

APPENDIX C
Research Design

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ARCHAEOLOGICAL RESEARCH DESIGN

The evaluation of cultural resources and the recovery of scientific data from them occur within the context of research programs that are designed to advance knowledge concerning particular aspects of prehistory and history. While the research potentials of presently unknown resources cannot be anticipated with any precision, general regional research domains and a number of specific issues that may be applicable are identified briefly here, for use in helping to direct archaeological evaluation and data recovery efforts for the SRPL project.

A research design for a previous phase of the SRPL project was developed by Anna C. Noah and Dennis R. Gallegos (2008:4-1 through 4-19), and a modified version was included in the inventory report for the MSG segment (Garcia-Herbst et al. 2009). Regional research issues and questions have also been identified in other contexts (Laylander 2008, 2009). The following discussion is derived in part from those discussions.

PREHISTORIC ARCHAEOLOGICAL SITES

Chronology Building

Is a Pleistocene “Pre-Projectile Point” pattern represented in the region?

Comments: Evidence for early occupations have been claimed near both the western and eastern ends of the SRPL alignment, in the Mission Valley and coastal San Diego area and in the Yuha Desert (e.g., Begole 1973, 1976; Bischoff 1976; Carter 1957, 1980; Minshall 1976, 1989). Some of these specific claims have subsequently been refuted, while others are regarded with skepticism by many professional archaeologists (cf. Erlandson et al. 2007; Moratto 1984; Taylor et al. 1985). Nonetheless, the timing of the initial human occupation in the Western Hemisphere remains a topic of prime scientific and popular interest, and areas near the continent’s western coastline may be particularly suitable for addressing this issue (Dixon 1999).

Data Needs and Opportunities: To make significant contributions toward supporting the “Early Man” hypothesis, remains within the SRPL alignment would need to be unambiguously identified as cultural rather than natural, and they would probably also need to be strongly associated with early radiocarbon dates. Early Man assemblages might be recognizable as lacking in the assemblage characteristics of local post-Pleistocene sites.

Is the Early Holocene “San Dieguito” pattern chronologically distinct from a preceding Pleistocene “Clovis” pattern and subsequent Middle Holocene “Archaic” patterns?

Comments: Archaeological components that have been generally recognized as “San Dieguito” are scarce in the region, and they are usually not well dated, with the exception of the C. W. Harris type-site in Rancho Santa Fe (Pigniolo 2005; Rogers 1966; Warren et al. 2008). It has been proposed that San Dieguito assemblages may merely represent the remains from functionally distinctive activity sets, rather than markers for either a chronological period or a cultural tradition (cf. Gallegos 1987).

Data Needs and Opportunities: It may be possible to document the presence of characteristic “San Dieguito” artifact types, including large-stemmed projectile points, large bifaces, crescents, and scraping tools at sites in the SRPL alignment. Their association with chronometrically datable materials, such as charcoal or animal bone, may be able to further define their chronological position. Their association or non-association with artifact types that are often taken to be representative of earlier or subsequent cultural patterns, such as fluted, notched, narrow-stemmed, or small projectile points, or milling implements, may be able to clarify whether the “San Dieguito” pattern is chronologically distinct.

When did mortars begin to be used with frequency in the region?

Comments: A suggested chronological marker for the latest prehistoric period is the extensive use of bedrock and portable mortars, supplementing the longer-established use of portable metates and of bedrock grinding slicks and basins. William J. Wallace (1955, 1962) proposed that the use of the mortar and pestle was characteristic of the late prehistoric period (that is, after ca. A.D. 1000). Claude N. Warren (1964, 1968) put the local appearance of mortars earlier, around 3000 B.C.

Data Needs and Opportunities: Bedrock mortars are likely to be a common feature within the SRPL alignment. However, it is usually difficult or impossible to assign dates to bedrock milling features. If substantial cultural deposits are associated with the features and are dated, a chronological association between the features and the deposit may be proposed. Pestles may be recovered and dated in archaeological deposits, although their occurrence is not frequent in this region, and unshaped pestles may be difficult to distinguish from other artifacts or unmodified natural objects.

When were small projectile points, indicative of bow-and-arrow technology, introduced into the region?

Comments: Within the larger region encompassing California and the western Great Basin, the introduction of the bow and arrow and the manufacturing of small projectile points have been dated to about A.D. 500 (Yohe 1992). The presence of small, corner-notched (“Rose Spring”) forms, generally dated between ca. A.D. 500 and 1250, has been taken to mark the earliest phase of bow-and-arrow use. Corner-notched forms appear to be almost entirely absent from assemblages in the southernmost portion of California and Baja California (but cf. McFarland 2000). In contrast, triangular (“Desert series”) forms, with or without side-notching and serration (“Cottonwood,” “Desert,” and “Dos Cabezas” types), are present in abundance in

southernmost California. The appearance of Desert series point forms has been variously estimated as postdating ca. A.D. 1250, 1100, 900, 600, or 500 (Heizer and Hester 1978; Jennings 1986; Koerper et al. 1996; Warren 1984). Possible hypotheses to explain the disparity between the western Great Basin and southernmost California are that Desert series points were introduced relatively late, with a significant lag in the introduction of bow-and-arrow technology into the latter region, or else that triangular forms were introduced or innovated earlier in this region than elsewhere.

Data Needs and Opportunities: Small projectile points may be anticipated to occur relatively frequently at sites within the project area. The recovery of triangular points from well-dated early (pre-A.D. 1250) contexts would support the hypothesis of an early presence of this form. The recovery of corner-notched points in the project area would support the hypothesis that a limited local use of this form preceded the introduction of triangular forms.

When was pottery-making introduced in the region?

Comments: Ceramic technology is generally taken to be one of the hallmarks of the late prehistoric period. Potsherds are relatively common at late sites in the region. Estimates for the introduction of brownware pottery (“Tizon Brown”) have ranged from ca. A.D. 700 to 1200 (Berryman 1981; Griset 1996; May 1978; Warren 1964). However, claims have been made for the presence of similar-appearing fired clay artifacts in southern California sites as early as ca. 1500 B.C. or 3000 B.C. (Drover 1971, 1975, 1978; Drover et al. 1979; Porcasi 1998). The conventional assumption has been that pottery-making was introduced into the region from the east, from the Colorado River area and ultimately from either the American Southwest or northwestern Mexico. An alternative possibility that the technology might have been reinvented locally has also been suggested (Griset 1996).

Data Needs and Opportunities: Pottery is likely to be a common occurrence at sites in the SRPL alignment. To testing for possible early dates associated with such pottery, several approaches are now available. Firm associations between ceramic artifacts and radiocarbon samples, for instance charcoal in hearth contexts, has been the standard approach. Accelerator mass spectrometry (AMS) radiocarbon dating of very small samples of organic material now offers a potential to date carbon residues taken directly from sherds (Griset 1996). Thermoluminescence dating also offers promise, although the necessary controls and the available precision for this technique are less well defined (Feathers and Rhode 1998).

When were various changes in buffware pottery introduced into the region?

Comments: Buffware (“Lower Colorado Buff Ware”) pottery was produced in the Colorado Desert but is also found frequently in archaeological sites further west. Several proposals have been made for the recognition of chronologically diagnostic buffware types and attributes (Rogers 1945; Schroeder 1958; Waters 1982a, 1982b). These chronological proposals have not always been consistent with each another, and several of them have been challenged on the basis of more recent evidence (Hildebrand 2003; Laylander 1997a; Schaefer and Laylander 2007).

Data Needs and Opportunities: Buffware ceramics are fairly likely to occur at sites in the SRPL alignment, particularly in its eastern portions. As noted above, several methods are potentially available for dating potsherds. For documenting formal attributes, such as vessel shape and decoration, visual observations may be sufficient. For compositional attributes, visual observations may need to be supplemented by more intensive methods, such as petrographic thin-section analysis, x-ray fluorescence (XRF) analysis, and instrumental neutron activation analysis (IMAA) (Hildebrand et al. 2002).

When was the practice of cremation introduced into the region?

Comments: The replacement of inhumation by cremation has been taken as another key attribute indicative of the latest period of prehistory in this region. It is uncertain whether or not this change coincided chronologically with the introduction of ceramics and small projectile points. It has been suggested that cremation was adopted in coastal San Diego County as early as ca. 500 B.C. (Moriarty 1966).

Data Needs and Opportunities: Inhumations and cremations are likely to be fairly rare in the project area. If such remains are encountered, any detailed scientific study of them may be preempted by contemporary Native American concerns and by burial protection laws such as the Native American Graves Protection and Repatriation Act (NAGPRA). If permitted, radiocarbon dating would offer the most likely method for testing hypotheses concerning changes in burial customs.

How can obsidian hydration be used as an effective chronometric method, and what is the precision that can be obtained with it?

Comments: Obsidian hydration dating is a promising direct chronometric technique, but it is still relatively undeveloped in this region. Factors that have limited its use include the fairly common availability, as an alternative, of organic materials for radiocarbon dating; the scarcity of occurrence of obsidian artifacts within the well-dated contexts needed to provide reliable hydration calibration points (cf. Dominici 1984; Laylander 1997a); relatively minor overall use of obsidian throughout much of the region (Laylander and Christenson 1987); the necessity of controlling for the specific geological sources of specimens and for effective hydration temperature; and uncertainties as to the chronological precision that is obtainable through the method (cf. Laylander 2002).

Data Needs and Opportunities: The recovery of obsidian specimens from independently datable contexts at sites within the project area may be able to contribute significantly to the refinement of local hydration chronologies. Obsidian artifacts are likely to be present at most of the more sites in the SRPL alignment that contain substantial assemblages of flaked lithic artifacts. They are particularly likely to be present at sites that date from the late prehistoric period and are located near the crest of the Peninsular Range. Hydration readings for specimens recovered from subsurface contexts tend to be less erratic than for surface specimens. To interpret hydration readings, it is usually necessary to chemically source specimens, which may only be

possible for specimens above a minimum size. Hydration readings are particularly useful if they are taken on chronologically diagnostic artifacts (usually projectile points) or on specimens from contexts that are independently well-dated.

Paleoenvironments

When was Lake Cahuilla present in the Imperial Valley, and when was it absent?

Comments: Few Holocene paleoenvironmental changes within the project area were extreme enough or are well-enough documented in archaeological deposits to be likely to be effectively addressed at sites in the SRPL alignment. One notable exception is prehistoric Lake Cahuilla. The lake was created when the Colorado River spontaneously diverted its course into the Imperial and Coachella valleys on several occasions during the Late Holocene and perhaps earlier as well. It is likely that the lake's rises and falls substantially affected aboriginal settlement and resource use (Laylander 2006); defining the lake's chronology is consequently a key issue for the region's human prehistory. Lake Cahuilla was once thought to have been in existence between ca. A.D. 1000 and 1500, but successive archaeological studies have extended the time range of the lake forward into the 1600s and backward at least several centuries prior to A.D. 1000, and they have distinguished several nonlacustrine intervals within that range (Laylander 1997a; Love and Dahdul 2002; Rogers 1945; Schaefer and Laylander 2007; Waters 1983; Wilke 1978).

Data Needs and Opportunities: The eastern end of the SRPL alignment approaches the western maximum shoreline of Lake Cahuilla. Archaeological deposits containing remains from lacustrine resources, such as freshwater fish, shellfish, and water birds, in datable contexts may provide additional evidence concerning the lake's chronology.

Subsistence and Resource Use

Did agave roasting become substantially more important in the region during the latest prehistoric period?

Comments: Roasting pit features are abundant within the region, particularly along the upper eastern margin of the Peninsular Range (e.g., Cook and Fulmer 1980; May 1987). A sampling of 20 reported radiocarbon dates from roasting pit features in western Imperial and eastern San Diego counties includes one age estimate of 11,000 years, four dates in the A.D. 1400s, three dates in the 1600s, and 12 dates later than 1800 (Bastian 1977; Cheever and Gallegos 1988; Shackley 1983, 1984). The use for such earth ovens to roast agave is well documented ethnographically (e.g. Castetter et al. 1938; Gifford 1931; Shipek 1991). However, there is also ethnographic evidence for pit roasting of at least 11 additional plant species, as well as meat (cf. Laylander 2009).

Data Needs and Opportunities: Roasting pit features may be expected in central-eastern portion of the SRPL alignment. The chronology of roasting pit use may be refined further through the acquisition of additional radiocarbon dates from samples of the charcoal they contain. The

recovery and identification of floral and faunal remains from the features may shed light on the resources that were processed in them and the materials that were used in them for fuel.

Did the exploitation of acorns and pine nuts become substantially more important in the region during the latest prehistoric period?

Comments: There has been considerable discussion as to whether or not the focused exploitation of acorns was a Late Holocene phenomenon in prehistoric California, including San Diego County (cf. Basgall 1987; Jones and Klar 2007:306; True 1993). Similar questions have been raised concerning a late intensification in the exploitation of pine nuts in some parts of the state (e.g., Bettinger 1976; Hildebrandt and Ruby 2006). Ethnographic evidence attests to the use of both these resources by local groups (Drucker 1937, 1941; Hohenthal 2001; Shipek 1991; Spier 1923). Oaks were prevalent in much of San Diego County from the crest of the Peninsular Range west, although the acorns from higher-elevation species, in particular *Quercus kelloggii*, may have been preferred. Pinyon pines were present in scattered portions of the Peninsular Range, and also on the coast in the Torrey Pines area. Indirect evidence of a late prehistoric intensification in the use of these resources comes from the late-period emphasis on the use of the mortar and pestle (see the discussion above) and an increased focus of settlement in interior areas (e.g., Christenson 1992).

Data Needs and Opportunities: The central portion of the SRPL alignment includes areas that were likely to have been involved with the exploitation of acorns and pine nuts. Arguably, indirect archaeological evidence for acorn processing may be encountered in bedrock mortars and granary foundations (James 1995). Documenting the distribution and frequency of such features, their social contexts, and, if possible, their chronology may shed light on intensifying acorn use. More direct evidence of acorn and pine nut processing may be obtainable from macrofloral remains within archaeological middens or from protein residues on processing tools or surfaces.

Were bighorn sheep a significant subsistence resource for groups living near the eastern margin of the Peninsular Range?

Comments: Bighorn sheep (*Ovis canadensis*) remains have been recovered from several archaeological sites in eastern San Diego County, but in particular from Indian Hill Rockshelter near the Imperial County line (Hubbs et al. 1960:202; Shackley 1981:84; Yohe et al. 1986). Small, serrated (“Dos Cabezas”) projectile points were relatively numerous at Indian Hill Rockshelter, and it was suggested that they may have been employed in particular to hunt bighorn sheep, because of a potential to maximize tissue damage (Wilke and McDonald 1986).

Data Needs and Opportunities: The central-eastern portion of the SRPL alignment includes areas of bighorn sheep habitat. Analysis of faunal assemblages from sites in this area may be able to shed light on the general importance of bighorn sheep within subsistence patterns. Protein residue analysis studies on artifacts, particularly serrated projectile points, may be able to determine whether these were used to procure or process bighorn sheep.

Was agriculture practiced prehistorically in Imperial Valley and in San Diego County?

Comments: Prehistoric Native Americans in most parts of California seem to have subsisted entirely on the hunting and gathering of natural plant and animal resources. An exception was the lower Colorado River area, where a pattern of corn-beans-squash (CBS) agriculture derived from the American Southwest prevailed. Ethnographic evidence suggests that CBS agriculture was also practiced in the Imperial Valley at least as early as the first half of the nineteenth century (Gifford 1931), but whether it had spread into that region prior to the arrival of the Spanish is uncertain. Ethnohistoric and ethnographic evidence has also been cited to argue that both CBS agriculture and the use of local cultigens were practiced aboriginally in areas to the west of the Peninsular Range, although this claim has been challenged (Bean and Lawton 1973; Forbes 1963; Shipek 1993; cf. Laylander 1995). Archaeological confirmation of pre-Spanish agriculture in the western Yuman area is still lacking.

Data Needs and Opportunities: The SRPL alignment includes areas on the western margin of Imperial Valley that might contain archaeological evidence for agriculture associated with the periodic overflow of Colorado River water into the Alamo and New river channels. In the Peninsular Range, the alignment also lies close to some finds of CBS cultigens in aboriginal but early historic contexts (Treganza 1947), and also near Jacumba valley, where native cultivation was reportedly practiced at least as early as the middle of the nineteenth century (Gifford 1931:22). Archaeological deposits containing macrofloral remains, pollen, or tools with protein residues may be able to address this question.

What factors determined prehistoric choices of lithic materials to be used in the manufacture of flaked lithic artifacts?

Comments: Within the SRPL alignment, the region's inhabitants had direct access to flakable toolstone from a considerable variety of different geologic contexts. The archaeological record indicates that these materials were exploited with varying frequencies during different periods and within different subregions (Dietler 2004; Hughes and True 1985; Laylander and Christenson 1987; McDonald and Eighmey 2008; Moriarty 1966; Pignuolo 1992, 1994, 1995, 1996). Major toolstone sources included the glass of Obsidian Butte in Imperial Valley, the volcanic rocks on the eastern margin of the Peninsular Range, veins of quartz in the granitic batholith of the Peninsular Range and interior valleys, metavolcanics of the Santiago Peak formation in a belt west of the batholith, various forms of cryptocrystalline silica in scattered occurrences, and cobbles of volcanic rocks and quartzite in the coastal sedimentary zone. Factors that likely influenced toolstone choices include specific technological requirements (nodule size, hardness, brittleness, etc.), the distance from the source to the location of use, and the presence of any intervening social barriers between the source and use locations.

Data Needs and Opportunities: Substantial assemblages of lithic artifacts within the SRPL alignment would offer opportunities to test hypotheses about toolstone preferences, based on the relative frequencies of different material types within the assemblage as a whole and within

particular classes of artifacts. Required steps to realize this potential would include the systematic recovery of sizeable, unbiased samples of artifacts, the identification of lithic material types in the assemblage, and the identification of the artifact classes represented.

Settlement

Are the prehistoric settlement systems in various parts of the region and during various time periods better categorized as those produced by “foragers” or by “collectors”?

Comments: An influential model for interpreting prehistoric settlement patterns has been based upon a dichotomy between “foragers,” who move their settlements to the locations of resources, and “collectors,” who bring harvested resources to their base settlements (Binford 1980). Archaeological traits that have been suggested as being diagnostic of collector systems include field camps, which were occupied overnight by task groups; “stations,” such as locations used to observe or ambush game; cache sites, and storage features within larger sites; and a greater amount of intersite variability. The forager/collector model has been applied to San Diego County by some researchers (e.g., Beck 1993; Byrd and Reddy 2002; Byrd et al. 1993; Graham 1981; Hector 1988; McDonald et al. 1993; Warren et al. 2008; Wilke and McDonald 1989). Generally, the region’s inhabitants during earlier periods have been characterized as “foragers,” and the inhabitants during later periods, as “collectors.”

Data Needs and Opportunities: The forager/collector dichotomy may be addressable within the SRPL alignment primarily by attempting to identify field camps, stations, caches, and storage features, and associating these sites with particular geographical settings and time periods. The “collector” site types will be characterized primary by the presence of artifacts and features appropriate to their specific functions and the absence of the range of artifacts and features that would be characteristic of habitation bases or temporary camps. In addition to surface observations, controlled excavation may be necessary to test for subsurface features and to recover representative samples of artifacts.

What were the character and composition of communities in various parts of the region and during various prehistoric periods?

Comments: A community may be defined as “a group of people of both sexes and potentially all ages, living in proximity to each other for an extended period of time” (Laylander 1997b:181). Relevant settlement system dimensions may include the size of communities, the degree of settlement nucleation, seasonal patterns of community fission and fusion, and fluidity in community membership. Ethnographic evidence relating to these dimensions has offered testimony that may be applicable to the latest prehistoric period, although there has been no unanimity concerning the interpretation of this evidence (cf. Laylander 1991a).

Data Needs and Opportunities: Several archaeological variables are potentially indicative of the various dimensions of community character and composition, including variables on the scales of regional patterns, overall site characteristics, and the attributes of individual artifacts, ecofacts, and features (Laylander 1997b). These proposed associations are summarized in

Table 1. Data recovered from sites in the SRPL alignment may be able to contribute to the emerging regional picture.

Table 1. Proposed Relationships between Settlement System Dimensions and Archaeological Variables (from Laylander 1997b:187).

	Community Size	Settlement Nucleation	Community Fission/Fusion	Fluidity in Community Membership	Daily Catchment Size	Annual Range Size	Distance of Residential Moves	Frequency of Residential Moves	Rate of Catchment Reoccupation	Rate of Site Reuse	Logistical Transporting of Resources	Storage of Resources	Intercommunity Exchange of Resources	Exclusivity in Land and Resources	Intensity of Resource Use
Artifact/Ecofact/Feature Variables															
Dwelling Construction	-	-	-	-	-	-	-	+	+	+	-	-	-	-	-
Storage Facilities	-	-	-	-	-	-	-	+	+	+	-	+	-	+	-
Management Facilities	-	-	-	-	-	-	-	+	+	-	-	-	-	+	+
Low-Ranked Resources	+	-	-	-	+	-	-	+	-	-	-	-	-	+	+
Exotic Materials	-	-	-	+	+	+	+	-	-	-	+	-	+	+	-
Processing Stage	-	-	-	-	+	-	+	+	-	-	+	+	+	-	-
Tool Use Wear and Formality	-	-	-	-	-	-	+	+	+	+	-	+	-	-	-
Site Variables															
Site Area	+	+	-	-	-	-	-	-	-	+	-	-	-	-	-
Quantity of Cultural Residues	+	-	-	-	-	-	-	+	-	+	-	-	-	-	-
Activity Diversity	+	-	-	-	-	-	-	+	-	+	+	-	-	-	+
Tool Diversity	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-
Seasonal Range	-	-	-	-	-	-	-	+	-	+	-	+	-	-	-
Intrasite Feature Redundancy	+	-	-	-	-	-	-	-	-	+	-	-	-	+	-
Resource Depletion	+	-	-	-	+	-	-	+	+	-	-	-	-	+	-
Stylistic Uniformity	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-
Regional Variables															
Site Density	-	+	-	-	+	-	+	+	+	+	-	-	-	+	-
Local Site Redundancy	-	+	-	-	+	-	+	+	+	+	-	-	-	+	-
Local Site Complementarity	-	-	-	-	+	-	+	+	+	+	-	-	-	+	-
Catchment Resource Diversity	+	-	-	-	+	-	-	+	-	-	-	-	-	-	+
Settlement Pattern Variability	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-

+ = the archaeological variable on the left is related to the settlement dimension above; - = no relationship is proposed.

What were the patterns of community mobility in various parts of the region and during various prehistoric periods?

Comments: As in the case of community character and composition, the general theme of community mobility may be addressed in terms of several potentially independent variables (Laylander 1997b). These include daily catchment size, annual range size, distance of

residential moves, frequency of residential moves, rate of catchment reoccupation, and rate of site reuse.

Data Needs and Opportunities: The archaeological variables that are potentially relevant to these dimensions of community mobility are also summarized in Table 1.

What methods, other than community mobility, were used to deal with spatial and temporal incongruities between resource availability, labor availability, and consumption needs?

Comments: Independent variables relating to this aspect of prehistoric settlement systems include the logistical transporting of resources to base settlements, seasonal storage of resources, exchanges of resources between communities, the assertion of exclusivity in land and resources, and intensity of resource use (Laylander 1997b).

Data Needs and Opportunities: The archaeological variables that are potentially relevant to these dimensions relating to the management of spatial and temporal incongruities are summarized in Table 1.

Exchange

How was the intercommunity exchange of obsidian organized, and how did exchange patterns change through time?

Comments: Obsidian has been the most extensively studied item of intercommunity exchange within this region, because its source locations are few and it is relatively easy to match archaeological specimens to those sources. In deposits dating from the early phases of prehistory, obsidian artifacts are relatively scarce, and the main source of glass was Coso Volcanic Fields in Inyo County (Hughes and True 1985). In light of the source's distance, Coso obsidian almost certainly had to pass through several steps of down-the-line transmission between communities and across ethnolinguistic lines in order to reach its ultimate consumers in San Diego County. During the late prehistoric period, glass from a less distant source at Obsidian Butte in Imperial County predominated, and the material was used more extensively than had been the case during the early period. Direct procurement at the Obsidian Butte source may have been undertaken by some communities at locations in the eastern portion of the SRPL alignment, but this is unlikely for most of the alignment. A pattern of intercommunity obsidian exchange in the upper portions of the Peninsular Range, probably associated with the autumn acorn harvest, has been suggested on the basis of the varying frequencies of the material at late prehistoric sites in different parts of San Diego County (Laylander and Christenson 1987). After Coso and Obsidian Butte, the third most frequent source for the obsidian in the San Diego region's sites was located near San Felipe in northeastern Baja California (McFarland 2000). The acquisition of San Felipe obsidian would presumably also have involved intercommunity and interethnic transmission in order to reach the areas of its consumption.

Data Needs and Opportunities: Sites within the SRPL alignment may contain obsidian artifacts that can be chemically matched to specific geologic sources, including Obsidian Butte, Coso Volcanic Field, San Felipe, and other sources. If substantial samples of obsidian artifacts from datable contexts are recoverable, they may be able to clarify changing patterns of material use from particular sources. Substantial samples from particular geographical contexts may be able to distinguish patterns of direct procurement and intercommunity exchange.

How was the intercommunity exchange of cryptocrystalline silica (chert, chalcedony, jasper, etc.) organized, and how did it change through time?

Comments: Compared to obsidian, sources of cryptocrystalline silica are generally more numerous, more likely to be locally accessible, and more difficult to match chemically or macroscopically with archaeological specimens. However, the high quality of this toolstone did result in its transmission across distances that evidently represented intercommunity exchange. Some beginnings have been made in matching different varieties of cryptocrystalline silica with their geologic sources and in analyzing the archaeological distributions of sourced specimens, including inferring the social implications of differences in the frequency of specific materials (Pigniolo 1992, 1994, 1995).

Data Needs and Opportunities: As in the case of obsidian, it may be possible to match cryptocrystalline silica artifacts recovered at sites in the SRPL alignment with their geologic sources. This information may be used to test patterns of intercommunity exchange during various periods of prehistory and within various subregions.

What patterns of intercommunity exchange are evidenced by prehistoric ceramics?

Comments: Most prehistoric ceramics in the region are presumed to have been produced locally by their consumers or at least by potters within the same community as the consumers. However, some sherds have attributes that indicate origins outside the local community. Decorated sherds that are assignable to pottery types from the American Southwest are not unknown, but they occur very rarely (e.g., Laylander 1991b; Schaefer 1994). Several proposed Lower Colorado Buff Ware types have been assigned to limited manufacturing areas in the Colorado River valley, but they have been reported from sites to the west of the Imperial Valley (Waters 1982a, 1982b, 1982c) and would therefore likely have been transmitted by intercommunity exchange. Some geographical patterning in varieties of Tizon Brown Ware have also been proposed (May 1978, 1001), but the validity of such patterning remains uncertain (cf. Griset 1996; Weide 1988).

Data Needs and Opportunities: Potsherds are likely to be encountered at sites in the SRPL alignment. Analysis of such sherds in terms of types or attributes that are proposed as geographically diagnostic may contribute information on prehistoric exchange patterns.

What patterns of intercommunity exchange are evidenced by prehistoric shell beads and ornaments?

Comments: Shell beads and ornaments have generally been found only in relatively small numbers in San Diego and Imperial county sites (McDonald and Eighmey 2008:153-162). A local chronology for bead and ornament types has not yet been developed, although chronologies from adjacent regions (Bennyhoff and Hughes 1987; King 1990) have been applied, and direct radiocarbon dating of individual specimens is also possible. At least one shell bead manufacturing site has been identified in western Imperial County (Rosen 1995). Intercommunity exchange may be represented by shell beads and ornaments at inland locations that are distant from the coasts; by bead and ornament types that do not seem to have been locally produced but may represent trade, for instance from the Santa Barbara Channel area; and by specimens made from shellfish species that are characteristic of distant source areas, in particular *Olivella* species that are limited either to the Pacific coast or to the Gulf of California.

Data Needs and Opportunities: Shell beads and ornaments are not likely to be abundant at sites within the SRPL alignment, but they may occur. Identification of bead and ornament types and the shellfish species from which they were made may shed light on prehistoric exchange patterns.

HISTORIC-PERIOD ARCHAEOLOGICAL SITES

Historic-period archaeological sites in the study area can be grouped into four principal site types: residential sites, mining sites, transportation routes and trash scatters. Current research issues for these site types are outlined below.

The research framework for evaluation of historical sites in the SRPL project is guided by the historical contexts for agricultural properties and mining sites in California developed in recent years by Caltrans (Caltrans n.d., 2007), and by historical contexts developed for rural historic sites in San Diego County (Schaefer and VanWormer 1986, 1993). These thematic studies were prepared specifically to provide assistance with evaluation of these property types to the California and National Registers by providing a historical overview and context and identifying specific research themes and questions.

RESIDENTIAL SITES

Residential sites in the SRPL project include late 19th century and early 20th century agricultural farmsteads, and ranches, and twentieth century residential sites. Such sites might include residential structural remains, outbuildings, archaeological deposits, landscape features and infrastructure. The research potential of isolated elements of a historic residential sites within the SRPL such as trash deposits, wells or irrigation features, will be assessed within the context of the ranch, farmstead or residential site and not as isolated features.

Broad research themes defined relevant to rural agricultural and ranching sites include: economic strategies employed by ranchers and farmers; economic and environmental adaptations; the role of women in family farms and ranches; ethnicity and acculturation; technological innovation; class relations and household composition; the effects of industrialization on rural agrarian households; and agricultural labor history.

Site Organization and Land Use

The contextual history of an individual historic site is necessary to provide the basic framework for interpretation of the archaeological data. Essential information about the site should be established, such as the nature of the site, when was it established, by whom, and the extent and boundaries of the property. In addition to providing basic details that define the function of the site, research questions relating to site structure and land use of the SRPL sites would include:

- When was a particular site first constructed and by whom? How long was the site in use? Was the property owned and operated over several generations?
- Did site function change over time? Are changes in land use or site structure attributable to generational changes in the household?
- Are specialized work areas present? Is there evidence of a high degree of specialization or more generalized use of the property? Was production specialized or diversified and did the focus of production change over time? How do changes in production relate to broader historical changes?
- To what extent did the quality of available natural resources determine the success or failure of the farmstead or ranch? Was the long-term success or failure of the farmstead or ranch related to distance from transportation routes?

Data Needs

Archaeological data needs to address these questions include mapped locations of buildings and/or building foundations; structural remains of known function; sheet refuse indicative of specialized activity areas; intact archaeological deposits of known association containing residential and agricultural waste, including trash-filled cisterns, privies and trash pits; landscape features; environmental adaptations such as windbreaks; remnants of fencing and corrals; and presence of orchards and evidence of other land uses. Artifacts collected from defined contexts, a sufficient variety and quantity of materials, items associated with specific activities, and the frequency and proportion of items can assist in supporting any interpretations.

Documentary data sources include land patent files; property and tax assessment records; property deeds; leases; probate records; census records; marriage and death records; financial and production records, if available; and oral history. Contextual sources consist of

comparative data on similar properties in the area, including range of size and productive capacity; range of economic strategies practiced locally; and comparison of archaeological findings from other sites.

Historic Economic Strategies

This theme focuses on economic strategies employed by property owners and farm workers to achieve basic subsistence or to produce income and meet household needs from agricultural production. Archaeological studies are ideally suited to the study of consumer behavior and economic strategies of rural households, and they provide an opportunity to examine how rural households adapted to economic conditions compared to households in other settings such as urban households. One important research issue concerns how successful rural farm families defined wealth and spent money compared to middle- and upper-middle class urban dwellers. Research has indicated that after achieving a basic standard of living that included inexpensive ceramics and a few luxury items, farm families invested in equipment, land, livestock and outbuildings rather than in status symbols favored by urban dwellers such as fine furniture, table settings and clothes (Friedlander 1991). The difference in household values between successful farm families and middle- and upper-middle-class urban residents is manifested through cross-site comparisons of functional profile and economic indexing data. Profiles of rural assemblages show higher frequencies of hardware, livery items, and equipment and machinery parts than those representing urban sites (Phillips and Van Wormer 1991; Van Wormer 1991; Van Wormer and Schaefer 1991; Van Wormer 1996). In addition, rural site assemblages tend to exhibit reduced ceramic index values (i.e. cheaper ceramic wares), that remain unaffected by fluctuating economic trends, as well as excessive ceramic and bottle manufacture-deposition lag time when compared to urban assemblages from the same period. These patterns indicate that rural households exhibited a different style of consumption from urban residents by spending less money on ceramic tableware and being more conservative about disposing of items only a few years old. Trash deposits from ranch and farmstead sites provide an excellent opportunity to test hypotheses relating to consumption patterns of rural versus urban dwellers. Remote rural dwellers survived in very difficult conditions and the rural consumer pattern may be further accentuated at these sites.

As rural areas became less isolated as a result of improved infrastructure, including the construction of roads and railways, agrarian households had access to a wider range of cheaper, mass-produced, and imported goods. Traditionally, rural households tended to be more frugal in terms of buying and disposing of mass-produced goods, compared to their urban counterparts. As access to markets opened up, did rural agrarian household consumer behavior change to conform to more urban consumer patterns? Factors that may have influenced consumer practices include access to resources, reduced cost, fashion, ethnic preference, availability of disposable income, and status aspirations (Yentsch 1993).

- In the SRPL project, to what extent did access to markets influence household purchasing decisions? To what extent did household members depend on mass-produced goods for their needs? How did households adapt to changing economic conditions?

- To what extent was economic diversification practiced? Is there evidence that household members worked outside the ranch or farm for wages? Was small-scale mining practiced?
- Is there any evidence for a greater degree of self-sufficiency during times of economic downturn, such as during the 1890s and 1930s?

Data Needs

Archaeological data needs for answering these questions include the presence of sheet refuse indicative of specialized activity areas; intact archaeological deposits of known association containing residential and agricultural waste, including trash-filled cisterns, privies, and trash pits; landscape features; farm equipment and workshop areas; and presence or absence of cellars, smokehouses, and other features that indicate home production. Artifact analysis includes identification of those materials reflective of home production and self-sufficiency, such as canning jars and homemade items; items that were repaired and reused; the proportion of decorative versus functional items; the proportion of mass-produced consumer goods versus home-manufactured goods; and an analysis of the relative cost of materials. Ecofactual analysis consists of the use of wild versus domestic plants and animals; commercial versus home butchering patterns; and evidence of ethnic dietary preferences.

Documentary sources include land patent files; property and tax assessment records; property deeds; leases; probate records; census records; marriage and death records; financial and production records, if available; and oral history. Contextual sources consist of comparative data on similar properties in the area, including range of size and productive capacity; range of economic strategies practiced locally; and comparison of archaeological findings from other sites.

Historic Household Composition and Lifeways

A household, defined as any group of people that share living quarters and domestic activities, is a microcosm of broader social interactions. In agrarian settings, households can be made up of nuclear families, extended families, unrelated individuals sharing living quarters (such as field workers), or nuclear families living with household servants, ranch hands, and/or field workers. Archaeological studies of rural households can provide insights into the relationships between household members and can also inform on the interactions of the household with society at large. Studies of households also provide an opportunity to examine class, ethnic and gender relations in the setting of agricultural properties.

- How did members of the household manifest age or gender roles? Is it possible to distinguish and interpret individual behaviors (relating to gender, for example)?

- Is there evidence for a family life cycle and generational changes (for example, dumping domestic furnishings and decorations as a new generation takes over the family home)?
- Is there evidence for the health and well-being of the family? How was health of household members maintained?
- How were values (familial, social, religious, moral) taught to children as reflected in children's material items (e.g., toys)?
- How was the class of individual household members expressed materially? Is it possible to distinguish between tenants, workers, and owners based on the nature of material deposits?
- Is there evidence for class distinctions and social distancing (for example, in the layout of residential buildings)?

Data Needs

Archaeological data needs for such questions include refuse-filled features with depositional integrity and a wide variety of associations; deposits with sufficient quantity and variety of materials to support statistically valid analyses; foundations or other remains of residential buildings; and sheet trash and structures representative of specialized activity areas, including root cellars, outdoor ovens, smokehouses, cold storage, and workshops. Examples of artifacts needed include medicine, drug, and alcohol bottles and containers; artifacts attributable to gender and age groups; evidence of modification of artifacts; and domestic furnishings and knick-knacks. Ecofactual data needs include wild and domestic faunal and botanical resources; commercial versus home butchering patterns; and parasite analysis.

Documentary sources include census records; agricultural census data; land patent files; property and tax assessment records; property deeds; leases; probate records; marriage and death records; oral history; personal papers; photographs; maps; and church, school and fraternal organization records. Contextual sources consist of social and local history; studies on similar property types; gender-based studies on agricultural history; relevant anthropological literature; and oral history.

MINING SITES

Mining in California went through several boom and bust cycles. The first great boom in mining, the Great Gold Rush, began in 1848. This period saw the emergence of mining in California from an individualistic endeavor to a developed industry (Caltrans 2007; Holliday 1981; Johnson 2000; Paul 1947). The second boom period extended from the end of the Gold Rush to the turn of the twentieth century. During this period, mining operations became increasingly industrialized as deep lode mining and hydraulic mining techniques were employed to exploit deeper deposits. Mining for non-precious metals also expanded at this

time. The scale and complexity of mining sites during this period of time is in contrast to the smaller scale placer mines of the Gold Rush era (Holliday 1981; Johnson 2000; Paul 1947). During the Great Depression (1929-1941), small-scale mining activities resumed in earnest as individuals sought to exploit small deposits that had previously been overlooked. The miners, many of whom were refugees from urban areas, sought out remote areas, often on public lands. Farmers and ranchers also engaged in prospecting for gold, other metals, and minerals to supplement their household incomes (Greenwood and Shoup 1983).

Mining sites, including failed ones, have the potential to provide data related to mining resources exploited as well as methods of exploitation. These sites may also provide data on the economic adaptive strategies employed by farmers and ranchers in the area during the Great Depression.

- *Were mining claims filed in the SRPL project? If so, by whom?*
- *What kind of minerals resources were being mined and for what use?*
- *What methods were used?*
- *Were those operations large operations or small mining attempts made by a local landowner/rancher?*

Data Needs:

Data needed from artifacts and features to address questions related to mining in the SRPL project area include size and depth of prospecting pits; the presence/absence of tailings; and the presence of a surface scatter of structural remains, mining tools, trash scatters, and/or trash pits.

Documentary sources needed include Bureau of Land Management mining claim records; County Courthouse records; State Mining Bureau county reports; property and tax assessment records; property deeds; oral history; and local newspaper accounts. Contextual sources consist of social and local history; studies on similar mining property types; and oral history.

REFUSE SCATTERS

In many rural areas municipal trash collection was never implemented and individual households remain responsible for disposing of their own trash. In the years before people had automobiles at their disposal, trash was generally disposed of either on the householder's property, preferably at some distance removed from the residence, or on an adjacent vacant piece of land. Often householders dug pits into which they deposited trash until it became too full. Periodically the trash was burned so that it would not attract rodents. The pit was eventually backfilled and another pit was excavated. Old privy pits were frequently used to

dispose of trash before they were backfilled. Trash was also dumped close to the main residence initially before it was moved to a pit for burning or burying. In rural settings, trash pits and trash surface scatters tend to cluster on the edge of the main residential/activity area, at some remove from the house.

Before the automobile, trash was transported in horse-drawn carts to municipal dumps. Farmers could also use carts to remove trash from their property to dump in an adjacent, vacant property, but as the road system was poor and moving trash by horse-drawn cart was a laborious process, rural dwellers did not tend to travel far to dispose of their trash. With the advent of the automobile, however, people experienced greater mobility and disposal of household trash became easier. People could now travel out of town to dump trash on vacant parcels on the outskirts of town, and farmers could also transport their trash more easily to dump outside their property. Improved roads also facilitated trash disposal. In the San Diego backcountry, there was no shortage of vacant land close to roads that was available for trash disposal. Transporting trash for dumping elsewhere required considerably less labor than excavating a pit, transporting the trash to the pit, burning it and then backfilling it.

Guerrero and Bupp (1996) identify three principal types of trash dumps in the archaeological record: trash dumps associated with a residence; trash dumps associated with an on-site activity, but not a residence; and isolated trash dumps that are not associated with either a residence or on-site activity. Historic archaeological sites are generally evaluated for their potential to address important regional research issues. Trash deposits associated with a known household have the greatest research potential. These are discussed under the research design for Residential Sites. Where no historical context can be established for a trash deposit and there is no known association with any household, ethnic group, community or labor group, the lack of a definitive association diminishes its research potential.

These research questions address three main research domains: chronology, and structure and integrity of the cultural deposits.

Chronology

- *Can the chronological placement of the trash deposit be determined?*
- *What kinds of chronometric data are available? How well do the different kinds of chronometric data correlate?*
- *Are there data indicating the presence of multiple dumping episodes at project sites?*

Data Needs

Date ranges for individual historic deposits are derived from glass maker's marks, maker's marks on ceramics, technological features of both tin cans and bottles and chronological markers such as glass color (Clark 1977; Fike 1987, 2002; Fontana and Greenleaf 1962; IMACS 1990; Jones and Sullivan 1985; Kendall 1978, 1979; Kovel and Kovel 1986; Lockhart

2000; Munsey 1972; Rock 1980a-b; Sharley 2002; Simonis 1987; Toulouse 2001). These various kinds of chronological data generally provide a fairly narrow date range for the manufacture of the artifact. In order to provide a date range for deposition, all of the chronological data from individual artifacts are correlated. The date of deposition is assumed to be sometime after the latest date of manufacture. The time lag between manufacture and discard varies depending on the function of the artifact. For example, an expensive porcelain teapot may be a family heirloom that would remain in the family for decades, while a tin can or milk bottle was likely discarded immediately after use. A date range for the deposit is estimated based on the latest manufacture date and the expected time lag before discard. Where multiple dumping episodes were suspected based on the range of dates of manufacture, an effort is made to differentiate individual dumping episodes and provide an estimated date range for each.

Technology, Subsistence and Settlement Organization

- *What is the nature of refuse at historic sites? Is it possible to determine the original activities that resulted in the historic deposit? For trash deposits is it possible to determine the origin of the deposits?*

Trash deposits associated with residential sites tends to be directly associated with the household and therefore can be analyzed for data regarding the date of occupation and abandonment of the residence, activities that took place within the farmstead/ranch, household composition and gender, and consumer behavior of the residents (see “Residential Sites” above). It should be remembered, however, that not all trash present on residential sites relates to the original occupation. Once sites were abandoned they were considered vacant, and roadside and opportunistic dumping could take place. It is important that every effort be made to identify post abandonment trash deposits so that they can be eliminated from analysis of homestead-related activity.

For trash deposits, it is more difficult to make an association with a single household or even group of households. Typically, isolated trash deposits are found on what were vacant lots at the time of deposition. While the trash may have been deposited from a nearby household, this is extremely difficult to establish. Cross- matching of artifacts from adjacent home sites is one method that can be used to associate an isolated trash deposit with a home site. If a portion of an artifact is found on a homesite and another portion found in a nearby dump, this would help to establish the origin of the trash deposit. The association of other trash dumps are difficult to identify and therefore their research potential is poor.

Structure and Integrity of Cultural Deposits

- *Do inclusive chronometric data from the sites permit the identification and definition of temporally and /or spatially discrete historic dumps?*

- *Are the definitions of discrete components supported by multiple, independent chronological controls and if so how similar are their age estimates?*
- *Is there substantial evidence of occupational 'overprinting'? How has this affected the temporal integrity of the refuse deposits?*

Later dumping episodes can result in a mixing of historic, submodern and modern deposits in such a way that differentiation of dumping episodes can be difficult, if not impossible. Since historic trash deposits tend to be largely surface scatters, the sites lack vertical stratigraphy which would help in distinguishing between historic and later deposits. In some cases, the dumping episodes have taken place in different areas of the sites and it is possible to distinguish between historic and later deposits. However, at many of the sites historic deposits are mixed with submodern and modern dumping. Consequently, chronological control is lacking, and the research potential of the historic deposits is reduced.

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