian hydration is no longer considered the primary geochemical technique used for dating an archaeological site, the hydration of obsidian has been continuous since 1960. The correlation between the age of volcanic glass and the growth of hydration bands is still viewed as measurable and predictable.

In March 2013, I selected twenty-four obsidian specimens, based on the geological sourcing data contained in Dr. Hughes' report titled, "Energy Dispersive X-ray Fluorescence Analysis of Artifacts from CA-Scr-12, Santa Cruz, Ca." and submitted them to San Jose State University alum Mr. John Schlagheck to perform an obsidian hydration study in the San Jose State University Obsidian Laboratory (SJSUOL). Mr. Schlagheck acquired technical competency in obsidian hydration through an apprentice-mentor relationship with Mr. Tom Origer at the Origer Obsidian Laboratory (OOL) in Sonoma, Ca. (Schlagheck 2011). Mr. Schlagheck received his Master's Degree in Applied Anthropology from San Jose State University in 2011, and the focus of his research included obsidian hydration. The distribution and context from which these twenty four obsidian specimens were recovered are as follows (see Table 9).

Table 9: Provenience Data – 24 Obsidian Specimens Selected for Hydration

Specimen #	Description	Unit #	Depth	Qty	Wt. Grams	Source (Chemical Type)
5-51	Thinning Flake	Unit # 1	10-20 cm	1	.71 g	Bodie Hills
8-3	Projectile Pt. Midsection	TRU# 3	0-10 cm	1	2.2 g	Napa Valley
14-1	Biface Projectile Pt. Fragment	Unit # 2	10-20 cm	1	2.67 g	Napa Valley
15-3	Biface Projectile Pt. Fragment	Unit # 2	30-40 cm	1	.83 g	Napa Valley
16-11	Biface Projectile Pt. Fragment	Unit # 2	40-50 cm	1	.35 g	Lookout Mtn Casa Diablo Area
17-8	Cortical Flake	Unit # 2	50-60 cm	1	.36 g	Napa Valley
17-22	Impact Fracture Flake	Unit # 2	50-60 cm	1	.54 g	Napa Valley
25-2	Projectile Pt. Fragment	TRU# 3	10-20 cm	1	3.61 g	Lookout Mtn Casa Diablo Area
31-5	Shatter	Unit # 5	40-50 cm	1	.39 g	Sawmill Ridge Casa Diablo Area
39-31	Pressure Flake	TRU# 1	30-40 cm	1	.36 g	Napa Valley
5-27	Thinning Flake	Unit # 1	10-20 cm	1	.18 g	Bodie Hills
5-50	Pressure Flake	Unit # 1	10-20 cm	1	.11 g	Annadel
14-4	Thinning Flake	Unit # 2	10-20 cm	1	.16 g	Casa Diablo Area
21-29	Pressure Flake	Unit # 1	30-40 cm	1	.08 g	Casa Diablo Area
26-51	Pressure Flake	TRU# 1	0-10 cm	1	.11 g	Mt. Hicks
30-2	Thinning Flake	Unit # 1	40-50 cm	1	.20 g	Casa Diablo Area
33-21	Pressure Flake	TRU# 1	20-30 cm	1	.14 g	Casa Diablo Area
D-100-16	Projectile Pt. Fragment	Unit # 1	0-20 cm	1	2.48 g	Bodie Hills
48-2	Pressure Flake	TRU# 3	70-80 cm	1	.08 g	Bodie Hills
57-5	Pressure Flake	TRU# 1	80-90 cm	1	.09 g	Mt. Hicks
61-50	Pressure Flake	Unit # 3A	0-30 cm	1	.13 g	Bodie Hills
64-4	Pressure Flake	TRU# 2	50-60 cm	1	.21 g	Annadel
64-26	Pressure Flake	TRU# 2	50-60 cm	1	.11 g	Bodie Hills
71-9	Thinning Flake	Unit # 3	60-70 cm	1	.16 g	Annadel

Methods: Reporting on a Process

On March 16, 2013, Mr. Schlagheck reported to the SJSUOL to begin the obsidian hydration study. Given my lack of knowledge of the obsidian hydration technique, I decided that I would function as a participant observer and document this particular obsidian hydration study. For more information regarding the theory and methods of obsidian hydration please view Mr. Schlagheck's Master's Project Report titled, "A Community Of Practice In Obsidian Studies 2011." That Master's Project Report is archived in the SJSU Department of Anthropology.

The tools and equipment required for the CA-SCR-12 obsidian hydration study included:

- Raytech Gem Saw
- Thermal Plastic (Lakeside Cement)
- Microscope slides
- Hot plate
- Glass plate
- 600 – grit silicon carbide abrasive powder
- Olympus polarizing microscope: Model BH2 - 100 / 115 V 0.40 /0.35A 50-60 HZ
- AWS-201 digital scale - (0.01g) accuracy

Mr. Schlagheck began the hydration study by performing a qualitative evaluation on all twenty-four obsidian specimens that were submitted to him for hydration. This involved performing a visual inspection of the unmodified specimens and determining cut locations for obsidian thin section removal (see Figure 62).

Figure 62: Choosing a Location for Obsidian Thin Section Removal

The variables which influence the cut location on a particular piece of obsidian include, but are not limited to: material thickness, shape, surface texture, visible fractures within the flake, and the presence or absence of any remnant cortex (Schlagheck 2011). Once Mr. Schlagheck determined the best location to cut a particular piece of obsidian, he used a Ray Tech gem saw to remove a thin section for the hydration study (see Figure 63). This required making two cuts (4 mm to 5 mm target depth) into the obsidian that were parallel to each other and perpendicular to the surface of the specimen.

Figure 63: Obsidian Thin Section Removal

Once thin section extractions were completed on all twenty-four obsidian specimens, Mr. Schlagheck began to prepare permanent thin section microscope slides. Here, thermal plastic (Lakeside Cement) is melted onto a glass slide using a hot plate (see Figure 64).

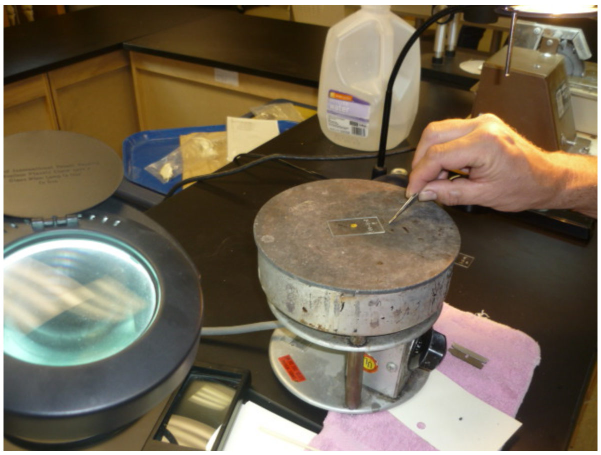


Figure 64: Preparing Obsidian Thin Section Microscope Slides

When the Lakeside Cement melted, Mr. Schlagheck placed a thin section of obsidian into the liquefied material and pressed it firmly against the slide until the liquid cement hardened, holding the obsidian thin section firmly in place (see Figure 65).

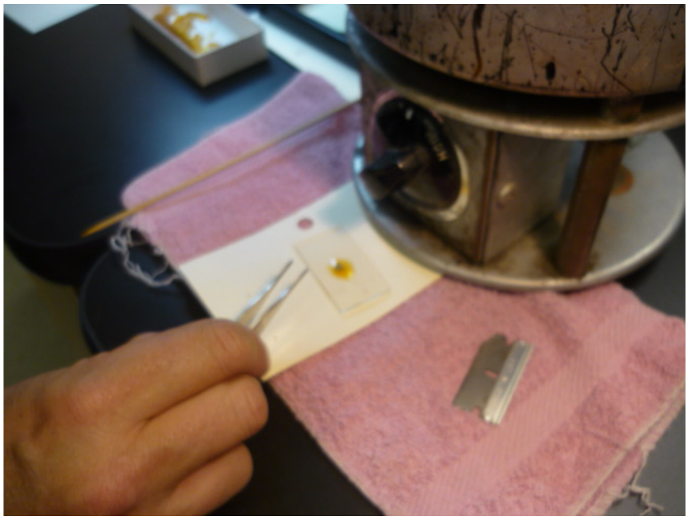


Figure 65: Obsidian Thin Section Positioned in Liquefied Metal

When all twenty-four obsidian thin section slides were prepared, Mr. Schlagheck began the process of grinding down each thin section slide using 600-grit silicon carbide abrasive powder and water on a glass plate **(**see Figures 66 and 67).

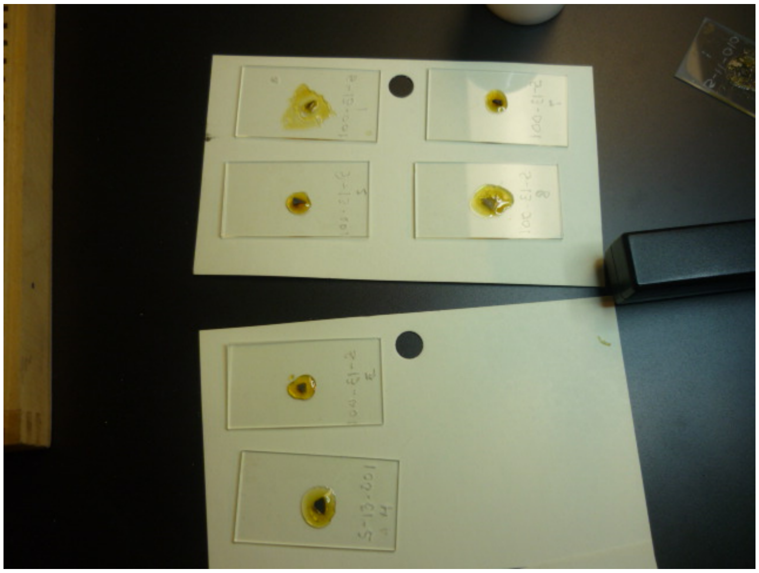


Figure 66: Sample of Prepared Obsidian Thin Section Slides

Figure 67: Preparing To Grind Thin Section Slides Using 600-Grit Powder, Glass Plate and Water

Each obsidian thin section sample was ground on one side to just over one-half its original thickness (see Figure 68). Mr. Schlagheck then placed the slides back onto the hot plate to heat and liquefy the Lakeside thermal plastic cement. Reheating and liquefying the cement allowed Mr. Schlagheck to invert the obsidian thin section on the slide before the cement hardened again.

Figure 68: Grinding Obsidian Thin Section to Half its Original Thickness

After the cement hardened, Mr. Schlagheck began the process of grinding the opposite side until the thin section measured approx. 0.003 inches thick. Once grinding was completed, the slides were rinsed with tap water and dried. Mr. Schlagheck placed a glass slide cover over each obsidian thin section and the hardened cement with a drop of permanent glue.

On April 2, 2013, Mr. Schlagheck came back into the SJSUOL and began making hydration readings using a 12.5x eyepiece mounted to an Olympus Model BH2 microscope (see Figure 69). This step of the hydration study involved placing individual obsidian thin section slides under the microscope and locating and measuring the hydration band, which is also referred to as the hydration rind.

Figure 69: Making Hydration Readings

After Mr. Schlagheck located the hydration band, he used the micrometer in the microscope's eyepiece to make up to six band measurements (Schlagheck 2011). The final hydration value for a particular obsidian thin section is the mean value of those six band measurements.

On April 16th 2013, Mr. Schlagheck submitted all twenty-four thin section slides along with each slide's final hydration value to Mr. Tom Origer at the Origer Obsidian Laboratory (OOL) in Sonoma, Ca. Mr. Origer verified the final hydration values of fifteen out of the twenty-four slides and converted those values to years before present (YBP). The proposed calendric dates for those fifteen obsidian specimens are discussed in Chapter 9 of this project report.

Discussion

Now that the analysis of the flaked, pecked, and battered stone assemblages recovered from CA-SCR-12 has been completed, I can now address the research question: *What were some of the activity sets that can be inferred from this assemblage recovered from CA-SCR-12?* As stated earlier in this chapter, a total of 11,720 (SJSU: n = 10746, ACRS n = 974) flaked stone elements were recovered from 912 Third Street. A total of 11,393 (SJSU: n = 10,455, ACRS: n = 938) of those elements were classified and placed into thirteen Debitage / Waste Flake categories. The remaining 327 elements (SJSU: n = 291, ACRS n = 36) were classified as "tools" and placed into eight formed (formal) and informal lithic tool categories.

A total of twenty flaked stone material types were identified in the CA-SCR-12 lithic assemblage and a comprehensive analysis of those materials indicated that nineteen of these material types were employed in stone tool manufacturing. The volume and diversity of the flaked stone materials present in the assemblage infers that on-site stone tool manufacture, reduction, and other maintenance activities were taking place as part of the ancestral Costanoan / Ohlone technologically-related subsistence activities that occurred at this site. Numerous lithic manufacturing trajectories clearly show that the number of small flakes should be greater than larger flakes by several orders of magnitude, under conditions of normal lithic manufacture and maintenance (Schick 1986). The CA-SCR-12 Debitage / Waste Flake assemblage demonstrates that a core reduction process was inherent and that stone tool manufacturing was a sophisticated activity set taking place in some particular area of the site.

Monterey chert represented the most predominant material type in the CA-SCR-12 flaked stone assemblage, accounting for 90 % (10,243) of all debitage / waste flakes recovered from the site (SJSU: n = 9332, ACRS n = 911). This data suggests that Monterey Chert was the preferred lithic material for the manufacture of flaked stone tools due to its knappability and regional availability as a raw lithic resource. Hunting and butchering was also an important activity set based upon the presence of projectile points and large utilized flakes and knife-like tools that exhibited use-wear patterns indicative of skinning and processing of hides.

The second research question can also be addressed. *What are the sources of the flaked obsidian materials and what can XRF sourcing tell us about ancestral Ohlone / Costanoan trade networks?* The geological and geographical sources of the “finger print” trace elements found in the obsidian artifacts were identified by Geochemical Research Laboratory. Combining quantitative composition estimates with integrated net count data indicated that 64% (n =54) of the eighty-five obsidian specimens were manufactured from North Coast Ranges obsidian (Napa Valley, n = 50; Annadel, n = 4). The other 36% (n =31) obsidian specimens were made from Mono Basin / western Great Basin volcanic glasses (Casa Diablo area, n= 21; Bodie Hills, n = 8, and Mt. Hicks, n = 2. North Coast Range obsidian (specifically) Napa Valley Obsidian, was clearly dominant over other source locations. However, the obsidian sourcing data suggests that there may have also been relatively strong trade networks with groups to the east in the central Valley toward the Mono Basin / western Great Basin areas as well.

Chapter 4

Analysis of Shellfish Remains Recovered from CA-SCR-12

Introduction

This chapter reports on the analysis of several species of bay and marine shellfish that were recovered from the site. The SJSU shell assemblage was recovered from two distinct contexts: 1) seven controlled hand excavated Test Units and screen recovery, and 2) four controlled hand excavated Trench Units and screen recovery. Approximately 9,383.5 grams (20.7 lbs) of shell were recovered from both contexts: Test Units = 3,984.6 g and Trench Units = 5,398.9 g.

Methods

In November 2012, the analysis of the shell material commenced. All shellfish remains were removed from their original unit level bags and placed onto sorting trays in the San Jose State University Department of Anthropology Laboratory. These materials were washed with tap water, examined, sorted, counted, and weighed using an Ohaus Series 700 2610g triple beam scale. The sorted shell materials were then placed into new unit level bags which were labeled with the site number, unit number, unit level, and a reference number. All unit and material provenience data along with material quantities and weights were recorded into the new CA-SCR-12 archaeological catalog.

In January 2013, all sorted shell materials (totaling 82 unit level bags) were submitted to Mr. Frank Perry of Museum Services in Santa Cruz, California, to perform a comprehensive speciation study (see Figure 70).

Figure 70: Eighty-Two Unit Level Shell Samples

Mr. Perry has over 40 years experience studying Central California coast marine mollusks and other shellfish species. The focus of the speciation study included:

1) Examining the contents of each sample bag and identifying the shellfish species (excluding fragmentary shells smaller than 30 mm in diameter) from the CA-SCR-12 assemblage.

2) Identifying smaller shell species (> 30 mm in diameter) if they represented species not present in the larger fraction.

3) Identification of the principal taxa present in the assemblage and placing examples of each type into separate bags.

4) Offering observations regarding the general composition of the various shell types.

5) Identifying *Mytilus* shells from the basement layers and placing those specimens in separate plastic bags for possible AMS dating.

6) Preparing a report listing all of the identified shell species present in the assemblage and their relative abundance.

The proveniences and weights of all shell specimens recovered from each arbitrary level of each excavation unit are noted in Table 10.

Table 10: Distribution and Weight of Shell

Unit #	0-10 cm	10-20 cm	20-30cm	30-40cm	40-50cm	50-60	60-70cm	70-80cm	80-90cm	90-100cm	Total Wt. Grams
Unit # 1	68.1g	99.8g	-	131.1g	46.7g	100.6g	206.9g	256.3g	143.5g	-	1053g
Unit # 2	29.6g	38.5g	31.1g	8.1g	19.3g	39.1g	32.8g	21.9g	-	-	220.4g
Unit # 3	-	-	45.2g	29.4g	94.4g	274.3g	296.9g	34.6g	-	-	774.8g
Unit # 3A	17.4g			12.6g			**60-75cm** = 39.1g **75-90cm** = 47.5g			-	116.6g
Unit # 3B	11.4 g			62.8g			53.1g	N/A	-	-	127.3g
Unit # 4	39.0g	78.2g	40.0g	126.1g	29.4g	140.8g	410.5g	74.9g	-	-	938.9g
Unit # 5	31.6g	118.2g	48.5g	54.9g	145.1g	103.2g	202.4g	49.7g	-	-	753.6g
TRU# 1	119.3g	302.6g	198.1g	115.9g	196.4g	298.5g	128.6g	263.9g	218.3g	-	1841.6g
TRU# 2	15.5g	62.2g	59.4g	245.4g	195.8g	225.8g	173.1g	231.5g	82.6g	-	1291.3g
TRU# 3	258.9g	260.2g	222.3g	148.6g	147.9g	73.9g	41.2g	18.4g	21.5g	34.3g	1227.2g
TRU# 4	46.5g	95.1g	177.8g	231.1g	173.3g	130.2g	130.1g	43.8g	10.9g	-	1038.8g
										Total Wt. = 9383.5 g	

Note: - = No samples recovered

<u>List of Identified Taxa</u>

A total of thirty-six taxa were discovered in the CA-SCR-12 assemblage. The following is a list of thirty-three identified taxa, with the scientific and common name of each. Included in this list are three species of shell which remain unidentified and they are: unidentified land snail, unidentified chitons, and unidentified shell.

Species: Mollusca, Bivalvia

1.) *<u>Clinocardium nuttallii.</u>* Nuttall's Cockle
2.) *<u>Crasadoma gigantea.</u>* Giant Rock Scallop
3.) *<u>Macoma nasuta.</u>* Bent-Nose Clam
4.) *<u>Mactromeris catilliformis</u>*. Dish Surfclam
5.) *<u>Mytilus californianus.</u>* California Mussel
6.) *<u>Petricola carditoides.</u>* Nestling Clam
7.) *<u>Platyodon cancellatus.</u>* Boring Softshell Clam
8.) *<u>Protothaca staminea.</u>* Common Pacific Littleneck
9.) *<u>Saxidomus nuttalli.</u>* California Butterclam
10.) *<u>Tresus nuttalli.</u>* Pacific Gaper Clam
11.) *<u>Zirfaea pilsbryi.</u>* Rough Piddock

Species: Mollusca, Gastropoda

12.) *<u>Acanthina spirata.</u>* Angular Unicorn
13.) *<u>Acmaea mitra.</u>* White-Cap Limpet
14.) *<u>Collisella digitalis.</u>* Ribbed Limpet

15.)	*Collisella pelta.*	Shield Limpet
16.)	*Collisella scabra.*	Rough Limpet
17.)	*Crepidula adunca.*	Hooked Slipper Shell
18.)	*Haliotis rufescens.*	Red Abalone
19.)	*Helix aspersa.*	European Land Snail
20.)	*Homalopoma luridum*.	Red Snail
21.)	*Lottia gigantea.*	Owl Limpet
22.)	*Notoacmaea scutum.*	Plate Limpet
23.)	*Nucella canaliculata.*	Channeled Dogwinkle
24.)	*Nucella emarginata.*	Emarginate Dogwinkle
25.)	*Ocenebra lurida.*	Lurid Rock Snail
26.)	*Olivella biplicata*.	Purple Dwarf Olive2
27.)	*Tegula brunnea.*	Brown Turbin Snail
28.)	*Tegula funebralis*.	Black Turbin Snail
29.)	Unidentified land snail	

Species: Mollusca, Polyplacophora

30.)	*Cryptochiton stelleri.*	Gumboot Chiton
31.)	Unidentified chitons	

Species: Arthropoda, Crustacea

32.)	*Semibalanus cariosus*	Barnacle
33.)	*Balanus sp.*	Barnacle
34.)	*Coronula diadma*.	Whale Barnacle
35.)	*Cancer antennarius.*	Rock Crab
36.)	Unidentified Shell	

As I mentioned earlier in this chapter, a total of eighty-two unit level sample bags representing eleven excavation units were analyzed by Mr. Frank Perry. Per my request, Mr. Perry generated a list of the principal taxa present in the assemblage by occurrence. The following is a list of the number of samples in which each of the more common taxa occurred (see Appendix I). Taxa not listed were found in 1 to 10 of the samples.

- *Mytilus californianus.* n = 72 samples out of 82
- *Protothaca staminea.* n = 70
- *Olivella biplicata* n = 55
- Barnacles n = 45
- *Saxidomus nuttalli.* n = 33
- *Tegula* spp. n = 26

- *Platyodon cancellatus.* n = 16
- *Collisella* spp. n = 15
- Undifferentiated chitons n = 13
- *Cryptochiton stelleri.* n = 12
- *Nucella canaliculata.* n = 11

The identified taxa were not segregated into quantifiable samples by species. However, qualitative observations were made regarding the principal taxa present within each level. In terms of both the volume and number of fragments of shell, mussel shell (*Mytilus californianus*) is generally more common in the lower levels, clam (*Protothaca staminea*) and other shell material dominate the upper levels (Perry 2013, 9). See Appendix I for shell distribution trends by occurrence.

Principal Species Present (by Frequency) in the CA-SCR-12 Assemblage

Molluca, Bivalvia:

- ***Mytilus californianus***. California Mussel. This species was present in seventy-two (72) out of the eighty-two (82) unit level samples (see Figure 71). The exterior of these shells are purplish-gray and white with numerous irregular, flattened radiating ribs. The interior of these shells tend to be grayish to grayish-white. The species lives intertidally attached to rocks and coral to depths of (50 m) deep (National Audubon Society 1981). The California Mussel's habitat ranges from Alaska to central Mexico. Dense beds of mussels occur along the rocky parts of the Santa Cruz County coast, including along West Cliff Drive (Perry 2013). The species is edible and rich in vitamins. A sample of *Mytilus californianus* shell was identified and submitted to Beta Analytic Inc. in Miami Florida, for an AMS radiocarbon date. This shell sample was recovered from

Trench Unit # 1 at a depth of 80-90 cm BS. The results of the radiocarbon dating study are discussed in Chapter 9 of this project report.

Figure 71: *Mytilus californianus* Shell Samples

- ***Protothaca staminea.*** Common Pacific Littleneck. This species was present in seventy (70) out of the eighty-two (82) unit level samples. The exterior of these shells tend to be yellowish-white or brownish while the interior of the shells are white (see Figure 72). The species lives in the lower half of the intertidal zone in sandy mud, in bays, or on the open coast near rocks (National Audubon Society 1981). The Common Pacific Littleneck's habitat ranges from the Aleutian Islands to southern Baja California. It is sought after by both commercial and sports fishermen as a delicacy. This species of clam was clearly a food resource of the ancestral Ohlone / Costanoans occupying CA-SCR-12.

Figure 72: *Protothaca staminea* Shell Sample

- ***Olivella biplicata.*** Purple Dwarf Olive. This species was present in fifty-five (55) out of the eighty-two (82) unit level samples, although in relatively small numbers (see Figure 73). This species lives on sand, from the low-tide line to water depths of (50 m deep). The Purple Dwarf Olive's habitat ranges from Vancouver Island, British Columbia, to Baja Mexico (National Audubon Society 1981). It is very common near Capitola, California (Perry 2013). It is not clear if this species of shellfish was a major food resource for the ancestral Ohlone. However, the shells were fashioned into shell beads and used for economic transactions, ornamentation and were considered a marker of wealth in pre and post contact periods in California (Bennyhoff and Hughes 1987).

Figure 73: *Olivella biplicata* Shell Samples

- ***Semibalanus sp*. / *Balanus sp.* / *Coronula diadma***. These species were present in forty-five (45) out of the eighty-two (82) unit level samples (see Figure 74). The extremely fragmented nature of both the *Semibalanus cariosus*. and the *Balanus sp*. shell remains made taxa identification difficult. However, two fragments of *Coronula diadma*. (whale barnacle) were present in the assemblage (see Figure 75). This species is found locally on the humpback whale and has also been reported from fin, blue, and sperm whales (Newman and Abbott 1980). These barnacles may have been deposited on the site as a result of processing whale meat and blubber (Perry 2013).

Figure 74: Thatched Barnacle Samples

Figure 75: *Coronula diadma* (whale barnacle) exterior view

- ***Saxidomus nuttalli.*** California Butter Clam. This species was present in thirty-three (33) out of the eighty-two (82) unit level samples. The exterior of these shells are grayish-yellow to brownish, while the interior of the shells are white and purple (see Figure 76). This species lives deeply buried in the sand, in bays, or off rocky coasts, from near low-tide line to water depths ranging from (10 m to 46 m) deep (National Audubon Society 1981). The California Butter Clam's habitat ranges from Central California to northern Baja California. Empty shells commonly wash up on the beach near Capitola, California (Perry 2013). These and other types of shellfish were a staple food for the ancestral Ohlone (Jacknis 2004).

Figure 76: *Saxidomus nuttalli* (shell fragment)

- ***Tegula funebralis.* / *Tegula brunnea.*** These species were present in twenty-six (26) out of the eighty-two (82) unit level samples **(**see Figure 77). *Tegula funebralis.* (Black Turban snail) lives on rocks intertidally and is very common along the rocky shores of

Santa Cruz County (Perry 2013). The Black Turban Snail's habitat ranges from Vancouver, British Columbia, to central Baja Mexico. *Tegula brunnea.* (Brown Turban Snail) also lives on rocks intertidally and is found from Oregon to the Santa Barbara Islands (National Audubon Society 1981).

Figure 77: *Tegula funebralis* (left side)   *Tegula brunnea* (right side)

- ***Platyodon cancellatus.*** Boring Soft-Shell Clam. This species was present in sixteen (16) out of the eighty-two (82) unit level samples. The exterior of these shells are chalky white, and yellowish brown, while the interior of the shells are white (see Figure 78). This species lives intertidally, boring into heavy clay, soft sandstone, and mudstone and is common along the Santa Cruz rocky shores (Perry 2013).

Figure 78: *Platyodon cancellatus* (shell fragments)

- ***<u>Collisella digitalis.</u>*** Ribbed Limpet / ***<u>Collisella pelta.</u>*** Shield Limpet / ***<u>Collisella scabra</u>.*** Rough Limpet. These species were present in fifteen (15) out of the eighty-two (82) unit level samples and are described below.

<u>Collisella digitalis.</u> Ribbed Limpet. This species lives on vertical rock surfaces in the intertidal zone where there is wave action (National Audubon Society 1981). The exterior of these shells range in color from dark greenish gray to reddish brown, while the interior of the shells are bluish white (see Figure 79). The Ribbed Limpet habitat ranges from Alaska to Baja Mexico.

Figure 79: *Collisella digitalis* Shell Sample

<u>Collisella pelta.</u> Shield Limpet. This species lives on rocks intertidally. The exterior of these shells are grayish with irregular white radial stripes (see Figure 80). The interior of the shells are bluish white with dark and light spotting (National Audubon Society 1981). The Shield Limpet's habitat ranges from Alaska to Baja Mexico.

Figure 80: *Collisella pelta* Shell Sample

***<u>Collisella scabra</u>*.** Rough Limpet. This species lives on rocks at mid-tide level in the spray zone (National Audubon Society 1981). The exterior of these shells tend to be grayish and greenish white with radiating ribs along the edges (see Figure 81). The Rough Limpet's habitat ranges from Southern Oregon to Baja California.

Figure 81: *Collisella scabra* Shell Sample

- **Undifferentiated Small Chitons**. Several unidentified species of chiton were present in thirteen (13) out of the eighty-two (82) unit level samples **(**see Figure 82). Over 140 species of these marine mollusks exist in North America today (National Audubon Society 1981). Locally, several species of chiton live intertidally on rocks (Perry 2013).

Figure 82: Undifferentiated Chitons

- ***__Cryptochiton stelleri.__*** Gumboot Chiton. This species was present in twelve (12) out of the eighty-two (82) unit level samples (see Figure 83). The Gumboot Chiton lives among rocks, near low-tide level to water depths of (18m) deep. This species of chiton is the largest in the world, reaching 33 cm in length (Perry 2013). The Gumboot Chiton's habitat ranges from Alaska to the Channel Islands, California (National Audubon Society 1981).

Figure 83: *Cryptochiton stelleri* (shell fragments)

- ***<u>Nucella canaliculata.</u>*** Channeled Dogwinkle. This species was present in eleven (11) out of the eighty-two (82) unit level samples (see Figure 84). The Channeled Dogwinkle lives on rocks intertidally and is found from Alaska to Monterey California (National Audubon Society 1981). This species is characteristic of mussel beds and could have been brought to the site accidentally with mussels (Perry 2013).

Figure 84*: Nucella canaliculata* Shell Sample

<u>Discussion</u>

CA-SCR-12 is located in the coastal terrace ecological zone. The coastal terrace encompassed sites situated adjacent to the shoreline, along the coastal plain and up to the lower most uplifted terraces which appear as low foothills overlooking the ocean (Hyklema 1991). There is a rich mosaic of plant communities in this part of the Central Coast Region and they include: coastal strand, coastal salt marsh, riparian, redwood and mixed redwood-Douglas fir forest, broadleaf evergreen forest, coast live oak, foothill woodland, chaparral, and grassland (Moratto 2004). Located in the coastal strand (an area of cliffs, beach, and dunes), CA-SCR-12 had access to the nearby beaches and rocky shorelines for hunting sea mammals, fishing, and collecting shellfish (Baker 1980).

As stated earlier in this chapter, a total of 9,383.5 grams (20.7 lbs) of shellfish remains were recovered by SJSU from 912 Third Street. A total of thirty-six taxa of bay and marine shellfish were discovered in the CA-SCR-12 shell assemblage and most of those species were considered as nutritional food resources by the ancestral Ohlone.

With the resultant analysis of the CA-SCR-12 shell assemblage complete, I can now address the research question: *What types of activity sets can be inferred from the CA-SCR-12 assemblages*? First and foremost, we have evidence of shellfish harvesting from the low, medium, high intertidal, and subtidal coastal water zones as well as from the Bay and the mouth of the San Lorenzo River. Second, the volume (9,383.5g) and diversity of shellfish remains present in the assemblage suggests that those food resources were collected and transported back to the site for further processing, distribution and consumption. Shellfish harvesting is an inferred subsistence-related activity set indicated by the recovery of large volumes of shellfish remains by previous investigators (Fritz and Fritz 1974, Roop and Flynn 1976 & 1977, Woosely 1978, Baker 1979, and SJSU in 1986).

For comparative purposes, approximately 17,400 grams (38 lbs) of shellfish remains were recovered from Susanne Bakers' 1980 data recovery program at 514 Cliff Street, which is located approximately 300 ft to the east of 912 Third Street. A total of twenty-five taxa of shellfish were identified and they are listed below:

1.) *Protothaca staminea*. Common Pacific Littleneck
2.) Unknown pen shell
3.) *Ocenebra lurida*. Lurid Rock Snail
4.) Crab
5.) *Clinocardium nutalli*. Nuttall's Cockle
6.) Land snail

7.)	*Balanus sp.*	Barnacle
8.)	*Tellina idea.*	Ida's Tellin
9.)	*Macoma nasuta.*	Bent Nosed Clam
10.)	*Acmaea sp.*	Limpet
11.)	*Tressus nutalli.*	Pacific Gaper Clam
12.)	*Tegula sp.*	Turbin snail
13.)	*Saxidomus nuttalli.*	California Butterclam
14.)	*Panomya ampla.*	Clam
15.)	*Cryptochiton stelleri.*	Gumboot Chiton
16.)	*Semele rupicola*	Rock Semele
17.)	*Haliotis rufescens.*	Red Abolone
18.)	*Olivella biplicata.*	Purple Dwarf Olive
19.)	*Cerithidiae*	Ceriths
20.)	*Mytilus californianus.*	California Mussel
21.)	*Penitella penita.*	Flat-tipped Piddock
22.)	Unidentified Chitons	
23.)	*Crepidula sp.*	Slipper Shell
24.)	*Calliostoma sp.*	Top Shell Family
25.)	*Thais sp.*	Rock Shell

The results from Baker's excavation indicates that the dominant shell species recovered from that portion of CA-SCR-12 were *Protothaca staminea*, followed by *Mytilus sp.* and balanus (barnacles) (Baker 1980).

Chapter 5

Analysis of Faunal Bone Recovered from CA-SCR-12

Introduction

This chapter addresses the large assemblage of vertebrate faunal remains that were recovered from 912 Third Street by San Jose State University in August 1986 and Archaeological Consulting and Research Services (ACRS) in July 1986. The SJSU faunal bone assemblage was recovered from two distinct contexts 1) seven controlled hand excavated Test Units and screen recovery, and 2) four controlled hand excavated Trench Units and screen recovery. A total of 3,074 bone elements weighing 4,771.1 grams were recovered from both contexts: Test Units n = 1,539 elements weighing 2,466.6 g and Trench Units n = 1,535 elements weighing 2,304.5 g.

The ACRS faunal bone assemblage was recovered from three rapid recovery test excavation units and screen recovery (Dietz 1986). A total of 223 bone elements weighing 429.3 grams were recovered from this excavation. See Appendix A for a detailed summary of all mammal, fish, and bird taxa recovered from the site by ACRS.

Methods

In January 2013, the analysis of the faunal material commenced. All faunal bones were removed from their original unit level bags and placed onto sorting trays in the San Jose State University Department of Anthropology Laboratory. These materials were washed with tap water, counted, weighed using an Ohaus Series 700 2610g triple beam scale, and sorted into the following categories of taxa: bird, fish, reptile, rodent, and mammals (See Appendix J for the distribution of faunal bone elements by provenience, number, and weight). The faunal materials were then placed into new unit level bags which were labeled with the site number, unit number, unit level number, reference number, and a taxon description. All unit and material provenience data along with quantities, descriptions, and weights were recorded into the two newly generated CA-SCR-12 archaeological catalogs.

A comprehensive analysis of the vertebrate faunal bone assemblage was beyond the scope of this study. However, in March 2013, I contacted San Jose State University faunal analyst, Ms. Jean Geary, and requested her to examine and attempt to identify some of the larger bone elements that were present in the collection. Ms. Geary selected approximately forty–five bone specimens and compared them with the comparative mammalian and avian osteological collection curated at the Museum of Birds and Mammals, Department of Biological Science at San Jose State University. Ms. Geary noted as part of her methodology that if a specimen matched the comparative material it was issued a species designation. Ms. Geary successfully identified 31 % of the selected samples and based upon her analysis of those samples, the site did provide some species of significance in identifying ancestral Ohlone / Costanoan paleo-environmental adaptation and exploitation strategies.

Taxonomic Composition

Of the fourteen specimens identified, seven species were represented and they are listed below (See Table 11).

Table 11: Taxonomic List of Identified Faunal Species from CA-SCR-12

CLASS: **MAMMALIA (Terrestrial Mammals)**

ORDER: **ARTIODACTYLA**

Family	Cervidae	Deer, elk, moose, caribou
	Odocoileus hemionus	Black-tail deer
	Cervus canadensis roosevelti	Roosevelt elk

CLASS: **MAMMALIA (Marine Mammals)**

ORDER: **CARNIVORA**

Family	Mustelidae	Otters, badgers, weasels, martens,
	Enhydra lutris	Sea otter
Family	Otariidae	Sea lions, seals, walrus
	Zalophus californicus	California sea lion
	Eumetopias jubata	Steller sea lion
Family	Phocidae	Earless seals
	Phoca vitulina	Harbor seal

ORDER: **RODENTIA**

Family	Geomyidae	
	Thomomys bottae	Botta's pocket gopher

Terrestrial Mammals / Artiodactyla

Odocoileus hemoinus (17 specimens: SJSU n = 6, ACRS n = 11)

A total of six *Odocoileus hemoinus* (Mule deer / California Black-Tailed Deer) remains were identified within the sample. All of the specimens were recovered from Test Unit # 3A at a depth of 60-75 cm BS and they included: two left astragalus fragments, one right 1st phalange, one right distal radius fragment, and two ventral fragments. The Mule deer / California Black-Tailed deer inhabits several vegetative communities (forest edge, woodlands, grasslands and chaparral) in Central Coastal California (see Figure 85).

Figure 85: Mule Deer / California Black-Tailed Deer

A total of eleven *Odocoileus hemionus* (California black-tailed deer) remains were recovered from two additional areas within the site by ACRS in July 1986. Six specimens were recovered from ACRS Test Unit # 1 at depths ranging from 20-60 cm BS. The other five specimens were recovered from ACRS Test Unit # 3 at depths ranging from 40-100 cm BS.

Cervus canadensis roosevelti (2 specimens: SJSU n =2)

A total of two *Cervus canadensis roosevelti* (Roosevelt elk) bones were identified. One cervical bone specimen (Ref. # 67-10) was recovered from Test Unit # 3A at a depth of 30-60 cm BS (see Figure 86).

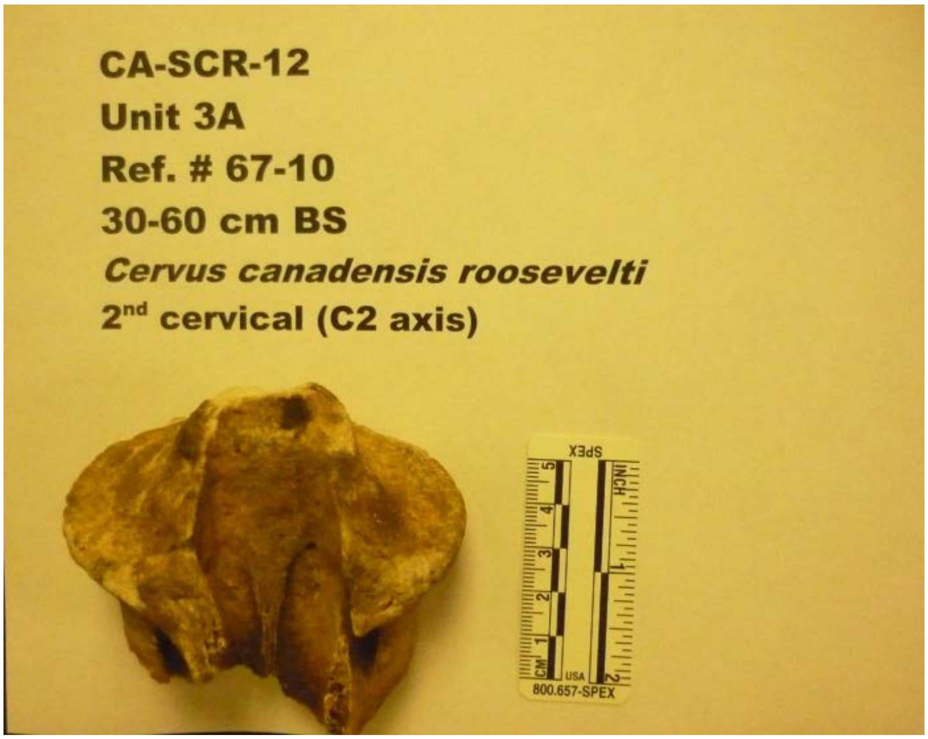


Figure 86: *Cervus canadensis roosevelti* Cervical Bone (Ref. # 67-10)

A sample of this specimen (11.1 grams) was submitted to Beta Analytic for AMS dating in April, 2013 (see Figure 87). The results of the AMS study are discussed in Chapter 9 of this project report.

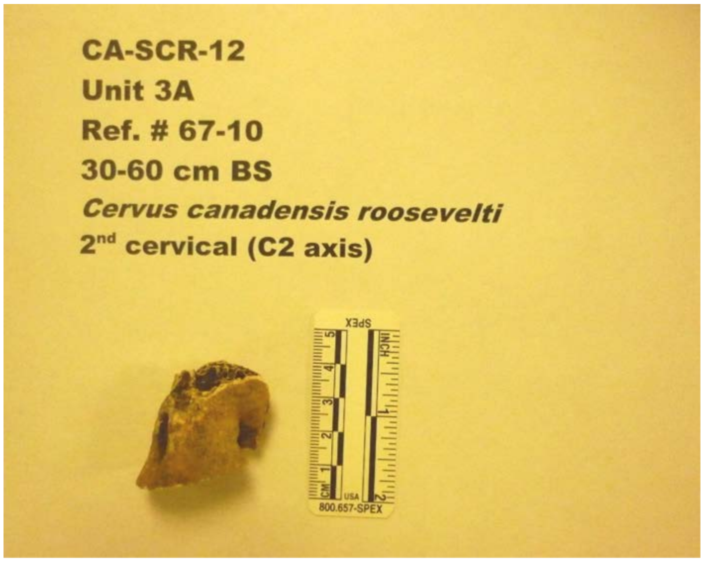


Figure 87: *Cervus canadensis roosevelti* AMS Sample (Ref. # 67-10)

The other specimen (Ref. # 29-3: not pictured**)** represents a distal end rib fragment that was recovered from Test Unit # 3 at a depth of 40-50 cm BS and it exhibits multiple cut marks along one face. The Tule elk (*Cervus nannoides*) is a subspecies of elk found only in California. The species thrived in California central and coastal grassland habitats until European contact (see Figure 88).

Figure 88: Roosevelt Tule Elk (C*ervus canadensis roosevelti)*

Marine Mammals / Mustelidae

Enhydra lutris (6 specimens: SJSU n = 1, ACRS n = 5)

One *Enhydra lutris* (Sea otter) bone was identified within the sample. Specimen (Ref. # 37-6: not pictured) represents a complete right humerus that was recovered from Trench Unit # 3 at a depth of 30-40 cm BS. The specimen also exhibits cut marks along its distal end. The sea otter generally lives in shallow offshore environments along the California Coast and it is the sea floor that provides the otter with most of its food supply: fish, sea urchins, mollusks, crabs and other invertebrates. The Ancestral Ohlone / Costanoans procured a wide range of natural resources for clothing / blankets and they often hunted the sea otter for its hide and its exceptionally thick coat of fur (see Figure 89).

Figure 89: California Sea Otter (*Enhydra lutris*)

A total of five *Enhydra lutris* (Sea otter) remains were recovered from two other excavation units within the site by ACRS in July 1986. Three unidentified bone fragments were recovered from Test Unit # 2 at depths ranging from 20-80 cm BS. The other two bone fragments were recovered from Test Unit # 3 at a depth of 40-60 cm BS.

Marine Mammals / Otariidae

Zalophus californicus (10 specimens: SJSU n = 2, ACRS n = 8)

Two *Zalophus californicus* (California sea lion) bones were identified within the sample. Specimen (Ref. # 43-7: not pictured) represents a manus (front paw) fragment that was recovered from Trench Unit # 3 at a depth of 50-60 cm BS. The other specimen (Ref. # 59-11) represents a right ulna fragment that was recovered from Test Unit # 1 at a depth of 60-70 cm BS (see Figure 90). A 12.1g sample of this specimen (Ref. # 59-11) was submitted to Beta Analytic for AMS dating, in May of 2013. The results of the AMS study are discussed in Chapter 9.

Figure 90: California Sea Lion (*Zalophus californicus)* AMS Sample (Ref. # 59-11)

The California sea lion habitat includes: rocky shorelines, sandy beaches, sand bars, sheltered coves, and the tide pools of coastal inland and mainland shorelines (see Figure 91). Male California sea lions can weigh up to 770 lbs and grow to lengths which exceed eight feet. Females can weigh up to 220 lbs and grow to lengths which exceed six feet. CA-SCR-12 is located in the coastal terrace ecological zone and it is situated adjacent to the shoreline. The ancestral Ohlone / Costanoans therefore had easy access to the nearby beaches and rocky shorelines for hunting these and other species of sea mammals.

Figure 91: California Sea Lion *(Zalophus californicus)*

A total of eight *Callorhinus ursinus / Zalophus californicus* (Fur seal / Sea lion) bones were recovered from two other excavation units within the site by ACRS in July 1986. One specimen was recovered from Test Unit # 2 at a depth of 60-80 cm BS. The other six specimens were recovered from Test Unit # 3 at depths ranging from 20-100 cm BS.

Eumetopias jubata (1 specimen: SJSU n = 1)

One *Eumetopias jubata* (Steller sea lion) bone was identified within the sample. Specimen # 60-16 (not pictured) represents a rib fragment that was recovered from Test Unit # 3 at a depth of 50-60 cm BS. The Steller sea lion (i.e. Northern sea lion) is the largest of the eared seals. Steller sea lion females typically weigh between 500-750 lbs and can grow to lengths which exceed eight feet. Stellar males typically weigh between 900-2,500 lbs and they can grow to lengths which exceed eleven feet. This species of sea lion mainly forages near mainland coastlines and in between intertidal zones and continental shelves (see Figure 92).

Figure 92: Steller Sea Lion (*Eumetopias jubata)*

Phoca vitulina (1 specimen: SJSU n = 1)

One *Phoca vitulina* (Harbor Seal) bone was identified within the sample. Specimen # 51-6 (not pictured) represents an incomplete left femur fragment that was recovered from Test Unit #3 at a depth of 60-75 cm BS. The Harbor Seal thrives in a wide range of habitats: shallow coastal waters, estuaries, rivers, and sandbars and beaches during the low tides (see Figure 93).

Figure 93: Harbor Seal (*Phoca vitulina)*

Discussion

As stated earlier in this chapter, a comprehensive analysis of the CA-SCR-12 vertebrate faunal bone assemblage was beyond the scope of this study. However, the site did provide some species of significance in identifying ancestral Ohlone / Costanoan paleo-environmental adaptation and exploitation strategies. The remains (burnt and unburnt) of several major species consisting of both terrestrial and marine mammals were identified in the SJSU faunal bone assemblage, thus inferring that those food resources were procured through hunting and fishing and brought back to the site for further processing, distribution and consumption. Terrestrial and marine mammal hunting are inferred activity sets indicated by the recovery of 3,297 faunal bones (SJSU n = 3,074, ACRS n = 223) from the 912 Third Street address locus. In addition, large quantities of faunal bone remains were recovered and reported upon by previous researchers from other areas within the site (Fritz and Fritz 1974, Edwards 1975, Roop and Flynn 1976 and 1977, Woosely 1978, and Baker 1980).

Chapter 6

Analysis of Bone and Shell Artifacts from CA-SCR-12

Introduction

This chapter reports on the analysis of the bone and shell artifacts that were recovered from 912 Third Street by San Jose State University in August 1986 and Archaeological Consulting and Research Services in July 1986. A total of four possible bone awl specimens were recovered from the site (SJSU n = 3, ACRS n = 1). In addition, a total of four *Olivella* shell beads were reported as being recovered from the site by ACRS. One is an *Olivella* type A1b Medium Spire-lopped bead, two are *Olivella* type A1c Large Spire-lopped beads, and one is an *Olivella* type G2 Normal Saucer or G6 Irregular Saucer bead (Dietz 1986; Bennyhoff and Hughes 1987). However, in February 2013, I revisited the ACRS shell assemblage and it was noted that only one out of the four *Olivella* shell bead artifacts was present in the collection. That specimen (Ref. # 12-11: G2 or G6 series Saucer) is described below. See the ACRS Final Report located in Appendix A for a comprehensive description of the other three *Olivella* shell bead artifacts: type A1b (n = 1), and type A1c (n = 2).

Methods

In February 2013, all bone and shell artifacts were removed from their original unit level bags and placed onto trays in the San Jose State University Department of Anthropology Laboratory. The artifacts were then cleaned, measured, and weighed using an Ohaus Series 700 2610g triple beam scale. Each bone awl specimen was examined under a Bausch & Lomb AS245 10.5 – 45x variable stereoscopic microscope for evidence of polishing, striations, abrasions and burning. The *Olivella* shell bead specimen (Ref. # 12-11) was also examined under the microscope to confirm perforation type (conical, biconical and etc.). The bone and shell artifacts were then placed into new unit level bags which were labeled with the site number, unit number, unit level number, and reference number. All unit and material provenience data along with quantities, descriptions, and weights were recorded into the two CA-SCR-12 archaeological catalogs.

<u>Bone Artifacts</u> (4 specimens: SJSU n = 3, ACRS n = 1)

Bone Awls

Bone awls consist of pieces of worked bone that have been modified for use as specialized tools. These tools are usually associated with tasks which include the weaving of baskets, netting, woven traps, and as punches for perforating animal hides (Leventhal et al. 2009). A total of four bone awl specimens were recovered from the site and described below.

Specimen # D- 12-18 appears to be a reworked awl-like tool, possibly made from deer bone. The entire body exhibits heavy polishing with manufacturing striations. The tip (distal end) exhibits rounding with a tapered blunt end that appears to be reworked. The proximal end appears to be a reworked snap and exhibits rounding and some polishing. It is not clear that this tool was originally used as an awl " but highly likely." The specimen appears to have been reworked into a peg-like tool for some unknown use. It was recovered by ACRS from Test Unit 3 at a depth of 60-80 cm BS (see Figures 94 and 95). Max length = 37.9 mm, Max. width at tip = 7.9 mm, Max.width at base the base = 11.2 mm. Wt. 2.6 g.

Figure 94: Possible Bone Awl Tip – Ref. # D-12-18

Figure 95: Possible Bone Awl Tip – Ref. # D-12-18 (Illustrated)

Specimen # 6-40 is a midsection fragment of a polished bone artifact, possibly made from deer bone. The specimen may be a remnant of an awl or fishing gear. Both the tapered "distal end" and the proximal end are truncated or "snapped." The midline also exhibits a break parallel to one of the polished edges. The overall body exhibits polishing, manufacturing striations, and organic staining. The specimen was recovered by SJSU from Test Unit 4 at a depth of 20-30 cm BS (see Figure 96). Max. length = 21.9 mm, Max. Width = 5.3 mm. Wt. .55 g.

Figure 96: Possible Bone Awl Remnant – Ref. # 6-40

Specimen # 79-5 is a midsection fragment of a polished bone artifact, possibly made from deer bone. The morphology of this specimen is very similar to Specimen D-12-18 described above. Both the distal and proximal ends are truncated or "snapped" as well as the midline. The remnant body and one intact edge also exhibit polishing and manufacturing striations. This specimen was recovered by SJSU from Trench Unit 4 at a depth of 40-50 cm BS (see Figure 97). Max. length = 21.8 mm, Max width = 9.8 mm. Wt. .92 g.

Figure 97: Possible Bone Awl – Ref. # 79-5

Specimen # 6-1 is a distal midsection of an awl-like tool, possibly made from deer bone. Both the proximal and distal ends are truncated or "snapped." The remnant body exhibits polishing and manufacturing striations. The specimen was recovered by SJSU from Test Unit 4 at a depth of 20-30 cm BS (see Figures 98 and 99). Max. length = 28.8 mm, Max. width = 6.8 mm. Wt. 1.21 g.

Figure 98: Possible Bone Awl – Ref. # 6-1 (Illustrated)

Figure 99: Possible Bone Awl – Ref. # 6-1

Shell Artifacts (ACRS n = 4 specimens)

***Olivella* Shell Beads**

Although a total four *Olivella* shell beads were reported by ACRS as being recovered from the site (912 Third Street), only one shell bead artifact was located in the "ACRS: July 1986 CA-SCR-12 shell assemblage." That specimen (Ref. # 12-11) was recovered from Test Unit 3 at a depth ranging from 40-60 cm BS (see Figure 100). Max. Length = 7.6 mm, width = 7.4mm, curvature = 1.9 mm, perforation diameter = 1.8 mm (slightly off center), biconically drilled.

Note: Bead is not perfectly round

Figure 100: Possible G2 or G6a Series Bead Saucer (Exterior View)

Discussion

The bone awl artifacts recovered from the site are very similar to each other, suggesting evidence of a worked bone technology and manufacturing process. While these specimens are too fragmented to succinctly classify, using E.W. Gifford's 1940 " Californian Bone Artifacts" as a typological guide, all four specimens appear to be remnants of Type A1 Bone Awls made from the leg bones of deer.

Based on the general morphological characteristics of shell bead specimen (Ref. # 12-11) described above, Dietz ascribed it to either the G2 or G6 series Saucer bead. If it types out as a G6, it would then be classified as a G6a Irregular Saucer. The G6 series was defined as a new bead type by Bennyhoff and Hughes (1987), based on a large grave lot of 3,271 of those beads found within a single burial (Burial #5) at CA-MNT-229 in Moss Landing (Dietz 1986). Based on three radio carbon dates obtained from those samples of G6 shell beads found within the burial, Bennyhoff ascribed the beads to the "Early/Middle period Transition phase" or ca. 2,500 – 2,200 years B.P. (Scheme B1, Bennyhoff and Hughes 1987:135; Dietz 1986).

Chapter 7

Historic Artifacts Recovered from CA-SCR-12

Introduction

The focus of this chapter is to provide a description and numeration of the different categories of non-aboriginal (historical) artifacts that were recovered from 912 Third Street. The SJSU historical artifact assemblage was recovered from two contexts 1) seven controlled hand excavated Test Units and screen recovery, and 2) four controlled hand excavated Units and screen recovery. A total of 989 historic artifacts were recovered from both contexts: Test Units n = 604 and Trench Units n = 385. See Appendix K for the distribution of these historic artifacts by number and provenience. The ACRS historical artifact assemblage was recovered from three controlled hand excavated rapid recovery Test Units and screening. A total of 72 additional artifacts were recovered from this context.

Methods

In February 2013, all historical artifacts were examined in the San Jose State University Department of Anthropology Laboratory. The artifacts were removed from their original unit level bags and sorted into the following "material of manufacture" (Orser 2004) categories: metal, glass, porcelain, rubber, plastic, brick, ceramic, clay, asphalt, tar, iron, and copper. These artifacts were cleaned, counted, weighed using an Ohaus Series 700 2610g triple beam scale, and placed into new unit level bags. The unit level bags were labeled with the site number, unit number, unit level number, and reference number. All unit and material provenience data along with quantities, descriptions, and weights were recorded into the new CA-SCR-12 archaeological catalogs.

Material Summary

A combined total of 1,061 (SJSU: n = 989, ACRS: n = 72) historic artifacts were recovered from the site. In order of prevalence they are as follows:

SJSU Historical Artifact Assemblage (N = 989)

1.) Glass fragments represented the most predominant material type in this assemblage, accounting for approximately 55.3 % (n = 548) of all historic materials recovered from the site. Included in this count is one glass marble (Ref. # 39-18) that was recovered from Trench Unit 1 at a depth of 30-40 cm BS.

2.) Metal nail fragments (round and square) accounted for 25.7 % (n = 255) of the total.

3.) Porcelain fragments accounted for 7.3 % (n = 72) of the total.

4.) Assorted metal fragments such as: flakes, screws, spikes, and bullet shell casings accounted for 3.6 % (n = 36) of the total.

The remaining nine other material types have fewer than twenty specimens represented in each category and when combined they account for 7.9 % (n = 78) of the total historic assemblage. In order of prevalence they are: brick (n = 18), rubber (n = 15), clay (n = 13), plastic (n = 10), asphalt (n = 7), ceramic (n = 7), tar (n = 6), iron (n = 1), and copper (n = 1). Included in these counts are: one clay marble (Ref. # 25-25) that was recovered from Trench Unit # 3 at a depth of 10-20 cm BS and one complete clay dish that was recovered from that same provenience.

ACRS Historical Artifact Assemblage (N = 72)

1.) Metal fragments represented the most predominant material type in this assemblage, accounting for 48.6 % (n = 35) of all historic materials recovered from this collection.

2.) Glass fragments accounted for 41.6 % (n = 30) of the total.

3.) Porcelain fragments accounted for 9.7 % (n = 7) of the total.

<u>Discussion</u>

A comprehensive analysis of these historical artifacts was outside the scope of this particular project study. However, both the San Jose State University and the Archaeological Consulting and Research Services (ACRS) CA-SCR-12 historic assemblages have been sorted, thus providing a generalized classification of these two collections. The two collections have also been segregated from their prehistoric assemblages so that they may be analyzed by a San Jose State University Historical Archaeology class at some future date.

Although some of these materials may date to the late 19th and early 20th centuries, it appears that no significant historical features and/or artifacts were encountered within this portion of the larger site.

Chapter 8

Burial Descriptions and Skeletal Biology: Inventory and Analysis

Introduction

This chapter reports on the human remains that were recovered from the SJSU excavation conducted on CA-SCR-12 at 912 Third Street. A total of three isolated adult human skeletal elements and one neonate burial were recovered from the site. For purposes of this study, I am treating all three skeletal isolates as separate individuals. These burials (which I assume to have been primary inhumations prior to disturbance) were assigned as Burials #1, #2, #3, and #4, thus indicating that there were a possible minimum number (MNI) of four individuals that were recovered by the SJSU field school excavation project at CA-SCR-12 (see Map 3 below for the locations of Burials # 1 - # 4).

Methods

On March 1, 2013, I contacted San Jose State University alumna Ms. Melynda Atwood who has worked as an osteologist on many ancestral Ohlone skeletal populations, and requested of her to examine all of the human bone elements that were present in the CA-SCR-12 collection. On March 6, 2013, Atwood conducted the skeletal analyses on all four human burials. The neonate skeleton (Burial # 3 – Ref. # 51-20) was laid out in anatomical position in the Anthropology Lab and the elements were recorded on Ohlone Families Consulting Services (OFCS) skeletal inventory sheets (see Appendix L). The aging criteria used for analysis of the neonate burial followed the 1994 Standards edited by Buikstra and Ubelaker and also Bass (1995).

Sex and a specific age were impossible to determine on the other three skeletal isolates (Burial # 1 - Ref. # 51-1, Burial # 2 - Ref. # 55-10, and Burial # 4 - Ref. # 51-19) being that they are each represented by a single element. What information could be ascertained was recorded into the San Jose State University Department of Anthropology Burial Record Catalog.

Burial: 1 Description

Burial # 1 (Ref. # 51-1) is represented by a portion of a moderately robust adult left femur which measures 94.9 mm in length. This skeletal element was recovered from Test Unit 3A at a depth of 60-75 cm BS. This element consists of the upper 1/3 of the diaphyseal shaft with the superior margin just inferior to the lesser trochanter (see Figure 101). Per the terms of the COSS research grant agreement and with the permission of both the Department of Anthropology and the Muwekma Ohlone Tribe, a 9.7 gram sample from this specimen was submitted to Beta Analytic in December 2012, for an AMS radiocarbon dating and isotopic analysis. The results of those two studies are discussed in Chapter 9 of this project report.

Figure 101: Burial # 1 - Adult Left Diaphysis Femur Fragment (Ref. # 51-1)

Burial: 2 Description

Burial # 2 is represented by a right talus (Ref. # 55-10) which measures 56.6 mm in length. This skeletal element was recovered from Test Unit 4 at a depth of 60-70 cm BS (see Figure 102). Very little information can be ascertained from this element other than the fact that it is complete, moderately robust, and represents the remains of an adult individual.

Figure 102: Burial # 2 - Right Talus (Ref. # 55-10)

Burial: 3 Description

Burial # 3 is represented by the remains of a neonate (Ref. # 51-20). This burial was recovered from Trench Unit 1 at a depth of 80-90 cm BS (see Figure 103). The condition of the skeleton is good, with slight postmortem damage to the cortex and some fragmentation (Atwood 2013). The sex of the neonate could not be ascertained, however its age was estimated to be 0-6 months.

Figure 103: Burial # 3 – Neonate Burial (Ref. # 51-20)

Burial 3 - Cranium: The cranium is fragmentary with three vault fragments present which includes: 1) the right petrous portion of the temporal, 2) three fragments that are possibly sphenoid and 3) a complete left zygomatic. The mandible is absent.

Axial Skeleton: A complete left clavicle and right scapula are present. Seven cervical vertebrae, five thoracic vertebrae, and five lumbar vertebrae are present. Of the os coxae (pelvis), a complete left pubis and left ilium are present. Four left ribs are present and the sternum and the sacrum are absent.

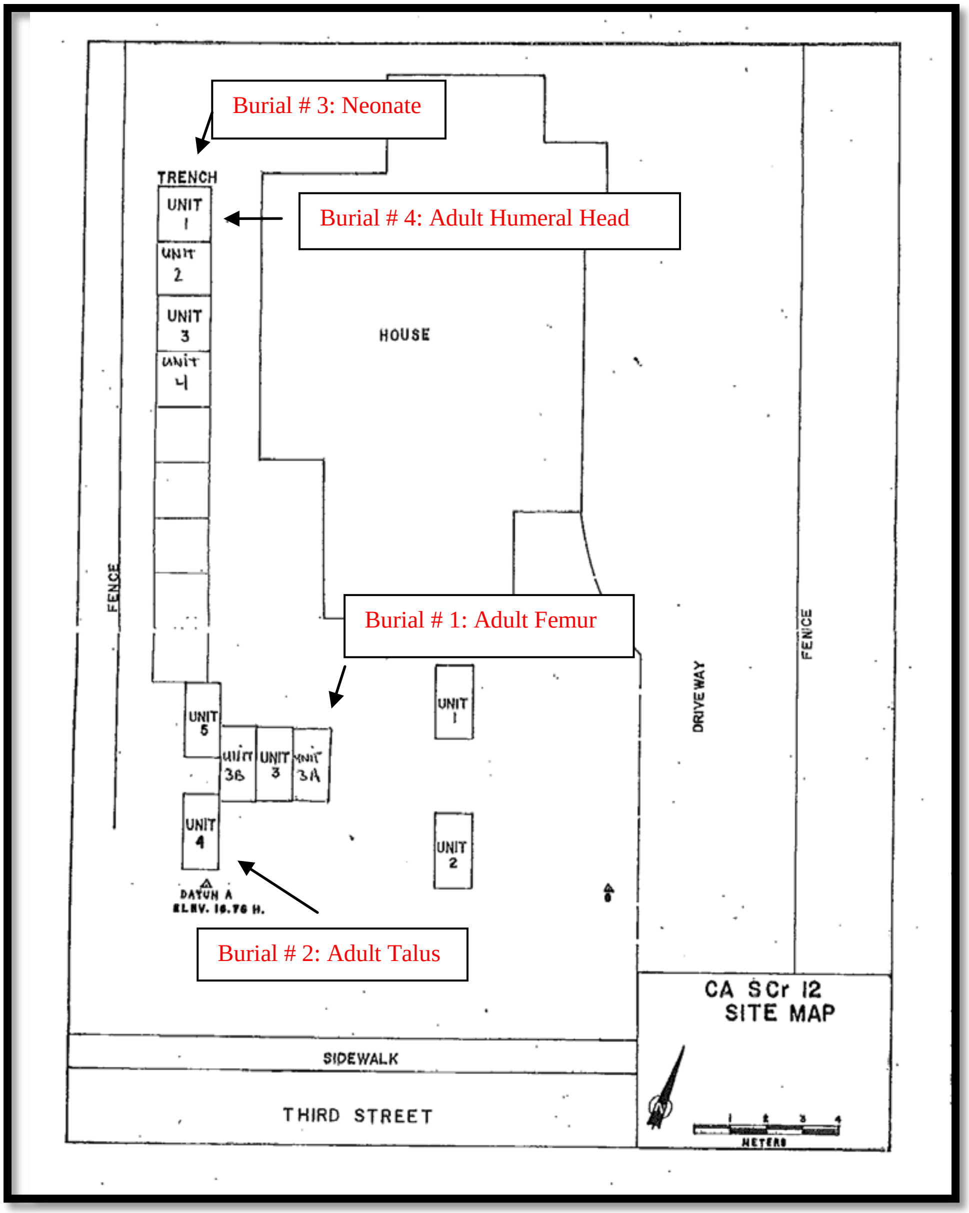
Upper Appendicular Skeleton: The upper appendicular skeleton is fragmentary with one right humerus, two right ulna, and one left radius fragment present. The hands are absent.

Lower Appendicular Skeleton: Only the right leg is present and it is consists of a complete femur and tibia. The fibula is incomplete and the patella and feet are absent.

Burial: 4 Description

Burial # 4 (Ref. # 51-19) is represented by an adult humeral head fragment which measures 28.9 mm in length. This skeletal element was recovered from the same unit and provenience as the neonate burial: Trench Unit 1 at a depth of 80-90 cm BS (see Figure 104).

Figure 104: Burial # 4 - Humeral Head Fragment (Ref. # 51-19)



Map 3: Site Map 912 Third Street – Burial Locations

Discussion

A review of all archival records associated with CA-SCR-12 indicated that there has been a continuous history of recovering human remains from this site dating from excavations conducted from 1950 to 1986. In chronological order, the recovery of human remains began with the site's initial recording in 1950. According to the site survey records, human remains were uncovered by a bulldozer and then reburied during the construction of the Laura Lee Court Motel, located at 820 Third Street. In 1954, human remains were uncovered once again during the construction of a four unit addition to the El View Motel located at 810 Third Street (Atwood 1979). In 1975, Rob Edwards noted in his final report to Nittler & Nittler Realtors that human remains had been found in the process of excavating a utilities trench in 1969 - 1970 on a parcel of land located at 912 Third Street.

In June 1977, human remains were collected during an archaeological reconnaissance on three land parcels that lay within the recorded boundaries of CA-SCR-12. In September 1977, an additional thirty-six human bone fragments were excavated from those aforementioned three land parcels. In March 1979, a nearly complete flexed human burial was recovered from 514 Cliff Street by Susan Baker. In August 1986, three isolated human skeletal elements and one neonate burial were recovered from 912 Third Street by the SJSU field school class.

Prior to the present osteological analysis, no previous investigator formally analyzed or C14 dated any of the skeletal remains reported from CA-SCR-12. As a result, based upon both the archival record and the skeletal data presented above, it seems reasonable to conclude that mortuary/funerary-related activities had taken place at this ancestral Ohlone/Costanoan site.

Lastly, late in this analysis, Dr. Eric Bartelink from CSU, Chico, analyzed the results of the nitrogen stable isotope obtained by Beta Labs on Burial #1's femur which yielded dietary evidence of high marine sources of food such as sea mammal, fish and shell fish. The results of this study was expected given that this individual was recovered within a coastal locality with evidence of abundant marine resources (see Appendix H for Bartelink's full report).

Chapter 9

The Dating and Chronological Placement of the Prehistoric Site CA-SCR-12

Introduction

On October 9, 2012, I received a letter of support from the Muwekma Ohlone Tribal leadership (see Appendix C) allowing for the submittal of four small samples of bone (human: n = 1, mammalian: n = 2) and one sample of *Mytilus* shell to Beta Analytic for Accelerator Mass Spectrometry (AMS) dating. In addition, I was granted permission to conduct obsidian hydration studies on all obsidian specimens that were recovered by the two excavation projects (SJSU and ACRS) that were conducted at 912 Third Street. These studies were necessary in order to obtain chronological information on the temporal components represented at this site. Given that no attempt has ever been made to radiocarbon date CA-SCR-12, I predicted a resultant date ranging from 2500 to 1500 years BP (500 B.C. – A.D. 500) based on the relative dates that have been postulated in the CA-SCR-12 archival record.

Per the terms of the COSS Research grant agreement, the bone (human and mammalian) and shell specimens were submitted to Beta Analytic for AMS dating (see Appendix D for the AMS dating results). The obsidian specimens were submitted to Mr. John Schlagheck and Mr. Tom Origer of the Origer Obsidian Laboratory (OOL) for a hydration study after their respective sources had been determined by XRF by Dr. Richard Hughes (Geochemical Research Laboratory) (see Appendix E and Appendix F for the obsidian hydration and XRF reports). The results of the AMS dating and obsidian hydration studies are discussed below.

AMS Dating: Human Burial # 1 (Left Diaphysis Femur - Ref. # 51-1)

Based upon my research questions, I wanted to know whether the mortuary component represented at this portion of CA-SCR-12 predated, or post-dated or was coeval with the subsistence –settlement patterns gleaned from the site's artifactual and ecofactual assemblages.

On December 12, 2012, a 9.7g sample of bone (Left Diaphysis Femur – Ref. # 51-1) was submitted to Beta Analytic for AMS dating and for 15N / 14N Stable Isotope analysis (an indicator of the propensity of dietary foods (e.g., marine mammal, fish, terrestrial mammal or terrestrial plant during the last ten years of a person's life). The results from Beta Analytic were obtained on January 7, 2013. Burial # 1 yielded a mid-range date of 1955 BC thus placing it within the Early Period (which spans 3500 B.C. – 600 B.C.), based upon Jones, et al. (2007) regional chronology for North Central California (see Figure 105).

Cultural Period	Dates A.D. / B.C
Late Period	A.D. 1250 - 1769
Middle - Late Transition	A.D. 1000 - 1250
Middle Period	600 B.C. - A.D. 1000
Early Period	3500 B.C. - 600 B.C.

Adapted from Jones et al. 2007

Figure 105: Cultural Chronology of North Central Coast California

AMS Dating: Mytilus Shell (*Mytilus californianus*)

Based upon the result of dating the human femur, I then raised the question, when was the earliest evidence of shell fish exploitation going on at the site? As a result on February 15, 2013, a sample of *Mytilus californianus* shell was submitted to Beta Analytic for AMS dating. The sample was recovered from Trench Unit 1 at a depth of 80-90 cm BS. The results from Beta Analytic were obtained on February 26, 2013. The *Mytilus californianus* shell specimen yielded a corrected (after applying Delta R value 225 + / - 35) mid-range date of 240 BC thus falling within the Middle Period (spanning 600 B.C. – A.D. 1000).

<u>AMS Dating: Roosevelt Elk (2nd Cervical Vertebra - Ref. # 67-10)</u>

Based upon the AMS dating of the human femur and the *Mytilus* shell sample, I wanted to know whether or not elk hunting was coeval with either mortuary practice or shell fish harvesting activities. On April 24, 2013, an 11.1g sample of a cervical vertebra from an identified Roosevelt Elk (*Cervus canadensis roosevelti* – Ref. # 67-10) was submitted to Beta Analytic for AMS dating. On May 7, 2013, I received an email communication from Beta Analytic (from Mr. Chris Patrick, May 7, 2013) stating that:

> The bone specimen's C13 /12 ratio was more depleted (more negative) than expected @ -21.4 o/oo. Typically, the C13/12 ratio for animals will range between -9 and -21 o/oo. C13/12 ratios more negative than -21 o/oo can indicate the presence of exogenous carbon compounds (like humic acids) that could not be removed by the pretreatments applied.

It was also noted that the bone's collagen appeared to be darkly stained and was visually not very good. Beta Analytic recommended that I not pursue dating this elk bone specimen unless I was willing to accept a result (date) that may be biased. I decided not to proceed with the AMS dating of that elk bone.

<u>AMS Dating: California Sea Lion (Right Ulna - (Ref. # 59-11)</u>

After failing to obtain a date on the Elk vertebra I decided to raise the same chronological question relative to the hunting of sea mammals. On May 15, 2013, a 12.1g sample of marine mammal bone from a California Sea Lion (*Zalophus californicus* – Ref. # 59-11) was submitted to Beta Analytic for AMS dating. The results from Beta Analytic were obtained on June 5, 2013. The California Sea Lion bone yielded a corrected (Delta R value 225 + / - 35) mid-range corrected date of 556 BC which also dates to the Middle Period (600 B.C. – A.D. 1000). The following table summarizes the results of the AMS C14 dating technique (see Table 12).

Table 12: Results from AMS Dating Burial #1, Shell, and Mammalian Bones

Beta Lab #	Specimen	Radiocarbon Age	Conventional Age Corrected (2 Sigma)	Calendar Age (Intercept)
338823	Burial #1	3430 + / - 30 BP	3590 + / - 30 BP	1955 BC
343288	*Mytilus* Shell	2330 + / - 30 BP	2750 + / - 30 BP	240 BC
347804	Elk	N/A	N/A	N/A
349175	Sea Lion	2780 + / - 40 BP	2990 + / - 40 BP	556 BC

Obsidian Hydration Study

On April 16, 2013, a total of twenty-four hydrated obsidian thin section slides, which were prepared by John Schlagheck, were submitted to the Origer Obsidian Laboratory (OOL) in Sonoma, California (see Table 13). Mr. Origer successfully verified the final hydration values of fifteen out of the twenty-four slides and converted those values to years before present (YBP). See Table 14 and Appendix E for the converted calendric dates for those fifteen specimens.

Table 13: Hydrated Obsidian Thin Sections Submitted to Origer Obsidian Laboratory

Specimen #	Description	Unit #	Depth	Qty	Wt. Grams	XRF Source (Chemical Type)
5-51	Thinning Flake	Unit # 1	10-20 cm	1	.71 g	Bodie Hills
8-3	Projectile Pt. Midsection	TRU# 3	0-10 cm	1	2.2 g	Napa Valley
14-1	Biface Projectile Pt. Fragment	Unit # 2	10-20 cm	1	2.67g	Napa Valley
15-3	Biface Projectile Pt. Fragment	Unit # 2	30-40 cm	1	.83 g	Napa Valley
16-11	Biface Projectile Pt. Fragment	Unit # 2	40-50 cm	1	.35 g	Lookout Mtn Casa Diablo Area
17-8	Cortical Flake	Unit # 2	50-60 cm	1	.36 g	Napa Valley
17-22	Impact Fracture Flake	Unit # 2	50-60 cm	1	.54 g	Napa Valley
25-2	Projectile Pt. Fragment	TRU# 3	10-20 cm	1	3.61g	Lookout Mtn Casa Diablo Area
31-5	Shatter	Unit # 5	40-50 cm	1	.39 g	Sawmill Ridge Casa Diablo Area
39-31	Pressure Flake	TRU# 1	30-40 cm	1	.36 g	Napa Valley
5-27	Thinning Flake	Unit # 1	10-20 cm	1	.18 g	Bodie Hills
5-50	Pressure Flake	Unit # 1	10-20 cm	1	.11 g	Annadel
14-4	Thinning Flake	Unit # 2	10-20 cm	1	.16 g	Casa Diablo Area
21-29	Pressure Flake	Unit # 1	30-40 cm	1	.08 g	Casa Diablo Area
26-51	Pressure Flake	TRU# 1	0-10 cm	1	.11 g	Mt. Hicks
30-2	Thinning Flake	Unit # 1	40-50 cm	1	.20 g	Casa Diablo Area
33-21	Pressure Flake	TRU# 1	20-30 cm	1	.14 g	Casa Diablo Area
D-100-16	Projectile Pt. Fragment	Unit # 1	0-20 cm	1	2.48g	Bodie Hills
48-2	Pressure Flake	TRU# 3	70-80 cm	1	.08 g	Bodie Hills
57-5	Pressure Flake	TRU# 1	80-90 cm	1	.09 g	Mt. Hicks
61-50	Pressure Flake	Unit # 3A	0-30 cm	1	.13 g	Bodie Hills
64-4	Pressure Flake	TRU# 2	50-60 cm	1	.21 g	Annadel
64-26	Pressure Flake	TRU# 2	50-60 cm	1	.11 g	Bodie Hills
71-9	Thinning Flake	Unit # 3	60-70 cm	1	.16 g	Annadel

Table 14: Conversion Dates on the Mean Hydration Values from CA-SCR-12

Specimen #	Estimated YBP	Atifact Type	Mean Hydration Value	XRF Source
5-51	2100	Thinning Flake	3.5 microns	Bodie Hills
8-3	3835	Projectile Point Midsection	4.7 microns	Napa Valley
15-3	2100	Biface Projectile Point Fragment	3.5 microns	Napa Valley
16-11	1037	Biface Projectile Point Fragment	3.0 microns	Lookout Mtn Casa Diablo Area
17-22	959	Impact Fracture Flake	2.4 microns	Napa Valley
31-5	1773	Shatter	3.7 microns	Sawmill Ridge Casa Diablo Area
39-31	2333	Pressure Flake	3.7 microns	Napa Valley
D-100-16	1829	Projectile Point Fragment	3.3 microns	Bodie Hills
5-50	1203	Pressure Flake	2.1 microns	Annadel
26-51	1879	Pressure Flake	3.9 microns	Mt. Hicks
30-2	1773	Thinning Flake	3.7 microns	Casa Diablo Area
33-21	884	Pressure Flake	2.7 microns	Casa Diablo Area
48-2	2706	Pressure Flake	4.0 microns	Bodie Hills
57-5	2836	Pressure Flake	4.7 microns	Mt. Hicks
64-4	1571	Pressure Flake	2.3 microns	Annadel

Discussion

Although the mean hydration values of only fifteen obsidian specimens were converted to estimated years before present (YBP), much can still be ascertained from the resultant data. When applying calendar conversion formulae based upon their respective identified source to the hydrated obsidian artifacts recovered from CA-SCR-12, we find that the resultant temporal range spans from 1822 BC to AD 1129.

When we consider the AMS C14 date on Burial # 1 from this site, the temporal range increases by 133 years, thus spanning approximately from 1955 B.C. - A.D. 1129. Six of the above obsidian specimens: Ref. # 8-3 (3835 BP), Ref. # 15-3 (2100 BP) and Ref. # 39-31 (2333 BP) all sourced to Napa Valley; Ref. # 48-2 (2706 BP) and Ref. # 5-51 (2100 BP) both sourced to Bodie Hills; and Ref. # 57-5 (2836 BP) sourced to Mt. Hicks. Based upon these results, their converted dates do fall within the range of the AMS dates ranging from 1955 BC – AD 240. Furthermore, these resultant calendar conversion data also support the argument that this site was continuously occupied from the Early through the Middle Periods, with a possible presence periodically through the beginning of the Late Period (AD 1129).

The resulting temporal span based upon the respective sourcing and obsidian hydration studies is as follows:

1.) Napa Valley	1822 B.C. - A.D. 1054	(2,876 years)
2.) Mt Hicks	823 B.C. - A.D. 134	(957 years)
3.) Bodie Hills	693 B.C. - A.D. 184	(877 years)
4.) Casa Diablo Area	A.D. 240 - A.D. 1129	(889 years)

Temporal Placement of Diagnostic Artifacts

Single *Olivella* G Series Bead

The *Olivella* shell bead specimen (Ref. # 12-11) described in Chapter 6 was identified as either the G2 or G6 series bead saucer by Stephen Dietz. If it is indeed a G6a (irregular saucer bead), it was ascribed to the Transition Phase, between the Early and Middle periods (ca. 2450 – 2150 years BP) using Bennyhoff and Hughes 1987 temporal dating scheme B1. If it is classified as a G2 (Normal Saucer) bead, it too is a marker of the Middle Period "with an emphasis of the early phase (including the Early/Middle Transition)" (Bennyhoff and Hughes 1987:132).

Side-Notched Projectile Point

The attributes of the side-notched Green Franciscan Chert projectile point (Ref. # D-12-17) described in Chapter 3 were compared to other small side-notched dart points recovered from sites in the greater Monterey Bay Area, such as CA-Mnt-229 and CA-Mnt-391. Analysis of projectile points from those other sites have yielded dates ranging from ca. 3,000 – 1,500 B.P. (Middle Period) and this projectile point from CA-SCR-12 falls within these attribute ranges (Dietz 1986).

Chapter 10

Conclusion

The primary goals of this Master's project were to open up paths for further analyses and the temporal placement of the prehistoric CA-SCR-12 archaeological assemblages. These assemblages have now been revisited, analyzed, re-combined and inventoried. A foundation has now been laid that provides definition to the temporal components which are represented at this particular portion of the site, 912 Third Street. This way, we can continue to develop a more in-depth understanding of the indigenous groups who left that archaeological record; the ancestral Ohlone / Costanoans.

During my analysis of the CA-SCR-12 collection, I framed some basic research questions about the nature of the site. The following research questions were put forward, some of which were pursued outside the funding for this project study:

Research Question # 1: *What activity sets did CA-SCR-12 possess*?

Research Question # 2: *What are the sources of the flaked stone materials (obsidian) and what can XRF sourcing tell us about Ancestral Ohlone /Costanoan trade networks*?

Research Question # 3: *What are the temporal components represented at the site*?

With the analysis of the prehistoric CA-SCR-12 archaeological assemblages complete, I can now address the above research questions in chronological order. First, we have evidence that CA-SCR-12 possessed a minimum of four distinct activity sets: stone tool manufacturing, shellfish harvesting, terrestrial and marine mammal hunting, and mortuary practice.

Second, a total of eighty-five (85) obsidian artifacts were submitted to Geochemical Research Laboratory for sourcing via non-destructive Energy Dispersive X-Ray Fluorescence (EDXRF). The results of the sourcing study indicated that 64 % (n = 54) obsidian specimens were manufactured from North Coast Ranges obsidian (Napa Valley, n = 50; Annadel, n = 4). The other 36% (n =31) obsidian specimens were made from Mono Basin / western Great Basin volcanic glasses (Casa Diablo Area, n = 21; Bodie Hills, n = 8; and Mt. Hicks, n = 2). The obsidian sourcing data infers that relatively strong trade networks existed between the groups with a seasonal presence at CA-SCR-12 and the groups in the North Coast Range regions and the Mono Basin / western Great Basin areas. In addition, twenty-four obsidian specimens were submitted to the SJSU Obsidian Hydration Laboratory for the purposes of conducting hydration studies.

Third, several organic materials (human bone, terrestrial and marine faunal bone, and shell) were submitted to Beta Analytic for the purposes of conducting radiometric accelerator mass spectrometry (AMS) dating. Based upon the results of the above analyses, the temporal range of CA-SCR-12 potentially spans from 1955 B.C. - A.D. 1129. Subsequently, the AMS C14 dates on the *Mytilus* shell (240 B.C.) and the California Sea Lion bone (556 B.C.) also suggest, that while these two activity sets (shellfish harvesting and terrestrial and marine mammal hunting) may not appear to be coeval, they do fall within close range of each other and they are occurring during the Middle Period (600 B.C. - A.D. 1000). The Middle Period has been characterized by the continued exploitation of shellfish, while fish and terrestrial game are increasingly selected (Sunseri 2009).

Furthermore, the attributes of: 1) a possible G6a type *Olivella* shell bead and 2) a side-notched Green Franciscan Chert projectile point were compared to other G6a shell bead types and side notched points recovered from sites in the greater Monterey Bay Area.

Implications of this Study

This project report represents a major contribution to the San Jose State University Department of Anthropology, because it serves as a permanent record of all materials recovered by both excavation projects (SJSU: August 1986 and ACRS: July 1986) that were conducted at 912 Third Street. A copy will be submitted to the Northwest Information Center at Sonoma State University, in Rohnert Park, Ca. so that it may be viewed by the archaeological community and other interested publics.

This report also contains scientific data that were generated via accelerator mass spectrometry (AMS) dating, isotopic analysis, Energy Dispersive X-Ray Fluorescence (EDXRF), and hydration studies. That data serves as an important contribution to the scientific community because it increases our understanding of prehistoric Central California Coast region chronologies and cultural lifeways. The AMS C14 test results will be submitted to Mr. Gary Breschini so that he can input the data into his California C14 Database.

In 1990, the Native American Graves and Repatriation Act (NAGPRA; U.S. Public Law 101-601) was enacted, mandating that all U.S. Government agencies, non-Smithsonian Institution museums and other institutions receiving federal funding to inventory Native American human remains, assess ancestral associations (cultural affiliation), communicate with federally recognized tribes, and return remains if requested by these tribes (Larsen 1997). Included in this report, is a comprehensive skeletal analysis that identifies a possible minimum number of four Native American individuals. All bone element data were recorded onto 1) Ohlone Families Consulting Services (OFCS) skeletal inventory sheets and 2) the San Jose State University Department of Anthropology Burial Record Catalog. The analyses, identifications, and inventorying of the those skeletal remains therefore contributes to the Native American Graves Protection and Repatriation Act (NAGPRA) requirements for the San Jose State University Department of Anthropology.

On October 9th 2012, Muwekma Tribal Council Chairwoman Rosemary Cambra submitted a letter to the SJSU Department of Anthropology, which served as a statement of full support of my efforts to learn more about their ancestral site CA-SCR-12. Muwekma Ohlone Tribal members participated in the oversight of the SJSU field school excavation project at CA-SCR-12 in 1986 and the recent lab analysis of all cultural materials recovered from this ancestral heritage site. As a result of this collaboration with the Muwekma Ohlone Tribal leadership, who not only supported the AMS dating and obsidian sourcing and hydration, the Muwekma Language Committee was asked to help rename CA-SCR-12 in one of their several Native dialects. Because this site is located in Santa Cruz County, the Language Committee chose to employ the Awaswas (Santa Cruz) language for naming this ancestral heritage site. Monica V. Arellano, Vice-Chairwoman and Co-Chair of the Language Committee worked on the naming and translation of the site.

As mentioned earlier in this project report, CA-SCR-12 is located on a sandy bluff overlooking the San Lorenzo River. Based upon this strategic location the Tribal leadership decided to name the site in their language "*Satos Rini Rumaytak*," which translates into English as either "At the Hill Above the River Site" or "Place of the Hill Above the River Site." Therefore, CA-SCR-12 will now be referred to as Satos Rini Rumaytak. The linguistic sources employed in this translation are as follows:

- ***Satos*** = Hill (Hills, Sierra) *(1877 J.W. Powell Awaswas/Santa Cruz)*
- ***Rini*** = Above *(1879 Alphonse Pinart Awaswas/Santa Cruz)*

☐***Rumay*** = River *(1877 J.W. Powell Awaswas/Santa Cruz)*

☐**Site =** -*tka* after vowels; ***-tak* after a consonant** *(JP Harrington Chochenyo)*

Note: The locative definition of the ***–tak*** and ***–tka*** suffix endings refers to the following meanings 'At, Place, Place of, Location, Area, Site, By the, Into the and etc.'

This collaborative effort between the Muwekma Ohlone Tribe and San Jose State University makes vital linkages between the aboriginal tribe of this region and our institution of higher learning. The renaming of the Tribe's ancestral heritage site supports the Tribe's process of cultural and linguistic revitalization and political reclamation within their aboriginal homelands. This relationship further embraces the Tribe's history and heritage, thus creating meaningful bonds between our two communities. It is my hope that this study offers a contribution to the Native Ohlone community and provides scientific and historical information that the Tribe can find useful as it reconnects with their ancestral past.

Recommendation for Future Research

The scientific data that has been generated from my analysis of the prehistoric CA-SCR-12 archaeological assemblages simply represents a snapshot of a series of activities that occurred in a particular locality within a specific period of time. That data does not provide definitive answers to any of the research questions postulated in this study, rather it hints at several possibilities.

Although this body of work contributes to our understanding of prehistoric Central California Coast region chronologies, in many ways it remains incomplete due to the limitations of budget, personnel, and time constraints. The scope of this project was also narrowed by the nature of 1986 excavations at 912 Third Street, giving order to the CA-SCR-12 collection, creating two archaeological catalogs, and focusing on particular temporal components that were present within the CA-SCR-12 assemblage. However, now that the SJSU CA-SCR-12 archaeological assemblage has been revisited, analyzed, re-combined and inventoried, it can now be analyzed by others thus potentially furthering the research on the lifeways of the ancestral Costanoan/ Ohlone people who inhabited this region over the millennia.

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APPENDIX A

FINAL REPORT

ARCHAEOLOGICAL TEST EXCAVATIONS OF A CERTAIN PORTION OF PREHISTORIC SITE CA-SCR-12 LOCATED AT 912 THIRD STREET, SANTA CRUZ, CALIFORNIA

APN 5-183-06

ARCHEAOLOGICAL CONSULTING

AND RESEARCH SERVICES INC.

S8703

S-8703

Final Report
Archaeological Test Excavations of a Portion of Prehistoric Site CA-SCr-12 Located at 912 Third Street Santa Cruz, California APN 5-183-06

Prepared for:
T. O'Neill
912 Third Street
Santa Cruz, California

Prepared by:
Stephen A. Dietz
Principal Investigator
Archaeological Consulting and Research Services, Inc.
Santa Cruz, California

October 1986

Final Report
Archaeological Test Excavations
of a Portion of Prehistoric Site
CA-SCr-12
Located at 912 Third Street
Santa Cruz, California
APN 5-183-06

Introduction

This document is a report which is intended to provide a description of the results of Archaeological Consulting and Research Services' (ACRS) archaeological test excavations of a portion of prehistoric site CA-SCr-12 situated within a parcel located at 912 Third Street, Santa Cruz, California (Maps 1 and 2). This final report follows a preliminary report which was prepared in August, 1986 and which forwarded a number of mitigation alternatives from which a mitigation plan was devised to offset potential impacts to CA-SCr-12 by the proposed project.

The proposed residential development will include two units (townhouses), a carport, additional parking, walkways, private and community gardens, landscaping, and the resurfacing of the existing driveway (Goldspink 1986). An existing historic structure located at the front of the parcel is to be removed.

Investigation Personel

The field investigatoins and the preparation of this report were completed by Stephen A. Dietz, Principal Investigator for ACRS. Stephen A. Dietz holds an M.A. degree in anthropology with emphasis on archaeology, has over 18 years field and report preparation experience with California prehistoric and historic archaeological resources, and is a certified member of the Society of Professional Archaeologists.

Serving as field technicians during the test excavations were Deborah Rippey, Peter Johnson, Larry Bordeaux, Pat Lambert, and Marsha Kelly. All have a minimum five years field experience in archaeology and hold B.A. degrees in anthropology with emphasis on archaeology.

Ella Rodriguez of the Pajaro Valley Ohlone Indian Council (P.V.O.I.C.) provided her services as Native American monitor and community liaison during the test excavations. Ms. Rodriguez has over 10 years experience representing the P.V.O.I.C. in this capacity and has worked throughout the Monterey and San Francisco Bay Areas.

Previous Investigations

The parcel at 912 Third Street was reconnoitered and augered by ACRS during May of this year. The reconnaissance also included a records and literature search completed through the California Archaeological Inventory's Northwest Information Center at Sonoma State University, Rohnert

Park. As detailed in ACRS' reconnaissance report (ACRS 1986), the records and literature search indicated that the project location was situated within the limits of a known prehistoric cultural resource, CA-SCr-12. This resource had been the subject of previous archaeological investigations, one of which had occurred within the property located on the west side of the O'Neill parcel. So as to familiarize the reader with the previous work undertaken relative to site CA-SCr-12, we will reproduce here the results of the records and literature search which were initially provided in our reconnaissance report (ACRS 1986:2-6).

According to the Information Center files, CA-SCR-12 was initially recorded in 1950 as a "shell midden" with a depth of 3 to 4 feet. The location is given on a site survey record as "3rd St. and Cliff St. (Beach Hill NE corner)". Human burials and artifacts were apparently uncovered at the location during the construction of the Laura Lee Court motel situated at 820 3rd St. (DWL and WJW 1950). An attached letter dated May 10, 1979 recounts the observations of George Atwood, a plumbing contractor who worked on the nearby El View Motel (810 Third St.) during the construction of a 4 unit addition in 1954. He notes that,

> As we proceeded from north to south with the addition of these units, we uncovered what in my estimation was an Indian Burial site approximately the distance of the City street width from the southern edge of the existing structure shown in the photograph. We picked up numerous artifacts, shells, beads and some bones. All of these objects were recovered from a depth of 3 ft. or less and appeared to be concentrated within an area not more than 50 to 60 feet in diameter.
>
> At that time, my uncle, William Atwood, was an amateur archaeologist, and he confirmed that this was indeed a burial site (Atwood 1979).

With the advent of cultural resource management concerns in the mid 1970's, CA-SCr-12 became the focus of a number of archaeological studies which were prepared as input to environmental impact reports. One of the first of these was undertaken in 1974 by Margaret C. Fritz and John M. Fritz (Fritz and Fritz 1974) who test excavated a portion of the site on the lands of Ronald Lee Trupp on Cliff Street above Third Street (at 514 Cliff Street). A total of 7 mechanical borings and 4 1X1 meter test units were placed within the parcel. Midden (prehistoric cultural deposit) depths recorded in the borings and units ranged from 20 to 90 centimters. The authors concluded that while portions of the site within the property appeared disturbed, certain areas of the resource remained intact and was significant enough to warrant data recovery excavations should development of the parcel be undertaken. Shell, bone, and debris from the manufacture of stone tools are noted, as are flake tools, projectile points, a milling stone, bone tools fragments, shell beads, and thermally-altered rock. The collection from this test excavation is apparently housed at UCSC.

The lot situated between 912 and 924 Third Street was subject to an archaeological reconnaissance during August, 1975 by Rob Edwards (Edwards 1975). This property is immediately adjacent and on the west side of the parcel being described in this report. Of particular import is the statement by Edwards that "a report was gathered by this investigator in 1972 that human remains had been found in the process of excavating a utilities trench in 1969-70 at 912 Third Street (immediately adjacent this project)." He also notes that the site had been surface collected over the years (Pillington in the 1930's, Stafford in 1972) with collections stored at the Santa Cruz City Museum. Edwards' surface reconnaissance of the property revealed possible human bone fragments, "prehistoric refuse", and historic artifacts. Subsurface testing to evaluate the significance of the site was recommended.

Following Edwards' preliminary reconnaissance, the parcel between 912 and 924 Third Street was subject to test augerings and excavations by Archaeological Resource Service during January, 1976 (Roop and Flynn 1976). A total of 12 borings and 3 test units (two 1X1 and one 1X2 meter units) were completed within the parcel; soils removed from the borings and units were passed through 1/4" mesh dry screens. Materials recovered included shell and bone fragments with Mytilus sp. (mussel) and Protothaca staminea (Pacific littleneck clam) predominating in the former and deer, grey squirrel, and rabbit present in the latter. Artifacts present included pestles, mortars, manos, projectile points, flake scrapers, awls, "spatulates", "abalone prys", needles, bird bone beads, and deer bone "hair pins" (Roop and Flynn 1976:7). Forty-four fragments of Olivella biplicata shells were also recovered, perhaps suggesting that beads were being manufactured at the site from this material. Two obsidian biface fragments were also recovered. A feature comprised of a concentration of groundstone artifacts (2 pestles, 1 mortar fragment, 1 possible mano fragment, 1 possible metate) and a thermally-altered rock was recorded in one of the test excavation units at 73-80cms. Roop and Flynn's conclusions were similar to those offered by Fritz and Fritz for their project. While it was obvious that the site had been impacted by previous construction and other historic activities, a portion of the resource remained intact with midden depths to 87cms. Soils above 40cms. in depth were considered to be disturbed over most, if not all, of the parcel. Historic features and debris were also encountered and recovered. Data recovery excavations and monitoring were recommended in the event the project was developed as proposed.

Rob Edwards conducted another archaeological reconnaissance of a parcel on the north side of Second Street between Main Street and Younger Way. The survey was completed in 1976; no indications of CA-SCr-12 or any other cultural resources were discovered during the investigations.

In December of the same year (1976), Archaeological Resource Service completed a program of archaeological test augerings and excavations at 1031 Third Street. Twelve (12) 3 and 4 inch diameter hand augerings and two 1X1 meter test units were excavated. The test units were excavated in arbitrary 10 centimeter levels and all soils passed through 1/4" mesh dry shaker screens. Little in the way of macroconstituents associable with a prehistoric deposit were found. It was concluded that the property was not situated within the limits of CA-SCr-12, what materials were present had apparently been "dragged" to the parcel from elsewhere (Flynn 1977a:3-4). It was felt that the southern boundary of CA-SCr-12 was situated to the north of the property in the area of 912 and 924 Third Street. The possible presence of historic features such as trash dumps was, however, considered to be "high" (Flynn 1977a:4).

A parcel located at 405 Cliff Street near Third Street was surveyed in April, 1977 by Archaeological Resouce Service (Flynn 1977b). Although historic debris attributable to the late nineteenth century and twentieth century was observed over the surface of the parcel, no indicators of prehistoric resources were noted.

Three additional lots in the Beach Hill area were reconnoitered in June, 1977 by Archaeological Resource Service (Flynn 1977c). Two of the lots were situated adjacent one another at the southeast corner of Cliff and Third Streets, the third lot fronted Third Street just west of Cliff Street adjacent 821 Third Street. Surface indicators (bone and shell, lithic debitage, artifacts) of archaeological resources possibly associated with site CA-SCr-12 were observed on all of the parcels and test excavations were recommended. Flynn and Barker (1977) report on the results of the test excavations which were completed in July, 1977. Five 1X1 meter test units were excavated during the investigations; 2 at the corner lots (Cliff and 3rd) and 3 at the lot fronting Third Street. All units were excavated in arbitrary 10 centimeter levels and screened through 1/4" mesh hardware cloth. A sample of one of the units located within the lot fronting Third street was passed through 1/8" mesh screen.

The units excavated within the corner lots at Cliff and Third produced faunal remains (shell and bone) lithic debitage, utilized flakes, stone tools ("knives, scrapers, projectile points"), Olivella bead manufacturing waste, bone tool fragments, and ground and battered stone in a very disturbed matrix. Obsidian tools and debitage are included in the collection. It was concluded that this area of CA-SCr-12 had been almost completed mixed with historic debris and no intact portions of the site were present.

The units completed within the lot fronting Third Street yielded similar materials. In addition, human bone was found in a unit placed near the center of the lot, as were 8 Olivella beads. Specific beads types are not provided. The authors concluded that intact portions of CA-SCr-12 to depths of ca. 50cms. were present in the middle portion of the lot. Mitigation alternatives were presented with "no project, plan modification, and salvage excavation" options.

A survey of a parcel at 327 Main Street was undertaken by Dr. Anne I. Woosley in April, 1978. Her reconnaissance revealed what appeared to be disturbed historic and prehistoric site indicators which were examined through the use of 2 shovel tests taken to 30cms. below the surface. Limited subsurface testing and monitoring of construction activities were forwarded as options for additional work within the lot (Woosley 1978).

Archaeological Consultants reconnoitered a vacant lot at the southwest corner of Third and Younger Street (131-133 Younger Street) in September, 1979. Surface examinations of the property indicated the presence of historic and possible prehistoric debris. Subsurface archaeological testing was recommended as a next step prior to any development within the parcel (Baker 1979). Following their survey, Archaeological Consultants completed a prosram of auser testins within the parcel durins November, 1979. Seven (7) borinss ransins in depth from 40 to 60 centimeters in depth were aused in the southern 3/4 of the lot with all soils beins passed through 1/8" mesh screen. No indicators of prehistoric resources were found; a few frasments of slass, ceramics, plastic, and concrete were recovered from the upper levels of the borinss. Additional testins was recommended if future developments included the northern 1/4 of the property.

Archaeolosical Consultants conducted a data recovery excavation durins September and October, 1979 within the parcel at 514 Cliff Street which had been initially tested by Fritz and Fritz in 1974 (see above). The data recovery excavations followed the preparation of an archaeolosical mitisation plan which had been constructed by Archaeolosical Consultants in 1978 and 1979 (Breschini and Haversat 1978; 1979). Two 2X2 meter and 2 1X2 meter excavation units were completed at the west side of the parcel adjacnet Cliff Street. The units were excavated in arbitrary 10 centimeters levels with soils passed through 1/8" mesh dry screens. Similar in their stratisraphy, the units encountered 20 to 30 centimeters of disturbed soils, under which were 10 to 20 centimeters of "less disturbed dark brown to black midden". Below this were 20 to 25 centimeters of compact brown soils which contained yellow clay.

Macroconstituents from the site included larse and small mammal bone frasments, shell frasments (predominantly Pacific littleneck clam, mussel, and barnacle), thermally-altered rock (many of which were frasments of sroundstone tools), lithic debitase (Monterey chert for the most part, and some obsidian). Artifacts recovered include Monterey chert biface frasments and projectile points, flake tools, sroundstone tools (includins manos, metates, pestles, pitted stones), notched stones (possible net weishts), bone awl frasments, and Oliuella shell beads. The latter included 439 examples, 438 of which were spire-lopped or spire-sround specimens, and 1 of which was a possible saucer. Four hundred and twelve (412) of the spire-lopped and spire-sround beads were associated with a human burial found in Unit 1 at 45 to 75 centimeters below the surface.

The burial appeared to be that of an adult female (mid to late twenties in ase) and was flexed on its risht side. Several very small pieces of red ochre were found around the ribs and under the pelvis. As mentioned above, 412 Oliuella spire-lopped and spire-sround beads were associated with the burial, these were situated in the area of the neck and shoulders. The outline of a shallow pit was discernable around and beneath the interment (Baker 1980).

In sum, site CA-SCr-12 has been the object of considerable archaeolosical attention since 1950. A variety of archaeolosical reconnaissances, test excavations, and data recovery excavations have been conducted within and adjacent the limits of the resource (Map 4). These have, in part, served to establish the boundaries of what appears to be the most intact portion of the site, which apparently extends from the east side of Cliff Street west to the west side of the parcel located at 924 3rd Street. The north and south boundaries appear to be Third Street and the bluff edse to the north of Third Street above Front Street. Additional disturbed areas of the resource extend beyond these boundaries into the surroundins parcels. Of sreatest import to this project is that the parcel situated at

912 Third Street is within what is considered to be the most intact portion of CA-SCr-12 and adjacent a parcel (924 Third Street) which produced a large and varied inventory of artifacts and other macroconstituents associated with the site. Equally important is the fact that a number of human interments may have been removed from the site near or within the lot at 912 Third Street, it has at least been verified that several burials have been taken from CA-SCr-12 over the years.

As mentioned at the beginning of this section, ACRS' reconnaissance of the project location included an auger test of the property. A total of eleven (11) borings were completed within the parcel (Map 3). The results of the field reconnaissance and augering program indicated that

> . . . the entire parcel located at 912 Third Street is occupied by a portion of the cultural deposit (midden) associated with site CA-SCr-12. Deposits at the rear of the parcel appear to have been heavily disturbed, this is evidenced by the array of historic debris recovered in augerings 1-3 at the back of the lot. Deposits through the middle and front portions of the parcel appear to be relatively undisturbed and, on the aversae, are ca. 80 centimeters (approximately 32 inches) deep. A variety of macroconstituents were contained in the augerings and included faunal remains (shell and bone fragments), Monterey chert debitage (chipping debirs), and artifacts (possible biface fragment, mano fragment). The materials recovered are similar in nature to those described for other archaeological investigations undertaken within the area of CA-SCr-12.

It was recommended that a limited program of archaeological test excavations be completed to determine the integrity and significance of that portion of site CA-SCr-12 which was found to be situated within the project parcel. In particular, the test excavations would evaluate the condition and data potential of that portion of CA-SCr-12 which would be disturbed by the proposed planned development.

Methodologies

A total of three (3) rapid recovery test excavation units (Units 1 through 3) were completed during these investigations. Each measured 1X1 meters in area and all were excavated in arbitrary 20 centimeters levels using shovels, picks, and trowels. Unit 1 was taken to 75 centimeters, Unit 2 to 80 centimeters, and Unit 3 to 100 centimeters; a total of 2.55 cubic meters of soil were removed during the excavations.

The highest corner of each unit was utilized as a datum. All soils removed from the units were passed through 1/4" mesh dry shaker screens. Level bags and records were maintained for each 20 centimeter level, individual artifacts were bagged separately and tagged with artifacts forms. All bone and lithic debitage recovered was retained for analyses, shell species observed were noted on level records, and all thermally-altered rock was weighed on a level-by-level basis. The excavations were photographed in a 35mm. format.

The test excavation units (Units 1 through 3) were placed adjacent the older house at the front of the property on the structure's south (Unit 1), west (Unit 2), and north (Unit 3) sides (Map 3 provides the locations of the units, note, however, that this map is an older site plan showing four proposed units instead of two).

The test excavations were, as noted above, undertaken with a crew of six archaeologists and one Native American monitor, and were completed in a single day on July 14, 1986.

Stratigraphy

The surface of each unit was occupied by a groundcover of introduced grasses. The area of Unit 3 was also covered with a tangle of blackberry bushes. The soils within Unit 1 were found to be silty loams and were very hard and compact from the surface to the termination of excavations at 75 centimeters. A pick was required to loosen the soils excavated from the unit. A deposit of midden which was very dark brown (Munsell 10YR 2/2) to black (Munsell 10YR 2/1) in color extended from the surface to 60 centimeters below datum. At 60 centimeters, the midden began to mottle with dark yellowish brown (Munsell 10YR 4/6) sterile (non-cultural) soils, by 75 centimeters only small traces of midden remained, probably as the result of rodent disturbance. A feature of thermally-fractured rocks was found at 19-31 centimeters below datum in the unit (see Features below).

Soils within Unit 2 were almost identical to those found in Unit 1, although the midden was not as hard packed. In addition, shell amounts appeared to be higher in the matrix. Although a pick was required to break up the midden during the initial 20-30 centimeters, the deposit could be shoveled without picking through the lower levels. Soil color was the same and sterile mottling occurred at 65-70 centimeters below datum. The unit was finished at 80 centimeters below datum where soils were comprised almost solely of sterile deposits.

Unit 3 contrasted with Units 1 and 2 in its stratigraphy. Soils within this unit were relatively loose and friable, and were comprised of loamy deposits with some sand. The soil was easily shoveled from the unit with no picking required. The midden was very dark brown to black in color and continued from the surface to 90 centimeters below darum where mottling with dark yellowish brown sandy sterile soils began. Shell contained in the midden matrix was present in much greater amounts than that observed in Units 1 and 2. At 100 centimeters below datum the unit was occupied by completely sterile deposits (a small amount of midden occurred in rodent burrows).

Macroconstituents

Faunal Remains

Shell observed during the excavations was predominated by fragments of mussel and Pacific littleneck clam with the latter appearing to be in greater abundance. Also present were barnacle, limpet, gaper, bent-nosed clam, Washington clam, abalone, and crab in much smaller amounts. The observations seem to reflect the earlier findings of Flynn and Barker (1977) and Baker (1980) who report that clam and mussel were the most common shell species present in the site followed by a suite of others in lesser amounts.

Bone recovered includes that of mammal, fish, and bird. Land and sea mammals are represented; deer, otter and fur seal/dea lion are within the collection. Much of the mammal bone is fragmented, 13% has been burned. Fish vertebrae and gill plates were also found but in fewer numbers than the mammal bone (this may be a result of the screen size used for the rapid recovery units). Only three fragments of bird bone were recovered, one of these has been identified as snow goose. The bone was examined by Mr. Jeff Hall of San Jose State University, he was able to identify 15% of the collection. Tables 1 and 2 summarize the results of his examination.

Table 1
List of Identified Taxa

Taxa	Common Name
Odocoileus hemionus columbianus	Black-tail deer
Enhydra lutris	Sea otter
Oteriidae	Fur seal/ sea lion
Chen sp.	Snow Goose

Table 2
Element Counts
All Units

Taxa	Depth (cms.) 0-20	20-40	40-60	60-80	80-100	Total
Deer	-	4	4	2	1	11
Sea Otter	-	2	2	1	-	5
Fur Seal/Sea Lion	-	2	1	4	1	8
Snow Goose	-	1	-	-	-	1
Bird (no I.D.)	-	-	1	-	1	2
Fish	4	1	1	-	1	7
I.D. Total	4	10	9	7	4	34
Unid. Burnt	4	8	8	9	1	30
Unid. Unburnt	22	70	36	16	15	159
Unid. Total	26	78	44	25	16	189
Total Elements	30	88	53	32	20	223

Lithic Debitage

The collection of lithic debitage is predominated by Monterey chert with relatively few flakes of Franciscan chert, porphyry, and obsidian. Much of the Monterey chert has been burned, a characteristic which has been noted at other sites in the region (cf. Dietz 1985; Dietz, Hildebrandt and Jones 1986). Heating of cherts is hypothesized as a technique for strengthening the fabric of the material prior to its being worked.

The Monterey chert debitage collection contains a variety of flake types. Many of the flakes (cortical flakes) have cortex remaining from the pebble or cobble from which they were struck, indicating that the reduction of small pebbles and cobbles was taking place at the site. The same situation has been reported at sites throughout the Monterey Bay Area (cf. Dietz, Hildebrandt and Jones 1986). Most of the other flakes appear to be primary reduction flakes with some secondary reduction, thinning, and bipolar flakes. Shatter and bipolar shatter also appear to be present. The debitage from Unit 2 was subject to size and material identification sorts. The results are presented in Table 3 and include a total of 328 flakes of Monterey chert weighing 633.3 grams, 4 flakes of Franciscan chert weighing 10.2 grams, 13 flakes of quartzite weighing 41.1 grams, and 12 flakes of porphyry weighing 92.8 grams.

Only five (5) flakes of obsidian were found, although amounts of this material relative to other lithic debitage are usually quite low in Monterey Bay Area sites. The source of the obsidian is not known at this time, although it probably originated from the Napa Valley to the north or the east side of the Sierra Nevada in the Mono Lake region. Additional flakes of this material probably would have been recovered if a smaller screen size had been used during the test excavations. All of the obsidian flakes sort to 1/4", four are broken flakes and one is a thinning flake. Table 4 present the unit distribution of the obsidian flakes.

Table 3
Debitage Size Sort From Unit 2

Depth (cms.)	Material	1/4"	1/2"	1"	Totals
0-20	Monterey Chert	48	29	2	79
		(21.1)	(73.3)	(29.5)	(123.9)
	Franciscan Chert	1	1	-	2
		(.2)	(1.0)	-	(1.2)
	Quartzite	1	1	-	2
		(.6)	(.8)	-	(1.4)
	Porphyry	-	1	-	1
		-	(1.6)	-	(1.6)

Table 3 (Cont.)

Depth (cms.)	Material	1/4"	1/2"	1"	Totals
20-40	Monterey Chert	105	39	4	148
		(46.9)	(78.6)	(58.9)	(184.4)
	Franciscan Chert	-	2	-	2
		-	(9.0)	-	(9.0)
	Quartzite	2	6	1	9
		(.8)	(15.2)	(22.8)	(38.8)
	Porphyry	-	5	1	6
		-	(17.8)	(7.8)	(25.6)
40-60	Monterey Chert	20	36	4	60
		(8.1)	(133.7)	(51.8)	(193.6)
	Quartzite	1	1	-	2
		(.4)	(.8)	-	(1.2)
	Porphyry	-	1	1	2
		-	(9.5)	(9.9)	(19.4)
60-80	Monterey Chert	24	13	4	41
		(13.6)	(63.6)	(54.2)	(131.4)
	Porphyry	-	1	2	3
		-	(3.2)	(43.0)	(46.2)

Table 4
Distribution of Obsidian Debitage

Unit	Depth (cms.)	Count
1	0-20	2
2	20-40	2
	60-80	1

Artifacts

A number of artifacts were recovered and include shell beads, bone tools, biface fragments, a projectile point, possible choppers, and groundstone fragments.

Shell Beads

Included are 4 examples. One is an Olivella type A1b Simple Spire-lopped bead, two are Olivella type A1c Simple Spire-lopped beads, and one is an Olivella type G2 or G6 Normal or Irregular Saucer (cf. Bennyhoff and Hughes n.d.; Bennyhoff 1986).

The single type A1b Spire-lopped example was recovered from Unit 2 within the 20-40 centimeter level. It has a diameter of 9.0 millimeters, a length of 14.4 millimeters, and a perforation diameter of 3.6mm.

The 2 type A1c Spire-lopped specimens were found in Unit 3 within the 40-60 centimeters level. Respective diameters for the beads are 9.8 and 12.6 millimeters (mean=11.2), lengths 16.5 and 23.9 millimeters (mean=20.2), and perforation diameters 2.3 and 4.1 millimeters (mean=3.2).

The type G Saucer is from Unit 3 within the 40-60 centimeter level and can be ascribed to either the G2 or G6 series. If a G6, it would be a G6a Symmetrical Variant. Although a single bead of this kind is difficult to assess, the example is probably a G6a since the perforation is slightly off-center and the bead is not a perfect circle (suggesting that the bead was individually manufactured and not rolled in a strand with other beads). The bead is 7.6 millimeters long, 7.4 millimeters wide, has a curvature of 1.9 millimeters, and a perforation diameter of 1.8 millimeters. The perforation has been biconically drilled. The face of the bead exhibits wear above and below the perforation, as do the outside edges on the back of the specimen, suggesting that the bead may, at one time, have been included in a strand.

Bennyhoff (1986) has recently defined the G6 series as a new type based on a large grave lot of 3,271 of these beads found with a single burial (Burial 5) at site CA-Mnt-229 (Moss Landing). Based on three radiocarbon dates obtained from samples of G6 beads found with the burial, he ascribes the interment and beads to the transition phase between the Early and Middle periods or ca. 2,450-2,150 years B.P.

Whole_Olivella_Shells_and_Possible_Olivella_Bead_Manufacturing_Waste

In addition to the Olivella beads, a number of whole Olivella shells and Olivella shell fragments were recovered. Table 5 summarizes these materials.

Table 5
Whole Olivella Shells and Shell Fragments

Unit	Depth (cms.)	Description	Length (mm.)	Diameter (mm.)
2	60-80	Whole Shell	14.4	7.6
		Whole Shell	15.4	8.2
		Tip Fragment	-	-
3	20-40	Whole Shell	23.0	12.4
		Whole Shell	16.2	8.5
		Tip Fragment	-	-
		Tip Fragment	-	-
	40-60	Whole Shell	16.4	8.5

Table 5 (cont.)

Unit	Depth (cms.)	Description	Length (mm.)	Diameter (mm.)
3	60-80	Whole Shell	20.9	10.6
		Whole Shell	19.0	10.0
		Whole Shell	16.6	10.2
		Whole Shell	12.0	6.6
		Tip Fragment	-	-
	80-100	Whole Shell	15.8	8.1
		Whole Shell	12.6	6.0
		Whole Shell	11.2	6.1
		Split Shell	-	-

The tip fragments are all virtually identical and include the spire down to the top of the body whorl. The split shell has been split longitudinally down its entire length but appears to be a recent break.

Bone Tools

Included are a small awl and a possible antler wedge. The awl has been fashioned from a length of large mammal bone and has a very blunt tip. The end opposite the tip exhibits scoring and a snap break. The tip is well ground and striations are evident along the entire length of the tool. The awl is 37.8 millimeters long, 7.5 millimeters wide at the tip, 11.3 millimeters wide at the base, and 4.6 millimeters thick. It was found in Unit 3 within the 60-80 centimeter level.

The second bone tool is a possible wedge fashioned from a large tip fragment of an elk or deer antler. The end is missing, making a definite statement regarding the function of the artifact impossible. The antler fragment was found in Unit 3 within the 40-60 centimeter level. It is 224.5 millimeters long and 38.8 millimeters in diameter.

Flaked Stone Tools

Projectile Point

A single side-notched projectile point of green Franciscan chert was found in Unit 3 within the 60-80 centimeter level. It has a maximum length of 32.6 millimeters, a maximum width and basal width of 20.6 millimeters, a blade width of 19.6 millimeters, a neck width of 13.7 millimeters, a thickness of 7.2 millimeters, proximal shoulder angles of 130 and 140 degrees, distal shoulder angles of 200 and 210 degrees, a length/width ratio of 1.58, a basal indentation ratio of 1.0, and a weight of 4.6 grams.

Jones (n.d.; see also Dietz, Hildebrandt and Jones 1986:141) has suggested a Small Side-Notched type for the Monterey Bay Area which has dates to ca. 3,000-1,500 years B.P. The point from CA-SCr-12 falls within the attribute ranges taken from Small Side-notched points recovered from CA-Mnt-229 and CA-Mnt-391, although the population size for the type (N=8) remains small.

Biface Fragments

Three biface fragments were recovered. The first is from Unit 1 at 20 centimeters below datum. It is of obsidian and appears to be the base of a leaf-shaped projectile point. The fragment has been snapped across its body and is 24.9 millimeters long, 16.7 millimeters wide, 6.5 millimeters thick, and weighs 2.5 grams. The fragment has not yet been sourced or subject to obsidian hydration dating.

The second biface fragment is from Unit 1 at 20-30 centimeters below datum. It is a small tip fragment from a Monterey chert biface and is quite thick. The fragment is 17.0 millimeters long, 10.0 millimeters wide, 12.0 millimeters thick, and weighs 2.6 grams.

The third biface fragment was found in Unit 3 within the 0-20 centimeter level. It is a tip fragment and has been burned. The fragment is 27.7 millimeters long, 16.9 millimeters wide, 8.8 millimeters thick, and weighs 3.0 grams.

Choppers

Included are two possible examples. The first is from Unit 2 within the 20-40 centimeter level and is a porphyry cobble which has had a series of large flakes removed bifacially to form a jagged working edge. The edge has been battered and exhibits step fracturing. One smooth rounded end and portions of the cobbles top and bottom surface remain behind the edge. The tool is 95.0 millimeters long, 91.8 millimeters wide, 43.3 millimeters thick, and weighs 396.0 grams.

The second specimen has also been fashioned from a porphyry cobble and is from Unit 3 within the 20-40 centimeter level. The largest portion of the cobble has been removed through a series of large flakes taken from one side. Three small, shallow flake scars are present on the opposite side of the cobble, however these appear to have been spalled through use of the artifact. The working edge of the tool exhibits step fracturing. The artifact is 86.6 millimeters wide, 68.1 millimeters long, 36.0 millimeters thick, and weighs 209.0 grams.

Groundstone Artifacts

Included are 2 mano fragments and 1 possible metate fragment. The first mano fragment is from Unit 2 within the 0-20 centimeter level. The fragment is from the end of the tool and a portion of a ground, shouldered surface remains. The surface has alaso been pecked in one area. The fragment is 57.2 millimeters long, 62.3 millimeters wide, 47.2 millimeters thick, and weighs 142.9 grams.

The second mano frasment is from Unit 3 within the 60-80 centimeter level. The frasment is a medial one from a porphyry or granite cobble. Both sides of the frasment appear to have been ground. The frasment is 71.9 millimeters long, 79.3 millimeters wide, 41.3 millimeters thick, and weighs 277.3 grams.

The possible metate or grinding slab frasment is of granite and has been burned. A small portion of a flat surface which appears to have been ground remains on the frasment. It was found in Unit 1 within the 20-40 centimeter level and is 84.6 millimeters long, 80.8 millimeters wide, 41.3 millimeters thick, and weighs 324.7 grams.

Table 6 presents a vertical distribution of the artifacts recovered during the test excavations.

Table 6
Vertical Distribution of Artifacts

Artifacts	Depth (cms.) 0-20	20-40	40-60	60-80	80-100
Ol. A1b bead	-	1	-	-	-
Ol. A1c beads	-	-	2	-	-
Ol. G6 bead	-	-	1	-	-
Bone Awl	-	-	-	1	-
Antler Wedge	-	-	1	-	-
SN Proj. Pt.	-	-	-	1	-
Biface frags.	1	2	-	-	-
Choppers	-	2	-	-	-
Mano frags.	1	-	-	1	-
Metate frag.	-	1	-	-	-
TOTALS:	2	6	4	3	0

Unit 1 produced 2 biface frasments at 20 and 20-30 and 1 possible metate frasment at 20-40. Unit 2 produced 1 Olivella A1b bead at 20-40, 1 chopper at 20-40, and 1 mano frasment at 0-20. The remaining artifacts were recovered from Unit 3.

Features

A single feature of thermally-altered rock was recorded in Unit 1. Situated in the southwest quadrant of the unit, the concentration included 14 rock frasments and complete cobbles. Eight additional rock frasments and cobbles were recorded along the east wall of the unit, suggesting that a second deeper feature of this type extends into this area. The rocks in the southwest quadrant extended in depth from 19 to 31 centimeters below datum (mean depth=23.3 centimeters). The rocks along the east wall of the unit extended in depth from 27 to 38 centimeters below datum (mean depth=34.6 centimeters).

Discussion

The primary goals of ACRS' test excavations were to determine the integrity and potential significance of that portion of site CA-SCr-12 which is situated within the parcel located at 912 Third Street, Santa Cruz. Concerning the former, the test excavations have shown that the deposit associated with CA-SCr-12 has maintained its internal integrity despite continued residential use at the location for most of this century. We should qualify that statement by saying that we are addressing ourselves to the area in which the proposed townhouses will be built and not the rear portion of the property where the more recent dwelling is situated. Our initial reconnaissance and augerings indicated that the area around the newer home has been subject to considerable disturbance.

The integrity of the site is evidenced by the presence of intact features of thermally-altered rock which were found in Unit 1 at a depth of less than 20 centimeters (8 inches). The rocks included in a feature in the southwest quadrant of the unit appeared to be in situ and undisturbed. The edge of a possible second feature of thermally-altered rock was found at a deeper level along the east sidewall of Unit 1 and also appeared to be undisturbed. Additional evidence of the undisturbed nature of the deposit is in the almost total lack of historic debris found in the test excavation units. In addition, no signs of disturbance were noted in any of the unit sidewalls or during the excavation of any of the unit levels. In short, the midden associated with the site in the areas tested has very good to excellent integrity.

The significance of the resource can be addressed in a number of directions. For the purposes of this discussion, we will approach this topic in terms of the scientific and ethnic significance of the site and in a review of other researchers opinions concerning CA-SCr-12. The scientific significance of the resource can be measured through the data potential of the site and the information it is likely to yield in regard to certain research questions currently being pursued by archaeologists interested in the prehistory of the Monterey Bay Area. Our test excavations and the test and mitigation excavations undertaken for previous projects within the area of CA-SCr-12 have produced a number of data categories. As an example, the obsidian obtained through these works can be used in establishing patterns of trade and exchange of this material by sourcing the glass through X-ray fluorescence trace analyses. Each obsidian source within and adjacent California has a distinct chemical "fingerprint" which can be read using the XRF technique. Typically, obsidian found in the Santa Cruz area is from sources to the north in the area of Napa Valley and Santa Rosa (Napa Valley and Annadel sources). There are, however, obsidians present which were obtained from the east side of the Sierra Nevada, most commonly from the Casa Diablo source in the Mono Lake region. Determining the presence and proportionns of these and other obsidian present in the Santa Cruz area enables us to reconstruct prehistoric trade relationships between different regions. By adding the element of obsidian hydration dating, we can also ascertain how these trade relationships changed over time.

Concerning obsidian hydration dating, the glasses obtained from a site add to our body of data concerning specific rates at which source specific obsidians hydrate. The construction of rates for the different obsidians

(Napa Valley, Annadel, Casa Diablo, etc.) offers a means for dating artifacts and archaeological sites at a cost which is much less expensive than that for radiocarbon age determinations. Briefly, when obsidian is flaked, the fresh flake scar takes in or hydrates water. The infusion of the water creates a layer or band on the surface of the glass which is measurable when a thin section of a flake is cut and viewed microscopically. The formation of the band proceeds over time at different rates for different obsidians. The longer the time a flake or artifact of obsidian is in the ground, the thicker the band gets. We are just beginning to produce what are considered to be fairly accurate rates for the formation of these bands for the various obsidian sources found to the north and southeast of the Monterey Bay Area.

The Olivella shell beads, whole shells, and possible bead manufacturing waste found at CA-SCr-12 indicates that the site may have functioned as a major bean manufacturing center during a certain portion of the prehistoric period. Bennyhoff (1986) offered some discussion of this topic. We know that site CA-Mnt-101 on the Monterey Peninsula was a major location for the production of Olivella beads (cf. Dietz 1985) and CA-SCr-12 may have been its northern counterpart. Baker (1980) reported on the burial found at CA-SCr-12 with over 400 Olivella spire-lopped and spire-ground beads, and others have described various beads, whole shells, and possible manufacturing waste from different areas of the site. The remains of this activity which are recovered through excavation of the site enable us to determine methods of manufacture and bead types produced by the local industry.

The artifacts collected from the site help to define local and regional assemblages which are just beginning to be reconstructed with any amount of detail. The reconstruction of assemblages enables researchers to cross date sites through comparative means, establish the makeup of tool kits used by the area's prehistoric inhabitants, and infer what activities were taking place at various sites in the region. This, in turn, helps to determine the function of a given site and how that site played a roll in local and regional subsistence strategies and settlement patterns. Based on what was obtained (burials, diverse array of technomic and sociotechnic artifacts, diverse array of faunal remains, features) through our test excavations and the excavations of other researchers, we would estimate that CA-SCr-12 functioned as a permanent or seasonal residential base (village) during a period beginning ca. 2,500 to 1,250 B.P. (the estimate is based on comparison with data obtained from other sites excavated in the Monterey Bay Area such as CA-Mnt-101, CA-Mnt-391, and CA-Mnt-229). Depending on who you talk to (cf. Breschini 1980, 1983; Breschini and Haversat 1978, 1980; Dietz and Jackson 1981; Patch and Jones 1984; Dietz 1985; Dietz, Hildebrandt and Jones 1986) it appears that during a period from ca. 5,000 B.P. to ca. 1,600-900 B.P. aboriginal populations were utilizing a series of permanent and seasonal residential bases established along the coast immediately adjacent the shoreline. It is postualted that after ca. 1,600 to 900 B.P. a shift occured which witnessed the establishment of permanent residential bases in areas away from the coast in places such as the Carmel Valley, Salinas Valley, and other smaller interior valleys and terraces. The reason and timing for this shift remains in question, some feel that a second population immigrated to the region from the San Francisco Bay and

Santa Clara Valley and established their villages in the interior in setting that offered simsilar resource bases. Others feel that the shift to the interior was undertaken by the original inhabitants of the area, perhaps due to the introduction of technological innovations (bow and arrow, acorn processing). Some postulate that this took place as long ago as 1,600 years ago, some as recently as 900 years ago. In any event, the data provided from a site such as CA-SCr-12 is invaluable in addressing these problems and makes a significant contribution to our understanding of the prehistory of Santa Cruz, the Monterey Bay Area, and the Central Coast Region.

While we could also discuss the data potential of the faunal remains for assisting in our understanding of subsistence strategies and the reconstruction of site catchments, the value of osteometric and anthropometric data obtained from burials, the information the site can provide for the reconstruction of local lithic industries, and so on, the few illustrative examples provided above will, hopefully demonstrate the scientific significance of CA-SCr-12 and, specifically, the area tested by ACRS. We will note that this conclusion has been offered by other researchers as a result their work at the site. Fritz and Fritz (1974), Edwards (1975), Roop and Flynn (1976), Breschini and Haversat (1978), and Baker (1980) all felt that the site was of considerable significance and recommended test and mitigation excavations for various projects constructed within the area of the resource.

Finally, we will mention that the site is of ethnic significance to local Native Americans due to the presence of burials within the resource. The P.V.O.I.C. has been involved with this and other excavations undertaken at CA-SCr-12, and continues to express its concerning over the potential for human remains and the disposition of the same for the site.

In sum, the integrity and data potential of the site as well as the ethnic concerns discussed lead us to conclude, as other archaeologists have, that CA-SCr-12 is a significant resource which warrants mitigation measures in situations where undisturbed portions of the site may be impacted.

Potential Impacts to the Resource

Based on discussions with the owner of the property, Mr. Tom O'Neill and the project architect, Mr. Robert J. Goldspink, it appeared that CA-SCr-12 would be impacted by the proposed undertaking. The removal of the older existing structure, the excavation of building and other trenches, the resurfacing of the existing driveway and the construction of new parking facilities, and landscaping would to one extent or another, cause disturbance to the deposit associated with the site. While much of this will be confined to the surface or upper levels of the site, the trenching will be completed to a depth of 18 inches (R. Goldspink, personal communication, 1986) or approximately 45 centimeters into the deposit. A review of our findings showed that these depths were more than adequate to disturb features such as those found during the test excavations and would penetrate over half way into the midden in most areas. Even the most shallow disturbance might encounter features such as the thermally-altered rock concentration found in Unit 1 at a depth of approximately 8 inches. We also noted in the preliminary test report that burials found within the site had been encountered at relatively shallow depths; Baker (1980) reported that the burial with over 400 shell beads was first discovered at 45 centimeters (ca. 18 inches) and extended to a depth of 75 centimeters.

The disturbance of the site would also result in the physical loss of artifacts and other macroconstituents and the stratigraphic relationships which may exist between them. The density of artifacts and other materials per cubic meter is, in fact, quite high; higher than that for other sites in the area (CA-SCr-101 and CA-SCr-229) which have been found to be eligible for nomination to the National Register of historic places (cf. Dietz 1985; Dietz, Hildebrandt and Jones 1986).

Recommendations

In light of our findings, it appeared that some form of data recovery program should have been undertaken as a means for mitigating the potential disturbance to those portions of CA-SCr-12 which would be affected by the proposed project. Discussions with the property owner provided input for the construction of a mitigation plan which would, in our opinion, offset the potential disturbance to the resource. A preliminary report prepared by ACRS (Dietz 1986) forwarded a series of possible mitigation alternatives. The final mitigation plan selected from the alternatives includes the following:

1. Monitoring of all trenching and other activities which might disturb portions of the site deposit by a qualified archaeologist and Native American representative. The monitoring will provide the opportunity to obseve for artifacts, features, and human remains which might be encountered by these activities. We have been informed that the trenching for the proposed townhouses will be done by hand; this method would provide for careful and well-paced monitoring of the excavations. Any artifacts observed will be collected, any features or burials encountered will have their limits established for excavation and removal by qualified archaeologists. We have also been informed that the older structure at the front of the property will be removed by hand and that no grading of the property is contemplated. This will keep any disturbance to the site to a minimum during project development activities. Any work undertaken will be summarized in a report which details the results of the monitoring and describes artifacts recovered and/or features and burials excavated.

2. Excavation of a portion of the site within the project parcel by an archaeological field class from San Jose State University. Discussions undertaken at the completion of the test excavations resulted in permission for the investigation of CA-SCr-12 on the project property by a field class from S.J.S.U. as part of the project's mitigation plan. These excavations will, in conjunction with the monitoring and the test units already completed, allow for the removal of a portion of the site's deposit and provide an effective means for mitigating the disturbance which will occur to

the site during the development and construction of the proposed townhouses. The field class excavations began in September and are in progress. The property owner has offered to provide funds for two radiocarbon dates in the event that the S.J.S.U. excavations recover any suitable materials for dating.

A report of any work completed by professional archaeologists will be prepared as part of their involvement. Excavations completed by S.J.S.U. will be summarized in a report prepared by the class. The materials obtained during ACRS' test excavation (1 archive box) will be included with those recovered by the S.J.S.U. field class and accessioned into the collections of the San Jose Stae University Anthropological Facility. Sourcing and hydration dating of the obsidian debitage included in the ACRS test collection will be undertaken as part of the S.J.S.U. field class studies.

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Explanation of Figure

a. *Olivella* A1b Simple Spire-lopped Bead. Unit 2, 20-40cms.
b. *Olivella* A1c Simple Spire-lopped Bead. Unit 3, 40-60cms.
c. *Olivella* A1c Simple Spire-lopped Bead. Unit 3, 40-60cms.
d. *Olivella* G2 Normal or G6 Irregular Saucer. Unit 3, 40-60cms.
e. Bone Awl Tip Fragment. Unit 3, 60-80cms.
f. Franciscan Chert Side-Notched Projectile Poinnt. Unit 3, 60-80cms.

Explanation of Plates

1. View looking northwest across Third Street at project location. Test excavation Unit 1 is being completed in area at front of older residential structure.

2. View looking northeast at test excavation Unit 2 being completed adjacent the southwest corner of the older residential structure.

3. View looking north at test excavation Unit 3 being completed adjacent the northwest corner of the older residential structure.

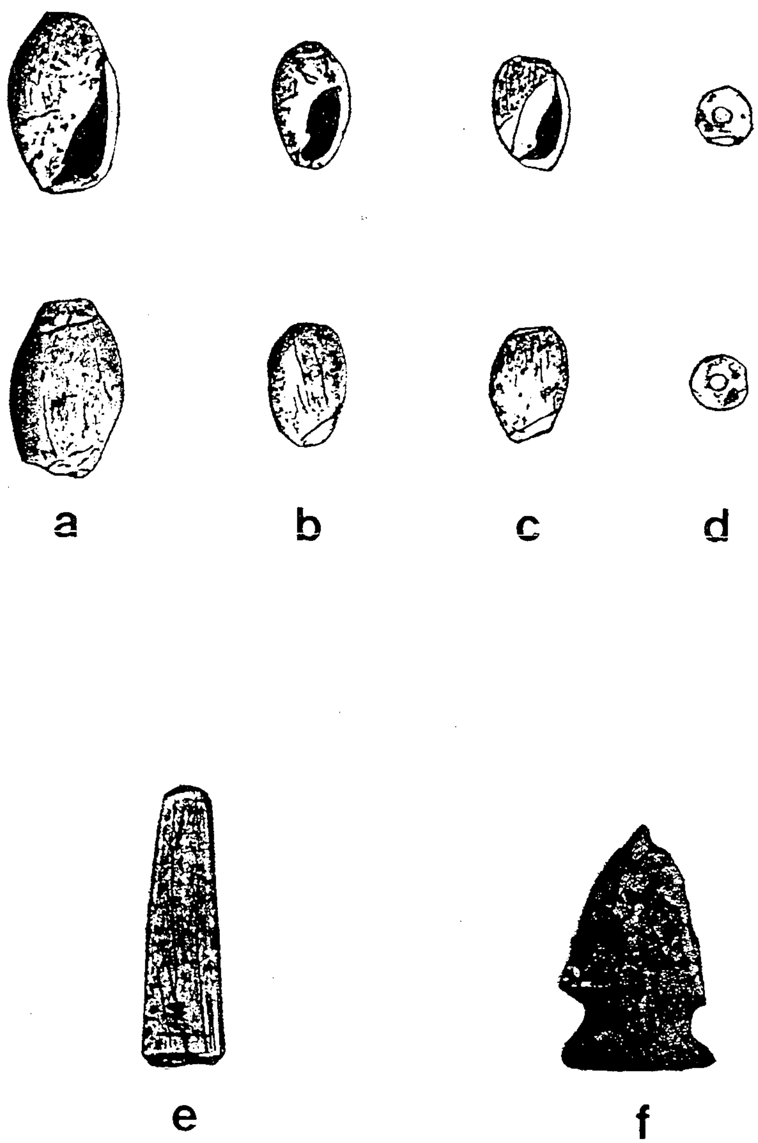
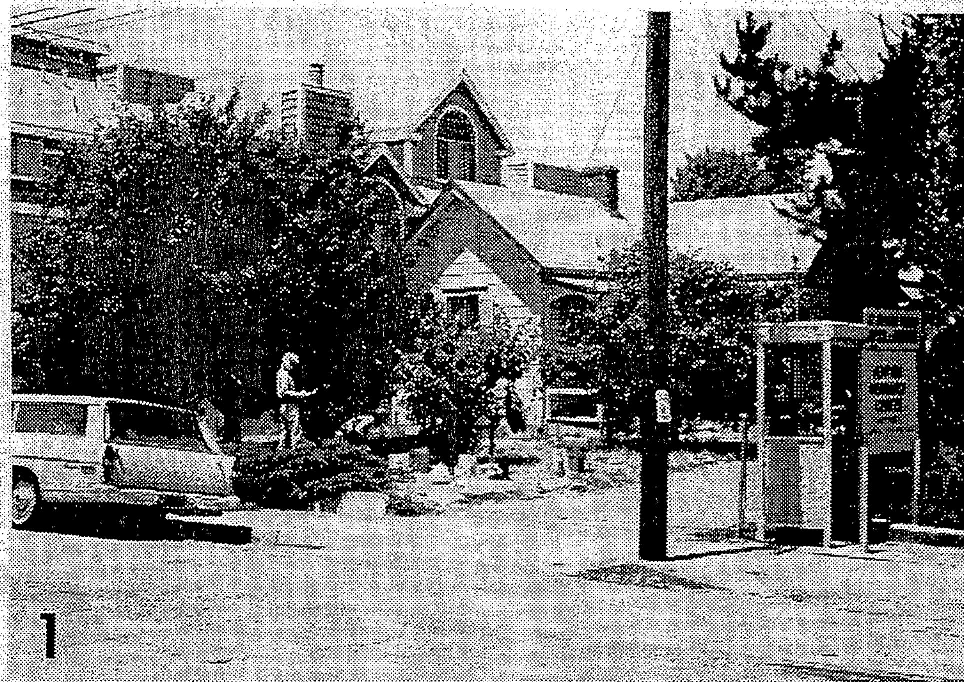


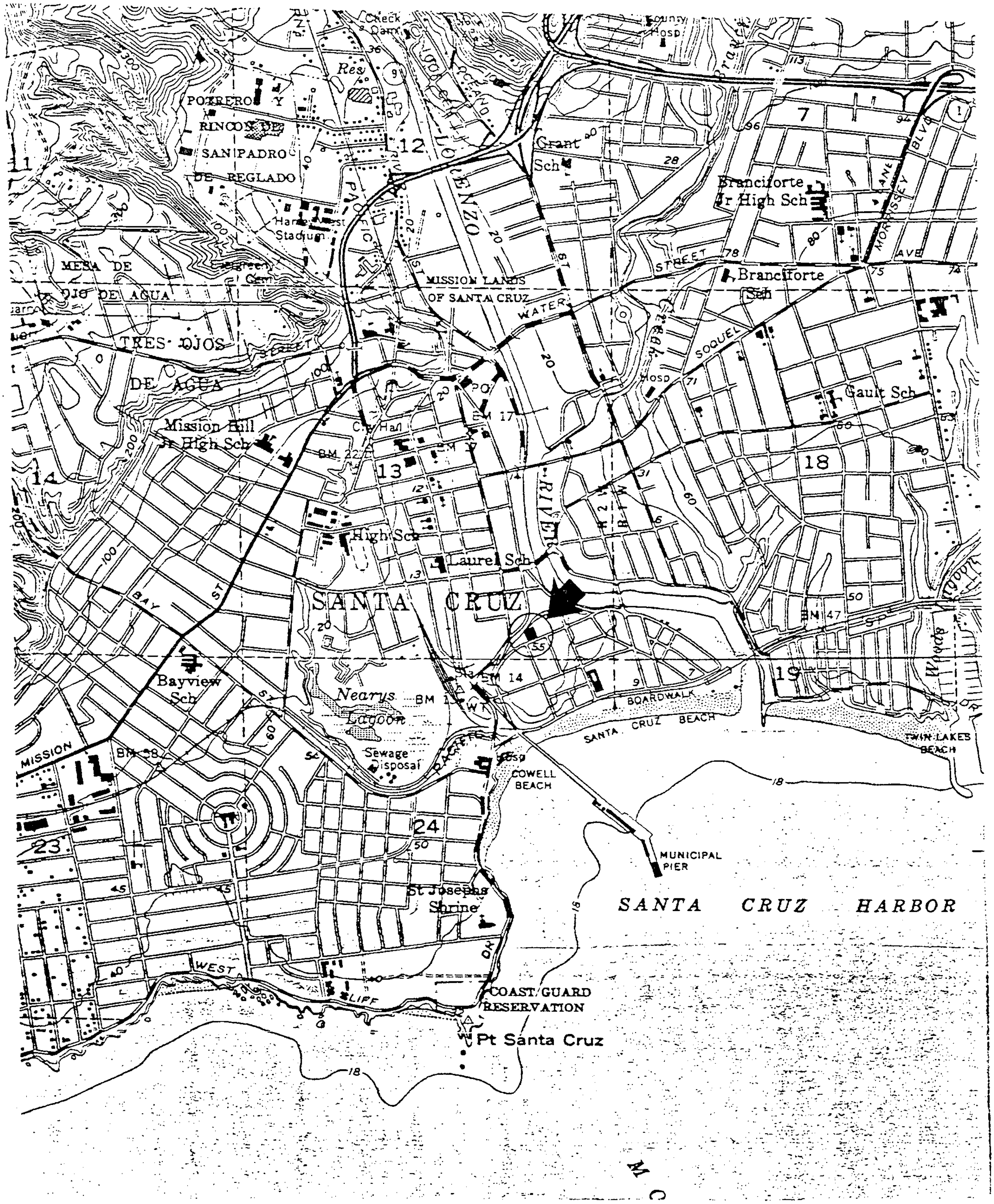
FIGURE 1



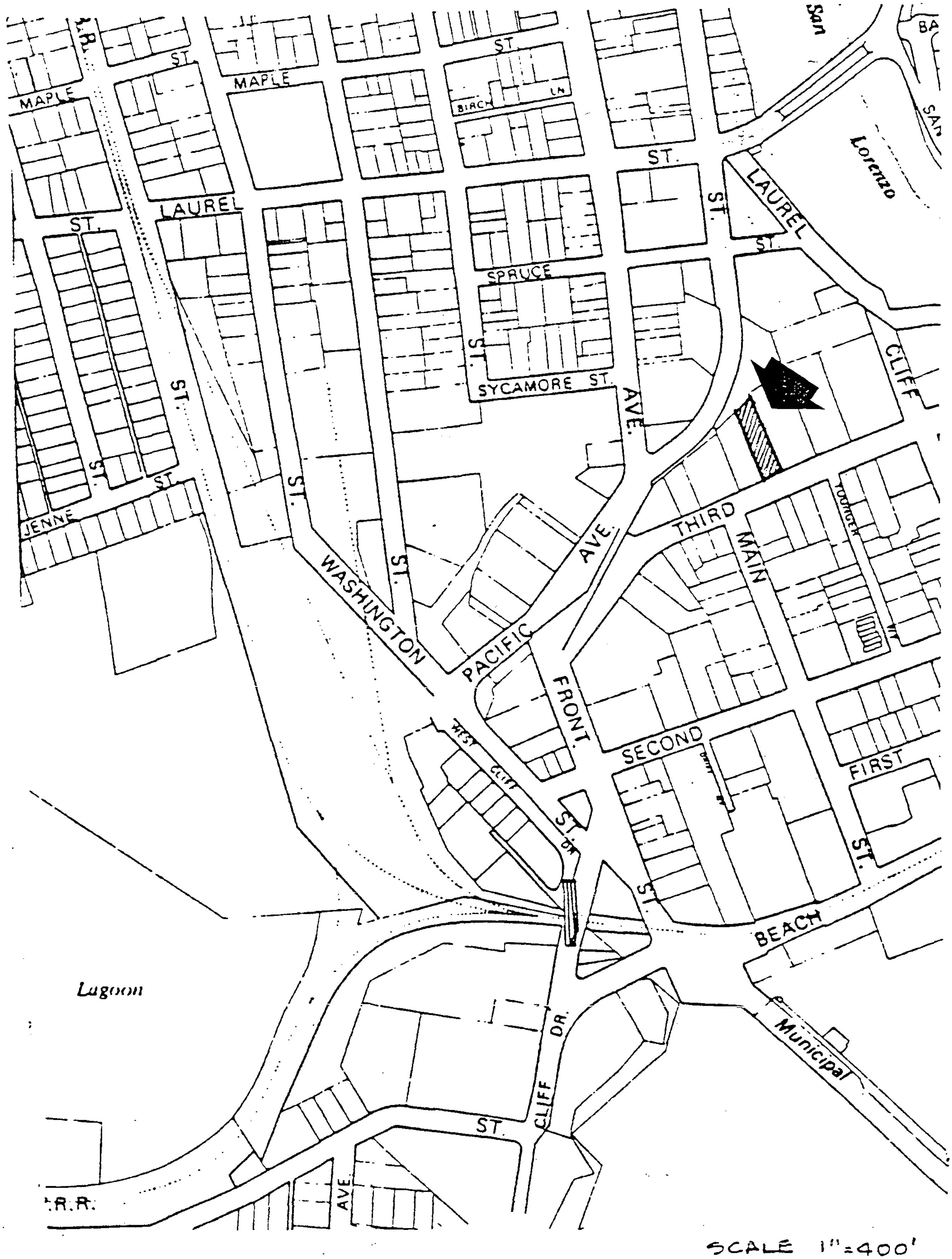
1

2

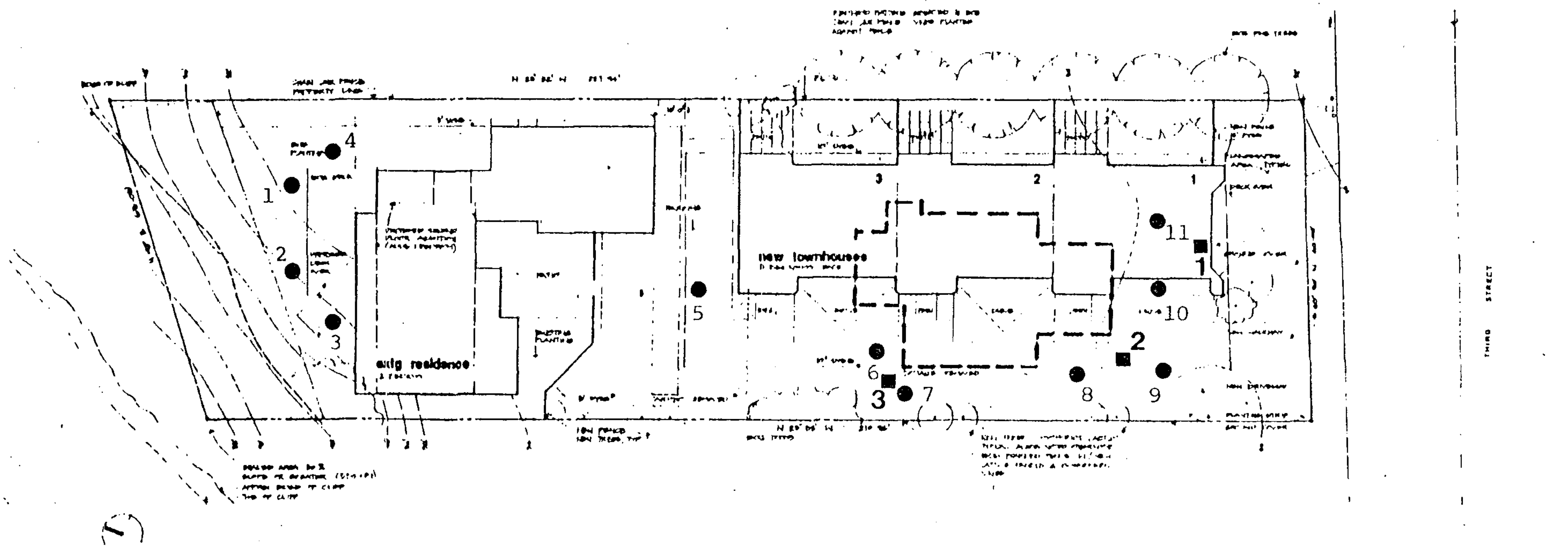
3



Map 1
Location of Project
U.S.G.S. Santa Cruz 7.5' Quadrangle
1:24000



Map 2
Location of Project

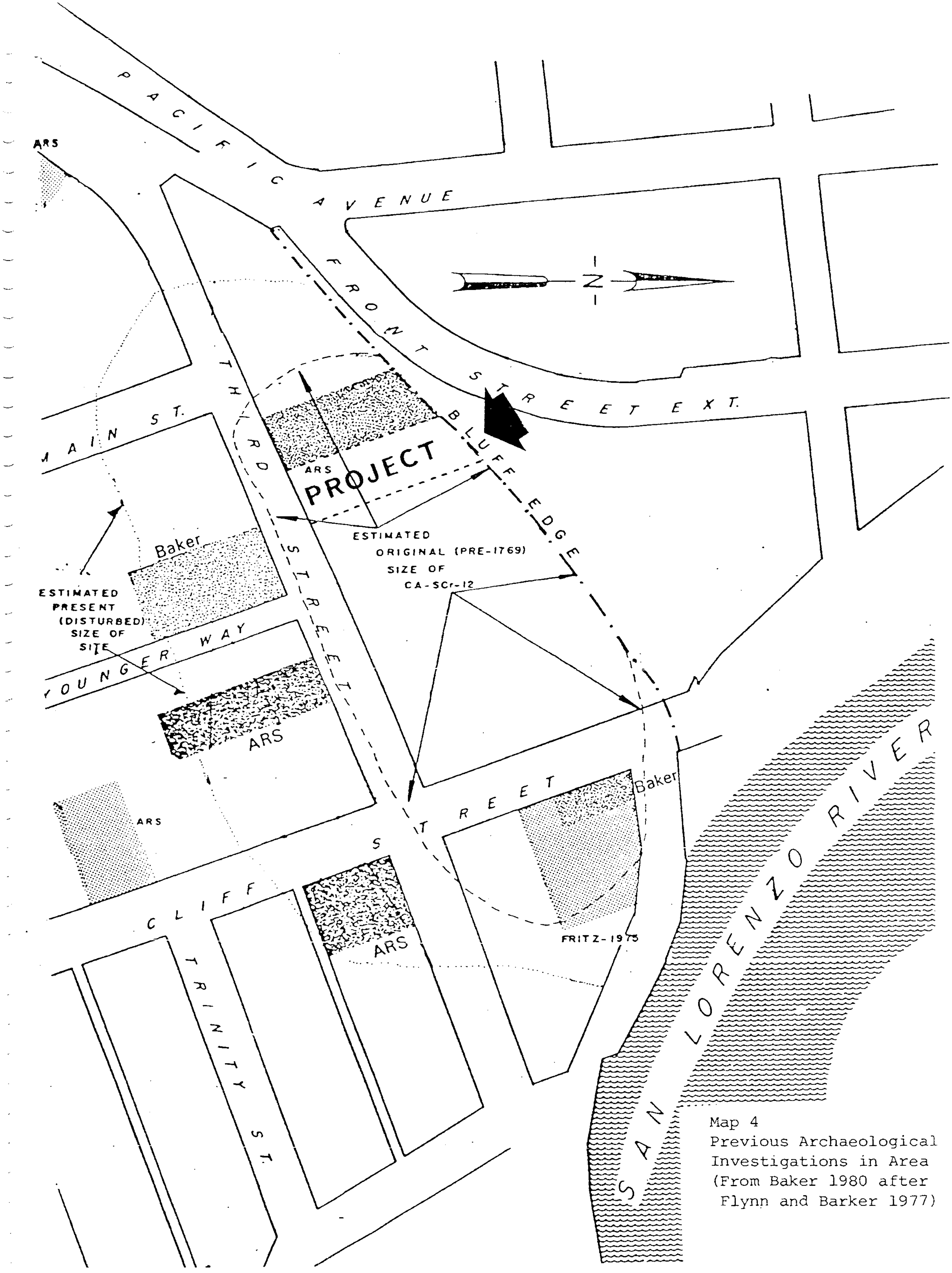


SITE PLAN

● Auger Locations 1 through 11

■ Test Unit Locations 1 through 3

Map 3
Locations of Auger Borings
and Test Excavation Units



Map 4
Previous Archaeological Investigations in Area
(From Baker 1980 after Flynn and Barker 1977)

APPENDIX B

SJSU RESEARCH FOUNDATION GRANT

SAN JOSÉ STATE UNIVERSITY

College of Social Sciences

Office of the Dean

One Washington Square
San José, California 95192-0107
Voice: (408) 924-5300
Fax: (408) 924-5303

www.sjsu.edu

TO: **Gerald Starek**
Charlotte Sunseri
Anthropology

DATE: December 14, 2012

FROM: Jan English-Lueck, Assoc. Dean

SUBJECT: COSS SJSU Research Foundation Research Grants: Fall 2012

The College Research Committee, which is composed of one representative from each Department, has met and acted on the College Foundation Research Grant Proposals for the Fall, 2012 semester. The College Committee can offer you an award of $$1,995.00. Your account number is 5516140069.

Students awarded grants must receive signature approval on all payments, by their faculty sponsors. Faculty sponsors are ultimately responsible to oversee appropriate utilization of the award, as well as preparation of paperwork, such as, requisitions or travel claims.

INTERNATIONAL TRAVEL FOR BOTH FACULTY AND STUDENTS REQUIRES AN APPROVAL OF TRAVEL FORM, SUBMITTED TO THE DEAN'S OFFICE, NO LATER THAN 45 DAYS PRIOR TO THE BEGINNING OF YOUR TRIP. FAILURE TO DO THIS WILL RESULT IN LOSS OF GRANT MONEY FOR TRAVEL REIMBURSEMENT. You should have already done this when you applied for the grant. Make sure that you have a copy of the approval of travel, approved by the Provost and the President, at least 45 days prior to your trip.

NOTE: All funds must be expended by January 31, 2014. Any moneys not spent by this date automatically revert to the Dean's Office SJSU Research Foundation account to be made available to other faculty. Additionally, if you are paying a student assistant or other hourly worker with your grant moneys, you must factor benefits into your total expenditures. All workers paid with SJSU Research Foundation funds must sign up in the Foundation Human Resources Department. You must contact the SJSU Research Foundation Payroll office to obtain this information. ALSO, please note that if you overspend your award, you are personally responsible to repay the amount overspent. It is very important that you consult the University Foundation Office (Rick Yoneda, 924-1441) prior to expenditures that might involve gifts to others, or any type of payment to a consultant or other assistant, as there are specific foundation guidelines governing these types of payments. YOU MAY NOT pay someone out-of-pocket then be reimbursed. All such payments, if any, must be made via the Foundation; it cannot be a personal payment.

Also, you cannot give gift certificates/cards to survey participants (if applicable). This requirement is in place because such payments are potentially considered taxable income, and thus, the SJSU Research Foundation is required to maintain these records in case of audit.

Please note that all reimbursements from this account require original, itemized receipts and the completion of an SJSU Research Foundation requisition or travel claim. Please contact Vanetia Johnston, 924-5302 if you have any questions concerning how to apply for reimbursements.

A copy of your application may be retained on file in WSQ 103 as a guide to future applicants. Please accept my best wishes for the success of your work.

c: Chair, Department of Anthropology

SJSU Research Foundation

Summary of Account Status - Cumulative

Run Date: 12/11/2012
Account: 5516000009
Period: 12/01/2012 to 12/31/2012

Account Name: LEVENTHAL/STAREK - FALL 2012
Administrator: LEVENTHAL, ALAN

Account Open/End Date: 12/01/2012 - 01/30/2013

Deliver To: JOHNSTON, VANETIA 0107
Additional Signers: ENGLISH-LUECK, JAN
RAMIREZ, TERRI

Object Code	Description	Prior Rev/Exp	Current Rev/Exp	Cumulative Rev/Exp	Outstanding Commitments	Available Balance
19500	Other Interfund Transfers	0.00	1,995.00	1,995.00	0.00	1,995.00
Total Revenue		**0.00**	**1,995.00**	**1,995.00**	**0.00**	**1,995.00**
	Account Total	**0.00**	**1,995.00**	**1,995.00**	**0.00**	**1,995.00**

Transaction Detail

Run Date: 12/11/2012
Account: 5516000009
Period: 12/01/2012 to 12/31/2012

Account Name: LEVENTHAL/STAREK - FALL 2012
Administrator: LEVENTHAL, ALAN

Transaction Date	System	Ref	Ref 2	Description	Debit	Credit
Object Code:	**19500**		**Other Interfund Transfers**			
12/11/2012	JE	JE13C022		trsf fr 51-1600-0001	0.00	1,995.00
				Object Total	**0.00**	**1,995.00**
		19	Interfund Transfers		0.00	1,995.00

APPENDIX C

LETTER OF SUPPORT

MUWEKMA OHLONE TRIBAL LEADERSHIP

MUWEKMA OHLONE INDIAN TRIBE

OF THE San Francisco BAY AREA REGION

'Innu Huššištak Makiš Mak-Muwekma *"The Road To The Future For Our People"*

October 9, 2012

Dr. Charles Darrah, Chairman Anthropology Department

Dear Dr. Darrah,

A request for a letter of support came to our Tribe's attention from Anthropology graduate student Mr. Jerry Starek in consultation with Mr. Alan Leventhal to conduct AMS dating on small samples of human remains and obsidian artifacts that were excavated in 1986 by San Jose State University. Since that time it is my understanding that no analysis or a preliminary report was ever written summarizing the San Jose State University field school salvage excavations. Furthermore, it is my understanding that Mr. Starek intends to write up this ancestral heritage site as his Master's thesis.

As you may already know that the Muwekma Tribal leadership has supported many faculty, graduate and undergraduate student studies in the past, and at time we have worked hand-in-hand with the same on our ancestral burials and burial regalia.

Therefore, please allow this letter serve as a statement of full support in Mr. Starek's efforts to learn more about our ancestral site Ca-Scr-12 located in the City of Santa Cruz. Furthermore, he has the Tribe's permission to conduct radio carbon dating on sample of our ancestral remains, charcoal, and animal remains under the supervision of Mr. Alan Leventhal or the department's archaeologists. He also has our support for his proposed obsidian hydration studies.

Please note, that back in 1986 I was contacted by the Native American Heritage Commission about the excavations at this site and I supported the project back then.

Should you have any questions, please feel free to contact me or Tribal Administrator Ms. Norma Sanchez at rcambra@muwekma.org or nsanchez@muwekma.org.

Sincerely,

Rosemary Cambra, Chairwoman

Cc: Muwekma Tribal Council
Cultural Resources file Ca-Scr-12

P.O. Box 360791, Milpitas, California 95036

APPENDIX D

RESULTS FROM AMS DATING

BETA ANALYTIC RADIOCARBON DATING LABORATORY

Beta Analytic Inc.
4985 SW 74 Court
Miami, Florida 33155 USA
Tel: 305 667 5167
Fax: 305 663 0964
Beta@radiocarbon.com
www.radiocarbon.com

Consistent Accuracy . . .
. . . Delivered On-time

Darden Hood
President

Ronald Hatfield
Christopher Patrick
Deputy Directors

January 7, 2013

Mr. Alan Leventhal
San Jose State University
College of Social Sciences
Office of the Dean
San Jose, CA 95192
USA

RE: Radiocarbon Dating Results For Sample Burial # 1 CA-SCR-12

Dear Mr. Leventhal:

Enclosed are the radiocarbon dating results for three samples recently sent to us. They each provided plenty of carbon for accurate measurements and all the analyses proceeded normally. As usual, the method of analysis is listed on the report with the results and calibration data is provided where applicable.

As always, no students or intern researchers who would necessarily be distracted with other obligations and priorities were used in the analyses. We analyzed them with the combined attention of our entire professional staff.

If you have specific questions about the analyses, please contact us. We are always available to answer your questions.

Our invoice will be emailed separately. Please, forward it to the appropriate officer or send VISA charge authorization. Thank you. As always, if you have any questions or would like to discuss the results, don't hesitate to contact me.

Sincerely,

Darden Hood
Digital signature on file

BETA ANALYTIC INC.
DR. M.A. TAMERS and MR. D.G. HOOD
4985 S.W. 74 COURT
MIAMI, FLORIDA, USA 33155
PH: 305-667-5167 FAX:305-663-0964
beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

Mr. Alan Leventhal — Report Date: 1/7/2013

San Jose State University — Material Received: 12/18/2012

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 338323	3430 +/- 30 BP	-15.2 o/oo	3590 +/- 30 BP
SAMPLE : Burial # 1 CA-SCR-12		15N/14N= + 14.4 o/oo	

ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (bone collagen): collagen extraction: with alkali
2 SIGMA CALIBRATION : Cal BC 2030 to 1880 (Cal BP 3980 to 3830)

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-15.2:lab. mult=1)

Laboratory number: **Beta-338323**

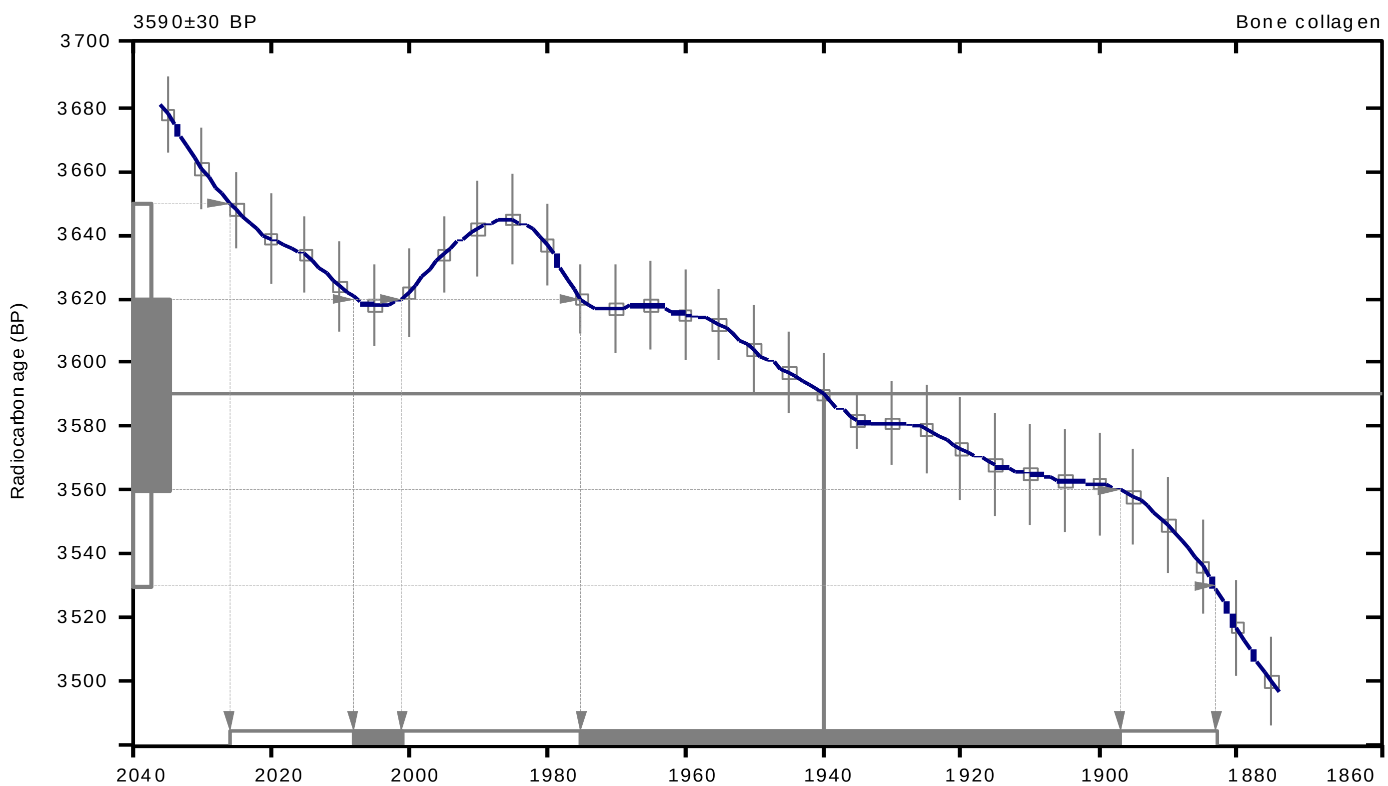
Conventional radiocarbon age: **3590±30 BP**

2 Sigma calibrated result: (95% probability) **Cal BC 2030 to 1880 (Cal BP 3980 to 3830)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal BC 1940 (Cal BP 3890)

1 Sigma calibrated results: (68% probability) Cal BC 2010 to 2000 (Cal BP 3960 to 3950) and Cal BC 1980 to 1900 (Cal BP 3920 to 3850)



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Darden Hood
President

Ronald Hatfield
Christopher Patrick
Deputy Directors

October 7, 2013

Mr. Alan Leventhal
San Jose State University
College of Social Sciences
Office of the Dean
San Jose, CA 95192
USA

RE: Radiocarbon Dating Result For Sample CA-SCR-12 Ref#59-11

Dear Mr. Leventhal:

Enclosed is the radiocarbon dating result for one sample recently sent to us. The sample provided plenty of carbon for accurate measurement and the analysis proceeded normally. As usual, the method of analysis is listed on the report with the results and calibration data is provided where applicable.

The web directory containing the table of all your results and PDF download also contains pictures including, most importantly the portion actually analyzed. These can be saved by opening them and right clicking. Also a cvs spreadsheet download option is available and a quality assurance report is posted for each set of results. This report contains expected versus measured values for 3-5 working standards analyzed simultaneously with your sample.

The reported result is accredited to ISO-17025 standards and the analysis was performed entirely here in our laboratories. Since Beta is not a teaching laboratory, only graduates trained in accordance with the strict protocols of the ISO-17025 program participated in the analyses. When interpreting the result, please consider any communications you may have had with us regarding the sample.

If you have specific questions about the analyses, please contact us. Your inquiries are always welcome.

Thank you for prepaying the analyses. As always, if you have any questions or would like to discuss the results, don't hesitate to contact me.

Sincerely,

Digital signature on file

BETA ANALYTIC INC.
DR. M.A. TAMERS and MR. D.G. HOOD
4985 S.W. 74 COURT
MIAMI, FLORIDA, USA 33155
PH: 305-667-5167 FAX:305-663-0964
beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

Mr. Alan Leventhal — Report Date: 10/7/2013

San Jose State University — Material Received: 5/17/2013

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 349175	2780 +/- 40 BP	-12.3 o/oo	2990 +/- 40 BP

SAMPLE : CA-SCR-12 Ref#59-11
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (bone collagen): collagen extraction: with alkali
2 SIGMA CALIBRATION : Cal BC 730 to 380 (Cal BP 2680 to 2330)

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-12.3:Delta-R=225±35:Glob res=-200 to 500:lab. mult=1)

Laboratory number: Beta-349175

Conventional radiocarbon age: 2990±40 BP

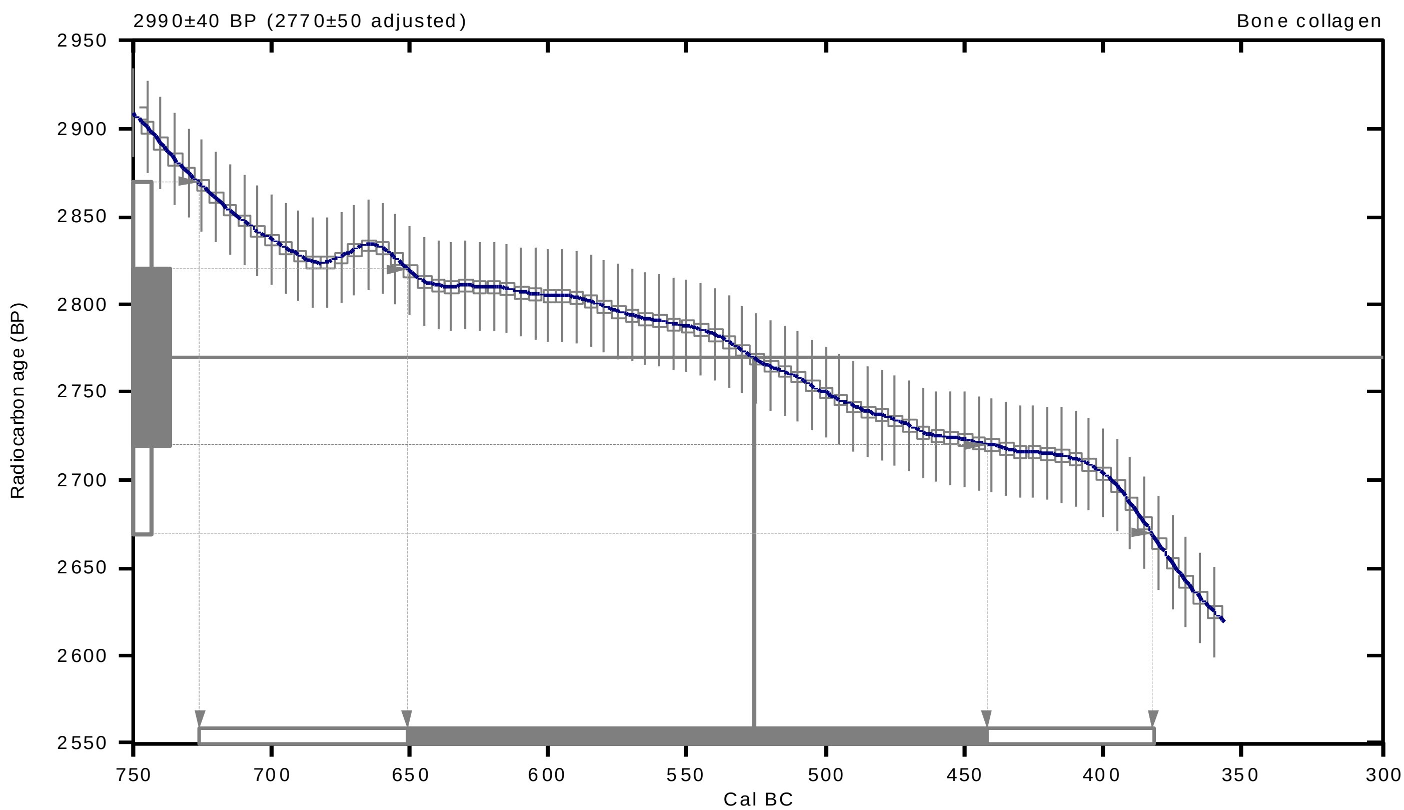
(2770±50 adjusted for local reservoir correction)

2 Sigma calibrated result: Cal BC 730 to 380 (Cal BP 2680 to 2330)
(95% probability)

Intercept data

Intercept of radiocarbon age with calibration curve: Cal BC 530 (Cal BP 2480)

1 Sigma calibrated result: Cal BC 650 to 440 (Cal BP 2600 to 2390)
(68% probability)



References:

Database used

MARINE09

References to INTCAL09 database

Heaton,et.al.,2009, Radiocarbon 51(4):1151-1164, Reimer,et.al, 2009, Radiocarbon 51(4):1111-1150, Stuiver,et.al,1993, Radiocarbon 35(1):137-189, Oeschger,et.al.,1975,Tellus 27:168-192

Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

Beta Analytic Radiocarbon Dating Laboratory

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REPORT OF RADIOCARBON DATING ANALYSES

Mr. Gerald Starek

Report Date: 2/26/2013

Material Received: 2/21/2013

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 343288	2330 +/- 30 BP	+0.8 o/oo	2750 +/- 30 BP

SAMPLE : CA-SCR-12
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (shell): acid etch
2 SIGMA CALIBRATION : Cal BC 360 to 120 (Cal BP 2310 to 2070)

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=0.8:Delta-R=225±35:Glob res=-200 to 500:lab. mult=1)

Laboratory number: Beta-343288

Conventional radiocarbon age: 2750±30 BP

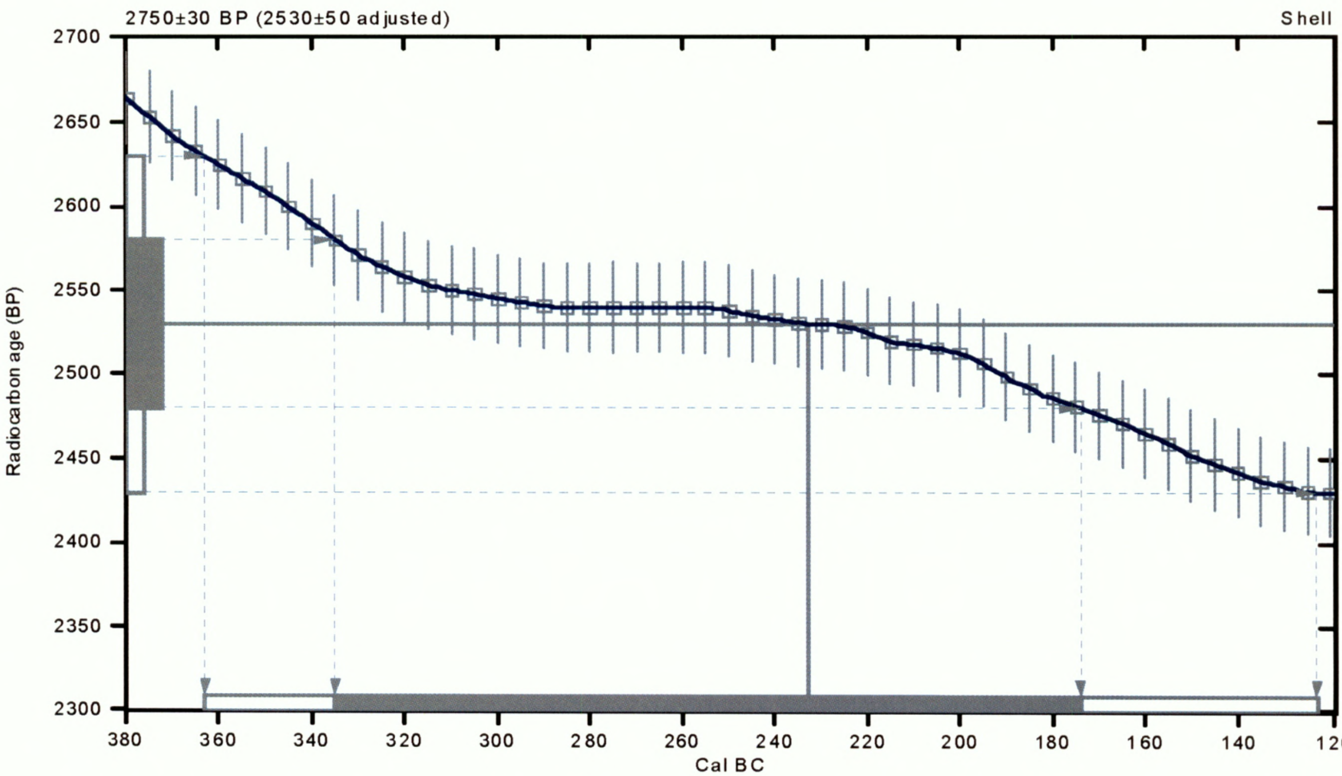
(2530±50 adjusted for local reservoir correction)

2 Sigma calibrated result: Cal BC 360 to 120 (Cal BP 2310 to 2070)
(95% probability)

Intercept data

Intercept of radiocarbon age with calibration curve: Cal BC 230 (Cal BP 2180)

1 Sigma calibrated result: Cal BC 340 to 170 (Cal BP 2280 to 2120)
(68% probability)



References:

Database used

MARINE09

References to INTCAL09 database

Heaton,et.al.,2009, Radiocarbon 51(4):1151-1164, Reimer,et.al, 2009, Radiocarbon 51(4):1111-1150, Stuiver,et.al,1993, Radiocarbon 35(1):1-244, Oeschger,et.al.,1975,Tellus 27:168-192

Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

Beta Analytic Radiocarbon Dating Laboratory

4985 S.W. 74th Court, Miami, Florida 33155 • Tel: (305)667-5167 • Fax: (305)663-0964 • E-Mail: beta@radiocarbon.com

Email communication: Tuesday, May 7, 2013 at 12:37 PM

Allan

We have completed the pretreatment of your sample CA-SCR-12 Ref# 67-10.

It yielded sufficient extracted collagen for dating, however when the C13/12 ratio was checked we noted that it was more depleted (more negative) than we would normally expect @ -21.4 o/oo

Typically the C13/12 ratio for most animals will range between -9 and -21 o/oo. C13/12 ratios more negative than -21 o/oo can indicate the presence of exogenous carbon compounds (like humic acids) that could not be removed by the pretreatments applied.

If exogenous carbon is present it may bias the age typically in a more recent direction by some unknown amount. There are other reasons that the C13/12 can be depleted, like high fat diets, starvation, disease, partial heating or cooking of the bone, or some combination of all, but as this is not typically known by the researcher, it is difficult to know if the dating should be recommended.

This particular bones collagen appears to be darkly stained and visually is not good looking. Because of the combination of all these factors I would not recommend the dating of this sample unless you can accept a result that may be biased to some extent in the more recent direction. Unfortunately there is no way to predict how much, if any, bias there might be...it could be very small or very large.

Let me know if you have any questions and if you would like us to cancel at this time or proceed with the dating. The cost to cancel at this point is $195

Sincerely,

Chris Patrick

Deputy Director / Technical Manager

Beta Analytic, Inc

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Miami, FL 33155 U.S.A.

Tel: (01) 305-667-5167 / Fax: (01) 305-663-0964

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APPENDIX E

RESULTS FROM OBSIDIAN SOURCING
GEOCHEMICAL RESEARCH LABORATORY

Geochemical Research Laboratory Letter Report 2013-3

Energy Dispersive X-ray Fluorescence Analysis of Obsidian Artifacts from CA-SCr-12, Santa Cruz, California

January 16, 2013

Mr. Gerald M. Starek
1461 West Hacienda Avenue
Campbell, CA 95008

Dear Mr. Starek:

This letter reports the results of energy dispersive x-ray fluorescence (edxrf) analysis of 86 artifacts from CA-SCr-12 located in Santa Cruz, California. This analysis was conducted pursuant to your letter request of January 9, 2013.

Analyses of obsidian are performed at my laboratory on a QuanX-EC™ (Thermo Electron Corporation) edxrf spectrometer equipped with a silver (Ag) x-ray tube, a 50 kV x-ray generator, digital pulse processor with automated energy calibration, and a Peltier cooled solid state detector with 145 eV resolution (FWHM) at 5.9 keV. The x-ray tube was operated at differing voltage and current settings to optimize excitation of the elements selected for analysis. In this case analyses were conducted for the elements rubidium (Rb Kα), strontium (Sr Kα), yttrium (Y Kα), zirconium (Zr Kα), niobium (Nb Kα) and iron vs. manganese (Fe Kα/Mn Kα) ratios. Analyses for barium (Ba Kα) were conducted as necessary. X-ray tube current was scaled automatically to the physical size of each specimen.

After x-ray spectra are acquired and elemental intensities extracted for each peak region of interest, matrix correction algorithms are applied to specific regions of the x-ray energy spectrum to compensate for inter-element absorption and enhancement effects. Following these corrections, intensities are converted to concentration estimates by employing a least-squares calibration line established for each element from analysis of up to 30 international rock standards certified by the U.S. Geological Survey, the U.S. National Institute of Standards and Technology, the Geological Survey of Japan, the Centre de Recherches Petrographiques et Geochimiques (France), and the South African Bureau of Standards. Further details pertaining to x-ray tube operating conditions and calibration appear in Hughes (1988, 1994).

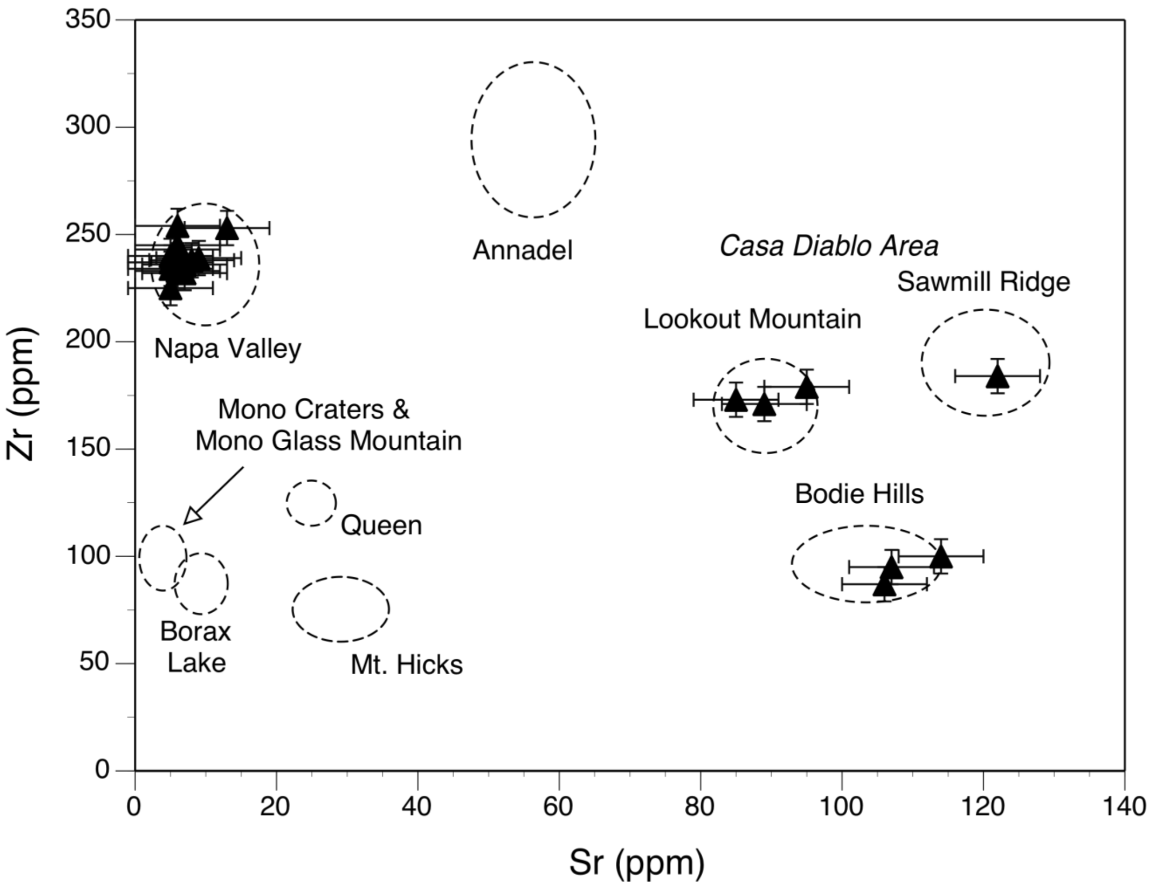
Trace element values (except Fe/Mn ratios) for the artifacts in Table 1 are expressed in quantitative units (i.e. parts per million [ppm] by weight), and these were compared directly to values for known obsidian sources that appear in Bowman et al. (1973), Hughes (1983, 1985, 1986, 1988, 1989, 1994), Jack (1976), Jackson (1986, 1989), and Stross (et al. 1976). Artifacts are assigned to a parent obsidian type if diagnostic trace element concentration values (i.e., ppm values for Rb, Sr, Y, Zr and, when necessary Ba, Ti, Mn and $Fe_2O_3^T$) corresponded at the 2-sigma level. Stated differently, artifact-to-obsidian source (geochemical type, *sensu* Hughes 1998) matches are considered reliable if diagnostic mean measurements for artifacts fell within 2 standard deviations of mean values for source standards. The term "diagnostic" is used here to specify those trace elements that are well measured by x-ray fluorescence, and whose concentrations show low intra-source variability and marked variability across sources (see Hughes 1993). Zn and Ga ppm concentrations are not considered "diagnostic" because they don't usually vary significantly across obsidian sources (see Hughes 1984).

The trace element composition measurements presented in Table 1 are reported to the nearest ppm to reflect the resolution capabilities of non-destructive edxrf spectrometry for quantitative analysis. The resolution limits of the present x-ray fluorescence instrument for the determination of Rb is about 4 ppm; for Sr about 3 ppm; Y about 3 ppm; Zr about 4 ppm; and Nb about 2 ppm (see Hughes [1994] for other elements). When counting and fitting error uncertainty estimates (the "±" value in the table) for a sample are greater than calibration-imposed limits of resolution, the larger number is a more conservative reflection of composition variation and measurement error arising from differences in sample size, surface and x-ray reflection geometry.

Twenty of the obsidian artifacts you submitted were large enough to generate reliable quantitative composition estimates. As Table 1 and Figure 1 show, 13 of these were manufactured from obsidian of the Napa Valley (*sensu* Jackson 1989: 89) chemical type, four were made from Casa Diablo area obsidians (Lookout Mountain, n=3; Sawmill Ridge, n= 1; cf. Hughes 1994), and three were fashioned from Bodie Hills volcanic glass (Jack 1976: Table 11.5).

Figure 1

Zr vs. Sr Composition of Obsidian Artifacts from CA-SCr-12

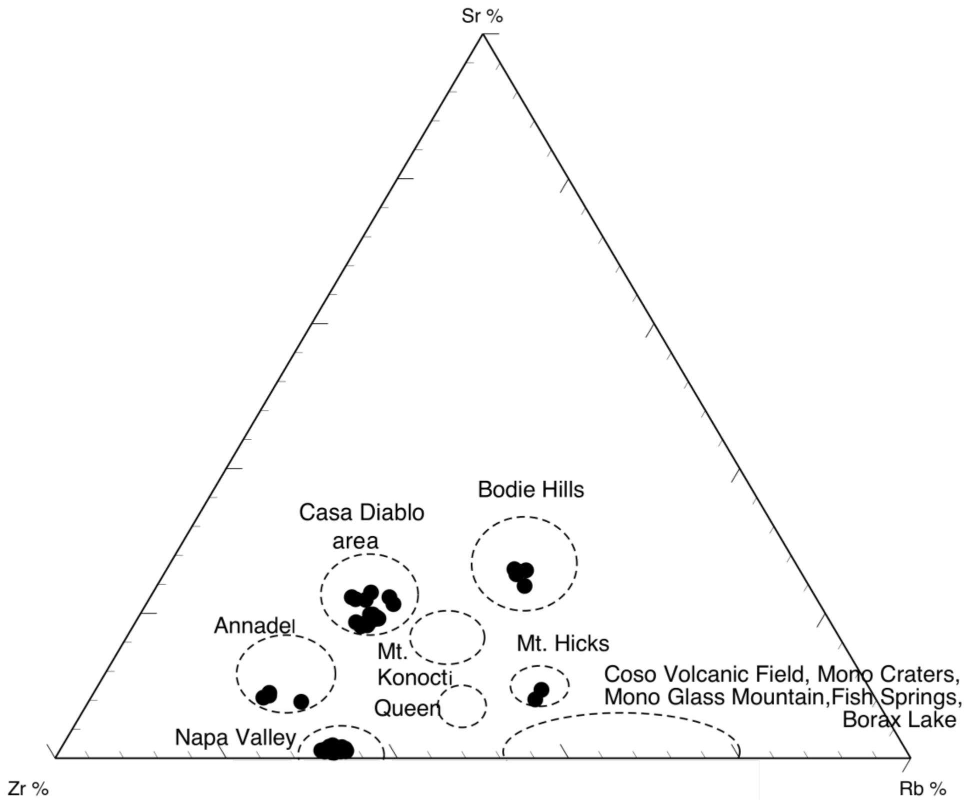


Dashed lines represent the range of variation measured in geologic obsidian source samples. Filled triangles plot artifacts listed in Table 1. Error bars are two-sigma (95% confidence interval) composition estimates for each specimen. The numbers of artifact plots do not correspond exactly to the tabulations in Table 1 because of convergence of data points at this scale.

I generally report trace element measurements in quantitative units (i.e. ppm) and make artifact-to-source attributions on the basis of correspondences in diagnostic trace element concentration values (e.g. those presented in Table 1), but 66 of the specimens you sent were too small and thin to generate x-ray counting statistics adequate for proper conversion from background-corrected intensities to quantitative concentration estimates (i.e., ppm). I analyzed both artifacts to generate integrated net count (intensity) data for the elements Rb, Sr, Y, Zr, Nb, Fe and Mn. After background subtraction, the intensities (counts per second) were converted to percentages. The counting data and derived ratios appear in Table 2, and the plotted values appear in Figure 2. Source assignments were made by comparing the plots for artifacts against the Rb/Sr/Zr parameters of known source types identified archaeologically in the Sacramento Valley and San Francisco Bay area (following Jackson 1974; 1989: Figure 3; Jack 1976: Figure 11.1a. 11.2a) and by comparison with geologic standards in my extensive in-house reference collection. Further discussion of this analysis technique, and potential problems with the use of ternary diagrams, appears in Hughes (1998, 2010).

Figure 2

Ternary Diagram Plots for Obsidian Artifacts from CA-SCr-12



Dashed lines represent range of variation in geologic obsidian source samples. Black dots plot SCr-12 artifacts reported in Table 2. The numbers of artifact plots do not correspond exactly to the tabulations in Table 2 because of convergence of data points at this scale. Non-obsidian sample no. 39-10 not plotted.

The Rb/Sr/Zr plots for the specimens in Table 2 (see Figure 2) effectively identify 41 artifacts as matching the profile of obsidians from the North Coast Ranges (Napa Valley, n= 37; Annadel, n= 4), while the remaining 24 were manufactured from obsidians erupted to the east in the Mono Basin/western Great Basin area (Casa Diablo area, n= 17; Bodie Hills, n= 5; Mt. Hicks, n= 2) chemical type. One artifact (no. 39-10) was made from a non-obsidian parent material.

In summary, combining quantitative analysis results (Table 1) with integrated net count rate data (Table 2), this research shows that 54 of the 85 obsidian artifacts analyzed from SCr-12 were manufactured from North Coast Ranges obsidian (Napa Valley, n= 50; Annadel, 4), and that the other 31 obsidian specimens were made from Mono Basin/western Great Basin volcanic glasses (Casa Diablo area, n= 21; Bodie Hills, n= 8; and Mt. Hicks, n= 2).

I hope you will find this information useful in your overall evaluation of the significance of this site. Please contact me (lab phone: [650] 851-1410; e-mail: rehughes@silcon.com; web site: www.geochemicalresearch.com) if I can provide any further assistance or information.

Sincerely,

Richard E. Hughes, Ph.D., RPA
Director, Geochemical Research Laboratory

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Table 1

Quantitative Composition Estimates for Obsidian Artifacts from CA-SCr-12

	Trace and Selected Minor Element Concentrations											Ratio	
Cat. Number	Zn	Ga	Rb	Sr	Y	Zr	Nb	Ba	Ti	Mn	$Fe_2O_3^T$	Fe/Mn	Obsidian Source (Chemical Type)
5-51	nm	nm	211 ±5	114 ±4	13 ±2	100 ±4	18 ±2	616 ±28	nm	nm	.80 ±.02	15	Bodie Hills
8-3	nm	nm	185 ±4	5 ±2	49 ±3	234 ±4	11 ±2	nm	nm	nm	nm	70	Napa Valley
14-1	nm	nm	200 ±5	7 ±2	52 ±3	232 ±5	11 ±2	nm	nm	nm	1.50 ±.02	79	Napa Valley
15-3	nm	nm	187 ±4	5 ±2	46 ±3	225 ±4	10 ±2	nm	nm	nm	nm	85	Napa Valley
16-11	nm	nm	149 ±4	89 ±3	17 ±2	171 ±4	14 ±2	997 ±40	nm	nm	1.40 ±.02	44	Lookout Mountain, Casa Diablo area
17-8	nm	nm	201 ±5	6 ±2	52 ±3	245 ±5	10 ±2	nm	nm	nm	1.49 ±.02	70	Napa Valley
17-22	nm	nm	200 ±5	6 ±2	51 ±3	243 ±5	11 ±2	nm	nm	nm	1.52 ±.02	71	Napa Valley
25-2	nm	nm	142 ±4	85 ±3	18 ±2	173 ±4	13 ±3	1015 ±34	nm	nm	nm	45	Lookout Mountain, Casa Diablo area
31-5	nm	nm	150 ±4	122 ±4	18 ±2	184 ±4	14 ±2	1137 ±37	nm	nm	1.46 ±.02	40	Sawmill Ridge, Casa Diablo area
39-31	nm	nm	220 ±4	13 ±2	53 ±3	253 ±4	10 ±3	446 ±34	nm	nm	nm	nm	Napa Valley
41-2	nm	nm	186 ±4	6 ±2	49 ±3	233 ±4	12 ±2	nm	nm	nm	nm	84	Napa Valley
47-1	nm	nm	152 ±4	95 ±3	18 ±2	179 ±4	15 ±3	1001 ±38	nm	nm	nm	42	Lookout Mountain, Casa Diablo area
61-1	nm	nm	196 ±4	5 ±2	52 ±3	237 ±4	9 ±2	nm	nm	nm	1.43 ±.02	81	Napa Valley
68-5	nm	nm	193 ±4	8 ±2	50 ±3	238 ±4	10 ±2	nm	nm	nm	1.47 ±.02	81	Napa Valley
74-16	nm	nm	197 ±5	9 ±2	49 ±3	239 ±5	12 ±2	nm	nm	nm	1.51 ±.02	89	Napa Valley
76-51	nm	nm	200 ±5	6 ±2	52 ±3	254 ±5	13 ±2	nm	nm	nm	1.39 ±.02	85	Napa Valley
77-20	nm	nm	194 ±5	107 ±4	13 ±2	95 ±4	18 ±2	560 ±28	nm	nm	.77 ±.02	16	Bodie Hills

Values in parts per million (ppm) except total iron (in weight percent) and Fe/Mn ratios; ± = two σ estimate (in ppm) of x-ray counting uncertainty and regression fitting error at 120-240 seconds livetime; nm = not measured; + = patinated.

Table 1

Quantitative Composition Estimates for Obsidian Artifacts from CA-SCr-12

Cat. Number	Zn	Ga	Rb	Sr	Y	Zr	Nb	Ba	Ti	Mn	$Fe_2O_3^T$	Ratio Fe/Mn	Obsidian Source (Chemical Type)
			Trace and Selected Minor Element Concentrations										
85-4	nm	nm	196 ±4	5 ±2	50 ±3	240 ±4	10 ±2	nm	nm	nm	1.44 ±.02	72	Napa Valley
100-2	nm	nm	184 ±4	7 ±2	50 ±3	236 ±5	12 ±2	nm	nm	nm	1.38 ±.02	76	Napa Valley
100-16	nm	nm	185 ±5	106 ±4	14 ±2	87 ±4	16 ±2	590 ±30	nm	nm	.75 ±.02	16	Bodie Hills
U.S. Geological Survey Reference Standard													
RGM-1 (measured)	nm	nm	150 ±4	109 ±3	27 ±3	217 ±4	10 ±3	813 ±28	nm	nm	1.86 ±.02	65	Glass Mtn., CA
RGM-1 (recommended)	nm	nm	150 ±8	110 ±10	25	220 ±20	9 ±1	810 ±46	1617 ±120	279 ±31	1.86 ±.03	nr	Glass Mtn., CA

Values in parts per million (ppm) except total iron (in weight percent) and Fe/Mn ratios; ± = two σ estimate (in ppm) of x-ray counting uncertainty and regression fitting error at 120-240 seconds livetime; nm = not measured; $^+$ = patinated.

Table 2

Integrated Net Intensity Element Data for Obsidian Artifacts from CA-SCr-12

	Element Intensities				Intensity Ratios									
Cat. no.	Rb	Sr	Zr	Σ Rb,Sr,Zr	Rb%	Sr%	Zr%	Fe/Mn	Rb/Sr	Zr/Y	Y/Nb	Zr/Nb	Sr/Y	Obsidian Source (Chemical Type)
4-2	410	10	862	1282	.320	.008	.672	78.4	41.0	6.8	3.6	24.6	.1	Napa Valley
5-27	443	273	359	1075	.412	.254	.334	14.6	1.6	10.6	.5	5.5	8.0	Bodie Hills
5-28	386	16	841	1243	.311	.013	.677	74.9	24.1	6.4	3.5	22.1	.1	Napa Valley
5-50	289	127	992	1408	.205	.090	.705	62.7	2.3	7.1	3.4	24.2	.9	Annadel
6-4	437	14	899	1350	.324	.010	.666	77.5	31.2	6.6	3.6	23.7	.1	Napa Valley
8-6	441	15	929	1385	.318	.011	.671	84.2	29.4	6.6	3.5	23.2	.1	Napa Valley
8-28	418	17	883	1318	.317	.013	.670	70.0	24.6	6.4	3.1	19.6	.1	Napa Valley
12-6	353	14	696	1063	.332	.013	.655	81.2	25.2	6.4	3.1	19.9	.1	Napa Valley
12-30	385	17	785	1187	.324	.014	.661	90.4	22.7	6.7	3.0	19.6	.1	Napa Valley
13-34	387	12	840	1239	.312	.010	.678	86.5	32.3	6.7	3.5	23.3	.1	Napa Valley
14-4	266	182	545	993	.268	.183	.549	42.2	1.5	10.9	1.2	12.7	3.6	Casa Diablo area
15-11	510	14	998	1522	.335	.009	.656	87.4	36.4	6.4	3.0	19.6	.1	Napa Valley
18-2	420	12	920	1352	.311	.009	.681	73.0	35.0	6.8	4.2	28.8	.1	Napa Valley
18-50	427	15	955	1397	.306	.011	.684	86.8	28.5	6.8	4.3	28.9	.1	Napa Valley
19-4	434	15	908	1357	.320	.011	.669	75.3	28.9	6.9	3.2	22.2	.1	Napa Valley
21-29	279	191	521	991	.282	.193	.526	46.1	1.5	12.7	1.1	13.7	4.7	Casa Diablo area
21-35	466	293	375	1134	.411	.258	.331	14.7	1.6	12.9	.5	6.0	10.1	Bodie Hills
21-36	446	16	925	1387	.322	.012	.667	83.9	27.9	6.8	3.1	21.0	.1	Napa Valley
23-4	407	19	860	1286	.317	.015	.669	71.9	21.4	6.3	4.5	28.7	.1	Napa Valley
23-50	452	20	934	1406	.322	.014	.664	76.2	22.6	6.5	3.3	21.2	.1	Napa Valley
26-4	463	18	911	1392	.333	.013	.655	90.4	25.7	6.8	3.0	20.2	.1	Napa Valley
26-50	456	18	938	1412	.323	.013	.664	75.8	25.3	6.6	3.4	22.3	.1	Napa Valley
26-51	366	57	280	703	.521	.081	.398	14.5	6.4	5.8	.6	3.5	1.2	Mt. Hicks
27-4	449	15	938	1402	.320	.011	.669	88.2	29.9	6.4	4.4	28.4	.1	Napa Valley
28-24	405	298	698	1401	.289	.213	.498	46.3	1.4	17.5	.8	14.0	7.5	Casa Diablo area
30-2	373	335	756	1476	.255	.229	.516	41.8	1.1	14.3	1.1	16.1	6.3	Casa Diablo area
30-50a	428	21	890	1339	.320	.016	.665	80.7	20.4	6.4	3.5	22.3	.2	Napa Valley
30-50b	299	125	1021	1445	.207	.087	.707	60.4	2.4	6.9	3.5	24.3	.9	Annadel
33-2	433	17	920	1370	.316	.012	.672	89.7	25.5	6.2	3.2	19.6	.1	Napa Valley
33-21	229	216	527	972	.236	.222	.542	43.7	1.1	17.0	.8	12.9	7.0	Casa Diablo area
37-2	435	16	894	1345	.323	.012	.665	75.3	27.2	6.4	3.5	22.4	.1	Napa Valley
38-3	471	22	945	1438	.328	.015	.657	83.7	21.4	6.7	2.9	19.7	.2	Napa Valley
38-26	344	254	682	1280	.269	.198	.533	40.5	1.4	13.1	1.0	12.3	4.9	Casa Diablo area
39-10	7	135	33	175	.040	.771	.189	8.5	.1	nc	0	4.7	nc	Not Obsidian
39-31	424	24	896	1344	.316	.018	.667	70.1	17.7	6.6	3.1	20.4	.2	Napa Valley
39-32	451	18	922	1391	.324	.013	.663	70.4	25.1	6.4	3.1	19.6	.1	Napa Valley
46-3	437	12	878	1327	.329	.009	.662	81.5	36.4	6.8	3.0	20.4	.1	Napa Valley
47-3	304	208	629	1141	.266	.182	.551	42.6	1.5	13.1	.9	12.3	4.3	Casa Diablo area
47-26	427	12	895	1334	.320	.009	.671	76.1	35.6	7.0	2.5	17.6	.1	Napa Valley
48-2	475	305	389	1169	.406	.261	.333	14.9	1.6	10.8	.5	5.8	8.5	Bodie Hills
51-3	362	312	753	1427	.254	.219	.528	43.4	1.2	14.8	.8	11.8	6.1	Casa Diablo area
53-2	370	259	701	1330	.278	.195	.527	46.6	1.4	14.6	.9	12.5	5.4	Casa Diablo area
53-100	413	15	916	1344	.307	.011	.682	69.7	27.5	6.7	3.0	20.8	.1	Napa Valley
57-5	381	69	281	731	.521	.094	.384	15.8	5.5	6.5	.5	3.6	1.6	Mt. Hicks
61-5	275	250	614	1139	.241	.220	.539	45.8	1.1	12.5	.9	11.4	5.1	Casa Diablo area
61-50	459	283	349	1091	.421	.259	.320	15.5	1.6	10.0	.6	5.9	8.1	Bodie Hills
62-3	409	16	853	1278	.320	.013	.667	85.3	25.6	6.1	3.2	19.8	.1	Napa Valley
64-4	287	119	1018	1424	.202	.084	.715	63.0	2.4	7.1	3.8	26.8	.8	Annadel
64-26	459	254	355	1068	.430	.238	.332	14.9	1.8	9.3	.7	6.3	6.7	Bodie Hills
66-4	462	15	939	1416	.326	.011	.663	72.7	30.8	6.4	3.6	22.9	.1	Napa Valley
66-14	389	20	836	1245	.312	.016	.672	72.1	19.5	6.2	3.4	21.4	.2	Napa Valley
66-37	354	245	676	1277	.277	.192	.531	45.7	1.5	13.6	1.1	15.1	4.9	Casa Diablo area
71-9	393	123	1064	1580	.349	.078	.673	60.1	3.2	7.1	4.3	30.4	.8	Annadel
72-3	381	13	806	1200	.318	.011	.672	84.0	29.3	6.5	3.4	22.4	.1	Napa Valley
76-18	414	16	871	1301	.318	.012	.670	91.3	25.9	6.2	4.2	26.4	.1	Napa Valley
76-50	449	14	946	1409	.319	.010	.671	91.6	32.1	6.4	3.1	20.1	.1	Napa Valley
81-1	327	222	648	1197	.273	.186	.541	44.3	1.5	13.5	.9	12.2	4.6	Casa Diablo area

Table 2 (continued)

Integrated Net Intensity Element Data for Obsidian Artifacts from CA-SCr-12

	Element Intensities				Intensity Ratios									
Cat. no.	Rb	Sr	Zr	Σ Rb,Sr,Zr	Rb%	Sr%	Zr%	Fe/Mn	Rb/Sr	Zr/Y	Y/Nb	Zr/Nb	Sr/Y	Obsidian Source (Chemical Type)
83-3	265	193	570	1028	.258	.188	.555	42.0	1.4	13.6	.8	11.2	4.6	Casa Diablo area
85-15	293	207	615	1115	.263	.186	.552	46.1	1.4	11.6	1.0	11.6	3.9	Casa Diablo area
85-16	359	262	699	1320	.272	.199	.530	42.1	1.4	12.9	1.1	13.7	4.9	Casa Diablo area
85-17	312	248	556	1116	.280	.222	.498	43.2	1.3	14.6	.9	13.6	6.5	Casa Diablo area
85-18	456	14	911	1381	.330	.010	.660	76.5	32.6	6.1	3.4	20.7	.1	Napa Valley
100-1	487	15	951	1453	.335	.010	.655	90.2	32.5	6.4	3.4	21.6	.1	Napa Valley
100-14	432	17	901	1350	.320	.013	.667	77.7	25.4	6.6	3.3	22.0	.1	Napa Valley
100-15	320	215	637	1172	.273	.183	.544	44.5	1.5	13.6	1.0	13.9	4.6	Casa Diablo area
103-1	431	10	896	1337	.322	.008	.670	79.1	43.1	6.4	4.3	27.2	.1	Napa Valley

Elemental intensities (counts/second above background) generated at 30-60 seconds livetime. * = patinated. nc= not computed.

APPENDIX F

RESULTS FROM OBSIDIAN HYDRATION STUDY

SJSU OBSIDIAN LABORATORY AND ORIGER OBSIDIAN LABORATORY

August 20, 2013

Mr. Jerry Starek
Graduate Student
Department of Anthropology
San Jose State University

RE: Obsidian Hydration Results: (Job Number: SJSUOL-13-001)

Dear Jerry:

Thank you for trusting your obsidian samples to the San Jose State University Obsidian Laboratory (SJSUOL). This letter summarizes laboratory analysis for twenty-four (24) specimens from site CA-SCA-12 in the City of Santa Cruz, CA.

Methods

Laboratory technicians visually survey each specimen to identify two or more surfaces that will likely yield hydration results. Two parallel cuts are required to remove a thin section from the selected location on each specimen with a four-inch diameter circular saw blade mounded on a lapidary saw. The raw thin sections are about one millimeter thick when removed and are mounted on a standard microscope slide with Lakeside Cement.

The mounted sections are then manually ground in two stages using #600 silicon carbide abrasive on plate glass. Grinding is complete when the sample is about 0.003 inches thick, or when light passes readily through the thin section. A glass slide cover is permanently mounted over the thin section.

Technicians measure the hydration band using a 40X objective and a 12.5X eyepiece mounted on an Olympus BH-2 polarizing microscope. Ideally, six measurements are obtained from various locations along the cross-sectional margin of each sample. The measurements are averaged to yield the mean values reported on the attached data sheet. Due to normal limitation of the equipment, an error of +/-0.2 microns is acknowledged for the reported data. The measurements reported here were done at SJSUOL and verified by Tom Origer at the Origer Obsidian Laboratory (OOL) in Santa Rosa, CA.

Of the twenty-four pieces of obsidian examined, fifteen yielded hydration readings. See the "comments" area of the data sheet for specific information on individual specimens including the conversion of the mean hydration value to an estimated Years Before Present (YBP). The estimated age is the result of using the equation YBP = kx^2 (Friedman & Smith, 1960), where the constant (k) is 153.4 for Napa obsidian (Origer, 1987), and the hydration measurement (x) is corrected for Effective Hydration Temperature (EHT) (Basgall, 1990) in the Santa Cruz area and the difference in hydration rate by source. The estimated date is appropriately used as a rough estimate of the time since the surface of a particular specimen was last exposed to the atmosphere rather than a precise indicator of age.

While most of the specimens in your assemblage were debitage flakes, four were clearly fragments of formed tools. In order to mitigate the destructive effects of the obsidian hydration procedure on the potential diagnostic value of these artifacts, they were drawn in detail by Phil Schmidt, a noted scientific illustrator, prior to being cut in the laboratory. The drawings are attached to this report letter.

Sincerely,

John Schlagheck, M.A., RPA
Hydration Technician
SJSUOL

Works Cited

Basgall, M. E. (1990). Hydration Dating of Coso Obsidian: Problems and Prospects. *Presented at the 1990 SCA Annual Meeting.* Foster City.

Friedman, I., & Smith, R. L. (1960). A New Dating Method Using Obsidian: Part I-The Devleopment of the Method. *American Antiquity, 25*(4), 476-493.

Origer, T. M. (1987). Temporal Control in the Southern North Coast Ranges of California: The Application of Obsidian Hydration Analysis. *Papers in Northern California Anthropology, 1*.

San Jose State University Obsidian Laboratory (SJSUOL) Data Sheet

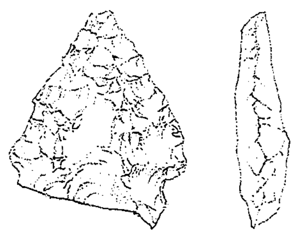
Client ID Number	Catalogue Number (SJSUOL-13-001-)	Description of Specimen	Mass (g)	Illustrated	Mean Hydration Value (Microns)	Comments
5-51	1	Flake	0.71		3.5	Source: Bodie Hills Estimated YBP: 2100
8-3	2	Point Fragment	2.20	Yes	4.7	Source: Napa Estimated YBP: 3835
14.1	3	Point Fragment	2.67	yes	NA	Source: Napa
15-3	4	Point Fragment	0.86		3.5	Source: Napa Estimated YBP: 2100
16-11	5	Point Fragment	0.35		3.0	Source: Casa Diablo Estimated YBP: 1037
17-8	6	Flake	0.36		NA	Source: Napa
17-22	7	Impact Fracture Flake	0.54		2.4	Source: Napa Estimated YBP: 959

Client ID Number	Catalogue Number (SJSUOL-13-001-)	Description of Specimen	Mass (g)	Illustrated	Mean Hydration Value (Microns)	Comments
25-2	8	Point Fragment	3.67	Yes	NA	Source: Casa Diablo Variable width/weathered surface
31-5	9	Shatter	0.39		3.7	Source: Casa Diablo Estimated YBP: 1773
39-31	10	Point Fragment	0.36		3.7	Source: Napa Estimated YBP: 2333
100-16	20	Point Fragment	2.48	Yes	3.3	Source: Bodie Hills Estimated YBP: 1829
5-27	22	Flake	0.18		NA	Source: Bodie Hills Diffuse Hydration
5-50	24	Flake	0.11		2.1	Source: Annadel Estimated YBP: 1203
14-4	31	Flake	0.16		NA	Source: Casa Diablo Thin Section too thin/Lab error
21-29	36	Flake	0.08		NA	Source: Casa Diablo Lab error

Client ID Number	Catalogue Number (SJSUOL-13-001-)	Description of Specimen	Mass (g)	Illustrated	Mean Hydration Value (Microns)	Comments
26-51	43	Flake	0.11		3.9	Source: Mt. Hicks Estimated YBP: 1879
30-2	46	Flake	0.20		3.7	Source: Casa Diablo Estimated YBP: 1773
33-21	50	Flake	0.14		2.7	Source: Casa Diablo Estimated YBP: 884
48-2	59	Flake	0.08		4.0	Source: Bodie Hills Estimated YBP: 2706
57-5	63	Flake	0.09		4.7	Source: Mt. Hicks Estimated YBP: 2836
61-50	65	Flake	0.13		NA	Source: Bodie Hills Lab error/too thin
64-4	67	Flake	0.21		2.3	Source: Annadel Estimated YBP: 1571
64-26	68	Flake	0.11		NA	Source: Bodie Hills Lab error

Client ID Number	Catalogue Number (SJSUOL-13-001-)	Description of Specimen	Mass (g)	Illustrated	Mean Hydration Value (Microns)	Comments
71-9	72	Flake	0.16		NA	Source: Annadel Lab error

Client: Jerry Starek
SJSU Lab Job Number: S-13-001



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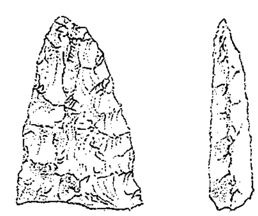
Ref. # 47-1



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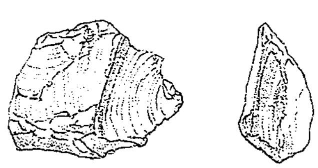

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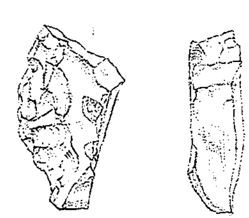


Ref. # 14-1

Illustrations by Phil Schmidt

APPENDIX G

RESULTS FROM SHELL ANALYSIS

MUSEUM SERVICES LABORATORY

Identification of Shell Material

From CA-SCR-12
Santa Cruz County, California

Prepared by

Frank A. Perry
Research Associate, Santa Cruz Museum of Natural History

February 9, 2013

Background and Procedure

This report was prepared at the request of Mr. Gerald Starek of San Jose State University for his study of CA-SCR-12, a Native American archaeological site in Santa Cruz County, California. Most of the material had already been washed and had been bagged by reference number. There were 11 units (Unit 1, Trench Unit 1, Unit 2, Trench Unit 2, Unit 3, Trench Unit 3, Unit 3A, Unit 3B, Unit 4, Trench Unit 4, and Unit 5). Most were sampled in 10 cm intervals down to a depth of 90 cm.

I examined the contents of each bag, made a list of the taxa, and placed examples of each in separate bags with my identifications. Most of the shells were fragmentary and most were from mollusks. Emphasis was placed on the identification of larger (greater than 30 mm) pieces. However, smaller specimens were also recorded if they represented species not present in the larger fraction. Thirty-six taxa were discovered. At the request of Mr. Starek, some qualitative observations were made of the relative abundance of the principal taxa.

In the majority of cases, each reference number referred to a particular unit and depth, although in some cases multiple reference numbers applied to the same unit and depth. Because the catalog for the excavation was lost, it is unclear why some depths for certain units have more than one reference number (Starek, personal communication, 2013). For statistical purposes (see Distributional Trends, page 8), data from these duplications were combined and the depth intervals for each unit designated "samples." There were 82 samples from the 11 units.

List of Taxa

The following is a list of taxa, with the scientific and common name of each.

Molluca, Bivalvia:

- *Clinocardium nuttallii.* Basket Cockle
- *Crasadoma gigantea*. Giant Rock Scallop
- *Macoma nasuta*. Bent-Nose Macoma
- *Mactromeris catilliformis*. Dish Surfclam
- *Mytilus californianus.* California Mussel
- *Petricola carditoides*. Nestling Clam
- *Platyodon cancellatus.* Boring Softshell Clam

- *Protothaca staminea*. Common Pacific Littleneck
- *Saxidomus nuttalli.* California Butterclam
- *Tresus nuttalli.* Pacific Gaper Clam
- Zirfaea pilsbryi. Rough Piddock

Mollusca, Gastropoda
- *Acanthina spirata.* Angular Unicorn
- *Acmaea mitra*. White-Cap Limpet
- *Collisella digitalis.* Ribbed Limpet
- *Collisella pelta.* Shield Limpet
- *Collisella scabra.* Rough Limpet
- *Crepidula adunca.* Hooked Slipper Shell
- *Haliotis rufescens.* Red Abalone
- *Helix aspersa*. European Land Snail
- *Homalopoma luridum*.
- *Lottia gigantea.* Owl Limpet.
- *Notoacmaea scutum.* Plate Limpet
- *Nucella canaliculata.* Channeled Dogwinkle
- *Nucella emarginata.* Emarginate Dogwinkle
- *Ocenebra lurida.* Lurid Rock Snail
- *Olivella biplicata.* Purple Dwarf Olive
- *Tegula brunnea.* Brown Turban Snail
- *Tegula funebralis.* Black Turban Snail
- Unidentified land snail

Mollusca, Polyplacophora
- *Cryptochiton stelleri*. Gumboot Chiton
- unidentified chitons

Arthropoda, Crustacea
- *Semibalanus sp.?* Barnacle
- *Balanus sp.?* Barnacle
- *Coronula diadma.* Whale Barnacle
- *Cancer antennarius*. Rock Crab

- Unidentified shell

Condition of Material

Nearly all of the shell material is fragmentary. Only occasional intact gastropods and complete clam valves were observed, some of which were photographed for this report. Even small gastropods, such as *Tegula*, were cracked open by people to get the meat inside. In a few cases, shell fragments had rounded edges. Presumably these were beach-worn pieces of shell brought to the site incidentally with other shellfish.

Most of the shells have a chalky appearance and feel. This is typical of shell that has been buried in soil for a number of years and has started to dissolve. Some, however, preserve traces of the original coloration. The Black Turban Snail and Brown Turban Snail could sometimes be distinguished by slight differences in color. Mussel shells are usually dark gray unlike most of the other shell material, which is white.

Discussion of Species

Molluca, Bivalvia:

• *Clinocardium nuttallii.* Nuttall Cockle. This clam has been reported intertidally from Elkhorn Slough (Caffrey et al., 2002) and lives offshore in northern Monterey Bay (personal observation). Empty shells commonly wash up on Santa Cruz area beaches. It is reportedly good eating (Fitch, 1953). Only a few fragments of shells were found. Note that the species name is officially spelled with a double i while others have one.

• *Crasadoma gigantea*. Giant Rock Scallop. This species ranges from the intertidal to 80m (Coan et al., 2000). It is "highly prized as food" (Haderlie and Abbott, 1980A). The young scallops are free swimming, but as adults live attached to rocks (Haderlie and Abbott, 1980A). Empty shells wash up on Santa Cruz area beaches near rocky areas (personal observation). Only two shell fragments were found among the samples. It is also known as the Purple-Hinged Scallop and is listed in older literature as *Hinnites giganteus* or *Hinnites multirugosus*.

• *Macoma nasuta*. Bent-Nose Macoma. This species is common in exposed to sheltered areas from the intertidal to 50 m (Coan et al., 2000). In northern Monterey Bay, it apparently lives just offshore, as the empty shells commonly wash up on beaches (personal observation). The animal burrows into mud, sand, and gravel to a depth of 10 to 20 cm (Haderlie and Abbott, 1980A). Fitch (1953) reported it to have excellent flavor but stated it is difficult to clean. Only 3 specimens were recovered (all broken) from 3 samples.

Mactromeris catilliformis
(shell fragment showing hinge)

• *Mactromeris catilliformis*. Dish Surfclam. This is a subtidal species, living at water depths of 5 to 20 meters and burrowing into the sand or mud of the bottom (Coan et al., 2000). Although it would not usually be accessible to the Native Peoples of this region, unusually large storm waves can wash the clams up onto the beach while still alive. The author observed this in late January, 1981, at Rio Del Mar Beach, east of Santa Cruz, when thousands of these clams were cast onto the beach by large waves.

Mytilus californianus
(shell fragments)

• *Mytilus californianus.* California Mussel. These shells are dark blue and white in life with a rough exterior and radiating ribs. The species lives intertidally along exposed rocky shores and to a depth of 100 m (Coan et al., 2000). Dense beds of mussels occur along rocky parts of the Santa Cruz County coast, including along West Cliff Drive (personal observation).

Even small fragments show radiating ribs, which distinguishes them from smooth shells of the Bay Mussel, *Mytilus trossulus*. Both have been reported from middens near Elkhorn Slough (Caffrey et al., 2002).

Mussels are quite edible and can be taken today with a fishing license. The meat is rich in vitamins (Fitch, 1953). In the summer months mussels may feed on a type of plankton that makes the meat dangerously toxic to humans (Ricketts et al., 1985).

This species was found in more samples than any other (72 of the 82 samples).

• *Platyodon cancellatus.* Boring Softshell Clam. This species ranges from the low intertidal to 20m (Coan et al., 2000). It bores into soft sandstone and mudstone and is common along Santa Cruz rocky shores (personal observation). Fitch (1953) says, “It is of fine flavor and excellent in chowder.”

Protothaca staminea

• *Protothaca staminea*. Common Pacific Littleneck. This species lives in the middle to low intertidal zones in the sand and gravel of tidepools and under rocks (personal observation). It is commonly taken by clam diggers in the Opal Cliffs area near Capitola (personal observation) and has a fine flavor (Fitch, 1953). This species was found in 70 of the 82 samples (second only to *Mytilus*).

Petricola carditoides

• *Petricola carditoides*. Nestling Clam. Depth range: intertidal to 46 m (Coan et al., 2000). This species does not bore into rocks, but instead nestles in the empty holes of boring clams. Found in 7 samples.

Saxidomus nuttalli

• *Saxidomus nuttalli.* California Butterclam. This species inhabits the mud or sand of bays and lagoons at a water depth of intertidal to 10 m (Coan et al., 2000). It lives today in Elkhorn Slough and in protected parts of northern Monterey Bay. Empty shells commonly wash up on the beach near Capitola (personal observations). Fitch (1953) reported it to be “highly esteemed for food.” Older literature commonly uses the name “Washington Clam.”

• *Tresus nuttalli.* Pacific Gaper Clam. This is a large, deep burrowing species of the low intertidal and subtidal. It can burrow to depths of 1 meter or more in sandy mud (Haderlie and Abbott, 1980A) and is common in Elkhorn Slough (personal observation). Smaller specimens are sometimes found burrowing in the sand of tidepools at Opal Cliffs (personal observation). Only a few shell fragments were found (in 9 samples), mostly from small individuals.

Zirfaea pilsbryi
(shell fragment)

• Zirfaea pilsbryi. Rough Piddock. In the Santa Cruz area, this species is common boring into soft sandstone and soft mudstone of the low intertidal (personal observation). It can bore as much as 50 cm into the rock (Haderlie and Abbott, 1980A). Fitch (1953) listed it among edible bivalves. It was found in 2 samples.

Mollusca, Gastropoda

Acanthina spirata

• *Acanthina spirata.* Angular Unicorn. This small, carnivorous snail occurs on rocks in the middle and high tide zones (Abbott and Haderlie, 1980). It was found in 11 samples. Some of the shells are broken, suggesting that it was used as a food source despite its small size. The distinct spiral cords and shoulder ridge distinguish it from the closely-related Acanthina punctulata.

• *Acmaea mitra*. White-Cap Limpet. One specimen found. This limpet lives in the low intertidal and subtidal (Lindberg, 1981). Its high profile and white color make it distinctive.

• *Collisella digitalis.* Ribbed Limpet. Several specimens are definitely this species, which is common on rocks of the upper intertidal and splash zones. The apex is very close to the anterior end, which helps distinguish it from other limpet species.

• *Collisella pelta.* Shield Limpet. A very common limpet attached to rocks of the middle and low intertidal zones (Lindberg, 1981). It is highly variable, making identification in middens difficult. Several specimens, however, were found that match the profile and external sculpture of this species.

• *Collisella scabra.* Rough Limpet. This species lives on rocks of the upper intertidal and splash zones (Lindberg, 1981). It is easily identified by its coarse, radiating ribs.

• *Crepidula adunca.* Hooked Slipper Shell. This small slipper shell (to 25 mm) lives attached to the shells of intertidal snails such as *Tegula funebralis* (Abbott and Haderlie, 1980). It may have been brought to the site incidentally

Collisella scabra

while attached to the snails (which were broken and eaten).

Haliotis rufescens
(shell fragment)

• *Haliotis rufescens.* Red Abalone. On rocks in the low intertidal (uncommon) and subtidal to a depth of 180 m (Abbott and Haderlie, 1980). Only three shell fragments were found.

• *Helix aspersa*. European Land Snail. This species was introduced to California by Europeans (Hanna, 1966) and therefore would not have been consumed by people here prior to European settlement. Rodent activity could account for the fact that the one shell was found at a depth of 20-30 cm (Unit 2).

• *Homalopoma luridum*. This small, usually reddish, snail is common today in tidepools of the Monterey Peninsula but is very rare in the Santa Cruz area (personal observation). One specimen was recovered from Trench Unit 3 (20-30 cm).

• *Lottia gigantea.* Owl Limpet. This limpet lives on surf-swept rocks of the open shore. It is low in profile with a distinctive interior color pattern said to resemble an owl. The interior is smooth while the exterior is commonly rough and eroded. This is a large species, reaching 100 mm in length (Lindberg, 1981). It is considered quite edible, and there was even a commercial harvest in California for a short time in the early 1900s (Abbott and Haderlie, 1980). *Lottia* is still common along the Santa Cruz County coast (personal observation). Only parts of two shells were found.

• *Notoacmaea scutum.* Plate Limpet. One specimen of this species was found.

Nucella emarginata

• *Nucella emarginata.* Emarginate Dogwinkle. This snail lives on rocks and among mussels and barnacles in the middle and high intertidal zones (Abbott and Haderlie, 1980).

• *Nucella canaliculata.* Channeled Dogwinkle. Common on rocks and in mussel beds of the middle intertidal zone (Abbott and Haderlie, 1980). This species is characteristic of mussel beds and could have been brought in accidentally with mussels, especially small specimens.

• *Ocenebra lurida.* Lurid Rock Snail. Common underneath rocks in the low intertidal and subtidal (Abbott and Haderlie, 1980). Only one specimen of this small snail was found, which was fairly complete. It may have accidentally been brought to the site with other shellfish.

Olivella biplicata

• *Olivella biplicata.* Purple Dwarf Olive. This species occurs from the low intertidal to a depth of 80 m on sandy bottoms of bays, lagoons, and protected areas of the outer coast (Abbott and Haderlie, 1980). It is very common near

Capitola (personal observation). *Olivella* was found in nearly all the samples, though not in great numbers. Some of the shells are broken, suggesting that the animal inside was eaten.

• *Tegula funebralis*. Black Turban Snail. This species is abundant on rocks and in tidepools of the middle tidal zone (Abbott and Haderlie, 1980). It is very common today along the rocky shores of Santa Cruz County (personal observation). Several whole or nearly whole shells of this and the Brown Turban confirmed that both are present. It can be difficult to distinguish the two based on shell fragments.

• *Tegula brunnea.* Brown Turban Snail. This species lives lower down on the rocks than the Black Turban Snail and also lives subtidally (Abbott and Haderlie, 1980). It appears to be less common than the Black Turban.

• unidentified land snail. A small, native snail was found at the 0-10 cm level and is likely to be recent.

Mollusca, Polyplacophora

• *Cryptochiton stelleri*. Gumboot Chiton. According to Haderlie and Abbott (1980B), this species occurs from the low intertidal zone to subtidal. It does not attach firmly to rocks, so sometimes washes up on the shore during storms. It is the world's largest chiton, reaching a length of 33 cm.

Cryptochiton stelleri
(part of one plate)

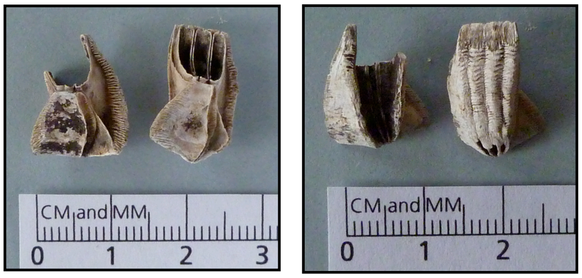
• Unidentified chitons. A number of chiton plates were recovered. These were not identified to species. Locally, several species of chiton live intertidally on rocks.

Arthropoda, Crustacea

• ?*Semibalanus cariosus* Barnacle. Several fragments of a "thatched" barnacle were found. The pieces most closely resemble the above species, but alternatively could be from the very similar *Tetraclita rubescens*.

• *?Balanus sp.* Barnacle. Barnacles of a particular species can vary so much in shape, it is difficult to identify them from shell fragments. The movable parts (the scuta and turga) are quite diagnostic, but none of these were found in the samples. The barnacle remains generally look like those of *Balanus aquila* and *Balanus nubilis*, both of which are large, edible, and occur on intertidal rocks.

• *Coronula diadma.* Whale Barnacle. Two fragments of this species were found in Trench Unit 4 at a depth of 40-50 cm. This species is found locally on the humpback whale and has also been reported from the fin, blue, and sperm whales (Newman and Abbott, 1980). All of these occur off our coast (and were no doubt more common prior to whaling by Europeans). In recent years humpbacks have been observed only a few hundred meters off the beach at Santa Cruz (see for example, Hoppin, 2011). The barnacles could have been brought to the site along with pieces of blubber and meat (see for example Kandel and Conard, 2003).



Coronula diadma
(interior [above] and exterior views of two fragments)

• *Cancer antennarius*. Rock Crab. This crab lives in the low intertidal to a depth of 40 m on rocky shores (Garth and Abbott, 1980). It is also caught from the Santa Cruz Wharf (personal observation). One fixed left finger was recovered (Trench Unit 3, 20-30 cm).

Unidentifed

• Unidentifed shell. Several examples of this shell were found. It is very slightly cupped, smooth on the convex side, with faint concentric lines and radiating ridges on the concave side. It was compared with several species of bivalve and with parts of barnacles and none matched. Though possibly just a part of some larger structure, its distinct morphology would seem to make it identifiable.

unidentified shell fragment

Distributional Trends

The following is a list of the number of samples in which each of the more common taxa occurred. Taxa not listed were found in 1 to 9 of the samples.

Mytilus californianus	72 samples out of 82 total
Protothaca staminea	70
Olivella biplicata	55
barnacles	45
Saxidomus nuttalli	33
Tegula spp.	26

Platyodon cancellatus	16
Collisella spp.	15
undifferentiated small chitons	13
Cryptochiton stelleri	12
Nucella canaliculata	11

In terms of both volume and number of fragments of shell, *Mytilus californianus* is generally more common in the lower levels, *Protothaca staminea* and other shell material dominates in the upper levels.

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APPENDIX H

STABLE ISOTOPE ANALYSIS AND PALEODIET OF OHLONE HUMAN BURIAL #1 (REF. #51-1) FROM CA-SCR-12

BY ERIC BARTELINK

STABLE ISOTOPE ANALYSIS AND PALEODIET OF AN OHLONE HUMAN BURIAL FROM CA-SCR-12, SANTA CRUZ COUNTY, CALIFORNIA

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INTRODUCTION

Since the late 1970s, stable isotope analysis has been commonly used by archaeologists to shed light on past human lifeways, including the reconstruction of ancient diets, migration patterns, infant weaning practices, and prehistoric trade networks. The adage "you are what you eat" is the foundation for isotopic studies used for dietary reconstruction and refers to the relationship between the isotopic composition of an animal's tissues and its diet (DeNiro and Epstein 1978; Fry 2006). Stable isotope analysis of bone provides a record of food consumption practices during the last 10-15 years of life of the individual. Paleodietary studies typically focus on stable carbon ($^{13}C/^{12}C$) and nitrogen ($^{15}N/^{14}N$) isotope analysis, which has provided baseline data on human subsistence patterns in different regions.

This report reviews the theoretical basis of stable isotope analysis and provides parameters for prehistoric diet using isotopic values of flora and fauna from central California. Next, it provides a dietary reconstruction from a femur of a late Holocene human burial from CA-SCR-12 using stable carbon and nitrogen isotopes of bone collagen. Radiocarbon dating by Beta Analytic reported a calibrated bone collagen date of cal BC 2030 to 1880 (cal BP 3980 to 3830).

STABLE ISOTOPE ANALYSIS

Stable isotopes are atoms of an element with the same number of protons and a different number of neutrons. Because stable isotopes do not undergo radioactive decay, they provide a record of the *in vivo* chemical signatures of an organism. Although chemically similar, isotopes of the same element react at different rates in chemical reactions due to small differences in atomic mass. This causes the disproportionate enrichment of one isotope over another, a process known as isotopic fractionation (Fry 2006). Stable isotope values are generally expressed as the ratio of the "rare" (heavy) isotope to the "abundant" (light) isotope (e.g., $^{13}C/^{12}C$) compared to a known standard, expressed in permil (‰) or parts per thousand relative to the standard (Schoeller 1999). International laboratory standards are provided by the National Bureau of Standards and the International Atomic Energy Agency in Vienna. The delta notation symbol (δ) is used to express the isotopic ratio of a sample relative to the standard. Isotope values are calculated as follows (where R is equal to the ratio of the rare to the abundant isotope in the sample compared with that of the standard):

$$\delta = (R_{\text{sample}} - R_{\text{standard}}) / R_{(\text{standard})} \times 1000$$

Stable carbon isotopes are expressed relative to the PDB (Pee Dee belemnite) standard, a Cretaceous fossil (*Belemnitella americana*) from the Pee Dee formation in South Carolina. PDB is assigned a value of 0‰ by definition and is enriched in ^{13}C relative to organic carbon and most terrestrial carbonate materials. Hence, $\delta^{13}C$ values for most living things are negative relative to the standard. Stable isotopes of nitrogen are expressed by the ratio of $^{15}N/^{14}N$ relative to the standard of atmospheric N_2 (AIR), also set at 0‰. Because air is more depleted in ^{15}N than most living things, $\delta^{15}N$ values in most living things are positive relative to the standard. Substances that have higher delta (δ) values are more enriched in the "heavy" isotope (Fry 2006).

STABLE CARBON AND NITROGEN ISOTOPES

Carbon isotopes ($^{13}C/^{12}C$) in bone reflect the consumption of C_3, C_4, and CAM plants and the animals that consume them. During photosynthesis each type of plant utilizes a different carbon molecule to incorporate carbon into its tissues. C_3 plants produce a 3-carbon molecule when fixing atmospheric carbon. This photosynthetic process is referred to as Calvin-Benson photosynthesis, and discriminates more against the isotopically heavier ^{13}C when incorporating atmospheric CO_2. C_3 plants include most plant life typical of temperate regions, including trees, shrubs, legumes, and tubers. C_4 plants produce a 4-carbon molecule (Hatch-Slack photosynthesis) that discriminates less against the isotopically heavier ^{13}C compared to C_3 plants when incorporating atmospheric CO_2. C_4 plants include tropical grasses such as maize, millet, and sorghum that are typical of hot and arid climates. $\delta^{13}C$ values for C_4 plants average –12.5‰, whereas C_3 plants average –26.5‰ (Schwarcz and Schoeninger 1991). CAM plants include succulents and cacti and fall in between C_3 and C_4 plants depending on the degree of daytime photosynthesis. In marine environments, carbon is derived from dissolved bicarbonate, C_3 and C_4 plants, and photosynthesizing phytoplankton. This typically results in less negative carbon isotope values in marine organisms, similar to those in C_4 plants. In regions such as central California where C_4 plants are not consumed as food resources, this distinction permits discrimination of marine versus terrestrial diets in a consumer's tissues (Schoeninger et al. 1983; Schwarcz and Schoeninger 1991).

Nitrogen has two stable isotopes, ^{15}N and ^{14}N, which are incorporated into plants from N_2 in the atmosphere and ocean water. Marine plants typically have more positive isotope values than terrestrial plants and these differences are reflected in animal consumers. Unlike carbon, nitrogen isotopes show a trophic level effect, with the tissues of its consumers enriched ~3‰ over food values at each level in the food web (Schwarcz and Schoeninger 1991). Nitrogen isotope values are typically higher in marine ecosystems than in terrestrial ecosystems due to longer food chains.

DIETARY RECONSTRUCTION

Stable carbon and nitrogen isotope analysis can provide evidence regarding the relative contribution of different foodstuffs to the diet, especially among groups that consumed resources from both terrestrial and marine ecosystems. The isotopic analysis of Burial 1 from CA-SCR-12 will shed light on ancient diet along the Santa Cruz coast, and will provide new data to compare with previous research (Bartelink 2006, 2009; Bartelink and Wright n.d.; Beasley 2008; Beasley et al. 2013). This report only discusses data from bone collagen, thus isotope values primarily reflect the protein component of the diet.

MATERIALS AND METHODS

Sample Preparation

With permission from the Muwekma Ohlone Tribe of the San Francisco Bay Area a sample of human femur bone was submitted by graduate student Gerald Starek and Alan Leventhal (San Jose State University) to Beta Analytic Inc. for radiocarbon dating and stable isotope analysis. Beta Analytic's pretreatment protocol involves washes through deionized water, mechanical cleaning of the external bone cortex, and pulverization of the sample. Sample treatment with hydrochloric acid (HCL) is used to remove the bone apatite fraction. After HCL treatment, samples are inspected for the presence of rootlets, and then treated with sodium hydroxide (NaOH) to remove secondary organic acids (i.e., "with alkali"). Beta Analytic Inc. data sheets report both the measured and conventional radiocarbon age and $\delta^{13}C$ and $\delta^{15}N$ values in permil (‰).

RESULTS AND DISCUSSION

General Comparisons

Table 1 presents the stable carbon and nitrogen isotope descriptive statistics. The $\delta^{13}C$ value is -15.2 and the $\delta^{15}N$ value is 14.4‰. The stable carbon and nitrogen isotope values of bone collagen are consistent with a mixed diet composed primarily of marine protein, such as shellfish and marine fish, with some contribution from terrestrial protein sources.

TABLE 1: Stable Carbon and Nitrogen Isotope Summary Statistics for Burial 1.

Sex	Age	$\delta^{13}C_{coll}$ (‰)	$\delta^{15}N_{coll}$ (‰)
Indeterminate	Adult	-15.2	14.4

Figure 1 plots stable isotope values for a number of economically important plant and animal resources from central California. The data for animals represent adjusted "meat values", accounting for published diet-to-tissue offsets due to fractionation between meat and bone collagen. The individual boxes represent minimum and maximum values for different food resources from central California based on archaeofaunal and modern faunal and floral data reported in Bartelink (2006). However, freshwater fish are poorly characterized for California and the box model represents a global range based on studies from a number of regions. The modern plant and animal carbon isotope values are corrected by +1.5‰ for the "Suess Effect" (the reduction of atmospheric $\delta^{13}C$ due to fossil fuel burning) to bring values in line with the prehistoric food web. The plot shows clear differences between marine and terrestrial resources and also demonstrates the ~3‰ stepwise increase in nitrogen isotope values along the food web. This model should be considered a reasonable approximation of the isotopic composition of available food resources due to the limited sample representation of some key food resources.

For stable carbon isotopes, human collagen $\delta^{13}C$ values will be ~5‰ higher than the source of dietary protein due to the average fractionation offset between diet and bone collagen (Ambrose and Norr 1993; Tieszen and Fagre 1993). This assumes that the $\delta^{13}C$ value of dietary protein is equal to that of the whole diet; thus, consumers of marine foods will have diet to collagen offsets higher than 5‰. Adjusting the $\delta^{13}C$ values for the 5‰ offset, the values overlap with shellfish as well as some higher trophic level marine fish. For $\delta^{15}N$, human collagen values should be ~3‰ higher than the source of dietary protein due to the trophic level effect. Subtracting 3‰, the range of human values also overlaps with these same protein sources (Figure 1).

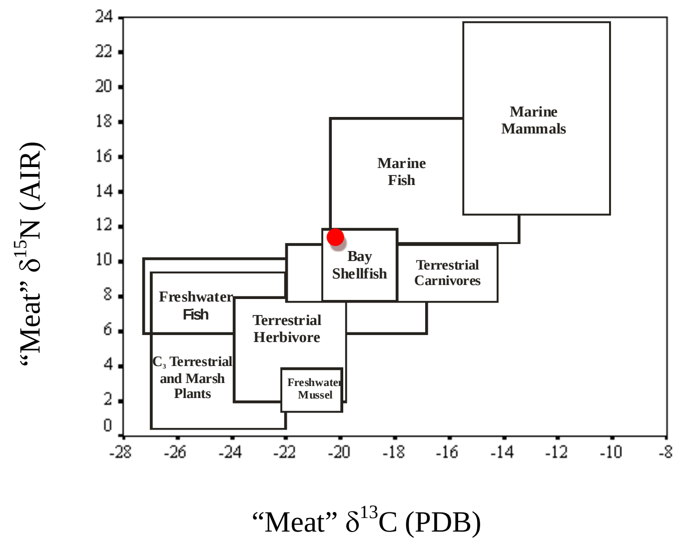

FIGURE 1: Reconstructed Stable Carbon and Nitrogen Isotope Values for Economically Important Dietary Resources in Central California (from Bartelink 2006, 2009). Red dot shows Burial 1 from CA-SCR-12.

Regional Comparisons

Figure 2 plots the stable carbon and nitrogen isotope values for the CA-SCR-12 burial with data from several late Holocene sites along the eastern shore of San Francisco Bay and the Sacramento-San Joaquin Valley and Delta (see Bartelink 2006, 2009). The linear correlation of $\delta^{13}C$ and $\delta^{15}N$ values for San Francisco Bay Area sites indicates a high level of variability in marine versus terrestrial resource consumption in the region, with dietary input coming from both ecosystems. In other words, some individuals (in the upper right quadrant of the plot) consumed diets focused mainly on marine protein, while individuals from other Bay area sites consumed greater amounts of terrestrial protein.

The individual from CA-SCR-12 plots most closely with Middle and Late Period sites along the eastern shore of San Francisco Bay (CA-ALA-309: Emeryville Shellmound; CA-ALA-312: Horton Landing Site; CA-ALA-328: Patterson Mound, CA-ALA-329: Ryan Mound). Thus, the burial is dissimilar to sites from the Sacramento-San Joaquin Valley and Delta (CA-SJO-68: Blossom Mound, CA-SJO-142: McGillivray Mound, CA-SJO-154: Cardinal Mound, CA-SAC-43: Brazil Mound, CA-SAC-60: Hicks Mound, CA-SAC-06: Johnson Mound). This clearly indicates that the individual buried at CA-SCR-12 consumed a mixed diet composed primarily of marine protein, such as shellfish and marine fish, with some contribution from terrestrial protein sources.

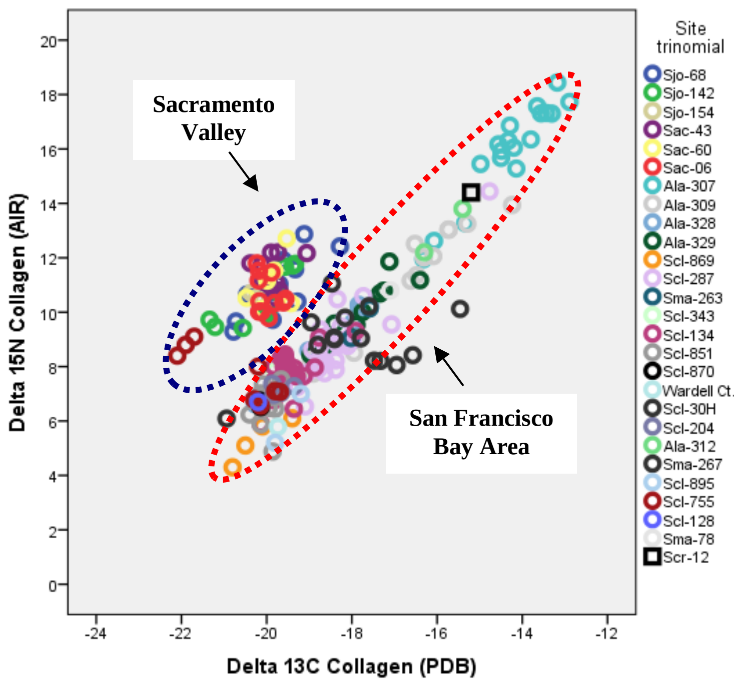

FIGURE 2: Bone Collagen Stable Carbon and Nitrogen Isotope Data for Burial 1from CA-SCR-12 compared to sites in Central California. Black square is the CA-SCR-12 burial.

SUMMARY

The implications of the paleodietary analysis of the human burial from CA-SCR-12 are significant, and contribute to broader paleodietary research along the central coast of California. Burial 1 had a diet consistent with consumption of a mixed diet composed primarily of marine protein, such as shellfish and marine fish, with some contribution from terrestrial protein sources. The isotope values indicate greater contribution from marine resources than terrestrial resources. Burial 1 is similar to many Middle and Late

Period burials from the eastern shore of San Francisco Bay and also to one individual who has a similar signature recovered from the west bay at CA-SCL-287/CA-SMA-263 (Bartelink 2010; Leventhal et al. 2010), but is distinctive from diets in the Central Valley.

ACKNOWLEDGEMENTS

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APPENDIX I

SHELL DISTRIBUTION TRENDS

BY OCCURRENCE

Test Unit # 1 Shell Distributional Trends By Occurrence

Taxa	0-10 cm	10-20 cm	20-30 cm	30-40 cm	40-50cm	50-60cm	60-70 cm	70-80cm	80-90cm
Clinocardium nuttallii			NO SAMPLES RECOVERED						
Crasadoma gigantea									
Macoma nasuta									
Mactromeriscatilliformis		x					x		
Mytilus californianus	x	x		x	x	x	x	x	x
Petricola carditoides									
Platyodon cancellatus	x			x					x
Protothaca staminea	x	x		x	x	x	x	x	x
Saxidomus nuttalli	x	x		x				x	
Tresus nuttalli					x				x
Zirfaea pilsbryi									
Acanthina spirata									
Acmaea mitra									
Collisella digitalis									
Collisella pelta									
Collisella scrabra									
Crepidula adunca									
Haliotis refescens									
Helix aspersa									
Homolopoma luridum									
Lottia gigantea									x
Notoacmaea scutum									
Nucella canaliculata									
Nucella emarginata	x								x
Ocenebra lurida									
Olivella biplicata		x		x		x	x	x	x
Tegula brunnea								x	
Tegula funebralis									
Cryptochiton stelleri				x			x		
Semibalanus cariosus									
Balanus sp.?		x				x			
Coronula diadma									
Cancer antennarius									
Unidentified land snail									
Unidentified Shell									
Unidentified chitons								x	

Test Unit # 2 Shell Distributional Trends By Occurrence

Taxa	0-10 cm	10-20 cm	20-30 cm	30-40 cm	40-50 cm	50-60 cm	60-70 cm	70-80 cm
Clinocardium nuttallii					NO IDENTIFIABLE SAMPLES			
Crasadoma gigantea			x					
Macoma nasuta								
Mactromeris catilliformis			x					
Mytilus californianus	x	x	x	x		x		x
Petricola carditoides								
Platyodon cancellatus	x							
Protothaca staminea	x	x	x			x	x	x
Saxidomus nuttalli		x						
Tresus nuttalli								
Zirfaea pilsbryi								
Acanthina spirata	x	x						
Acmaea mitra								
Collisella digitalis								
Collisella pelta								
Collisella scrabra								
Crepidula adunca								
Haliotis refescens								
Helix aspersa			x					
Homolopoma luridum								
Lottia gigantea								
Notoacmaea scutum								
Nucella canaliculata								
Nucella emarginata								
Ocenebra lurida								
Olivella biplicata	x		x			x	x	x
Tegula brunnea								
Tegula funebralis								
Cryptochiton stelleri								
Semibalanus cariosus								
Balanus sp.?		x				x		x
Coronula diadma								
Cancer antennarius								
Unidentified land snail	x							
Unidentified Shell								
Unidentified chitons								

Test Unit # 3 Shell Distributional Trends By Occurrence

Taxa	0-10 cm	10-20 cm	20-30 cm	30-40 cm	40-50 cm	50-60 cm	60-70 cm	70-80 cm
Clinocardium nuttallii	NO SAMPLES RECOVERED	NO SAMPLES RECOVERED						
Crasadoma gigantea								
Macoma nasuta								
Mactromeris catilliformis								
Mytilus californianus			x	x	x	x	x	x
Petricola carditoides						x		
Platyodon cancellatus								
Protothaca staminea			x	x	x	x	x	x
Saxidomus nuttalli				x	x			x
Tresus nuttalli								
Zirfaea pilsbryi								
Acanthina spirata				x	x			
Acmaea mitra								
Collisella digitalis								
Collisella pelta								
Collisella scrabra					x			
Crepidula adunca								
Haliotis refescens								
Helix aspersa								
Homolopoma luridum								
Lottia gigantea								
Notoacmaea scutum								
Nucella canaliculata								
Nucella emarginata								
Ocenebra lurida								
Olivella biplicata			x	x			x	x
Tegula brunnea			x					
Tegula funebralis								
Cryptochiton stelleri								
Semibalanus cariosus								
Balanus sp.?					x	x	x	
Coronula diadma								
Cancer antennarius								
Unidentified land snail								
Unidentified Shell								
Unidentified chitons								

Test Unit # 3A Shell Distributional Trends By Occurrence

Taxa	0-30 cm	30-60 cm	60-75 cm	75-90 cm
Clinocardium nuttallii	NO IDENTIFIABLE SAMPLES			
Crasadoma gigantea				
Macoma nasuta				
Mactromeris catilliformis				
Mytilus californianus		x	x	x
Petricola carditoides				
Platyodon cancellatus			x	
Protothaca staminea				x
Saxidomus nuttalli				x
Tresus nuttalli				
Zirfaea pilsbryi				
Acanthina spirata				
Acmaea mitra				
Collisella digitalis				
Collisella pelta				
Collisella scrabra				
Crepidula adunca				
Haliotis refescens				
Helix aspersa				
Homolopoma luridum				
Lottia gigantea				
Notoacmaea scutum				
Nucella canaliculata				
Nucella emarginata				
Ocenebra lurida				
Olivella biplicata				
Tegula brunnea				
Tegula funebralis				
Cryptochiton stelleri				
Semibalanus cariosus				
Balanus sp.?				
Coronula diadma				
Cancer antennarius				
Unidentified land snail				
Unidentified Shell				
Unidentified chitons				

Test Unit # 3B Shell Distributional Trends By Occurrence

Taxa	0-30 cm	30-60 cm	60-70 cm
Clinocardium nuttallii			
Crasadoma gigantea			
Macoma nasuta			
Mactromeris catilliformis			X
Mytilus californianus	X	X	X
Petricola carditoides			
Platyodon cancellatus			
Protothaca staminea		X	X
Saxidomus nuttalli	X	X	
Tresus nuttalli			
Zirfaea pilsbryi			
Acanthina spirata			
Acmaea mitra			
Collisella digitalis			
Collisella pelta			
Collisella scrabra			
Crepidula adunca			
Haliotis refescens			
Helix aspersa			
Homolopoma luridum			
Lottia gigantea			
Notoacmaea scutum			
Nucella canaliculata			
Nucella emarginata			
Ocenebra lurida			
Olivella biplicata	X	X	X
Tegula brunnea			
Tegula funebralis			
Cryptochiton stelleri			
Semibalanus cariosus	X		
Balanus sp.?		X	
Coronula diadma			
Cancer antennarius			
Unidentified land snail			
Unidentified Shell		X	
Unidentified chitons			

Test Unit # 4 Shell Distributional Trends By Occurrence

Taxa	0-10 cm	10-20 cm	20-30 cm	30-40 cm	40-50 cm	50-60 cm	60-70 cm	70-80 cm
Clinocardium nuttallii	NO IDENTIFIABLE SAMPLES		x					
Crasadoma gigantea								
Macoma nasuta								
Mactromeris catilliformis								
Mytilus californianus		x	x		x	x	x	x
Petricola carditoides								
Platyodon cancellatus								
Protothaca staminea		x	x		x	x	x	
Saxidomus nuttalli				x				
Tresus nuttalli								
Zirfaea pilsbryi								
Acanthina spirata		x						
Acmaea mitra								
Collisella digitalis								
Collisella pelta								
Collisella scrabra								
Crepidula adunca								
Haliotis refescens								
Helix aspersa								
Homolopoma luridum								
Lottia gigantea								
Notoacmaea scutum								
Nucella canaliculata							x	
Nucella emarginata		x						
Ocenebra lurida								
Olivella biplicata		x	x				x	
Tegula brunnea			x					
Tegula funebralis								
Cryptochiton stelleri								
Semibalanus cariosus					x			
Balanus sp.?		x	x	x		x	x	
Coronula diadma								
Cancer antennarius								
Unidentified land snail								
Unidentified Shell								
Unidentified chitons		x						

Test Unit # 5 Shell Distributional Trends By Occurrence

Taxa	0-1 0cm	10-20 cm	20-30 cm	30-40 cm	40-50 cm	50-60 cm	60-70 cm	70-80 cm
Clinocardium nuttallii								
Crasadoma gigantea		X						
Macoma nasuta								
Mactromeris catilliformis								
Mytilus californianus	X	X	X	X	X	X	X	X
Petricola carditoides								
Platyodon cancellatus					X	X		
Protothaca staminea	X	X	X	X	X	X	X	X
Saxidomus nuttalli		X		X				
Tresus nuttalli			X					
Zirfaea pilsbryi	X							
Acanthina spirata								
Acmaea mitra								
Collisella digitalis					X			
Collisella pelta								
Collisella scrabra					X			
Crepidula adunca								
Haliotis refescens								
Helix aspersa								
Homolopoma luridum								
Lottia gigantea								
Notoacmaea scutum								
Nucella canaliculata								
Nucella emarginata								
Ocenebra lurida								
Olivella biplicata		X		X	X	X	X	
Tegula brunnea								
Tegula funebralis								
Cryptochiton stelleri								
Semibalanus cariosus								
Balanus sp.?	X	X	X	X				
Coronula diadma								
Cancer antennarius								
Unidentified land snail								
Unidentified Shell								
Unidentified chitons						X		

Trench Unit # 1 Shell Distributional Trends By Occurrence

Taxa	0-10 cm	10-20 cm	20-30 cm	30-40 cm	40-50 cm	50-60 cm	60-70 cm	70-80 cm	80-90 cm
Clinocardium nuttallii	X					X			
Crasadoma gigantea									
Macoma nasuta								X	X
Mactromeris catilliformis									
Mytilus californianus	X	X	X	X	X	X	X	X	X
Petricola carditoides					X				
Platyodon cancellatus		X	X	X	X	X		X	
Protothaca staminea	X	X	X	X	X	X	X	X	X
Saxidomus nuttalli		X	X	X	X	X	X	X	X
Tresus nuttalli		X	X			X			
Zirfaea pilsbryi									
Acanthina spirata		X	X	X	X		X		
Acmaea mitra									
Collisella digitalis	X								
Collisella pelta							X		
Collisella scrabra						X			
Crepidula adunca									
Haliotis rufescens		X		X					
Helix aspersa									
Homolopoma luridum									
Lottia gigantea									
Notoacmaea scutum							X		
Nucella canaliculata					X			X	X
Nucella emarginata						X	X		X
Ocenebra lurida						X			
Olivella biplicata	X	X	X	X	X	X	X	X	X
Tegula brunnea		X				X		X	
Tegula funebralis	X				X		X	X	X
Cryptochiton stelleri	X	X		X		X		X	X
Semibalanus cariosus			X			X			
Balanus sp.?	X	X		X	X			X	X
Coronula diadma									
Cancer antennarius									
Unidentified land snail									
Unidentified Shell									
Unidentified chitons						X		X	X

Trench Unit # 2 Shell Distributional Trends By Occurrence

Taxa	0-10 cm	10-20 cm	20-30 cm	30-40 cm	40-50 cm	50-60 cm	60-70 cm	70-80 cm	80-90 cm
Clinocardium nuttallii									
Crasadoma gigantea									
Macoma nasuta									
Mactromeris catilliformis									
Mytilus californianus			X	X	X	X	X	X	X
Petricola carditoides							X	X	
Platyodon cancellatus									
Protothaca staminea	X	X	X	X	X	X	X	X	X
Saxidomus nuttalli		X		X		X		X	X
Tresus nuttalli					X				
Zirfaea pilsbryi									
Acanthina spirata					X	X			
Acmaea mitra									
Collisella digitalis							X		
Collisella pelta							X		
Collisella scrabra			X	X					
Crepidula adunca					X				X
Haliotis rufescens									
Helix aspersa									
Homolopoma luridum									
Lottia gigantea					X				
Notoacmaea scutum									
Nucella canaliculata			X		X			X	
Nucella emarginata							X	X	
Ocenebra lurida									
Olivella biplicata		X			X	X	X	X	X
Tegula brunnea				X	X			X	
Tegula funebralis							X		X
Cryptochiton stelleri					X				
Semibalanus cariosus		X						X	
Balanus sp.?				X	X	X	X		
Coronula diadma									
Cancer antennarius									
Unidentified land snail									
Unidentified Shell									
Unidentified chitons							X		X

Trench Unit # 3 Shell Distributional Trends By Occurrence

Taxa	0-10 cm	10-20 cm	20-30 cm	30-40 cm	40-50 cm	50-60 cm	60-70 cm	70-80 cm	80-90 cm	90-100 cm
Clinocardium nuttallii						X				
Crasadoma gigantea										
Macoma nasuta			X							
Mactromeris catilliformis										
Mytilus californianus	X	X	X			X	X		X	X
Petricola carditoides			X			X				
Platyodon cancellatus		X								
Protothaca staminea	X	X	X		X	X	X	X		X
Saxidomus nuttalli		X		X	X	X				
Tresus nuttalli										
Zirfaea pilsbryi			X							
Acanthina spirata	X	X								
Acmaea mitra						X				
Collisella digitalis			X		X					
Collisella pelta						X				
Collisella scrabra										
Crepidula adunca			X			X				
Haliotis rufescens										
Helix aspersa										
Homolopoma luridum			X							
Lottia gigantea										
Notoacmaea scutum										
Nucella canaliculata			X		X					
Nucella emarginata										
Ocenebra lurida								X		
Olivella biplicata	X	X	X	X	X	X	X		X	
Tegula brunnea				X						
Tegula funebralis			X				X	X	X	
Cryptochiton stelleri										
Semibalanus cariosus	X		X							
Balanus sp.?		X				X		X		
Coronula diadma										
Cancer antennarius			X							
Unidentified land snail										
Unidentified Shell										
Unidentified chitons						X				X

Trench Unit # 4 Shell Distributional Trends By Occurrence

Taxa	0-10 cm	10-20 cm	20-30 cm	30-40 cm	40-50 cm	50-60 cm	60-70 cm	70-80 cm	80-90 cm
Clinocardium nuttallii									
Crasadoma gigantea									
Macoma nasuta									
Mactromeris catilliformis									
Mytilus californianus	X	X	X	X	X	X	X	X	X
Petricola carditoides				X					
Platyodon cancellatus					X		X		
Protothaca staminea	X	X		X	X	X	X	X	X
Saxidomus nuttalli		X				X			
Tresus nuttalli					X		X		
Zirfaea pilsbryi									
Acanthina spirata			X						
Acmaea mitra									
Collisella digitalis									
Collisella pelta							X		
Collisella scrabra				X					
Crepidula adunca				X	X		X		
Haliotis rufescens							X		
Helix aspersa									
Homolopoma luridum									
Lottia gigantea									
Notoacmaea scutum									
Nucella canaliculata				X		X			
Nucella emarginata					X			X	
Ocenebra lurida									
Olivella biplicata			X	X	X	X	X	X	
Tegula brunnea				X					
Tegula funebralis				X		X	X	X	
Cryptochiton stelleri				X		X	X		
Semibalanus cariosus					X				
Balanus sp.?	X	X		X		X	X		
Coronula diadma					X				
Cancer antennarius									
Unidentified land snail									
Unidentified Shell									
Unidentified chitons				X	X		X		

APPENDIX J

FAUNAL BONE CHART
DISTRIBUTION OF TAXA BY
RECOVERY CONTEXT

Test Unit # 1 Faunal Bone Elements by Number and Weight

Test Unit 1 Depth	Small Mammal	Medium Mammal	Large Mammal	Small Mammal "Burnt"	Medium Mammal "Burnt"	Large Mammal "Burnt"	Fish	Bird	Rodent	Total Wt. Grams
0-10 cm			**35** /28.7g		**2**/1.1g	**9**/4.7g		**5**/1.3g		35.8 g
10-20 cm		**3**/1.0g	**27**/16.2g		**1**/0.9g	**5**/2.5 g		**2**/0.6g		21.2 g
20-30 cm			**1**/0.4g			**1**/0.9g	**1**/0.1			1.4g
30-40 cm		**98**/59.9g	**8**/10.8g		**10**/3.7g	**13**/8.1g		**1**/0.1g		82.6g
40-50 cm		**1**/0.2g	**45**/32.2g			**5**/2.8g	**1**/0.9g	**3**/1.0g		37.1g
50-60 cm	**1**/0.2	**9**/3.4g	**67**/41.9g		**9**/4.8g	**3**/1.6g				51.9g
60-70 cm			**50**/202.5g			**31**/66.1g				268.6g
70-80 cm						**6**/15.0g		**1**/0.1		15.1 g
80-90 cm			**14**/104.7g			**1**/2.4g				107.1g
Total Faunal Elements = 469 **Total Wt. = 620.8 g**										

Test Unit # 2 Faunal Bone Elements by Number and Weight

Test Unit 2 Depth	Small Mammal	Medium Mammal	Large Mammal	Small Mammal "Burnt"	Medium Mammal "Burnt"	Large Mammal "Burnt"	Fish	Bird	Rodent	Total Wt. Grams
0-10 cm			**15**/20.6g		**5**/2.1g					22.7g
10-20 cm	**6**/1.1g	**5**/3.1g	**17**/28.9g		**4**/1.9g					35.0g
20-30 cm		**3**/1.3g	**22**/17.9g		**1**/0.1g	**5**/3.2g				22.5g
30-40 cm		**4**/2.9g	**9**/6.3g		**1**/0.5g					9.7g
40-50 cm			**5**/7.9		**2**/1.0g	**4**/5.6g				14.5g
50-60 cm			**7**/3.5g	**1**/0.5g	**6**/2.8g					6.8g
60-70 cm			**5**/9.8g		**2**/1.7g					11.5g
70-80 cm		**5**/2.8g	**3**/1.2g							4.0g
Total Faunal Elements = 137 **Total Wt. = 126.7 g**										

Test Unit # 3 Faunal Bone Elements by Number and Weight

Unit 3 Depth	Small Mammal	Medium Mammal	Large Mammal	Small Mammal "Burnt"	Medium Mammal "Burnt"	Large Mammal "Burnt"	Fish	Bird	Rodent	Total Wt. Grams
0-10 cm		**8**/4.1g	**8**/32.1g		**5**/2.9g					39.1g
10-20 cm	No Specimens Recovered									
20-30 cm	**6**/2.1g	**10**/6.7g	**16**/58.1g							66.9g
30-40 cm		**5**/2.7g	**16**/28.3g		**2**/3.3g					34.3g
40-50 cm			**7**/16.7g							16.7g
50-60 cm		**2**/1.2g	**23**/146.6g		**3**/3.1g	**10**/57.0g	**1**/0.3g		**8**/2.1g	210.3g
60-70 cm			**10**/23.5g		**10**/7.6g	**12**/26.1g				57.2g
70-80 cm		**3**/1.4g	**6**/20.9g							22.3g
Total Faunal Elements = 171 **Total Wt. = 446.8 g**										

Test Unit # 3A Faunal Bone Elements by Number and Weight

Unit 3A Depth	Small Mammal	Medium Mammal	Large Mammal	Small Mammal "Burnt"	Medium Mammal "Burnt"	Large Mammal "Burnt"	Fish	Bird	Rodent	Total Wt. Grams
0-30 cm			**23/**83.2g			**2**/6.3g				89.5g
30-60 cm		**3**/2.7g	**13**/157.3g					**1**/0.2g		160.2g
60-75 cm		**6**/10.0	**155**/230.1g			**22**/70.6g		**2**/1.2g		311.9g
75-90 cm		**8**/13.4g				**3**/ 4.6g				18.0g
Total Faunal Elements = 238 **Total Wt. = 579.6 g**										

Test Unit # 3B Faunal Bone Elements by Number and Weight

Test Unit 3B Depth	Small Mammal	Medium Mammal	Large Mammal	Small Mammal "Burnt"	Medium Mammal "Burnt"	Large Mammal "Burnt"	Fish	Bird	Rodent	Total Wt. Grams
0-30 cm		**1**/0.4g	**9**/41.5g							41.9g
30-60 cm		**2**/1.1g	**13**/17.8g				**1**/1.1g	**1**/0.7g		20.7g
60-70 cm	**1**/1.0g	**4**/4.0g	**48**/62.2g			**12**/15.8g	**2**/1.4g			84.4g
Total Faunal Elements = 94 **Total Wt. = 147.0 g**										

Test Unit # 4 Faunal Bone Elements by Number and Weight

Test Unit 4 Depth	Small Mammal	Medium Mammal	Large Mammal	Small Mammal "Burnt"	Medium Mammal "Burnt"	Large Mammal "Burnt"	Fish	Bird	Rodent	Total # / Wt. Grams
0-10 cm		**2**/2.5g	**4**/2.6g				**1**/1.2g			6.3g
10-20 cm		**8**/2.7g	**37**/22.7g		**3**/1.2g	**15**/11.1g				37.7g
20-30 cm		**18**/11.9g	**27**/15.1g		**1**/0.2g					27.2g
30-40 cm	**3**/0.7g	**3**/2.7g	**56**/57.9g		**9**/5.0g	**12**/7.3g	**2**/0.1g			73.7g
40-50 cm		**16**/9.5g	**14**/25.9g			**10**/51.0g			**4**/0.1g	86.5g
50-60 cm			**38**/32.5g		**31**/16.2g	**5**/8.0g		**1**/0.3g		57.0g
60-70 cm		**7**/4.9g	**20**/30.9g			**5**/35.6g				71.4g
70-80 cm		**1**/0.5g								0.5g
Total Faunal Elements = 353 **Total Wt. = 360.3g**										

Test Unit # 5 Faunal Bone Elements by Number and Weight

Test Unit 5 Depth	Small Mammal	Medium Mammal	Large Mammal	Small Mammal "Burnt"	Medium Mammal "Burnt"	Large Mammal "Burnt"	Fish	Bird	Rodent	Total # / Wt. Grams
0-10 cm		**2**/0.9g			**1**/0.3g					1.2g
10-20 cm			**14**/17.3g							17.3g
20-30 cm			**6**/22.3g							22.3g
30-40 cm			**4**/6.4g							6.4g
40-50 cm		**4**/1.7g	**9**/53.0g		**1**/0.3g	**2**/3.7g				58.7g
50-60 cm		**4**/20.g	**16**/35.9g							55.9g
60-70 cm			**6**/6.1g							6.1g
70-80 cm			**4**/14.0g			**4**/3.5g				17.5g
Total Faunal Elements = 77 **Total Wt. = 185.4g**										

Trench Unit # 1 Faunal Bone Elements by Number and Weight

Trench Unit 1 Depth	Small Mammal	Medium Mammal	Large Mammal	Small Mammal "Burnt"	Medium Mammal "Burnt"	Large Mammal "Burnt"	Fish	Bird	Rodent	Total # / Wt. Grams
0-10 cm		**12**/10.0g	**42**/86.9g				**4**/1.5g			98.4g
10-20 cm		**20**/12.2g	**38**/62.1g			**9**/1.5g				75.8g
20-30 cm		**25**/22.5g	**12**/56.3g		**10**/5.3g	**11**/25.1g				109.2g
30-40 cm	**3**/0.9g	**17**/13.9g	**17**/36.0g		**9**/10.5g					61.3g
40-50 cm		**17**/14.7g	**24**/63.1g		**9**/5.8g	**1**/23.7g		**5**/0.9g		108.2g
50-60 cm		**21**/19.3g	**27**/61.4g		**13**/11.6g	**26**/59.3g	**1**/0.1g	**4**/11.1g		162.8g
60-70 cm		**4**/2.8g	**10**/11.7g			**3**/6.4g				20.9g
70-80 cm		**29**/21.9g	**33**/60.1g			**11**/21.8g		**3**/1.0g		104.8g
80-90 cm		**5**/6.3g	**6**/12.9g					**5**/2.0g		21.2g
Total Faunal Elements = 486 **Total Wt. = 762.6g**										

Trench Unit # 2 Faunal Bone Elements by Number and Weight

Trench Unit 2 Depth	Small Mammal	Medium Mammal	Large Mammal	Small Mammal ”Burnt”	Medium Mammal “Burnt”	Large Mammal “Burnt”	Fish	Bird	Rodent	Total # / Wt. Grams
0-10 cm			**4**/ 5.6g							5.6g
10-20 cm		**15**/ 12.9g	**9**/18.5g			**2**/1.9g		**1**/0.5g		33.8g
20-30 cm		**13**/9.0g	**15**/19.7g			**10**/18.1g				46.8g
30-40 cm		**8**/7.4g		**1**/0.4g						7.8g
40-50 cm		**15**/10.7g	**16**/27.2g		**5**/2.5g	**5**/5.1g				45.5g
50-60 cm		**25**/21.3g	**16**/35.8g		**2**/1.2g	**7**/3.2g		**2**/0.2g		61.7g
60-70 cm		**4**/2.9g								2.9g
70-80 cm		**31**/25.4g	**27**/88.7g			**7**/8.9g			**8**/2.9g	125.9g
80-90 cm		**27**/23.5g	**54**/150.9g		**11**/16.0g	**22**/19.7g		**3**/1.8g		211.9g
Total Faunal Elements = 365 **Total Wt. = 541.9g**										

Trench Unit # 3 Faunal Bone Elements by Number and Weight

Trench Unit 3 Depth	Small Mammal	Medium Mammal	Large Mammal	Small Mammal ”Burnt”	Medium Mammal “Burnt”	Large Mammal “Burnt”	Fish	Bird	Rodent	Total # / Wt. Grams
0-10 cm	**2**/0.7g	**29**/21.3g	**29**/27.0g		**5**/4.1g		**3**/0.3g			53.4g
10-20 cm	**6**/2.0g	**9**/7.1g	**21**/33.6g		**9**/10.6g			**4**/1.3g		54.6g
20-30 cm	**11**/4.6g	**13**/10.5g	**17**/32.9g	**3**/0.7g	**17**/17.7g					66.4g
30-40 cm		**8**/8.0g	**15**/78.7g	**2**/0.6g		**3**/5.6g		**1**/0.2g		93.1g
40-50 cm		**21**/26.1g	**10**/25.8g	**2**/0.6g	**14**/9.2g			**1**/1.2g		62.9g
50-60 cm		**20**/17.5g	**22**/95.4g	**1**/0.1g	**12**/11.1g	**16**/89.5g		**4**/2.3g		215.9g
60-70 cm		**17**/16.1g	**4**/12.1g		**4**/4.1g			**1**/0.1g		32.4g
70-80 cm	No Specimens Recovered									
80-90 cm	**2**/1.2g	**7**/4.1g								5.3g
90-100		**1**/2.4g								2.4g
Total Faunal Elements = 366 **Total Wt. = 586.4g**										

Trench Unit # 4 Faunal Bone Elements by Number and Weight

Trench Unit 4 Depth	Small Mammal	Medium Mammal	Large Mammal	Small Mammal "Burnt"	Medium Mammal "Burnt"	Large Mammal "Burnt"	Fish	Bird	Rodent	Total # / Wt. Grams
0-10 cm		**8**/12.1g			**1**/1.5g					13.6g
10-20 cm		**14**/13.3g	**7**/15.4g		**1**/0.4g					29.1g
20-30 cm		**8**/8.2g			**6**/5.3g					13.5g
30-40 cm	**1**/0.6g	**25**/18.9g	**17**/45.3g	**3**/0.6g	**2**/1.3g	**5**/6.6g		**1**/0.2g		73.5g
40-50 cm		**23**/19.5g	**34**/66.8g		**10**/11.6g					97.9g
50-60 cm	**11**/3.9g	**13**/12.6g	**30**/69.4g							85.9g
60-70 cm	**2**/0.3g	**22**/15.4g	**13**/22.4g		**8**/8.3g				**1**/0.2g	46.6g
70-80 cm	**4**/0.9g	**17**/12.1g	**21**/88.1g		**1**/1.6g					102.7g
80-90 cm		**6**/1.5g			**3**/2.2g					3.7g
Total Faunal Elements = 318 **Total Wt. = 466.5g**										

APPENDIX K

DISTRIBUTION OF HISTORIC ARTIFACTS BY RECOVERY CONTEXT

Test Unit # 1 Historic Artifacts

Material Type	0-10 cm	10-20 cm	20-30 cm	30-40 cm	40-50 cm	50-60 cm	60-70 cm	70-80 cm	80-90 cm
Metal	10	2	2		2	1			
Glass Fragments	27	36	21	4	7				
Porcelain	1	1	1						
Rubber									
Plastic			1						
Brick	3		1						
Ceramic									
Clay			1						
Asphalt									
Tar									
Iron									
Copper									
Total Artifacts: N = 121									

Test Unit # 2 Historic Artifacts

Material Type	0-10 cm	10-20 cm	20-30 cm	30-40 cm	40-50 cm	50-60 cm	60-70 cm	70-80 cm
Metal	6	6	2		2			
Glass Fragments	20	17	17	2		3		
Porcelain	1					1		
Rubber			1					
Plastic		1						
Brick								
Ceramic			1					
Clay								
Asphalt	1							
Tar								
Iron								
Copper								
Glass Bottle		1						
Total Artifacts: N = 82								

Test Unit # 3 Historic Artifacts

Material Type	0-10 cm	10-20 cm	20-30 cm	30-40 cm	40-50 cm	50-60 cm	60-70 cm	70-80 cm
Metal	9		8	3		2		
Glass Fragments	39		28	6	4		1	
Porcelain	1		2					
Rubber								
Plastic								
Brick								
Ceramic								
Clay				1				
Asphalt								
Tar								
Iron								
Copper								
Total Artifacts: N = 104								

Test Unit # 3A Historic Artifacts

Material Type	0-30 cm	30- 60 cm	60-75 cm	75-90 cm
Metal	11	1		
Glass Fragments	18			
Porcelain	1			
Rubber				
Plastic				
Brick				
Ceramic				
Clay				
Asphalt				
Tar				
Iron				
Copper				
Total Artifacts: N = 31				

Test Unit # 3B Historic Artifacts

Material Type	0-30 cm	30-60 cm	60-70 cm
Metal	8		
Glass Fragments	36		
Porcelain	1		2
Rubber			
Plastic			
Brick			
Ceramic			
Clay			
Asphalt			
Tar			
Iron			
Copper			
Total Artifacts: N = 47			

Test Unit # 4 Historic Artifacts

Material Type	0-10 cm	10-20 cm	20-30 cm	30-40 cm	40-50 cm	50-60 cm	60-70 cm	70-80 cm
Metal	6	14	5	2	4	2	1	
Glass Fragments	18	4	14	7	4	3		
Porcelain	1	1	1					
Rubber								
Plastic	1				1			
Brick		3						
Ceramic								
Clay	5							
Asphalt		2						
Tar	4							
Iron								
Copper								
Total Artifacts: N = 103								

Test Unit # 5 Historic Artifacts

Material Type	0-10 cm	10-20 cm	20-30 cm	30-40 cm	40-50 cm	50-60 cm	60-70 cm	70-80 cm
Metal		11	4	6	4			
Glass Fragments	8	45	8		7		1	
Porcelain		7	2					
Rubber								
Plastic	1		1					
Brick	4	4						
Ceramic	2							
Clay								
Asphalt	1							
Tar								
Iron								
Copper								
Glass Bottle								
Total Artifacts: N = 116								

Trench Unit # 1 Historic Artifacts

Material Type	0-10 cm	10-20 cm	20-30 cm	30-40 cm	40-50 cm	50-60 cm	60-70 cm	70-80 cm	80-90 cm
Metal	15	10	14		3	2			
Glass Fragments	40	10	13	3	3	1			
Porcelain	5	2				1			
Rubber									
Plastic	2								
Brick									
Ceramic									
Clay									1
Asphalt									1
Tar									1
Iron		1							
Copper	1								
Glass Marble				1					
Total Artifacts: N = 130									

Trench Unit # 2 Historic Artifacts

Material Type	0-10 cm	10-20 cm	20-30 cm	30-40 cm	40-50 cm	50-60 cm	60-70 cm	70-80 cm	80-90 cm
Metal		8	6		1				
Glass Fragments	4		3	3	2	1			
Porcelain		15	2					1	
Rubber									
Plastic			1						
Brick									
Ceramic		3							
Clay									
Asphalt									
Tar									
Iron									
Copper									
Glass Marble									
Total Artifacts: N = 50									

Trench Unit # 3 Historic Artifacts

Material Type	0-10 cm	10-20 cm	20-30 cm	30-40 cm	40-50 cm	50-60 cm	60-70 cm	70-80 cm	80-90 cm	90-100 cm
Metal	52	11			1	2		1		
Glass Fragments	40		1							
Porcelain	10					2				
Rubber										
Plastic						1				
Brick										
Ceramic										
Clay		1						1		
Asphalt										
Tar	1									
Iron										
Copper										
Glass Marble		1								
Ceramic Dish	1									
Total Artifacts: n = 126										

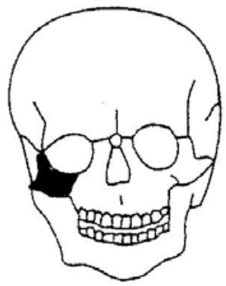
Trench Unit # 4 Historic Artifacts

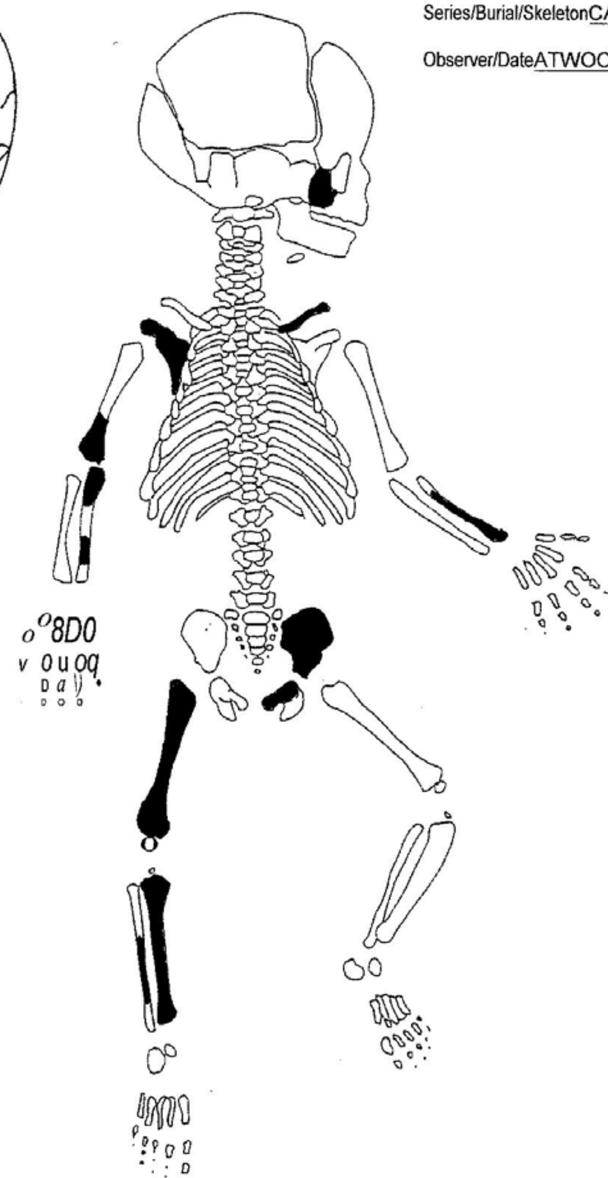
Material Type	0-10 cm	10-20 cm	20-30 cm	30-40 cm	40-50 cm	50-60 cm	60-70 cm	70-80 cm	80-90 cm
Metal	13	10		5	3				
Glass Fragments	9	7					1		
Porcelain	3	7							
Rubber	14								
Plastic									
Brick		3							
Ceramic	1								
Clay	1								
Asphalt		2							
Tar									
Iron									
Copper									
Glass Marble									
Ceramic Dish									
Total Artifacts: N = 79									

APPENDIX L

NEONATE SKELETAL INVENTORY SHEETS

JUVENILE SKELETON VISUAL RECORDING FORM
b. FETUS (NEWBORN), ANTERIOR VIEW





Series/Burial/Skeleton CA-SCR-12, B #3

Observer/Date ATWOOD 3/6/13

Notes

Cranium fragmentary

Vertebrae: 14 left neural arches and 7 right neural arches

6 long bone fragments, indeterminate

OHLONE FAMILIES CONSULTING SERVICES
HUMAN SKELETAL INVENTORY

Site: CA-SCR-12 Burial No.: 3 Date: 3/6/13 Recorder: Atwood

Metrics:

Sex (criteria used): Indeterminate (neonate)

Age (criteria used): Neonate, 0-6 months

Condition of Skeleton: Good, with slight postmortem damage to cortex and some fragmentation.

Cranium: F(8) = 3 vault fragments, R petrous portion of temporal, 3 fragments that are possibly sphenoid and complete L zygomatic

Cribra Orbitalia: (L) X (R) X

Mandible: X

Teeth Permanent-Loose: X In-situ: X
X X

Deciduous-Loose: X In-situ: X
X X

Hyoid: X Sternum: X

Vertebrae:
Cervical: 4 left cervical neural arches and 3 right neural arches

Thoracic: 3 left thoracic neural arches and 2 right neural arches

Lumbar: 5 left lumbar neural arches

Sacrum: X

Indeterminate: 2 additional left neural arches and 2 additional right neural arches

Os Coxae:		LEFT	RIGHT	INDT
Mature				
Immature:	Pubis	C(1)	X	X
	Ilium	C(1)	X	X
	Ischium	X	X	X

Ribs: No. Complete (L) 4 ** (R) X No. Incomplete X

	LEFT	RIGHT	INDT		LEFT	RIGHT	INDT
Clavicle	C(2)	X	X	Scapula	X	C (1)	X
Humerus	X	I (1)	X	Femur	X	C (1)	X
Radius	I (1)	X	X	Patella	X	X	X
Ulna	X	I (2)	X	Tibia	X	C (1)	X
				Fibula	X	F (1)	X
Carpals:				Tarsals:			
Navicular	X	X	X	Calcaneus	X	X	X
Lunate	X	X	X	Talus	X	X	X
Triquetral	X	X	X	Cuboid	X	X	X
Pisiform	X	X	X	Navicular	X	X	X
Grt. Mult.	X	X	X	1st Cuneiform	X	X	X
Lsr. Mult.	X	X	X	2nd Cuneiform	X	X	X
Capitate	X	X	X	3rd Cuneiform	X	X	X
Hamate	X	X	X				
Metacarpals:				Metatarsals:			
MC 1	X	X	X	MT 1	X	X	X
MC 2	X	X	X	MT 2	X	X	X
MC 3	X	X	X	MT 3	X	X	X
MC 4	X	X	X	MT 4	X	X	X
MC 5	X	X	X	MT 5	X	X	X

Phalanges: Hand X Foot X

Indeterminate 6 long bone fragments, unable to determine specific elements

Additional Notes ** 1 rib is possibly left 1st rib

(additional elements found in trench determined to be same individual)

KEY:

C (1) = complete (2/3 of element with articulating surfaces)
I (1) = incomplete (less than 2/3 of element but more than 1/3 with articulating surface)
F (1) = fragmentary (less than 1/3 of element or shafts only)
X = absent
Ribs = complete indicates that the vertebral end is present as well as completely present.
If element is complete but in pieces, indicate thus: C (3) for number of pieces
If epiphyses present on subadult's long bone indicate thus:

$\text{Femur C (1)}^{p}_{d}$