A Cultural Resource Evaluation (Phases I and II) for the Ta'u Secondary Road Located on Ta'u Island, American Samoa
March 1996

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Abstract

At the request of Mr. Jack Kachmarik of the American Samoa Disaster Recovery Office (ASDRO), Archaeological Consultants of the Pacific, Inc. (ACP) conducted a Phase I and Phase II cultural resource investigation along the proposed road improvements and reconstruction route for the Ta’u Secondary Road. Pedestrian survey, examination of the stratigraphy along the wave cut embankment and along the sand dune, and test excavations were conducted. The results indicate that two or more subsurface, culture-bearing deposits are present. This is supported by the recovery of artifactual materials, soil analyses and faunal analyses as well as the confirmation of previously recognized finds and cultural materials (Pentress, August 1995).

ACP, Inc.’s investigations confirm the previous recognition that Ta’u Village constitutes one large archaeological site (Site AS-11-51; Clark 1990). Cultural deposits and remains are evident in all sections of the proposed road reconstruction based on the current plans. The deposits and remains are significant for their historical value and the scientific data these will provide concerning history and prehistory in not only Ta’u, but the Manu’a island group and Samoa. Road construction activities will have an adverse effect in some areas of Site AS-11-51 (36 CFR Part 800.9 (b)(1)). It is therefore recommended that a Phase III data recovery plan be developed and implemented following guidelines and principles which accord with Department of Parks and Recreation-American Samoa Historic Preservation Office (ASHPO) guidelines, Section 106 of the National Historic Preservation Act (NHPA) and its implementing regulations promulgated by the Advisory Council on Historic Preservation (ACHP) 36 CFR Part 800: Protection of Historic Properties. An MCA will have to be made between FEMA, ASHPO and the Advisory Council on Historic Preservation. It is also recommended that the preparation of a data recovery plan be finalized after approval of final plans for proposed reconstruction activities and impacts.
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Section 1: Introduction

At the request of Mr. Jack Kackmarik of the American Samoa Disaster Recovery Office (ASDRO), Archaeological Consultants of the Pacific, Inc. (ACP) has conducted investigation for cultural resource evaluation, a Phase I and Phase II cultural resource investigation, for the Ta‘u Secondary Road (Ta‘u Secondary Road Project (GSR46969)) on Ta‘u Island, Manu‘a, American Samoa.

The Ta‘u Secondary Road has been severely damaged and eroded due to recent hurricane weather and water damage from severe wave action against and over the road. Many sections have virtually been washed away. It has been proposed that the Ta‘u Secondary Road be reconstructed (Ta‘u Secondary Road Project (GSR46969)). Clark (1990) recognized that Ta‘u Village (Site AS-11-51) constitutes one large archaeological site. This site area includes the location of the damaged Ta‘u Secondary Road and the location of the proposed reconstruction of the Ta‘u Secondary Road. A previous pedestrian survey was undertaken by Dave Herdrich, Territorial Archaeologist, and Jeff Fentress, ASPA (American Samoa Power Authority) Staff Archaeologist, on August 15, 1995 (Fentress 1995). The subject area runs an approximate length of nearly two kilometers and has an approximate width ranging between five and ten meters. However, about a 50m wide corridor was surveyed in order to assess the entire area since exact locations of the proposed construction activities has not yet been finalized. Extensive archaeological materials were reported along the entire route of the proposed secondary road.

Archaeological Consultants of the Pacific, Inc. was contracted to further assess these findings, evaluate their significance, evaluate the effect of the project on cultural and archaeological materials, and make recommendations for mitigation of impacts to archaeological sites along the proposed realignment and reconstruction area as needed and required in accordance with territorial and federal regulations.

A pedestrian survey was conducted on December 1 and 2, 1995 in order to locate and identify the reported cultural materials and further assess significance. Some of the cultural materials were unable to be located. These may have been washed away due to natural forces or removed during the months from August to December. The extent and density of present cultural materials during this examination did not accord with the previous Phase I assessment. However,
significant amounts of cultural materials were present such that further investigation is warranted and a Phase III data recovery plan be designed pending the finalized draft of proposed reconstruction activities. Construction activities will have an adverse effect along sections of Site AS-11-51.

Limited testing in the form of excavating small test units and profiles into the wave cuts along the deteriorated road and screening deposits in order to assess stratigraphy and recover cultural materials were conducted following the pedestrian survey. Significant cultural materials were recovered. Also, significant cultural deposits (anthropogenic deposits) were recognized in the stratigraphic profiles. These finds warrant further investigation as well.

Furthermore, in a separate current archaeological investigation conducted by ACP for the American Samoa Power Authority (ASPA), human remains were discovered in a location adjacent to the proposed reconstruction area at the north end of Ta’u Village (Latinis et al. 1996). The extent of burials in this location is yet unknown. These burials may extend into sections of the proposed reconstruction area. This also warrants further investigation. The burial is likely associated with Site AS-11-23; the Papatea Sacrifice/Burial Site.

Finally, this investigation along with future investigations will contribute to the development of knowledge concerning the history and prehistory within this region. Extensive research in this area is still deficient for addressing many research concerns. Information recovered during this investigation and further investigations will contribute to research designs and questions concerned with material culture, chronology, trade, settlement, spatial variation, temporal variation and change.

Based on Phase I and Phase II results, Archaeological Consultant’s of the Pacific, Inc. recommends a Phase III data recovery plan be prepared, including formalized reports of findings and further mitigation concerning historic properties and historic cultural materials in accordance with ASHPO and ACHP (President’s Advisory Council on Historic Preservation) regulations following the finalization of the proposed Ta’u Secondary Road reconstruction project plans. Construction activities will have an adverse effect (36 CFR Part 800.9 Criteria of Effect and Adverse Effect (b)(1)- Physical destruction, damage, or alteration of all or part of the property). The finalized reconstruction plans are needed in order to determine proper sampling techniques, field methods and locations as well as determine exact locations of adverse effects and the proposed impact that construction activities will have on the subject property and historic resources.
Section 2: Physical Setting

Section 2.1: The Samoan Archipelago

The Samoan Archipelago is a politically divided chain of islands in the central South Pacific about 4200km (2600mi) southwest of Hawaii and 1000km (620mi) northeast of Fiji. It is located between Geographic Grid Coordinates 168W to 173W and 13S to 15S. The large islands of 'Upolu and Savai'i, along with the small islands of Manono and Apolima, make up the independent nation of Western Samoa. To the east lies American Samoa, a U.S. territory. Tutuila, the largest island in American Samoa, and the small neighboring island of Aunu'u form a distinct subgroup about 100km (60mi) west of the Manu'a subgroup of Ofu, Olosega and Ta'u. Tiny Rose Atoll, about 160km (100mi) further east, represents the easternmost edge of the archipelago. Swains Island, 375km (225mi) to the northwest, though geographically a part of the Tokelau Islands, is the northernmost political possession of American Samoa.

Section 2.2: The Manu'a Group and Ta'u Island

Built by volcanic activity along the crest of the easternmost portion of the submarine Samoan Ridge, the Manu'a subgroup is a typical example of "hot spot" progressive volcanism stretching from northwest to southeast. Ta'u Island (see Figure 1), having an area of 28.5 square kilometers, represents the largest volcanic center of the subgroup, where a'a and pahoehoe flows of non-porphyritic basalt, olivine basalt, picrite basalt, and feldspar-pyrrhic basalts accumulated more than 912m (3056ft) AMSL (above mean sea level) at the summit of Lata Mountain (Stice & McCoy 1968).

The three Manu'a islands share a common physiography of a steep sided volcanic shield, narrow (or nonexistent) rockband coastline, fringing coral reef, and a limited area of habitable coastal plain. Potassium-Argon (K-Ar) dates for Ta'u reported by McDougal (1985), revealing an age of 0.1 million years Before Present (B.P.), are consistent with the steep topography of the island which contrasts the older, more eroded islands to the west.

Ta'u falls entirely within the Tropical Climate Zone characterized by a maritime climate with abundant rainfall and warm, humid days and nights. Trade winds blow predominantly from the east. Records from the airport on Tutuila (Nakamura 1984) indicate a mean annual rainfall of 3100mm (124"'). This average is probably representative of coastal regions on Ta'u. However, rainfall can vary greatly over small distances, due to topographical differences, with some areas receiving as much as 6200mm (250") in a year.
Mean daily temperature is reported at 80.0 degrees F (26.7 degrees C) (Nakamura 1984) ranging from a mean daily maximum of 85.4 degrees F to a minimum of 74.6 degrees F. Humidity is generally high during day and night ranging between 80 and 96 percent.

Hurricanes and cyclones strike the islands at irregular intervals, often after a prolonged spell of hot weather. The effect of such storms varies depending on the intensity of the storm and the path of the storm in relation to the islands. Evidence of hurricanes in the archaeological records can be found in the form of anomalous layers of gravel, rocks and coral fragments deposited by the high energy storm surge. The effects of such storms on the prehistoric populations of Ta’u were certainly as severe as those which have been historically recorded.

Yuncker (1945) lists 421 plant species for Manu’a, both indigenous and introduced species. The distribution of vegetation areas in Ta’u (with the exception of tropical montane forest and cloud forest) is largely dependent on the amount of human disturbance which, in turn, is often limited by topography. Additional edaphic, microclimatic, and drainage conditions also have a lesser effect on vegetation distribution. Along the coastal plains and less steep slopes, human activity has significantly modified the natural vegetation. Shifting gardens of taro (Colocasia esculenta), yam (Dioscorea alata), and other crops form a complex with secondary growth and stands of trees, mainly coconut (Cocos nucifera), breadfruit (Artocarpus communis), papaya (Carica papaya) and banana (Musa sp.). These dominate the lower elevations (Kirch 1993), many having been introduced with the first immigrants to the island.

A large marsh area at the northeast end of Ta’u Village, hypothesized to have been formed by the in-filling of a shallow embayment and formation of a broad dune ridge (Hunt & Kirch 1988), is well suited for intensive taro production. A leaf blight struck the taro crop throughout the archipelago in 1993 from which the area is just beginning to recover. As a result, little taro cultivation was observed during the field season in areas normally under intensive cultivation. All of the current survey was conducted in the area deemed "managed land" (Atlas 1981).

Surrounding the coastal plains, further inland and at a higher elevation, is a zone of "disturbed forest" (Atlas 1981). Inland of the "disturbed forest" zone is a vast expanse of the original tropical montane rain forest and, at higher elevations, cloud forest. The steep slopes and dense vegetation that comprise the majority of the inland area preclude any other than occasional utilization by humans.
Typical of island ecosystems, the fauna of Ta'ū is impoverished in terrestrial vertebrates with a somewhat higher diversity of invertebrate species. The highest vertebrate diversity is among the avifauna with several permanent resident species along with seasonal migrants and visiting seabirds. As in other Polynesian islands, the avifauna diversity has been drastically reduced since human occupation began.

There is one indigenous mammal, the fruit bat (*Pteropus samoensis*). Other mammals, the Polynesian rat (*Rattus exulans*), dog (*Canis familiaris*), pig (*Sus scrofa*), and more recently, the housecat (*Felis catus*) were all introduced. Lizards of the families Gekkonidae and Scincidae are the only other indigenous terrestrial vertebrates. Marine turtles (*Chelonia mydas* and *Eretmochelys imbricata*) are infrequent visitors today, although they were most certainly more common in the past.

Nearly the entire island of Ta'ū is surrounded by fringing coral reef 40m to 150m wide. This complex ecosystem supports over 800 species of fish and a wide variety of invertebrates (Jordan & Seale 1906) that are heavily exploited by humans. In the open ocean, beyond the coral reef, are a lesser variety of fish, dolphins and, seasonally, whales.

Soils on the island belong to the Latosols classification. Typical of a geologically young island, the soils of Ta'ū are undeveloped and generally shallow in parent materials of vitric-crystal ash, Lapilli tuff, alluvium, talus, and stream deposits.

According to Atlas of American Samoa (Atlas 1981) the subject corridor passes through areas containing one major soil type, although four additional soil types surround this corridor. The soil type which is present in the subject corridor is characterized as Urban Land-Ngedeubus complex. This soil complex occurs on nearly level coastal plains with slopes from 0-5%. It consists of 40-50% Urban Land and 30-50% Ngedeubus sand. The percentages vary from area to area. Many of these areas are leveled and filled with coral, sand, cinder, coral fragments and other soil materials. Ngedeubus soil is very deep and excessively drained. It is formed from calcareous sand derived from coral and seashells. Surface layers are composed of brownish gray and brown sand to about 10cmbs (centimeters below surface) with underlying pale brown and light yellowish brown sand layers which reach a depth of approximately 150cmbs. Ngedeubus soils are highly permeable and available water is low. Effective rooting depth is 150cmbs or more. Runoff is slow and there is slight hazard of water erosion. In some places this soil is subject to occasional brief periods of flooding during prolonged, heavy rainfall or during high surf.
The slope of the subject area varies from 0-5%. Elevation begins at sea level and reaches a maximum of three to four meters above mean sea level. The subject area receives from 3000-4100mm of annual rainfall. The subject area maintains a constant annual temperature of 26-27 degrees Celsius. Coconut and breadfruit trees (*Cocos nucifera* and *Artocarpus communis* respectively), small ornamental gardens, and some grasses are found near many of the households which border the eastern edge of the subject area. There are also a few banyan trees (*Ficus benghalensis*) located along the subject corridor near the beach. Mixed forest and marsh plants are located in areas to the east of the subject area further away from the coast.

The area including and surrounding the subject area is generally characterized as managed lands and coastal marsh with silty clay loams, sandy clay loams, bouldery loams and calcareous sand beach and coral. The subject area is primarily calcareous sand beach and coral. Bordering soils include Ofu Variant-Rock outcrop complexes, Inak Variant Clay Loam, Pava’ia’i Stony Clay Loam and Rock Outcrop-Hydrandepts-Dystrandepts associations.

The geology of the subject property is characterized as modern beaches composed of unconsolidated fragments of dead decaying remnants of marine organisms; beach rock being frequently present. This extends north to south at the western side of Ta’u Village along the coast. Directly behind the northern section of Ta’u Village in the marsh area to the east, the geology is characterized as "marsh" which sometimes occur in areas behind constructional benches (see Hunt and Kirch 1988 and discussion below for geological and soil development discussion which applies to this location). Immediately north of Ta’u village is an undifferentiated tuff complex of palagonitized vitric-crystal Lapilli tuff, breccia, and occasional horizontal lava flows from at least three main cones centered at Faleasao, To’a and Fa’asemene Cones. Behind Ta’u to the east and bordering both the dune area and the swamp are alluvium, talus and stream deposits. The area is further bordered to the east by volcanic deposits of red vitric-crystal ash, Lapilli tuff, olivine basalt lavas; and to the south by post-caldera volcanics consisting of olivine basalt, picrite-basalt, basalt and Hawaiian.

Kirch (1993) has developed a morphodynamic model of coastal terrace formation in relation to human occupation on Ofu that he believes is likely reflected on Ta’u due to their close proximity and similar geological age (see also Hunt and Kirch 1988; Kirch *et al.* 1990). The model, based on Holocene sea level change, subsidence due to point loading on the oceanic crust, and increased sedimentary budgets in relation to the formation of the coastal terrace would predict that the earliest formation and stabilization of the currently habitable coastal zone at To’aga, Ofu Island occurred about
5000 to 3000 years B.P., with rapid progradation after about 2000 years B.P. (Kirch 1993; Hunt and Kirch 1988; Kirch et al. 1990). It is suggested that the area of coastal terrace available for the initial establishment of human habitation (about 3400 to 3200 years B.P.) would have been restricted to a relatively narrow beach zone at the base of steep cliffs (Kirch 1993:40). Similarly, the earliest habitation on Ta’u, which being geologically younger than Ofu and likely to still be in a period of subsidence due to point loading on the earth’s crust, would be situated in a similar geomorphological location.

Hunt and Kirch (1988) suggest that coastal terrace progradation on Ta’u was accelerated by an increased sedimentary budget due to deforestation and clearing by human occupants. They believe this was especially important for the in-filling of a hypothesized shallow embayment and the formation of the marsh now located behind Ta’u Village and historically used for intensive taro production. Kirch’s morphodynamic model implies that the earliest archaeological deposits will be found at considerable depths, more likely in the former coastal terrace area and adjacent marshlands inland from Ta’u Village. This also has implications concerning early settlement and land use changes throughout time. The model is supported by Hunt and Kirch (1988) and Hunt’s excavations as reported by Clark (1990). Clark notes that the test units excavated by Hunt on the highest point of the beach ridge and in an area adjacent to the marsh did not produce significant amounts of cultural remains and no pottery was recovered from these two test units (see also Hunt and Kirch 1988). Hunt and Kirch excavated three test units in Ta’u Village along a seaward—land transect in the Si’ufaga sector. A pottery-bearing deposit (uncorrected C14 marine shell date 2,330 + / - 50 BP) along with preliminary depositional sequencing suggests that recent deposits are located on the seaward portion of the current beach ridge while older deposits are located on the inner slope of the beach ridge (Hunt and Kirch 1988). This accords with their morphodynamic model.

Section 2.3: Location of the Subject Property

The Ta’u Secondary Road begins from the northern end of Ta’u Village (see Figure 2) just south of the McConnell—Dowell housing building where it diverges from the main road at the intersection where the main road continues to Paleasao Village. From here the Ta’u Secondary Road follows the coastline south along the western edge of the village until it merges back into the main road which leads to the Ta’u pier at approximately the location of Paasouga Point. The grid coordinates of the area surveyed by Fentress (August 1995) are N676622.93/E325371.24 to N672797.87/E320758.36 (coordinates from the Fentress, August 1995 report). ACP personnel surveyed the area from grid
Figure 2: Subject Property on a Topographic Map

KEY

X Approximate locations of wave cut/dune embankment stratigraphic assessments

source: U.S. Topographic Map of the Manua Islands, American Samoa 1963
coordinates 14 13' 45''S by 169 30' 56''W to 14 14' 43''S by
169 30' 29''W; UTM coordinates 8426400mN by 660185mE to
8424650mN by 660950mE. The Ta’u Secondary Road ranges from
20-50m from the water and is located at the point the beach
rises into the dune on which Ta’u Village is located.
Elevation ranges from one or two meters above mean sea level
to approximately five or six meters above mean sea level.
The actual property surveyed included about a 50m corridor
which ran the length of the proposed secondary road, about
two kilometers (10 hectares or 24.7 acres). This corridor
included the beach, the wave cut area, the damaged Secondary
Road and a corridor along the upper dune on which the damaged
Secondary Road was originally built. The exact dimensions
and locations of the proposed Secondary Road were not made
known at the time of evaluation. Therefore, a larger
corridor than needed was evaluated in order to compensate for
the lack of specific information concerning location.
Section 3: Literature Review

Section 3.1: The Samoan Archipelago

Writings concerning sites of an archaeological nature in the Samoan Archipelago can be traced back to the early missionaries and secular writers of the 19th century. These authors, in the course of describing Samoan life at the time, or their experiences in Samoa, on occasion gave general locations for large sites such as abandoned villages and individual site types such as mounds, raised walk-ways and religious structures (fale aitu) (Pritchard 1866; Turner 1884; Stair 1894, 1895, 1897; Churchward 1887; Churchill 1902; Williams 1984). In addition, some authors explicitly described archaeological sites as such (Sterndale 1890; Stair 1894). Thompson (1927) provides a description of earthmounds in Western Samoa. Kramer's (1902-3) ethnography of Samoa and Buck's (1930) volume on Samoan material culture provide ethnohistoric information of interest to the archaeologist. In the 1940's, Freeman (1943, 1944a-c) described a number of archaeological sites. Using ethnohistoric material, Watters (1956, 1958), a geographer, constructed a model of early Samoan settlement patterns.

Modern archaeology in Samoa began in the late 1950's, early 1960's with Golson's (1957) preliminary survey and excavations followed by Green and Davidson's (1969, 1974) extensive surveys and excavations in Western Samoa. Another large survey and excavation project was carried out in Western Samoa in the 1970's (Jennings et al. 1976; Jennings and Holmer 1980). These surveys provided detailed information on settlement patterns, site types, artifact classes, and a complete chronology that placed initial occupation of the islands at c. 3000 B.P.. In addition, the discovery of Lapita pottery on Upolu in Western Samoa was important information linking the origin of Samoan peoples to migrations from as far away as the Bismark Islands located north of Papua, New Guinea (Jennings 1974, Kirch 1988).

Meanwhile, by comparison, very little archaeological work was being carried out in American Samoa. Kikuchi (1963, 1964) conducted a preliminary survey and description of surface sites primarily based on informant testimony and site checking. He and Sinoto conducted some very limited test excavations on Tutuila and Ta'u (Emory & Sinoto 1965). Several contract cultural resource management surveys were conducted by Federal agencies (Ladd & Morris MS 1970; Kikuchi, Silva and Palama MS 1975; McCoy MS 1977). In 1972, Frost (1976, 1978) carried out the next research directed survey. Clark (1980) compiled a site inventory based on a review of previous work, field checking of sites and very limited survey. Little of this research was intensive or systematic and, where it was, it was limited to small project areas tied to compliance.
In 1985, after more than a decade of unproductive years, a revitalized American Samoa Historic Preservation Office began funding a series of systematic archaeological surveys and excavations throughout the Territory (Gould, Honor, & Reinhart [later Brophy] 1985; Kennedy 1985; Brophy 1986; Leach & Witter 1986, 1987, 1990; Ayres & Eisler 1987; Hunt 1987 & Kirch 1988; Clark & Herdrich 1988; Herdrich and Clark 1993; Best, Leach & Witter 1989; Clark 1989; Herdrich 1991; Herdrich & Clark 1993; Kirch & Hunt 1993). These surveys and excavations created a much needed baseline understanding of site distribution, provided detailed excavations of the first early pottery sites known for the Territory, and contributed to the understanding of geomorphological processes that are important to locating early sites and understanding site formation processes. It has also stimulated academic interest in the Territory thereby encouraging scholars to seek funding and carry out work independently of the Historic Preservation Office (Sheppard et al. 1989; Best et al. 1992; Best 1994; Clark & Nunn 1994; Clark & Michlovic in press; Clark, Wright & Herdrich in review). In addition, beginning in 1989 enforcement of the National Historic Preservation Act of 1966 lead to an increase in the number of archaeological compliance projects conducted in the Territory (Kennedy 1989; Clark 1990; Foster 1991a-b; Best 1992a-b, Moore & Kennedy 1994; Herdrich et al. 1995; Shapiro & Cleghorn 1994).

Section 3.2: The Manu’a Group and Ta’u

Kramer (1902) visited the Manu’a Islands in 1898 providing some limited information on abandoned villages and noting a song that mentions the existence of pigeon catching mounds (aia seu lupe) on Ta’u. Buck 1930:322-24 also provides some information about Ta’u primarily about a raised road in Fitiuta. The first modern archaeological survey work on Ta’u was conducted by Kikuchi and Sinoto (Emory & Sinoto 1965) who excavated three tests units, one in Mata’ana Cave (Site A3-11-34) near Faleasao Village and the other two at "cooking-house sites", also in Faleasao. In 1975, Kikuchi et al. (1975) conducted a compliance survey for the U.S. Army Corps of Engineers at the then proposed Ta’u Harbor between Fusi and Fagamoto. They located several structures and recommended mitigation be carried out. Their recommendations were not acted on (Clark 1980:10). Clark (1980) visited the Manu’a group in 1980 and recorded eight sites on Ofu, eight sites on Olosega, and 50 sites on Ta’u.

In 1986, Hunt and Kirch (1988) (see also Kirch et al. 1990) carried out test excavations on all three islands as well as additional survey. Their excavations on Ta’u included four test units in Ta’u Village and coring in the marsh behind the Luma section of Ta’u Village. Their excavations provided information on the geomorphological history of the village (discussed above) and, with the
discovery of pottery dating to 2,330+/−50 B.P., provided initial data that the village had some antiquity (Hunt and Kirch 1988:168–171).

In 1987 and 1989 Hunt and Kirch focused their efforts on the To'aga site on Ofu by conducting extensive test excavations there (Kirch and Hunt 1993, Kirch et al. 1990). Since Hunt and Kirch’s 1986 work, Ta’u has been the subject of a series of compliance surveys, monitoring and limited excavations related to the Fitiuta Airport (Hunt 1987), the Ta’u Road (Clark 1990; Best 1992a; Hardrich et al. 1995) and the Faleasao Harbor (Foster 1991a–b). In addition, Hardrich and Clark conducted a brief hypothesis guided survey for star mounds in 1990 (Hardrich & Clark 1993).
Section 4: Methods

Section 4.1: Research Design

Previously Documented Sites:

There are four archaeological sites near the corridor of the project area: Ta’u Village itself (Site AS-11-51) (Hunt & Kirch 1988, Clark 1990), and three small coral scatters identified by Clark located further east behind Ta’u Village and up the slope of the hill/mountain bordering the back of the Ta’u Village area located along the Ta’u Road (Sites AS-11-59, 60 and 61) (1990). The test excavations and survey at Ta’u (AS-11-51) conducted by Hunt and Kirch (1988) led to the recovery of 115 sherds of Polynesian Plain Ware, shell fishhooks (one of considerable antiquity but presumed to postdate pottery), basalt tools, and a waterworn tabular-shaped coral pebble with parallel grooves (possible early form of net weight).

A polished, drilled bone bead was also recovered in the erosional deposits of the Amouli (AS-11-52) stream bed. This bead was associated with a plano-convex adze form which may indicate an early first millennium A.D. age (Hunt and Kirch 1988:175). However, caution should be exercised when assigning temporal context based on these associations. Plano-convex adzes do not necessarily indicate only an early first millennium A.D. age. The bead, of which similar forms are referred to elsewhere from early eastern Polynesia as "reel" ornaments (Leach et al. 1979; Kirch and Yen 1982), was the first documented from Samoa at the time of Hunt and Kirch’s report (1988). However, bone tool and ornamental artifacts are not necessarily rare.

Reported sites within a kilometer of the research area include three star mounds above Ta’u and Faleasao Villages (Herdrich & Clark 1993), six legendary sites in and between Ta’u and Faleasao (Hunt & Kirch 1987; Clark 1990), the tomb of the last Tu’i Manu’a located at the northern end of Ta’u village, walls and platforms found near Ta’u Harbor by Kikuchi et al. (1975—since destroyed, Clark 1980:10), a specialized site above the Siufaga section of Ta’u Village (Hunt & Kirch 1987, 1988), ten legendary sites (including pools and a spring), four historic sites, and the location of an artifact find north of the project area along the road (Kikuchi 1963; Hunt & Kirch 1987:19–25; Clark 1990:9).

Herdrich et al. (1995) documented three additional sites along the Ta’u Road (the road exiting Ta’u village and continuing to Pitiuta). The sites were assigned AS-11-70, -71, and -72 but will eventually be renumbered as Sites AS-11-73, -74, and -75 in a following report. Site AS-11-70 was originally thought to be Site AS-11-60 reported by Clark (1990). A large coral scatter and some debitage basalt
flakes were encountered on the surface. The site was subsequently tested for subsurface deposits. Ceramic sherds were recovered at a depth of 30-50 cm, including two large cojoinable chunks which may represent a broken clay paddle and anvil (Herdich et al. 1995:26). A charcoal radiocarbon sample recovered from an `umu or earth oven yielded a date of A.D. 1401-1676 (Beta-82354) for this site.

Research Topics:

Archaeological work conducted in the Samoan archipelago relates to a large variety of research topics. The results of the current work have relevance or potential relevance for several specific research topics discussed below.

The first research topic involves geo-morphodynamic models (Hunt & Kirch 1988; see also Kirch 1993). The Ta'u Secondary Road is essentially a testable transect which extends from the northern end of Ta'u Village and continues along the beach to the southern extent of the village. The northern half of the road is located at the ocean-side border (western border) of the sand dune which subsequently borders the marsh area to the east. The marsh area is thought to have been a bay which has in-filled at an accelerated rate due to human disturbances in the surrounding environment (e.g., clearing forest and subsequent land use). Early settlement is thought to have been along the old coastline along the back of this marsh until the 'spit' of land was formed which now houses the current settlement.

The southern half of the Ta'u Secondary Road is located past the marsh area. At this location, a narrow beach and arable coastline exist with the current settlement located along the dune area. The topography immediately gives way to steeper, mountainous terrain.

The geological processes occurring at these two locations may be quite different. If the entire area had been initially settled (both the back of the marsh in the northern section of Ta'u Village and the coastline along the southern section of Ta'u Village), then the archaeological deposits within the current dune area may be more recent along the current northern beach section of Ta'u Village as settlement shifted from the old coastline (in the back of the marsh) to the new coastal area after the current land was formed. The archaeological deposits in the back of the marsh, presumably the old coastline during the initial settlement and occupation period, would be much older. Likewise, the deposits in the southern section of Ta'u Village may be contemporary with those from the back of the marsh, or at least older than deposits from the current beach area in the northern section of Ta'u Village. However, this is assuming that the southern area was settled contemporaneously with the area in the back of the marsh, and
that geological processes have not extensively altered the southern sections of Ta’u Village (e.g., creating an extensive prograded spit of land in front of the old coastline) as is the case with the northern area in front of the marsh.

Dating initial occupational layers would provide the necessary information. Also, soil and sediment analyses will provide useful information to add to a database. Subsequently, this information will be useful for geological analysis concerning the nature of geological processes in Ta’u. This, in essence, could lend support to Hunt and Kirch’s geomorphodynamic model. Furthermore, this may yield important knowledge as to understanding initial settlement and subsequent settlement shifts.

The second area of research interest has to do with prehistoric ceramics. Green (1974a-b) has argued that Samoa has a continuous sequence of pottery which begins with the manufacture and use of Lapita pottery, a decorated and statistically thin pottery found in Upolu of Western Samoa. Pottery deriving from Lapita continues through time changing to an undecorated and statistically thicker pottery. Until recently it has been believed that pottery production stopped around 200-300 A.D. in Ofu (Kirch et al. 1990). However, Hunt and Kirch (1993) have found pottery at Togaga on Ofu that dates to 400-500 A.D., later than Green’s sequence. Hunt and Kirch (1993) argue that their dates simply show a minor variation and is of no consequence for Greens general description of the Samoan pottery sequence. Clark, however, (1993) has excavated pottery in Aoa on Tutuila with C14 dates as late as 1400 A.D.

Clark’s dates are, however, at least 1000 years later than Green’s and he raised a number of possibilities with regard to Green’s sequence. First, it may be that there is regional variation within the archipelago and that Green’s sequence is generally correct, but certain communities such as Aoa maintained their tradition longer (Clark 1993, 1994). Secondly, Green (1974a-b) did have late dates from his pottery sites, but interpreted pottery in late stratigraphic contexts as having been pulled up by the prehistoric excavation of posts and features. Clark, in a review of radiocarbon dates and contexts for Samoa, argues that Green’s interpretation exaggerated the extent of this uplifting process (Clark 1994).

The third research topic has to do with the extent of interisland trade of the material for stone tools. Recently, a number of authors have conducted elemental analyses on stone tools found throughout the Pacific and on source rock from known quarries on Tutuila. Best et al. (1992) have shown that stone tools found in Tonga, Fiji, the Solomon Islands, the Tokelau Islands, and the Cook Islands have all
originated from Tutuila quarries, and argues, in particular, that it originated from the quarry known as Tataga-matau near Leone. In addition, Weisler (in Kirch & Hunt 1993) has conducted analysis on stone tools in Manu'a and compared them to rock found at Tataga-matau. He concluded that 50% percent of the tools analyzed from Ta'u were from Tataga-matau. Most recently Clark, Wright and Herdrich (in press) have conducted analyses of basalt from all the major quarries on Tutuila and a literature review. One of the findings from that analysis is that there is an overlap between the elemental percentages found in stone at different quarries so it may not be possible to pin-point exactly which quarry any given tool came from; only that it came from a particular island. However, ACP has suggested that analysis of the trace element composition may differentiate between quarries on some islands (e.g., quarries located on Tutuila Island (Moore & Kennedy 1995)).

Furthermore, based on recovered lithic implements from Hunt and Kirch's research in Manu'a (1988), there may be a distinct lithic technology or tool kit represented in Manu'a which differs from other Samoan lithic tool kits (Hunt and Kirch 1988). This difference may be reflected in distributions of tool forms. Findings may confirm or contradict this suggestion.

The fourth research focus concerns the distribution of star mounds (tia 'ave) in Manu'a. Hunt and Kirch (1988:165-166) in their survey (which was primarily coastal) found no star mounds on the Manu'a Islands and made the strong claim that there were no star mounds anywhere on Ta'u or in Manu'a in general. Later Herdrich and Clark (1993) demonstrated that this was incorrect when they identified three star mounds above Ta'u Village and Palaeasao. Based on this information, Herdrich and Clark (1993) claimed that the distribution pattern of star mounds, on either high ridge tops or in uninhabited lowland rainforest areas, found throughout Samoa, could also be expected to be reflected on Ta'u. A star mound (Site AS-11-71) that was identified during the 1995 investigation (Herdrich et al. 1995) lends support to this hypothesis. However, no star mounds have been recorded on the outer beach dune area of the subject corridor. That a star mound is expected to be encountered within the subject property is highly unlikely.

The final topic of concern is the pattern of settlement distribution. Previous research in Samoa has shown a settlement pattern that started with coastal settlement. Following this, settlement systems were developed with the population moving inland until there was a shift, in the late prehistoric/early historic period, from inland settlements back to the coast (Davidson 1969, 1974). If this pattern holds for Manu'a, there is the potential for the presence of multiple coastal settlements throughout time with a possible
hiatus of limited coastal settlement in between these periods. Furthermore, based on morphodynamic models discussed above, settlement shifts are expected to have occurred due to landform changes and infilling of the previous coastal areas which has formed the current marsh area behind Ta'u Village.

The primary purpose of the current investigations was to assess the effect of road reconstruction activities through the identification and evaluation of historic and prehistoric archaeological sites within the corridor for a portion of the Ta'u Secondary Road as required by Section 106 of the National Register of Historic Places as amended, particularly Part 800 concerning the protection of historic and cultural properties. This research is important with regards to both territorial and regional research goals.

Territorial Goals:

Territorial goals include the following:
1) Development of an inventory of historic and prehistoric archaeological sites.
2) Evaluation of historic and prehistoric sites relative to the criteria for the National Register of Historic Places.
3) Nomination of eligible properties to the National Register of Historic Places.
4) Protection of significant historic and prehistoric archaeological properties from significant negative impacts.

The research contained in this report contributes to these territorial goals in the following ways: 1) By conducting a systematic survey of the road corridor any historic or prehistoric sites within the corridor would be identified, 2) By conducting a systematic evaluation of sites identified in the current survey area, a determination of their significance relative to the National Register of Historic Places criteria will be able to be made, 3) The evaluation of known sites is the first step in the process of nominating sites to the National Register of Historic Places, 4) An assessment of the impact of the road on sites identified as significant will be made and where necessary recommendations will be made for their protection. In addition, providing the location of significant archaeological sites will contribute to the protection of these sites in the event of future developments.

Regional Goals:

Regional goals include the following:
1) Gaining an understanding of trade relationships between various island groups (Best et al. 1990; Weisler 1993; Clark, Wright & Hardrich in review).
2) Polynesian Origins: Constructing a sequence of migration and colonization of island groups (Kirch & Green 1987).

3) Documenting settlement patterns as evidence of the evolutionary trajectory of island societies in order to gain an understanding of evolutionary mechanisms effecting the development of societies throughout the Pacific (Goldman 1970; Kirch 1984; Graves & Green 1993).

The research contained in this report contributes to these regional goals in the following ways: 1) Any collected pottery and lithic material can be made available for analysis to determine whether they were of local origin or are made of exotic materials thereby indicating the existence and extent of interisland trade networks with these materials, 2) Future analysis of pottery sites may provide important evidence for understanding the sequence of migration and colonization in the Pacific, and 3) The identification and analyses of sites are important contributions in understanding the evolution of Samoan settlement patterns. A clearer understanding of Samoan settlement patterns will eventually lead to a better understanding of regional evolutionary mechanisms and trajectories.

Due to the fact that this investigation is compliance oriented the investigators were not guided by an explicit theoretical orientation other than a very general scientific and evolutionary perspective. Also, given that this is a compliance investigation it was not guided by explicit hypothesis testing. However, some of the current findings may contribute to and have implications for hypotheses that are currently being discussed in the literature. The information collected during this survey has potential implications for the recent work discussed above concerning pottery, basalt tools, additional cultural materials and artifacts, features and sites, settlement and chronology.

**Section 4.2: Archaeological Methodology**

The current investigations were conducted under the supervision of the Principal Investigator, Joseph Kennedy, M.A.. Fieldwork was carried out by the Field Supervisors, D. Kyle Latinis, M.A. and James R. Moore, B.S. during December 1995. The field crew was accompanied by Fay Alailima-Rose (Consultant for ASDRO) and Falecsina (ASPA engineer) for further aid in determination of proposed project boundaries and impacts. Special thanks is given to the people of Ta’u for their aid and cooperation.
The limitations of the investigation include the following:

1) First and foremost this investigation was a compliance oriented project. Therefore, research was limited to the narrow corridor along the road. Had the investigations been guided only by research goals, the survey area would have had a wider scope and different survey techniques would have been used. In addition, Ta’u Village (Site AS-11-51) would have been tested with a larger number of 1m by 1m units along a systematic series of transects.

2) This compliance project was defined by the scope of work as Phase I (survey) and Phase II (evaluation) which limited the investigations to only conducting limited excavations for evaluation purposes. Once enough data was collected to evaluate a site it was not possible to collect additional data which would have contributed to answering purely research oriented questions.

Methodological Strategies:

The methods employed were: 1) Location, identification and further assessment of the various finds described by Fentress (August 1995, see Figure 3), 2) Further pedestrian survey of the subject property, 3) Examination of damaged areas to the previous road to identify cultural materials which may have eroded from underlying deposits, 4) Examination of the stratigraphy which has been exposed in a series of wave cuts located at the western edge of the dune upon which the road had previously been constructed in order to identify cultural remains and deposits, and 5) limited test excavations including screening of deposits at two locations along the dune at the exposed eroded wave cut areas of the western edge of the dune in order to identify and recover cultural materials, identify and assess the stratigraphy of the deposits, and recover soil samples from all stratigraphic layers.

The finds which were described by Fentress (August 1995) were expected to be located and identified according to the map provided in his memorandum. This was accomplished by pedestrian survey. Identification, visual assessment, recovery of cultural materials and/or description of cultural materials by mapping and photography were employed.

1) It was expected that further pedestrian survey might yield additional features and cultural material which were not listed during the previous Phase I assessment. This was accomplished by walking the length of the subject corridor at approximately five meter widths.
2) Visual examination of damaged areas to the road during pedestrian survey was expected to yield cultural materials and features exposed or eroding from these locations.

3) Examination of exposed stratigraphy was conducted along the entire length of the subject corridor with twelve locations more closely examined at approximately 150-200m intervals. The stratigraphy had been exposed due to a series of wave cuts against the western edge of the dune. The stratigraphy was further exposed with the aid of a trowel. The exposed surfaces were scraped in order to clear slumping and wind-blown deposits which had collected at the exposed surfaces and obscured the stratigraphy.

4) Two test units were excavated at locations along the wave cut at the western edge of the dune. These were excavated to a width of approximately one meter. The units were excavated to approximately 50cm into the dune from the exposed face. All deposits were screened with 1/4 inch screen. It was expected that cultural materials would be recovered and that cultural layers would be identified. The units were stratigraphically diagramed and photographs were taken. Soil samples were taken from each stratigraphic layer.

All recovered materials and soil samples were taken to the ACP laboratory facilities for further analyses.
Section 5: Archaeological Findings

Section 5.1: Initial Pedestrian Survey

The pedestrian survey to assess previously recorded finds (Fentress; August 1995, see Figure 3) yielded less extensive finds than what was recorded by Fentress (August 1995). However, in the months between August and December, it is possible that the dense lithic scatters, etc. had been removed or obscured by natural and other processes. The villagers had also subsequently conducted a massive sand mining operation to spread sand over the entire surface of the village to beautify it. Some of the areas along the wave-cut embankment were also filled.

A lithic concentration (Area A; see Figure 3 for location of all following identified areas and finds (A-X) taken from Fentress (August 1995)) was confirmed. These are mostly small scattered fragments of basalt. The density is fairly low. The lithics are eroding from the wave cut embankment of the dune and are scattered throughout the nearby beach sand. No diagnostic pieces were confirmed or recovered. Flake and adze fragments were not confirmed. At least two culturally significant, organic black layers were noted in the existing wave cut.

The pestle fragments (Area B; see Figure 3) were not confirmed. The organic layers at this location were present.

The collapsed concrete copra building (Area C; see Figure 3) was confirmed. It is sloped over the wave cut embankment and extends onto the beach. It is crumbled and broken, though several concrete walls are intact.

The cement, old base structure (Area D; see Figure 3) was confirmed. It is the remnants of an old foundation.

The remnants of an old foundation (Area E; see Figure 3) was confirmed.

The old thrown fragments of the church (Area F; see Figure 3) were confirmed.

The organic/sand strata lens (Area G; see Figure 3) was confirmed.

The mixed coral and sand strata lens (Area H; see Figure 3) was confirmed.

The flake scatter (Area I; see Figure 3) was not confirmed.

The foaga (stone with grinding basin (Area J; see Figure 3)) was confirmed.
The flakes and adze fragments found along the existing road (Area K; see Figure 3) were not confirmed.

The old foundation (Area L; see Figure 3) was confirmed.

The flake scatter (Area M; see Figure 3) was not confirmed.

Section 5.2: Additional Pedestrian Survey

Further pedestrian survey confirmed that at least two dark organic layers and several other layers of; 1) sand, 2) mixed sand and coral, 3) coral, 4) cultural, and 5) non-cultural deposits were present throughout the entire length of the surveyed area along the wave cut. The two dark layers were consistently spaced by coral and sand layers which appear to have formed possibly as storm surge deposits. Additional artifact scatters on the beach as well as on the dune were not encountered. However, numerous old foundations and graves of stone, cement, ili'ili and coral (some of which were located at the edge of the wave cut embankment) were encountered throughout the length of the subject corridor. Small lithic scatters of flakes, fragmented chunks and flake fragments were ubiquitous throughout the area, but never in any concentrated density. Whether these were cultural or natural is unable to be determined with the present information. Additional features such as foundations, recent graves and stone features were noted along the surveyed corridor (see Appendix A, Plates 5,6,9, and 10). Many of these are relatively recent.

Section 5.3: Additional Visual Examination

Additional visual examination of damaged areas included cultural materials which accorded with the materials noted during pedestrian surveys.

Section 5.4: Examination of Exposed Stratigraphy

Examination of the deposits and stratigraphy at the twelve locations along the wave cut embankment of the dune with the aid of a trowel confirmed a complex stratigraphy (see Appendix A, Plates 7-8). At least two dark cultural layers were encountered. These were significantly separated and surrounded by alternate layers of sand, sand and coral, and coral. These alternating layers may have formed as a series of storm surges and habitation deposits. Some materials were noted that may have been cultural. These included fish bones, bird bones (probably recent chicken bones), other mammalian bones (probably dog and/or pig), lithic fragments (unable to be determined if natural), and numerous marine shells (probably most of which were natural). However, no unusual concentrations of these materials were noted with the exception of the surface remains which yielded
most of the skeletal material. This skeletal/faunal materials were mostly chicken bones which were recently deposited. These were not collected.

Section 5.5: Test Excavations

Section 5.5.1: Stratigraphy and Soil Analysis

Test Unit 1: Test Unit 1 (TU1) was located 108m south of the southeast corner of the McConnel Dowell housing facility (173.0 degrees from Magnetic North (MN)). This was situated against the wave cut embankment along the westernmost location of the sand dune on which the old Secondary Road had been located.

The maximum width of TU1 measured 100cm although the width averaged approximately 80-85cm. The maximum length excavated into the embankment was approximately 50cm. The maximum depth was approximately 140cmbs (centimeters below surface). Eight layers and one sand lens were encountered (see Figure 4 and Appendix A, Plate 2). Layer IV was partially separated by the sand lens. Therefore, the uppermost portion of Layer IV above the sand lens is referred to as Layer IVa while the lower portion below the sand lens is referred to as Layer IVb.

Layer I extended from the surface to about 7cmbs. Layer I was composed of a white (10YR 8/1) sand. This layer appeared to be recently deposited. Two fragments of glass were recovered from Layer I (refer to Table 1).

Layer II extended from the base of Layer I to approximately 11-12cmbs. Layer II was composed of a light brownish gray (10YR 6/2) sand. Some coral fragments were present. The sand appeared to be hardened and densely compacted. This layer was likely the remnants of the old Secondary Road surface. Four glass fragments, a medium sized bird bone fragment and a fragment of concrete were recovered (refer to Tables 1 and 2).

Layer III extended from the base of Layer II to approximately 33cmbs. Layer III was composed of a dark gray (10YR 4/1) sand. Chunks of coral were present throughout. The sand appeared hardened and compacted with fragments of coral and rock. This was likely old road fill. One curious piece of coral, one basalt flake and 24 bone fragments (including sea turtle, rat (Rattus exulans), and indeterminate small to medium mammal) were recovered. The bone fragment distribution was dense at the base of Layer III (refer to Tables 1 and 2). The concentration of sea turtle bones at the base of Layer III may be from human activities rather than natural deposition.
Figure 4: Tau Secondary Road, Test Unit I, East Face

Layer I: 10 YR 8/1, white sand.
Layer II: 10 YR 6/2, light brownish gray sand.
Layer III: 10 YR 4/1, dark gray sand.
Layer IVa: 10 YR 4/2, dark grayish brown sand.
Layer IVb: 10 YR 4/2, dark grayish brown sand.
Layer V: 10 YR 6/2, light brownish gray sand.
Layer VI: 10 YR 4/3, brown to dark brown sand.
Layer VII: 10 YR 2/1, black sand.
Layer VIII: 10 YR 3/3, dark brown sand.

KEY

Rock
### Table 1: Artifacts from Ta’u Secondary Road, TU1 & TU2

<table>
<thead>
<tr>
<th>Layer</th>
<th>TU1</th>
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<th>TU2</th>
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</thead>
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<tr>
<td></td>
<td>I</td>
<td>II</td>
<td>III</td>
<td>IVa</td>
<td>V</td>
<td>VI</td>
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<tr>
<td>Weight grams (count)</td>
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<tr>
<td>Glass</td>
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<tr>
<td>White</td>
<td>7.0 (1)</td>
<td>3.0 (4)</td>
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<td></td>
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<tr>
<td>Brown</td>
<td>0.5 (1)</td>
<td></td>
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<tr>
<td>Concrete</td>
<td>1.0 (1)</td>
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<tr>
<td>Lithic</td>
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<tr>
<td>Flake/Frag</td>
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<tr>
<td>Polished/Ground Frag</td>
<td>1.5 (1)</td>
<td>5.5 (4)</td>
<td>37.5 (4)</td>
<td>2.5 (2)</td>
<td>8.0 (7)</td>
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<tr>
<td>Polished Adze Frag</td>
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<tr>
<td>Coral</td>
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<tr>
<td>Worked</td>
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<td>16.0 (1)</td>
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<tr>
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<td>1.0 (1)</td>
<td>1.5 (1)</td>
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<tr>
<td>Echinoderm Spine</td>
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<tr>
<td>Worked</td>
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<tr>
<td>Bone Artifact (polished, drilled, ornamental)</td>
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<tr>
<td>Charcoal</td>
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Table 2: Ta’u Secondary Road Faunal Analysis
(weight in grams)

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<thead>
<tr>
<th></th>
<th>TU1</th>
<th></th>
<th></th>
<th>IVa</th>
<th>V</th>
<th>VI</th>
<th>VII</th>
<th>Clean up</th>
<th></th>
<th>TU2</th>
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</thead>
<tbody>
<tr>
<td><strong>Layer</strong></td>
<td>I</td>
<td>II</td>
<td>III</td>
<td>IVa</td>
<td>V</td>
<td>VI</td>
<td>VII</td>
<td>Clean up</td>
<td>I</td>
<td>IV</td>
<td></td>
</tr>
<tr>
<td><strong>Chondrichthytes</strong></td>
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<td></td>
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<tr>
<td>Fish</td>
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<td></td>
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<td>0.3</td>
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<tr>
<td>Rattus exulans</td>
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Layer IVa extended from the base of Layer III to a maximum depth of 115cmbs. The area of maximum depth was at the northern end. At this location, Layer IVa cut through the remaining layers until just below the surface of Layer VIII. The remainder of Layer IVa ended at a sand lens at about 66cmbs. Layer IVa was composed of a dark grayish brown (10YR 4/2) sand. It was a dense mixture of some rock, a large amount of coral fragments and sand. Several large basalt pebbles were encountered. This may have been a severe or high energy storm surge deposit. Six fish bone fragments, two pieces of possibly worked coral, one worked echinoderm spine (abrader) and four basalt fragments were recovered (refer to Tables 1 and 2).

A sand lens "i" was encountered from about 66cmbs to 72cmbs on the southern portion of TU1. This lens partially separated Layers IVa and IVb. This lens was composed of a white (10YR 8/1) sand. No cultural materials were recovered.

Layer IVb began at the base of the sand lens and Layer IVa. It was bordered on the north end of TU1 by Layer IVa although a definite boundary was not discernable. The base of Layer IVb extended to 85cmbs. Layer IVb was composed of a dark grayish brown (10YR 4/2) sand. A high density of rock, coral and sand composed Layer IVb, however, the significant difference between Layers IVb and IVa was that Layer IVb had approximately half the density of coral fragments. No cultural materials were recovered.

Layer V began at the base of Layer IVb and extended to about 90cmbs. Layer V was bordered to the northern section of TU1 by Layer IVa. Layer V was composed of a light brownish gray (10YR 6/2) sand. Occasional bits of coral and shell were present in low density. These appeared to be natural. Layer V deposits, unlike Layers IVa and IVb, were composed almost entirely of sand grains. Four lithic fragments (including one possible adze fragment having one entirely polished surface and another porous basalt chunk with possibly two opposite ground surfaces) and 14 bone fragments (including fish and small mammalian bones) were recovered (refer to Tables 1 and 2).

Layer VI began at the base of Layer V and extended to 97cmbs. The northern section of Layer VI was bordered by Layer IVa. Layer VI was composed of a dark brown (10YR 4/3) sand. Coral fragments were present throughout Layer VI in a moderately low density. These appeared to be natural. Eight bone fragments (including fish and small mammal), two shark teeth of the same species and one piece of coral were recovered (refer to Tables 1 and 2).

Layer VII began at the base of Layer VI and extended to 110cmbs. Layer VII was bordered on the northern section of TU1 by Layer IVa. Layer VII was composed of a black (10YR
2/1) loamy sand. This deposit contrasted significantly with all other deposits. Bits of rock, coral and charcoal were noted throughout the Layer VII deposit. Four bone fragments (including fish bones), one echinoderm spine and two lithic flakes were recovered (refer to Tables 1 and 2).

Layer VIII began at the base of Layer VII and extended to approximately 140cmbs. This layer likely extended further, however, this was not excavated. Part of Layer IVa intruded into the northern section of Layer VIII. Layer VIII was composed of a dark brown (10YR 3/3) sand. Pieces of coral were present in low density. Layer VIII was barren of cultural materials.

Seven lithic flakes, fish bone, and one echinoderm spine and was recovered from between Layers IVa/IVb and Layers V, VI, VII, VIII (refer to Tables 1 and 2). Exact provenience was unable to be determined because it derived from the area bordered by Layer IVa and the remaining lower layers. The drilled bone artifact was recovered from an initial silt which was sluff located at the face of these layers. The matrix of the silt deposit was almost identical to those from Layers IVa and IVb. This may indicate that these deposits were of the same origin.

Test Unit 2: Test Unit 2 (TU2) was located 145m south (174 degrees from MN) of TU1. This was situated against the wave cut embankment along the westernmost location of the sand dune of which the old Secondary Road had been located.

The maximum width of TU2 measured 100cm although the width averaged approximately 80-85cm. The maximum length excavated into the embankment was approximately 50cm. The maximum depth was approximately 225cmbs (centimeters below surface). Seven layers were encountered (see Figure 5 and Appendix A, Plates 3, 4 & 11).

Layer I began from the surface and extended to 15cmbs. Layer I was composed of a very dark grayish brown (10YR 3/2) sand. Bits of rock and coral were present in a low density. This appeared to be a recent deposit with road fill. One piece of fish bone was recovered (refer to Table 2).

Layer II extended from the base of Layer I to approximately 50cmbs. Layer II was composed of a black (10YR 2/1) sand. Chunks of coral were present in low density. Charcoal was present throughout Layer II. This layer may have been a significant culture-bearing level due to soil characteristics and the presence of charcoal. However, no artifactual material was recovered, though the total volume of screened deposit was small.

Layer III extended from the base of Layer II to approximately 110cmbs. Layer III was composed of a dark brown (10YR 3/3) sand. A few fragments of naturally
Layer I: 10YR 3/2, very dark grayish brown sand.

Layer II: 10YR 2/1, black sand.

Layer III: 10YR 3/3, dark brown sand.

Layer IV: 10YR 3/2, very dark grayish brown sand.

Layer V: 10YR 2/1, black loamy sand.

Layer VI: 10YR 6/3, pale brown sand.

Layer VII: 10YR 5/2, grayish brown sand.
occurring shells were present in low density. Some charcoal and echinoderm spine were recovered (refer to Table 1).

Layer IV extended from the base of Layer III to approximately 165cmbs. Layer IV was composed of a very dark grayish brown (10YR 3/2) sand. A moderately dense amount of coral was present in this layer. This may have been a storm surge deposit. Seven pieces of fish bone and two echinoderm spines were recovered (refer to Tables 1 and 2).

Layer V extended from the base of Layer IV to only 170cmbs. This thin layer remained fairly consistent with a thickness of about 5cm. However, this may be a lens. The test excavation was too limited to yield further information. Layer V was composed of a black (10YR 2/1) loamy sand. Chunks of coral were present in low density, though, this may have intruded from Layers IV or VI. Some charcoal flecks in the deposit were noted. This layer appears to be a culture-bearing layer similar to Layer VII from TUL based on compositional characteristic of the deposit. The volume of screened deposit was extremely small. However, no significant cultural materials were recovered.

Layer VI extended from the base of Layer V to approximately 215cmbs. Layer VI was composed of a pale brown (10YR 6/3) sand. This layer appeared to be a layer of sterile sand. No cultural materials were recovered.

Layer VII extended from the base of Layer VI to approximately 225cmbs where excavation was halted. This layer likely extended further below the base of the excavation. Layer VII was composed of a grayish brown (10YR 5/2) sand. Coral chunks were present in high density throughout Layer VII. This deposit may have resulted from storm surge action. No cultural materials were recovered.

Section 5.5.2: Recovered Cultural Materials

The results of additional analyses of recovered artifactual material is provided below (see Table 1). It must be stressed, that, although few artifactual materials were recovered from excavated deposits, the two limited test excavations resulted in the removal of an extremely small sample of deposits. Though this sample size is small, it was adequate to support the conclusions in this report provided below. Data recovery to mitigate effects on deposits that will be destroyed is recommended. This will need to be conducted during a Phase III data recovery investigation prior to construction activities. In light of the relatively small sample size, the recovered materials suggest that the nearby deposits contain significant cultural materials (especially the polished bone artifact) which may date to at least the early first millennium A.D. The recovered cultural materials further leads to the suggestion that significant activity areas may have been present as
well. It is also noted that at least two separate culture-bearing layers which are separate from the current occupational deposits (Layer I from TU1 and TU2) are evident in the stratigraphy. These layers are likely representative of much earlier occupation.

The recovered lithic artifacts yielded little additional information after analyses were completed. These flakes, chunks and fragments were mostly non-diagnostic. These pieces may have resulted from artifact manufacture, thus falling under the category of debitage or waste flakes. However, this is difficult to determine due to the absence of associated lithic implements or dense lithic scatters indicative of lithic artifact workshop sites. However, one polished flake was recovered which probably derived from an adze. Also, one other lithic fragment was recovered which may have two ground surfaces. Furthermore, Fentress recorded lithic scatters in the immediate vicinity. If this was an area in which lithic implements were utilized, light to medium dense lithic scatters of small flakes and possibly exhausted and/or broken lithic implements would be expected. These would have resulted from use and curation or resharpening of lithic implements. Dense flake scatters would be expected at manufacturing sites, presumably located closer to the source of lithic material utilized for tool production, but not at activity sites where lithic tools were utilized rather than manufactured.

No indications of polishing, grinding or use damage were evident in the lithic artifacts recovered with the exception of the one polished flake and the other possibly ground fragment. However, many of the lithic pieces recovered did not have rounded or polished edges which would have resulted from natural dulling of the edges or polishing of surfaces due to wave or surf action within sand and water.

Two of the recovered echinoderm spines had evidence of use damage. These were likely utilized as abraders. The wear patterns on the utilized pieces indicate repetitive grinding or abrading action against a relatively hard contact material.

The recovered glass fragments were generally heavily weathered and the broken edges were dulled. This was likely due to sand and water action over the surfaces for some length of time. However, assessment of the antiquity of these glass fragments is unable to be determined. The inclusion of some of the glass fragments into lower layers may indicate some antiquity.

The recovered coral fragments yielded little information. Some of these may have been utilized for unknown purposes although analyses did not yield any patterns of definite use damage. These pieces may be natural.
Of particular interest was the polished and drilled bone artifact which was recovered from TU1 (see Figure 6). The stratigraphic layer from which this artifact originated is unable to be determined. However, it is known that this artifact was recovered from sluff located along the bordering area between Layer IVa and the remaining lower layers. This piece measures approximately 1.5cm by 1.0cm and weighs 0.5g. The cross section is lenticular or oval. A hole has been drilled through the piece from both of the opposite flat sides. The holes are cone shaped and reach their minimum diameter at the midpoint of the artifact where they connect. The artifact is broken at this point. The entire outer surface has been polished until smooth to the touch. There is a slight groove running longitudinally down one of the lateral surfaces of the piece. This piece may have been ornamental. Additional or alternate functions could not be determined. This piece, though morphologically different in form, may be similar to the "reel" ornaments (Leach et al. 1979; Kirch and Yen 1982; Hunt and Kirch 1988). Kirch and Hunt (1988) recovered a similar artifact from deposits in the sand dune in Ta‘u Village which they suggest may have some antiquity; early first millennium A.D.. Manufacturing techniques appear to be similar amongst this class of artifacts. This may indicate an association between these artifact classes.

Section 5.5.3: Faunal Analysis

Faunal analyses were conducted by Alan C. Ziegler, Ph.D., zoological consultant. His conclusions based on the faunal remains suggest that the tested areas are typical of a human habitation area (see Table 2 for detailed information concerning species, counts and weights). Determining temporal ranges was not possible based on the analyses.

Test Unit 1 yielded two common families of inshore fishes and possibly sea turtle remains. A medium bird bone was recovered, though this may represent a natural death rather than a human food item. A Polynesian Rat dentary is also present, along with a bone or two of a pig-sized and/or slightly larger mammal. Two shark’s teeth were also noted.

Test Unit 2 had one or two bones of medium-sized fish and an apparent shark and/or ray vertebra.

Ziegler (1996) suggests that, "The quite limited amount of vertebrate faunal material suggests a rather typical, but not at all heavily used, human habitation area. It is not determinable, however, from the present material whether this occupation occurred in the pre-or post-Contact period (or both)." This interpretation accords with other data recovered from this investigation. This further supports that Ta‘u Village (Site AS-11-51) is a significantly large
site characterized by a lengthy sequence of habitation and land use which undoubtedly contains numerous activity, ritual and habitation areas.
Section 6: Discussion And Evaluation

Archaeological Consultants of the Pacific, Inc (ACP) conducted a Phase I and Phase II cultural resource investigation along the proposed road improvement and reconstruction area for the Ta’u Secondary Road, Ta’u Village, Manu’a, American Samoa at the request of Mr. Jack Kaschmarik of the American Samoa Disaster Recovery Office (ASDRO). The Ta’u Secondary Road had been previously severely damaged due to hurricane weather and wave action. It has been proposed that the Ta’u Secondary Road be reconstructed (Ta’u Secondary Road Project (GSR46969)).

Ta’u Village has been recognized as constituting one large archaeological site (Site AS-11-15; Clark 1990). Previous fieldwork recognized several features, cultural materials and cultural deposits along and within the proposed reconstruction corridor (Fentress, August 1995). During recent investigations, ACP personnel attempted to locate and confirm these findings by additional pedestrian survey. Some of these were not confirmed. These may have been washed away or obscured by natural forces or may have been removed during the months between August and December (the period between Fentress’ (August 1995) investigation and the ACP investigation). In addition, the density of cultural remains described by Fentress (August 1995) was not confirmed by ACP personnel.

Following the pedestrian survey to locate the findings described by Fentress (August 1995), further survey and testing was conducted by ACP. This included further pedestrian survey of the entire subject property, examination of damaged areas to the road to identify cultural materials which may have eroded from underlying deposits, examination of the exposed stratigraphy in twelve locations along the wave cut embankment located on the western face of the sand dune of which Ta’u Village and the Ta’u Secondary Road remains are located, and limited test pit excavations at two locations along the wave cut embankment at the north end of Ta’u Village.

No additional major features were noted during pedestrian surveys. However, culture-bearing deposits and cultural materials were noted which partially accorded with Fentress’ (August 1995) initial survey. Examination of the exposed stratigraphy revealed at least two subsurface cultural layers separated by sand layers and layers of sand, coral and rock which likely represent deposits accumulated during storm surge events.

Test excavations yielded a stratigraphy of at least seven to eight layers. Cultural material was recovered from many of these. At least two distinct and separate subsurface cultural deposits are evident. These deposits may have
significant antiquity as other nearby excavated sites in Ta’u
indicate that Ta’u Village has been inhabited for a long
duration of time, having significant prehistoric and historic
sequences. These cultural deposits are separated by sand
deposits and deposits characteristic of storm surge
processes. Cultural material recovered included one polished
and drilled bone artifact, a possible adze fragment (polished
flake), a lithic fragment possibly ground on two surfaces,
worked echinoderm spines, lithic flakes, glass fragments,
coral, charcoal, concrete and faunal remains.

Of particular interest is the polished and drilled bone
artifact. This artifact may be related to similar artifacts,
one of which was recovered from Ta’u (Hunt and Kirch 1988),
which have been suggested to date to the early first

The faunal analyses indicate human habitation and the
exploitation of marine and animal resources. This accords
with prior expectations. Temporal information could not be
derived from faunal analyses. However, no post-Contact
introduced species were present.

The investigations and excavations confirm that Ta’u
Village (Site AS-11-51) is one large archaeological site.
However, due to the limitations of the tested areas,
important information concerning the extent of the site,
temporal sequences, spatial distribution of habitation areas,
activity areas, ritual areas, burials, etc., and the general
nature of the site(s) will require further investigation.
However, based on the information that was acquired and
previous reports concerning Ta’u, it is evident that this
area is significantly important for historical and cultural
content. It is recommended that a data recovery plan
concerning future mitigation be developed upon the
finalization of the proposed changes and construction
activities of the Ta’u Secondary Road as construction
activities will have an adverse effect on portions of Site
AS-11-51, Ta’u Village.
Conclusion

At the request of Mr. Jack Kachmarik of the American Samoa Disaster Recovery Office (ASDRO),Archaeological Consultants of the Pacific, Inc. (ACP) conducted a Phase I and Phase II cultural resource investigation along the proposed road improvements and reconstruction route of the Ta’u Secondary Road. Pedestrian survey, examination of the stratigraphy along the wave cut embankment and along the sand dune, and test excavations were conducted.

The results indicated that two or more subsurface culture-bearing deposits are present. This is supported by the recovery of artifactual materials which include a polished and drilled bone ornament, a polished lithic flake (possible adze fragment), a lithic fragment with possibly two ground surfaces, lithic flakes, glass fragments, utilized echinoderm spines, charcoal and concrete. Some of these are clearly of historic origin. However, many artifacts may have a prehistoric origins. Faunal material was recovered and analyses indicate a pattern of human habitation. Some historic and other previously recognized features (Fentress, August 1995) were confirmed.

ACP, Inc.’s investigations confirm the previous recognition that Ta’u Village constitutes one large archaeological site (Site AS-11-51; Clark 1950). Cultural deposits are evident in all sections of the proposed road reconstruction plans. The deposits and remains are significant for their historical value and the scientific data these will provide concerning history and prehistory in not only Ta’u, but the Manu’a island group and Samoa. The site as a whole is also associated with a historically significant individual, the Tu’i Manu’a. Thus, Ta’u Village (Site AS-11-51) meets criteria A (the site reflects major trends in history), B (the site is associated with the life of a significant person), and D (the site is likely to yield important scientific data).

It is therefore recommended that a Phase III data recovery plan be developed and implemented following guidelines and principles which accord with Department of Parks and Recreation-American Samoa Historic Preservation Office (ASHPO) guidelines, Section 106 of the National Historic Preservation Act (NHPA) and its implementing regulations promulgated by the Advisory Council on Historic Preservation (ACHP) 36 CFR Part 800: Protection of Historic Properties, pending the final plans for proposed reconstruction activities and impacts as construction activities will have an adverse effect on some areas of the Site AS-11-51.
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Appendix A: Photographs
Plate 1: Southern Extent of Surveyed Area, Ta'u Secondary Road

Plate 2: Test Unit 1, Ta'u Secondary Road
Plate 5: Old Foundation, Ta'u Secondary Road

Plate 6: Old Foundation, Ta'u Secondary Road
Plate 7: Wave Cut Embankment and Test Cut

Plate 8: Example of One of Twelve Cut Areas Examined for Stratigraphy and Cultural Deposits
Plate 9: Surveyed Area at Ta'u Secondary Road. Note Dune Embankment

Plate 10: Old Road and Recent Features at South Area of Surveyed Area
Plate II: Test Unit 2 Profile, Ta'u Secondary Road
Appendix B: Faunal Analysis
DATE: 9 January 1996

TO: Archaeological Consultants of the Pacific, Inc.
(ATTN: Patrick Sarvak, Laboratory Assistant)

FROM: Alan C. Ziegler, Zoological Consultant

SUBJECT: Identification of faunal material from Ta’u and Faleasao villages, Manu’a, American Samoa, received 5 January 1996

I have identified this lot of faunal material to the lowest taxonomic level possible for me, and am returning it all to you along with this MEMO in one box by prepaid Certified Priority Mail. Return Receipt Requested. An INVOICE covering the total of 3 hours spent on this work (itemized separately as 2 hours for the Ta’u material and 1 for the Faleasao material) is also included here.

Additionally, I have enclosed a 3½" computer diskette containing all of this same current hard-copy MEMO information, as well as that of a 9 January 1996 revision of my Faunal Category List. The format used is that of WordPerfect 5.1/MS-DOS 5.0, which I hope will be compatible with whatever word-processing program you are using. The file names are: KENNEDY.96 and KENNEDY.FAU. (The primary reason that I include the new Faunal Category List to replace the old one you may have on file is that it is slightly worded so that each category definition is as self-explanatory as possible—that is, in most cases it should not now be necessary to refer to additional categories to understand any given one.)

Each of the labeled plastic bags I received contained the (primarily) vertebrate faunal remains from a discrete excavation unit (i.e., from a particular site, test unit, trench, layer and/or level, or other sampled area). For each of these excavation units I have identified and separated the material into various faunal categories, and placed the remains of each category in an individual stapled plastic bag along with a yellow-paper slip giving the name of the particular category represented and sometimes a pertinent comment on the material (—but, note, to keep the identification time to a minimum, not the provenience, which appears only on the original labeled plastic container bag now holding the identified material).

All of these lots of stapled bags from each excavation unit have then been put back in your appropriate original labeled container bag. These various stapled bags with yellow-paper identification slips are arranged within each container bag in the same order as the category names appear on the Faunal Category List described below.

To allow possible future weighing of the material from each faunal category without the time and trouble of removing the material from each of my faunal-category bags, I might note that each of these stapled bags is of (approximately) the same weight as all of the others, bears one staple, and contains a single
paper-slip label of uniform weight; thus you should be able to deduct an identical tare weight throughout any in-bag weighing procedure.

Any remains identified as "Artifact" have similarly been placed in individual stapled bags, with an identification of the animal or nonfaunal substance apparently represented by the original raw material. Additionally, I segregated and saved in individual stapled plastic bags the invertebrate and nonfaunal items encountered, although you may well not need some of them.

To explain the faunal categories used for the present material. I have included with this MEMO a 9 January 1996 revision of the same general Faunal Category List used in earlier work for you, which still contains all previously identified categories (whether or not they appeared in the present lot of material) but which did not need updating because no new faunal categories appeared in the present lot of faunal remains.

It should be noted in this list that when I mention the common or scientific name of genera or species in explanations of the more-generalized faunal categories—such as, for example, in "Medium Bird" or "Small-to-Medium Mammal"—unless it is obviously indicated otherwise. I intend these names to convey only an idea of the general size of the animal represented rather than to definitely indicate that any specific taxon mentioned is necessarily present in the material.

For some identifications on the yellow-paper slips, I have prefixed the name of a family, genus, or species with "cf.". This means that the material seems extremely close osteologically to the taxon named and quite likely belongs to it, but I cannot entirely rule out the possibility that an extinct, accidental, or extremely rare, morphologically similar form—although, usually of the same order, family, or genus—is represented instead. For most later compilation purposes, however, I would advise simply omitting the "cf." whenever you see it in my identifications (—I guess the main reason I use it at all is to let any possible future identifiers examining the bones know that I did realize that in some cases there was an alternative, although unlikely, identification possible).

In regard to minimum number of individuals, if it was obvious that more than one individual was represented by the material in the stapled bag, I have noted on the yellow-paper identification slip the number indicated (written as "MNI = ...”).

In the case of fish other than sharks, rays, and eels, whenever vertebrae were present, I have given approximate total lengths of the particular individuals involved (written as "Len’s. = ..."), based on comparison of vertebra size with that of prepared skeletal specimens of known length. These estimates could well be off by perhaps 20-30% (depending, for example, on species represented and position of the vertebrae in the spinal column) but they will serve to give you at least a general idea of the size of many of the fish present.

I have not attempted to chronologically age any bird individuals whose bones are present in the faunal material, except to note on the yellow-paper slips any obviously immature bones (usually meaning nestlings in species other than chicken and other precocial ground-living birds), lack of any such notation meaning that the bird bones are apparently of adult individuals.
For mammals other than rodents, whenever possible I have endeavored to give a general idea of age at death (in the case of appropriate material often estimating the probable minimum and/or maximum chronological age at death by reference to published tables—when available—of dental replacement sequence or stage of long-bone epiphyseal union).

You may already routinely present the following in each of your archaeological excavation reports but, in case you do not, I hope you will consider including a minimal faunal-data table in each such final paper. That is, a simple table (similar to the sample included as an ATTACHMENT to this MEMO) for each trench, site, or other excavation unit, giving at least the actual numbers and/or weights of the bones/fragments per level assigned to each faunal category that occurs in the excavation unit. This is so possible future investigators will always have available these raw faunal data, along with other information such as midden volumes contained in your report, for use in faunal analysis calculations that, for one reason or another, you may not have carried out.

As I mentioned to others at your company previously, I usually do not write up a formal faunal analysis report per se (—having found that, in terms of the amount that would have to be paid for my time, this is much more expeditiously done by personnel who either actually participated in the field work or, at least, have more ready access to the complete original excavation data than I do)—but, instead, I provide a series of general and specific, largely subjective, comments (as I have done below) regarding the identified faunal material. (I would assume these comments would be more meaningful to you when considered jointly with any tabulation you may make of the material.) These comments can then be quoted or paraphrased, or the information contained in them otherwise utilized in the manner most suitable to the style of the final overall project report.

**COMMENTS ON TA'U VILLAGE 2ND ROAD PROJECT, AMERICAN SAMOA, FAUNAL MATERIAL**

The quite limited amount of vertebrate faunal material suggests a rather typical—but not at all heavily used—human habitation area. It is not determinable, however, from the present material whether this occupation occurred in the pre- or post-Contact period (or both).

T.U. 1 yielded two common families of inshore fishes, as well as possibly "Sea Turtle". To judge from the preservation of the single "Medium Bird" bone, it may well represent a natural death rather than a human food item. A Polynesian Rat dentary is also present, along with a bone or two of a pig-sized and/or slightly larger mammal.

T.U. 2 had only a bone or two of medium-sized "Fish" and an apparent "Shark and/or Ray" vertebra.

**COMMENTS ON FALEASAO VILLAGE PROJECT, AMERICAN SAMOA, FAUNAL MATERIAL**

The even-more-limited vertebrate faunal material from this project indicates a (presumably terrestrial) "Large Mammal", thus indicating deposition in the post-Contact Period for at least Trench 1; one of the bone fragments from a mammal of
this size is also metal-sawed. The partial dentary of a 3-4-month-old pig accompanied this larger mammal material of the trench.

T.P. 1 had only the unworn (?) adult upper first incisor of a pig of about 9-11 months of age.

T.P. 2 contained only an apparent dermal spine of "Diodontid" along with a very little material of "Fish" of small-to-medium body size.

I hope these few identifications and brief comments may be of some interest and use to you. Many thanks for the chance to see this material. Please be sure to let me know if there are any questions on any of my procedures, identifications or comments. Continued best in everything!!
Table 00. Sample "minimal faunal-data" table for a collection of nonartifactual vertebrate faunal remains from one excavation unit of a hypothetical Hawaiian site. Figures for faunal remains indicate raw numbers (or weights could be used instead) of identified bones and bone fragments.

<table>
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<th>Site 11-La-136</th>
<th>Depth (cm below datum)</th>
<th>Total per Species</th>
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CATEGORIES USED FOR ARCH. CONSULT. OF THE PACIFIC FAUNAL IDENTIFICATIONS

MISCELLANEOUS

Artifact. .............................................any historically manufactured item as well as any geological, vegetal, osteological, or other material obviously or possibly intentionally "worked", including bones showing apparent butchering marks.

NON-VERTEBRATE

Basalt.............................................all non-disintegrated volcanically derived material, including pumice, and volcanic glass fragments not included under "Artifact".

Inorganic.............................................usually, geological material not included under either of the 2 foregoing categories.

Coal

Charcoal

Vegetable.............................................all uncharred or otherwise unmodified vegetal material.

Coral Reef Rubble.................................including fragments of mollusk, echinoderm, etc., that seem obviously to have weathered out of the reef or to be quite beach-worn, and thus probably not human food midden.

Coral.............................................non-fossil material that seems to have entered the deposit in a relatively fresh condition, although sometimes beach-worn.

Echinoderm.............................................usually, exoskeleton remains of sea urchin, quite possibly being human food midden.

Mollusk.............................................non-fossil material of marine, freshwater, and/or terrestrial forms that seems to have entered the deposit in a relatively fresh condition, most of the non-terrestrial material probably being human food midden.

Crustacean.............................................usually, exoskeleton remains of crab or lobster, with an occasional barnacle plate, much--but not all--probably being human food midden.

Invertebrate.............................................remains of invertebrate groups either not more specifically identifiable, or other than those listed above; for example, bryozoan exoskeletons, calcareous polychaete worm tubes, insects, etc.

VERTEBRATE

CLASS CHONDRICHTHYES (Sharks and Rays) AND/OR CLASS OSTEICHTHYES (Bony Fishes)


Shark.............................................not identified to any lower taxonomic level; in Hawai'i there are 9 families comprising about 22 species.

Ray.............................................not identified to any lower taxonomic level; in Hawai'i there are 3 families comprising about 5 species.

Albulid.............................................member(s) of the family Albulidae (Bonefishes), of which there is a single species reported for Hawai'i; usually found near shore in open sand-bottomed areas, and reaching about 90 cm in length.

Synodontid.............................................member(s) of the family Synodontidae (Lizardfishes), of which there are 9 species in Hawai'i; primarily inshore bottom-dwellers of reefs and mud or sand substrates, and reaching 30 cm in length.
Muraenid..........................member(s) of the family Muraenidae (Moray Eels), of which there are over 35 species in Hawaii; some reaching a length of 150 cm.

Congrid..................................member(s) of the family Congridae (Conger Eels), of which there are at least 7 species in Hawaii; some reaching a length of 150 cm.

Marine Eel..........................member(s) of 1 (or more) of the 10 eel families recorded for Hawaiian waters, of which the Muraenidae (Moray Eels), Congridae (Conger Eels), and Ophichthidae (Snake Eels) are by far the most speciose and frequently encountered groups.

Belonid..........................member(s) of the family Belonidae (Needlefishes), of which there are 3 species in Hawaii; usually found somewhat offshore near the ocean surface, and reaching 100 cm in length.

Holocentrid..........................member(s) of the family Holocentridae (Squirrelfishes), of which there are about 15 species in Hawaii; many of them found in deeper reef areas, with most of them fairly small and only 1 or 2 approaching 45 cm in length.

Bothid..........................member(s) of the family Bothidae (Left-eyed Flounders), of which there are 12 species in Hawaii; 2 of the species are found on sandy bottoms in nearshore waters while the others occur primarily on the ocean floor in deeper offshore areas, with the largest individuals reaching about 40 cm in length.

Sphyraenid..........................member(s) of the family Sphyraenidae (Barracudas), of which there are 2 species in Hawaii; most often pelagic but sometimes found either singly or in small schools near shore, usually about 50-80 cm in length although an occasional individual may reach almost 200 cm.

Mugilid..........................member(s) of the family Mugilidae (Gray Mullets), of which there are only 2 species in Hawaii; both relatively common inshore forms, reaching a maximum length of about 45 cm.

Polynemid..........................member(s) of the family Polynemidae (Threadfins), of which Polyprolepis sexifilis (Mo) of inshore sand-bottomed areas is apparently the only species thus far reported for Hawaii, reaching perhaps 45 or 50 cm in length.

Serranid..........................member(s) of the family Serranidae (Groupers), of which there are about 15 species in Hawaii; most of them being deeper-water, and fairly small (2-20 cm) forms, although 1 species reaches 40-45 cm and 2 others are occasionally between 1 and almost 3 m long.

Priacanthid..........................member(s) of the family Priacanthidae ('Awooness or Bigeyes), of which 4 species are usually encountered in Hawaii; either nearshore or deeper-water forms, with maximum lengths of about 35 cm.

Apoconid..........................member(s) of the family Apocyonidae (Cardinalfishes), of which there are 11 species in Hawaii; all relatively common inshore forms but active mostly only at night, with the largest species reaching no more than about 10 cm in length.

Carangid..........................member(s) of the family Carangidae (Jacks), of which there are over 30 species in Hawaii; most of them deeper-water and fairly large forms; the species Caranx ignobilis (Ulua-or Pāpio for the smaller young) sometimes ranging in close to shore, and reaching 100 cm or more in length.

Lutjanid..........................member(s) of the family Lutjanidae (Snappers), of which there are 10 or 11 native species in Hawaii; most of them offshore deep-water--although not pelagic--forms, reaching maximum lengths of 30 to almost 100 cm.
Mullid. .......................................................... member(s) of the family Mullidae
(Goatfishes), of which there are 10 species in Hawai‘i; many of them living on the reef or
frequently visiting it, usually about 20–35 cm long but a few reaching 40–60 cm.

Kyphosid. .......................................................... member(s) of the family Kyphosidae
(Rudderfishes), the most often encountered of the 4 species reported from Hawai‘i being 2
members of the inshore genus Kyphosus (Nemue), which may reach 60 cm in length.

Chaetodontid. ................................................. member(s) of the family Chaetodontidae
(Butter-flyfishes), of which there are between 25 and 30 species in Hawai‘i (including 8
species separated as the family Pomacanthidae (Angel-fishes) by some authors), most often
inshore reef forms, reaching no more than about 30 cm in length.

Cirrhitid. ....................................................... member(s) of the family Cirrhitidae
(Hawkfishes), of which there are 5 or 6 species in Hawai‘i; all inshore forms, only 1 of
which reaches as much as 30 cm in length.

Pomacentrid. .................................................. member(s) of the family Pomacentridae
(Damsel-fishes), of which there are about 14 species in Hawai‘i; all except 2
characteristic of inshore waters (most in abundance), and reaching maximum lengths of near
25 cm.

Labrid. .......................................................... member(s) of the family Labridae (Wrasses),
which is the largest family of fishes in Hawai‘i with over 40 species; predominately
inshore forms, most of them fairly small but with a few larger forms reaching about 50 cm
in length.

Scarid. ........................................................... member(s) of the family Scaridae
(Parrot-fishes), of which the genera Calotomus (27 species) and Scarus (4-5 species) are
essentially the only 2 expected to occur in Hawai‘i; both being typically inshore groups,
and including 1 or 2 species that may reach 70 cm in length.

Acanthurid. .................................................... member(s) of the family Acanthuridae
(Surgeon-fishes), of which there are over 20 species in Hawai‘i; most of them inshore
forms, with the genus Naso (Unicornfish or (mostly) Kala) comprising the 5 generally
largest of these, reaching 40 to 75 cm in length.

Scombrid. ....................................................... member(s) of the family Scombridae (Tunas
and Mackerels), of which there are perhaps a dozen species in Hawaiian waters; almost all
open-ocean (pelagic) forms, many reaching a m or more in length.

Scorpaenid. .................................................... members of the family Scorpaenidae
(Scorpion-fishes), of which there are perhaps as many as 25 species in Hawai‘i; a majority
of them inshore, and fairly small (8-15 cm), forms, although several species may reach
between 25 and 50 cm in length.

Balistid. ........................................................ member(s) of the family Balistidae
(Trigger-fishes), of which there are about 10 species in Hawai‘i; mostly inshore forms,
with the largest reaching about 35 cm in length.

Monacanthid. ................................................ member(s) of the family Monacanthidae
(File-fishes), of which the small Parma spinosa (Fantail Filefish), reaching only
about 15 cm in length and sometimes washing up on beaches dead in great numbers, is by far
the most abundant of the 8 species to be expected in near-shore Hawaiian waters; the genus
Alutera contains the largest species, reaching about 60 cm in length.

Tetraodontid. ................................................ member(s) of the family Tetraodontidae
(Smooth Puffers), of which there are about 5 species, ranging up to 30 cm in length, in
Hawai‘i (—or perhaps close to a dozen if the several, generally small, species of the
genus Canthigaster (considered to constitute the family Canthigasteridae (Sharp-backed
Puffers); by some authors) are included—); a few forms of both types of these puffers may
found in shallower inshore areas, and all of the species may possess an intrinsic poison
although the flesh is apparently sometimes eaten without ill effects.
(Categories for Arch. Consuls. of the Pac. Faunal Ident., A.C. Zeigler, rev. 9 Jan. 1995, p. 4.)

Diodontid.......................................................... member(s) of the family Diodontidae (Spiny Puffers), of which 2 species of the genus Diodon, ranging from 25 to 70 cm in maximum length, are by far the most abundant in Hawaiian inshore waters, the single remaining species reported for Hawai‘i (genus Chilomycterus, 50 cm in length) apparently being quite rare here; all of these species are suspected of possessing an intrinsic poison although the flesh is apparently sometimes eaten without ill effects.

Fish.............................................................. material of indeterminate class and family.

CLASS AMPHIBIA

Order Anura
Family Bufonidae: (True Toads)
Bufo marinus (Giant Neotropical Toad).............. introduced to the Hawaiian Islands in 1932.

CLASS REPTILIA

Order Testudinata (Order Chelonia of some authors)
Family Cheloniidae: (Typical Sea Turtles) and/or Dermochelyidae: (Leatherback Sea Turtle)

Sea Turtle.......................................................... comprises fragmentary remains that could not be assigned to a particular one of the half-dozen species of marine turtle found in the Pacific; among the several cheloniids, Chelonia mydas (Green Sea Turtle) is possibly the most abundant and, apparently, the one most often taken for food; Dermochelys imbricata (Hawksbill Sea Turtle) is usually found much less frequently and is apparently not eaten, although the horny scutes of the carapace and plastron “turtle soup” are used artificially; while the sole dermochelyid, Dermochelys coriacea (Leatherback Sea Turtle) which lacks the large flat bony plates of the carapace found in all other sea turtles, is an important egg-producer for human food purposes in Indonesia, Malaysia, and probably other areas of the Southwest Pacific, although it does not lay eggs in Hawai‘i.

Family Indeterminate

Freshwater or Land Turtle...................................turtles(s), terrapin(s), and/or tortoise(s) of a non-marine family; any one of about 6 such groups could conceivably be represented, none of which is native to the Hawaiian Islands. Trionyx spinosus (Chinese Softshell Turtle; family Trionychidae) was once propagated here in fish ponds as a historic food item (and now maintains wild populations in various local bodies of fresh water). Members of other families have also been imported alive and were probably likewise occasionally eaten although none seems to have been raised here for this purpose; a number of individuals have apparently been released or escaped to possibly establish wild populations.

Order Squamata
Family Indeterminate

Small Lizard..................................................lizard(s) with a head-and-body length of less than about 10 or 15 cm; usually not identified to any lower taxonomic level although, in Hawai‘i, most or all of the material probably represents the Polynesian-introduced(? families Gekkonidae (geckos) and/or Scincidae (skinks) rather than any of the smaller members of historically introduced families.
CLASS Aves (Arrangement and nomenclature of historically known forms—unless modified by
the various Olson and James' references listed below—follow Pratt, R.D., P.L. Bruner,
University Press, Princeton, New Jersey; while information on prehistorically extinct
forms is drawn from Olson, S.L., and H.F. James, 1982, Prodromus of the fossil avifauna
of the Hawaiian Islands, Smithsonian Contributions to Zoology, No. 367; Olson, S.L.,
and H.F. James, 1991, Descriptions of thirty-two new species of birds from the Hawaiian
Islands: Part I, Non-passeriformes, Ornithological Monographs No. 45; and James, H.F.,
and S.L. Olson, 1991, Part II, Passeriformes, ibid. No. 46.)

Order Procellariiformes
Family Diomedeidae: (Albatrosses)
Dioptes sp. (Albatross)

Order Procellariidae: (Shearwaters, Petrels, and Fulmars)
Puffinus pacificus (Wedge-tailed Shearwater)

Puffinus sp. (Shearwater)............................member(s) of this genus that in Hawai'i
most likely include the relatively small species Puffinus nativitatis (Christmas
Shearwater) and, possibly, Puffinus lherminieri (Audubon's Shearwater; see Olson and James
1982:23), as well as the medium-sized species Puffinus pacificus (Wedge-tailed Shearwater)
and Puffinus nevelli (Newell's Shearwater).

Bulweria bulwerii (Bulwer's Petrel)
Pterodroma haemopus (Hawaiian Petrel)
Pterodroma sp. (Petrel)...............................member(s) of this genus that in Hawai'i
most likely include the relatively small species Pterodroma hypoleuca (Bonin Petrel) and
the prehistorically extinct Pterodroma jugabilis (Gracie Petrel) of Olson and James
1991:17-22, as well as the medium-sized species Pterodroma hypoleuca (Hawaiian Petrel).

Small Procellariid.................................smaller member(s) of the family
Procellariidae, in the general size range of Puffinus nativitatis (Christmas Shearwater),
Bulweria bulwerii (Bulwer's Petrel), Pterodroma hypoleuca (Bonin Petrel), as well as,
possibly, Puffinus lherminieri (Audubon's Shearwater; see Olson and James 1982:23) and the
prehistorically extinct Pterodroma jugabilis (Gracie Petrel) of Olson and James 1991:17-
22.

Medium Procellariid..............................medium-sized member(s) of the family
Procellariidae, in the general size range of Puffinus pacificus (Wedge-tailed Shearwater),
Puffinus nevelli (Newell's Shearwater), and Pterodroma hypoleuca (Hawaiian Petrel).

Family Hydrobatidae (Family Oceanitidae of Olson and James 1982:23): (Storm-Petrels)
Oceanodroma castro (Band-rumped Storm-Petrel).....material of a very small member of this
family, presumably this species but I have not been able to obtain comparative skeletal
material of it either locally or from the Smithsonian Institution, although I have
satisfactory material of the larger Oceanodroma tristrami (Tristram's Storm-Petrel).

Order Pelicaniformes
Family Phaethontidae: (Tropicbirds)
Phaethon lepturus (White-tailed Tropicbird).......the smallest of the 3 tropicbird species
occurring in the Pacific.

Order Ciconiiformes
Family Ardeidae: (Heron, Egrets, and Bitterns)
Nycticorax nycticorax (Black-crowned Night-Heron)
Drake Anseriformes  
Family Anatidae: (Swans, Geese, and Ducks)

Branta sp. (Goose)........................................presumably, either the historically known Branta sandvicensis (Hawaiian Goose) or one of the prehistorically extinct, apparently semi-flightless or possibly even flightless—medium-sized forms morphologically similar to, but evidently specifically distinct from, Branta sandvicensis; (see Olson and James 1991:42-47).

Thambetschen manio (O'ahu Lowland Moa-nalo)

Thambetschen sp. (Moa-nalo, in part).......................prehistorically extinct, large, "apothed-jawed", flightless, goose-like member(s) of the family Anatidae; (see Olson and James 1991:28-32, 35-38).

Moa-nalo (Large Flightless Anatid)..........................prehistorically extinct, large, obviously flightless, goose-like member(s) of the family Anatidae; (see Olson and James 1991:28-42 for the various genera and species potentially represented on the different Hawaiian Islands).

Small Anatid..................................duck(s) in the size range of Anas wyvilliana (Hawaiian Duck), Anas laysanensis (Laysan Duck), and some migrant or accidental continental teal; smaller than most other migrant ducks that often reach the Hawaiian Islands, which are often in the general "medium" size range of continental Anas platyrhynchos (Mallard).

Medium Anatid..................................member(s) of the family Anatidae in the general size range of smaller geese and larger ducks, such as Branta sandvicensis (Hawaiian Goose) and continental races of Anas platyrhynchos (Mallard).

Order Galliformes  
Family Phasianidae: (Turkeys, Peafowl, Guinea fowl, Chickens, Pheasants, Quail, etc.)

Gallus gallus (Red Junglefowl (=Chicken))...............(in almost all cases, fragmentary material representing pre-Contact Polynesian junglefowl would not be distinguishable from that of historically introduced chicken breeds of this same species. Also, I am not sure that most such material of other phasianids such as various species of larger pheasants (Phasianus, Lophura, etc.), as well as guineafowl (Numida), --all historically introduced--could usually be distinguished.)

Small- to Medium Galliform...............................member(s) of an indeterminate family (although, in Hawai'i, most likely family Phasianidae--) in the general size range of historically introduced Alectoris chukar (Chukar) and various Francolinus (francolins), all also historically introduced.

Medium Galliform...............................member(s) of an indeterminate family (although, in Hawai'i, most likely family Phasianidae--) in the general size range of Gallus gallus (Red Junglefowl (=Chicken)) and various larger species of pheasants (Phasianus, Lophura, etc.) as well as guineafowl (Numida), the latter two types all being historically introduced forms.

Large Galliform...............................member(s) of an indeterminate family (although, in Hawai'i, most likely all historically introduced members of the family Phasianidae--) in the general size range of Pico cristatus (Common Peafowl; introduced to the Hawaiian Islands in 1860) and Melanopsis gallopavo (Wild (=Domestic) Turkey; introduced in 1788).

Order Gralliformes  
Family Rallidae: (Rails, Moorhens, or Gallinules, Coots, etc.)

Porzana sp. (Hawaiian Flightless Rail)...................(formerly "Small Flightless Rallid"); sparrow- to plover-sized flightless member(s) of the family Rallidae; (see Olson and James 1991:29-32 for the various species potentially represented on the different Hawaiian Islands).
Gallinula chloropus (Common Moorhen)

Medium Gallinule.......................... Members of the family Gallinulidae in the general size range of Gallinula chloropus (Common Moorhen) and Fulica copei (Hawaiian Moorhen); most of the material probably consists of certain bones of 1 or both of these 2 species that I cannot satisfactorily distinguish, especially in the case of fragmentary material.

Order Charadriiformes
Family Charadriidae: (Plovers and Dotterels)

Pluvialis fulva (Pacific Golden-Plover)........(formerly "Pluvialis dominica (Lesser Golden-Plover)"); this relatively common migratory species is most abundant—and thus most readily available for capture—in the Hawaiian Islands from August through April, although a few individuals may occasionally be found here all year.

Family Scopelidae: (Curlews, Turnstones, Tattlers, Sandpipers, etc.)

Numenius tahitiensis (Bristle-thighed Curlew)

Medium Scopelid.......................... Members of the family Scopelidae, smaller than curlew, in the general size range of Arenaria interpres (Ruddy Turnstone), Heteroscelus incanus (Wandering Tattler), or a slightly larger species.

Family Laridae: (Gulls, Terns, and Jaegers)

Medium Larid.............................. Members of the family Laridae in the general size range of jaegers and medium-sized gulls, none of which breed in the Hawaiian Islands although several species are relatively frequent vagrants or winter residents here.

Order Columbiformes
Family Columbidae: (Pigeons and Doves)

Columba livia (Rock Dove).................... Introduced to the Hawaiian Islands in 1796. (There are no native Hawaiian columbiformes, and of the 20 or so species of the order [all family Columbidae except for 1 sandgrouse of the family Pteroclididae] historically introduced to the State only 4 managed to establish widespread, long-surviving, populations: Columba livia (Rock Dove or Domestic Pigeon), Streptopelia cheninensis (Spotted Dove), Geopeela striata (Zebra Dove), and Zenaidura macroura (Mourning Dove—apparently only in the Pu'uhonua'o'a area in the North Kona District of Hawai'i Island). Thus, I presume most or all bones of columbids found will represent only these 4 forms although in a few cases osteologically similar species—introduced but now extirpated—could conceivably be represented.

Streptopelia cheninensis (Spotted Dove)........... Introduced to the Hawaiian Islands sometime in the 1800's. (There are no native Hawaiian columbiformes, and of the 20 or so species of the order [all family Columbidae except for 1 sandgrouse of the family Pteroclididae] historically introduced to the State only 4 managed to establish widespread, long-surviving, populations: Columba livia (Rock Dove or Domestic Pigeon), Streptopelia cheninensis (Spotted Dove), Geopeela striata (Zebra Dove), and Zenaidura macroura (Mourning Dove—apparently only in the Pu'uhonua'o'a area in the North Kona District of Hawai'i Island). Thus, I presume most or all bones of columbids found will represent only these 4 forms although in a few cases osteologically similar species—introduced but now extirpated—could conceivably be represented.

Geopeela striata (Zebra Dove)................... Introduced to the Hawaiian Islands in 1922. (There are no native Hawaiian columbiformes, and of the 20 or so species of the order [all family Columbidae except for 1 sandgrouse of the family Pteroclididae] historically introduced to the State only 4 managed to establish widespread, long-surviving, populations: Columba livia (Rock Dove or Domestic Pigeon), Streptopelia cheninensis (Spotted Dove), Geopeela striata (Zebra Dove), and Zenaidura macroura (Mourning Dove—apparently only in the Pu'uhonua'o'a area in the North Kona District of Hawai'i Island). Thus, I presume most or all bones of columbids found will represent only these 4 forms.
although in a few cases osteologically similar species--introduced but now extirpated--could conceivably be represented.)

**Order Strigiformes**

**Family Strigidae: (Typical Owls)**

**Aego flammeus** (Short-eared Owl)

Medium Strigid..........................comprises owl material that does not appear to be the sole Hawaiian representative of the family Tytonidae Tyto alba (Common Barn-Owl, introduced to the Hawaiian Islands in 1958), but very likely represents either or both of the native Aego flammeus (Short-eared Owl) and the prehistorically extinct owl genus Grammolaxis (Stilt-Owl) of Olson and James 1991:67-81 (both family Strigidae), many of whose bones I cannot yet satisfactorily distinguish, especially when fragmentary.

**Order Passeriformes**

**Family Corvidae: (Ravens, Crows, Magpies, and Jays)**

**Corvus hawaiiensis** (Hawaiian Crow)

**Corvus** (Large species) (Crow)...................... member(s) of the genus in the general size range of continental Corvus corax (Common Raven); presumably either or both the prehistorically extinct Hawaiian Corvus infulatus and C. viridus of James and Olson 1991:11-22 could be included.

**Corvus sp.** (Crow)..........................comprises material presumably representing this genus but that could not be certainly assigned to any of the 3 Hawaiian species: the extinct Corvus hawaiiensis (Hawaiian Crow) or the prehistorically extinct Corvus infulatus (Arch-billed Crow) and C. viridus (Long-billed Crow) of James and Olson 1991:11-22.

**Family Meliphagidae: (Honeyeaters)**

**Chaeocephala sp.** (Kioea)...........................(historically extinct on Hawai'i Island, and known only fossil elsewhere in the State.)

**Family Indeterminate**

**Small Passeriform.**............................. member(s) of 1 or more families of this order ("Ploceidae" or "Scolopacidae"), up to the general size of cardinals or smaller thrushes; most of the extinct and extant endemic Hawaiian passeriform species--as well as a number of the historically introduced ones--would be of this size.

**Medium Passeriform.**............................. member(s) of this order in the general size range of jays and robin to larger jays; among endemic Hawaiian passeriform species, apparently only the extinct Chaeocephala sp. (family Meliphagidae) and, possibly, a very few of the larger prehistorically extinct species of Hawaiian Honeycreepers and Finches (subfamily Drepanidinae of the family Fringillidae; see James and Olson 1991)---as well as a few of the historically introduced species of various families---would be of this size.

**Order and Family Indeterminate**

**Small Bird.**.............................. member(s) of indeterminate order and family up through the general size of storm-petrel, quail, plover, sparrow, myna, and thrush; probably a large amount of the material represents passeriforms but smaller native or historically introduced species of 3 or 4 other orders could well be included, also.

**Medium Bird.**.............................. member(s) of indeterminate order and family in the general size range of shearwater and petrel, tropicbird, night-heron, duck, hawk, junglefowl (chicken), moorhen and coot, curlew, gull, owl, crow, and so on; in Hawai'i, probably no passeriforms other than Hawaiian species of the genus Corvus would be included, but a number of native or historically introduced species of up to a half-dozen other orders could potentially be.
Large bird..........................member(s) of indeterminate order and family in the general size range of ibis, gannet, frigatebird, goose, eagle, turkey, raven, and so on; in Hawaii, a number of native or historically introduced species of up to a half-dozen orders could potentially be included.

CLASS MAMMALIA (Insofar as possible, arrangement and nomenclature follow Temich, P.Q., 1996, Mammals in Hawaii’s, Second Edition, Bishop Museum Press, Honolulu; except that the more generally accepted name Mus musculus is used here instead of Mus domesticus.)

Order Chiroptera
Family Vespertilionidae: (Common Bats)

Lasiurus cinereus (Hoary Bat)

Order Primata
Family Hominidae: (Humans)

Homo sapiens (Modern Human)

Order Lagomorpha
Family Leporidae: (Hares and Rabbits)

Oryctolagus cuniculus (European Rabbit) introduced to the Hawaiian Islands sometime after 1778; known to have become established by 1825.

Order Rodentia
Family Muridae: (Old World Rats and Mice)

Rattus exulans (Polynesian Rat) comprises all material of this Polynesian-introduced species that, because of its relatively small size, could be distinguished with some degree of certainty from corresponding material of the larger Rattus norvegicus (Norway Rat) and R. rattus (Roof Rat), both historically introduced to the Hawaiian Islands.

Rattus norvegicus and/or Rattus rattus (Norway and/or Roof Rat) comprises all material that, because of its relatively large size, could be distinguished with some degree of certainty from that of the smaller Rattus exulans; although, except for essentially intact crania, I doubt that isolated skeletal elements of these 2 larger, post-Contact, species can safely be distinguished from each other.

Rattus sp. comprises material presumably all representing this genus but that could not be assigned to either the Polynesian-introduced Rattus exulans (Polynesian Rat) or the historically introduced R. norvegicus (Norway Rat) and R. rattus (Roof Rat), usually because of either its fragmentary nature or its relative immaturity.

Mus musculus (House Mouse) introduced to the Hawaiian Islands sometime after 1778.

Order Mysticeti
Family Balaenopteridae: (Fin-back Whales) and/or Balaenidae: (Right Whales)

Mysticeti, member(s) of the order Mysticeti (Whalebone Whales), of which perhaps 5 species might be expected to occur in the Central Pacific, with adult lengths ranging from about 8 to 30 m.

Order Odontoceti
Family Delphinidae: (Porpoises, Dolphins, etc.), Physeteridae: (Sperm Whales), and/or Ziphiidae: (Beaked Whales)

Physeter macrocephalus (Sperm Whale) a physeterid, with largest individuals (males) reaching a length of 19 m.

Small Odontocete(s) member(s) of the order Odontoceti (Toothed Whales) up to about 3 - or so in length, thus including in the Pacific a half-dozen or
more porpoise- and dolphin-like species of the family Delphinidae, as well as the 7 unusual tiny phytodetrids of the genus Nugas (Pygmy and Dwarf Sperm Whales).

Medium Odontocete ........................................ member(s) of the order Odontoceti (Toothed Whales) from about 3 to 9 m in length, thus including here only the 4 largest species of Pacific Delphinidae, as well as both Pacific members of the family Ziphiidae.

Order Carnivora
Family Canidae: (Wolves, Dogs, Foxes, etc.)

Canis familiaris (Domestic Dog) ................. (I doubt that it is possible to distinguish remains of pre-Contact Polynesian dogs from morphologically similar forms of historically introduced ones, although individuals of very large or otherwise osteologically distinct introduced modern breeds of this same species might be successfully identified as such.)

Family Viverridae: (Mongoose, Civets, etc.)

Herpestes auropunctatus (Small Indian Mongoose) ... introduced to the Hawaiian Islands in 1883.

Family Felidae: (Lions, Tigers, Cats, etc.)

Felis catus (House Cat) ......................... introduced to the Hawaiian Islands sometime after 1778.

Order Perissodactyla
Family Equidae: (Horses, Donkeys, Zebras, etc.)

Equus caballus (Domestic Horse) .................... member(s) of the family Equidae in the horse size range; although I have referred all such material to this species (introduced to the Hawaiian Islands in 1833), in reality, the similar-sized Equus asinus x Equus caballus (Mule; introduced or produced locally by at least 1851) - and perhaps even the smaller Equus asinus (Donkey; introduced by at least 1828) - could not always be distinguished from it on the basis of most fragmentary material. (In addition, there are apparently no comparative skeletons of Mule, and only a few miscellaneous bones of Donkey, available in Hawai'i.)

Order Artiodactyla
Family Suidae: (Pigs, Batruses, Watt Hogs, etc.)

Sus scrofa (Pig) ........................................ (just as in the case of the Domestic Dog, I doubt that it is possible to distinguish remains of pre-Contact Polynesian pigs from morphologically similar forms of historically introduced ones, although individuals of extremely large or otherwise osteologically distinct introduced modern breeds of this same species might be successfully identified as such.)

Family Cervidae: (Muntiacus, Deer, Elk, Pudu, Moose, Caribou, etc.)

Medium Cervid ........................................ member(s) of the family Cervidae in the size range of Axis axis (Axis Deer) and Otocricerus hemionus (Horse Deer), both of which have been introduced to various Hawaiian Islands, the former in 1867 and the latter, definitely, in 1951, if not as early as about 1815 (see pp. 133-134 in the Tomich 1986 reference cited on page 3 of this List).

Family Bovidae: (Cattle, Buffalo, Goats, Sheep, etc.)

Bos taurus (Domestic Cattle) .................... member(s) of the family Bovidae in the cattle size range; although I have referred all such material to this species (introduced to the Hawaiian Islands in 1793), in reality, other such large bovids as Bubalus bubalis (Himalayan Buffalo; introduced about 1867) and Bison bison (North American Bison; introduced in 1868) could not be distinguished from it on the basis of most fragmentary material.

Capra hircus (Domestic Goat/Sheep) .......... comprises fragmentary material from 1 or more smaller historically introduced members of, presumably, the family Bovidae, with the osteologically very similar Capra hircus (Domestic Goat; introduced to the Hawaiian...
Islands in 1778) and Ovis aries (Domestic Sheep; introduced in 1791) being the species most likely represented, although Ovis musimon (Mouflon; introduced in 1954) is an additional possibility on some Hawaiian islands. (Except for portions of the cranium, I doubt that isolated, often fragmentary, bone material of these 2 genera can safely be distinguished, considering both their general skeletal similarity and the osteological variation occasioned by possible interbreeding with and among the different breeds of domestic stock.)

**Family Indeterminate**

Medium Artiodactyl.................................member(s) of indeterminate family, other than Cervidae (deer), although on most isolated Pacific islands the possibilities (all historically introduced) are probably limited to Cervidae (various deer) and smaller Bovidae (Capra hircus (Domestic Goat) and Ovis aries (Domestic Sheep)); however, in Hawai‘i, Antilocapra americana (Pronghorn) of the family Antilocapridae, as well as the bovid Ovis musimon (Mouflon)—introduced here in 1959 and 1961, respectively—must additionally be considered.

**Order and Family Indeterminate**

Small Mammal................................................member(s) of indeterminate order and family up through the general size of Rattus sp. and mongoose; in Hawai‘i, Polynesian- or historically introduced species of at least 3 orders could potentially be included.

Small-to-Medium Mammal..............................member(s) of indeterminate order and family in the general size range of wallaby, rabbit, dog, and cat; in Hawai‘i, Polynesian- or historically introduced species of at least 3 orders could potentially be included.

Medium Mammal..........................................member(s) of indeterminate order and family in the general size range of man, porpoise, seal, pig, deer, and goat/sheep; in Hawai‘i, native or introduced species of at least 4 orders could potentially be included.

Large Mammal.............................................member(s) of indeterminate order and family in the size range of medium and large whales, horse, mule, donkey, and cattle; native or historically introduced species of up to 4 orders could potentially be included.

**CLASS INDETERMINATE**

**Order and Family Indeterminate**

Small Vertebrate...........................................comprises highly fragmented bone material representing member(s) of indeterminate class, order, and family, but with an estimated head-and-body length less than about 0.3 m.

Medium Vertebrate.....................................comprises highly fragmented bone material representing member(s) of indeterminate class, order, and family but with an estimated head-and-body length of from about 0.3 m to, roughly, 2.0 m.

Large Vertebrate........................................comprises highly fragmented bone material representing member(s) of indeterminate class, order, and family, but with an estimated head-and-body length of more than about 2.0 m.
Appendix C: Correspondence
TO: Joe Kennedy

DATE: 28 Nov. 1995

FROM: David Herditch

TEL: (808) 638-7442

MESSAGES:

Joe,

Here is a copy of the letter I sent to Jack Kachmarik and a copy of Jeff Fentress' Memo. There is a map that goes with the memo, but I don't have a copy right now. I will send The 800 regulations under a separate fax cover as there are 23 pages.

David
28 November 1995

Mr. Jack Kachmarik
American Samoa Disaster Recovery Office
Pago Plaza Suite 201
P.O. Box PPB
Pago Pago, AS 96799

RE: Ta'u Secondary Road Project (GSR46969)

Dear Mr. Kaschmarik,

This letter is a review of telephone conversations I have had with you and with Mr. Joe Kennedy of Archaeological Consultants of the Pacific over the past week concerning the Ta'u Secondary Road Project that will be funded by the Federal Emergency Management Agency.

To begin the project will involve two phases. The first phase will be to provide a report containing the identification of archaeological materials, an evaluation of their significance, an evaluation of the effect of the project on the archaeological materials, and if there is an effect recommendations for mitigation. If there is an effect on the archaeological materials (and I anticipate there will be) then before any archaeological mitigation work can be done our office and the Advisory Council on Historic Preservation must review the report in question and be provided an opportunity of thirty (30) days to comment. No mitigation work can be done until this phase is complete.

As I discussed with you the primary objective of the first phase of the process is to have the memorandum that was written by the ASPA archaeologist Jeff Fenness formalized into a report that meets the report writing guidelines of the American Samoa Historic Preservation Office.

The bulk of the work for the first phase will be report writing. Field work will be minimal involving a pedestrian survey and very limited testing with a backhoe. However, before any field work can be done plans of where the road will go and the extent of grading and
excavation for the road must be provided. These plans are necessary for two reasons. Firstly, they will provide information on which to base recommendations for data recovery mitigation. Secondly, given the plans it will be possible for the archaeological contractor to know where to do limited testing in those areas that will be impacted in order to access the depth and nature of the archaeological deposits. This will also provide the archaeological contractor with information necessary to base recommendations for data recovery mitigation. In addition, it will provide him with the information necessary to evaluate the time and costs involved in such mitigation.

The second phase will involve the production of a Data Recovery Mitigation Plan, the implementation of that plan, and the production of a report describing the results of the data recovery mitigation efforts. The extent of this work will depend on the level of impact of the project on the cultural resources.

If you have any questions regarding this correspondence, please call me at (684) 699-9513.

Sincerely,

David J. Herdrich
Territorial Archaeologist

cc: Mr. Joseph Kennedy, ACP
MEMORANDUM

DATE:  8/16/95
TO:    Sina Faial
FR:    Jeff Fentress, Staff Archaeologist
RE:    Pedestrian survey of Ta'u Secondary Road Project (GSR46969)

On 8/15/95 Territorial Archaeologist David Herdrich and I conducted an archaeological reconnaissance of the Ta'u secondary road. We were accompanied by Wayne Maupo, the ASPA highway inspector.

The road project begins just south of the McConnel/Dowell housing building (N67°66.22' E32°53.71') and extends to a point just north of Faagouga Point (N67°27.97' E32°07.58'). The project will replace the beachfront road through Ta'u which was severely damaged by hurricane Val. The proposed realignment will diverge from the former route of the secondary road in several places.

The purpose of the survey was to identify cultural materials and develop plans for mitigation of impacts to archaeological sites along the proposed realignment.

The ground surface of the proposed route was examined visually. In addition, all exposed cut banks, tree falls, and eroded drainages were inspected. In areas of exposed banks where archaeological materials were visible, artifacts were removed from the matrix, examined, and replaced in situ. Photographs were taken of representative cultural materials.

Extensive archaeological materials were observed along the entire route of the proposed secondary road. This finding is consistent with Clark's (1990) observation that Ta'u village (AS-11-15) constitutes one large archaeological site. Prehistoric cultural materials identified include evidence of stone tool manufacture: basalt cores, flakes, and preforms. Stone tools included broken adze fragments, utilized flakes, and one foaga (grinding stone) made from vesicular basalt. Historic features included a collapsed concrete copra storage building and concrete anchorages. The exposed burials resulting form Hurricane Val have been reinterred in graves quite close to the proposed secondary road.

As cultural materials and human graves are present throughout the route of the proposed road, there is a very high probability that more archaeological materials will be uncovered by any ground breaking activities.

The key questions, then, in relation to archaeological work along the
proposed road bed concern impacts to the ground surface:

Will the road surface be graded, thus, cutting into the ground surface?

Where will grading occur?

Will eroded banks and overhanging ground surface along the beach be cut away before fill is deposited?

In the event that the road surface will be disturbed by construction activities, Mr. Herdrich and I have agreed on the general outlines of a mitigation plan. In general, archaeological clearance requires three phases:

1. Identification (survey, small excavations).

2. Evaluation (determining the extent and significance of archaeological sites affected by construction).

3. Mitigation (avoiding sites, or recovering as much information as possible if the archaeological sites cannot be avoided).

The identification of cultural materials both on the surface and in subsurface deposits has been performed by the our survey on 8/15/95. It appears obvious from our survey and previous research at Ta’u village that the area of the proposed roadbed constitutes part of an extensive and significant archaeological complex that extends throughout the Ta’u village area. Further testing of the boundaries of the deposits is not necessary and would constitute an unnecessary expense.

We propose that if the ground is disturbed by construction work mitigation of damage to the archaeological materials could be completed by the following procedures:

A series of 1x2 m excavation units be placed along the proposed route of the Ta’u Secondary Road. The units should extend to at least 10 cm. below baseal cultural deposits. The excavations will be placed at the points where the archaeological materials are most obvious on the surface and at regularly spaced intervals between. The number of excavation units will depend on receiving more information about the ground disturbing activities of the road project.

With advanced planning, it may be possible to keep this project in house which would save considerable expense over hiring a contractor. Either David Eisler, Elliot Gehr or myself could serve as project director and Afu Fillisi, Sioesi and Salatonga could work as field assistants.

If you have any questions, please contact me at 699-1333.
January 4, 1996

Dr. Alan C. Ziegler
45-636 Liula Place
Kane'ohe, Hawaii 96744

Dear Dr. Ziegler,

Please find enclosed two bags, each containing samples of faunal material from two recent projects of ours. These projects took place in Ta'u and Faleasao Villages located on Ta'u Island, Manu'a, American Samoa. We would appreciate your assistance, at your earliest convenience, in identifying these samples to the species level, as possible.

We would like to thank you in advance for your assistance and will be expecting invoices for your services. Please bill us separately for each of the sets of samples included in this package and, as always, feel free to phone if you have any questions.

Sincerely,

Patrick Sarvak
Laboratory Assistant
ACP, Inc.
January 23, 1996

Mr. David J. Herdrich, Territorial Archaeologist
American Samoa Historic Preservation Office
Department of Parks and Recreation
American Samoa Government
Pago Pago, American Samoa 96799

Dear Mr. Herdrich,

Please find enclosed a copy of our draft report, "A Cultural Resource Evaluation (Phases I and II) For the Ta’u Secondary Road Located on Ta’u Island, American Samoa", which we submit for your review.

We would like to thank you in advance for your consideration of this document and look forward to your comments. If you have any questions, please feel free to phone or fax.

Sincerely,

D. Kyle Latinis
Project Supervisor
ACP, Inc.

cc: Mr. Jack Kachmarik
JOSEPH KENNEDY
Senior Archaeologist

March 15, 1996

Mr. David J. Herdrich, Territorial Archaeologist
American Samoa Historic Preservation Office
Department of Parks and Recreation
American Samoa Government
Pago Pago, American Samoa 96799

Dear Mr. Herdrich,

Please find enclosed a copy of our revised report, "A Cultural Resource Evaluation (Phases I and II) for the Ta’u Secondary Road Located on Ta’u Island, American Samoa" which we submit for your continued review.

Thank you for your previous comments and suggestions concerning the initial draft report. All of these issues have been addressed and changed accordingly. We would appreciate any additional comments or suggestions. If there is any additional information you require, please inform our office and we will provide it immediately.

Once again, we would like to thank you in advance for your consideration of this document and look forward to your comments.

Sincerely,

D. Kyle Latinis
Project Supervisor
ACP, Inc.

cc. Mr. Jack Kachmarik