

ARCHEOLOGICAL ASSESSMENT AND
RESOURCE MANAGEMENT GUIDE

TUMACACORI NATIONAL MONUMENT

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INTRODUCTION

Archeological resources at Tumacacori National Monument represent the history and culture of four peoples and three historical periods in southern Arizona. They exemplify the differences between the Hispanic and Anglo frontiers and bridge the transformation of southern Arizona from a frontier to part of modern United States industrial society. Containing the remains of three periods of southern Arizona's turbulent history and representing the interaction of peoples from four different cultures, Tumacacori is an archeological site where processes like acculturation, economic development and the growth of transportation and communication can be studied through documentary history and the remains of material culture.

Tumacacori has also been the scene of over 50 years of preservation activities that have included extensive investigation and, therefore, disturbance of its archeological resources. Past preservation projects have greatly increased our knowledge of the site's development, but they have also resulted in data loss and destruction of archeological resources without adequate documentation. This has led to the widely accepted belief that "not much more could be learned from further excavations" (Shenk 1976).

Recent excavations show this is not true; Tumacacori still has potential for further research. Less of the site is disturbed than was previously thought and the site's remaining research potential is relatively high. The purpose of this report is to re-evaluate Tumacacori's research potential in light of new information. This information comes from recent excavations in a few restricted areas. Continued investigation at the site will undoubtedly produce new data that will require further re-evaluation and will set new directions.

Careful, complete, well planned, and documented excavation can produce data useful to interpreting the site, and can further our knowledge of the Spanish mission period in southern Arizona. Recommendations for managing the site's remaining archeological potential include preceding excavations with a problem-oriented research design and instigating a more comprehensive plan for future archeological excavations required by stabilization or monument maintenance. Continued archeological research

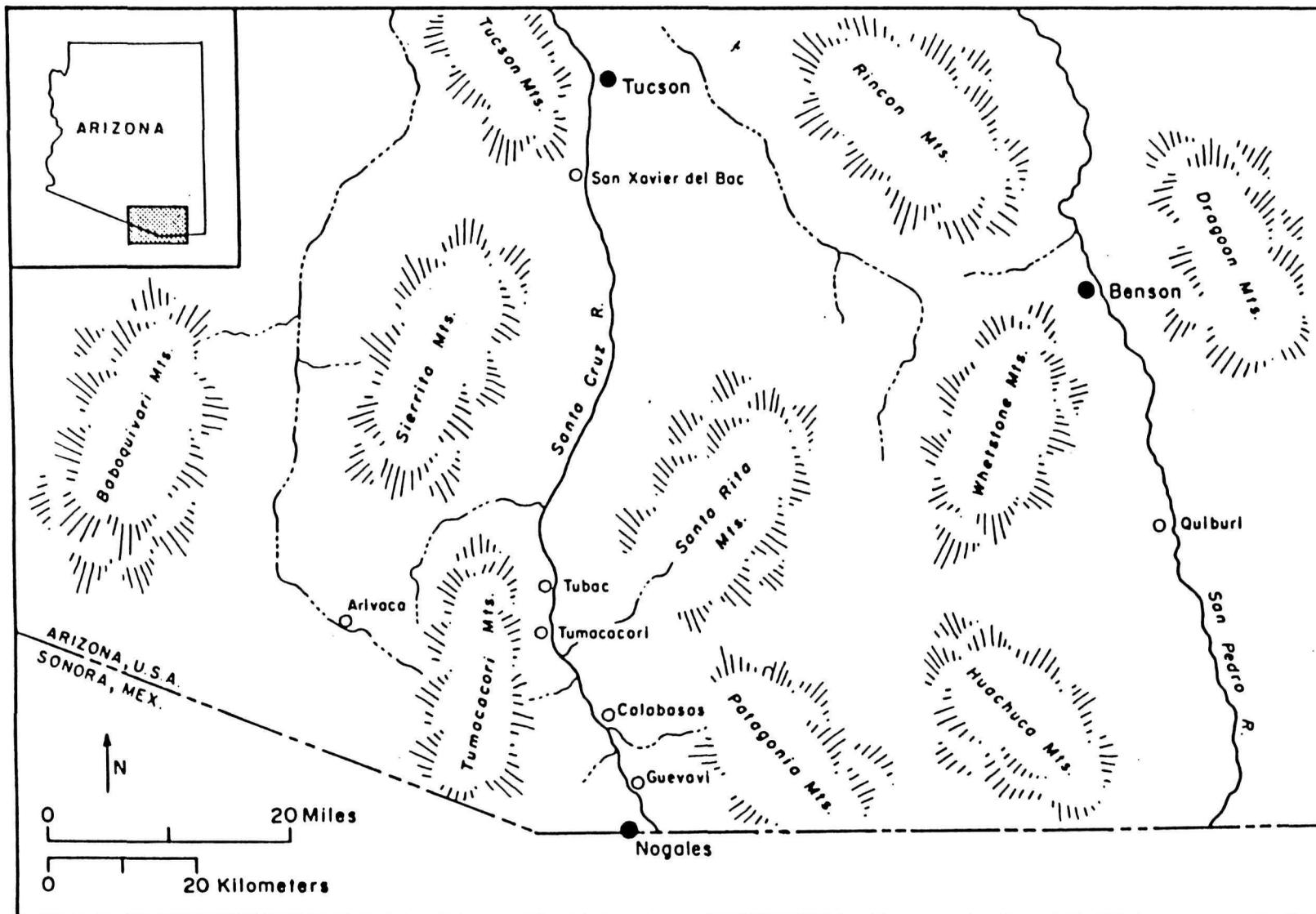


Fig. 1: Location of Tumacacori National Monument
(modified from Shenk and Teague 1975:3).

at Tumacacori, if coordinated and properly conducted will contribute much to enhancing the monument experience for the visitor as well as increasing our understanding and appreciation of southern Arizona's past.

SETTING AND HISTORY

Tumacacori National Monument is located in the Santa Cruz River Valley, just east of Interstate 19, between Tucson, Arizona, and Nogales, Mexico (figure 1). The monument preserves the remains of the Spanish frontier mission, San Jose de Tumacacori. The monument's 12 acres include the mission church, campo santo (burial ground), and adjacent convento (monastery), a kiln for processing lime, the ruins of the neophyte (Indian) village, and portions of the orchard, fields, and irrigation system (figure 2). In addition to the mission complex, the monument also contains a visitor center and three residences (built in the 1930s), a double garage that is used as a utility building, two residential trailers, and a pumphouse (figure 3).

Tumacacori is about $\frac{1}{4}$ mi. west of the Santa Cruz River. It sits at the edge of the floodplain on the river's third terrace, approximately 3,300 ft. above sea level. The Tumacacori Mountains rise to the west of the mission and the San Cayetano Mountains are east and south. The mission's environment is extremely arid. Although Tumacacori is located in the desert-scrub grasslands and juniper-pinyon woodlands transition zone, its vegetation is characteristic of the lower Sonoran Desert.

Tumacacori is part of the chain of northern Sonoran missions founded by Padre Kino in 1691. The community moved from its original position on the east bank of the Santa Cruz to its present location on the river's west bank in 1753. The Jesuit mission was built by 1757 and construction of the Franciscan structures was started in 1797-1802. The Franciscan church saw its first use in 1822. In 1843 the Sonoran missions were secularized, and in 1848 Tumacacori was abandoned by its resident Indian community. Tumacacori became part of the United States in 1854 when the Gadsden Purchase was ratified. Excellent histories of the mission and monument have been written by Kessell (1970, 1972) and Clemensen (1977).

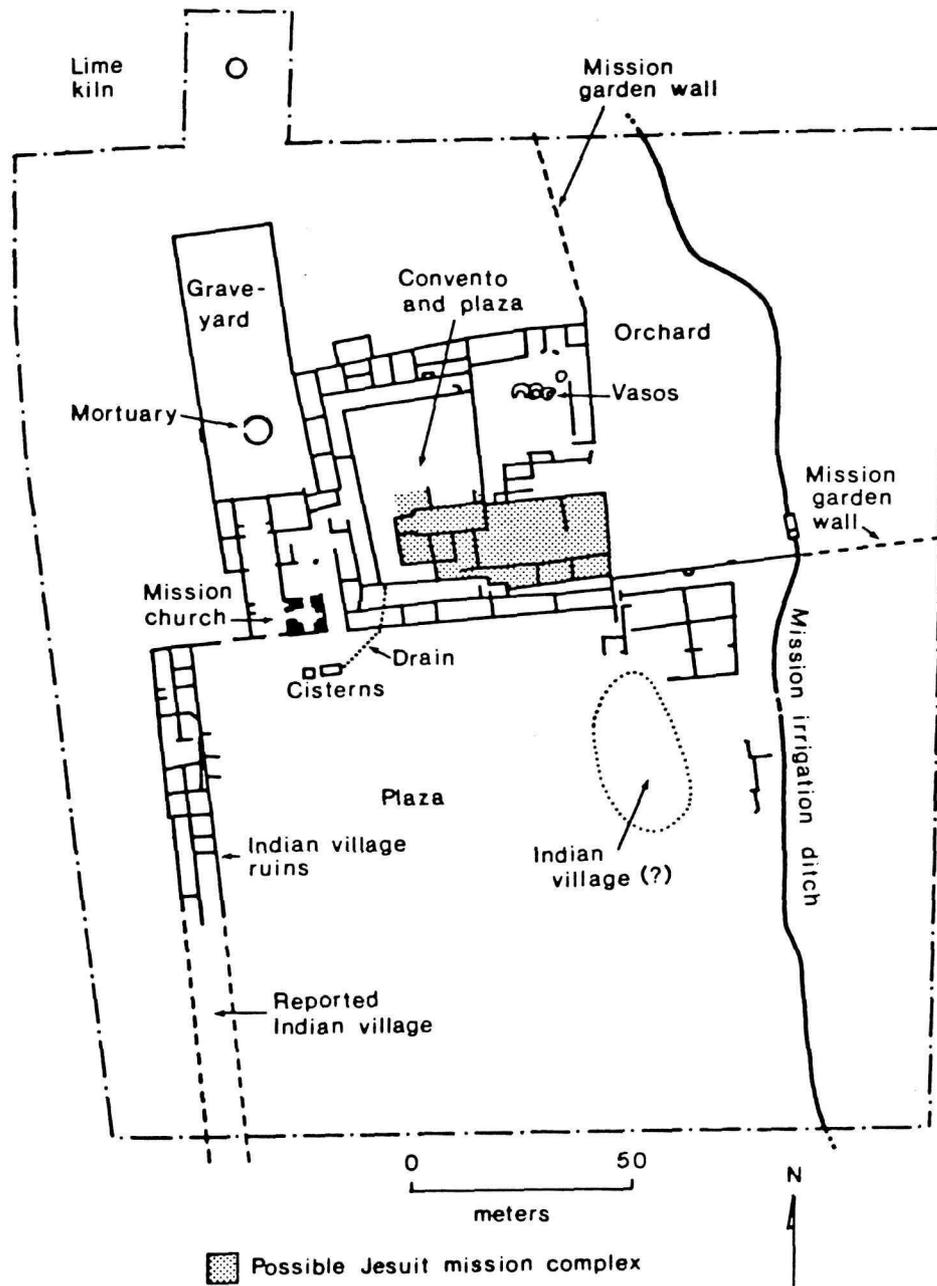


Fig. 2: Historic Resources

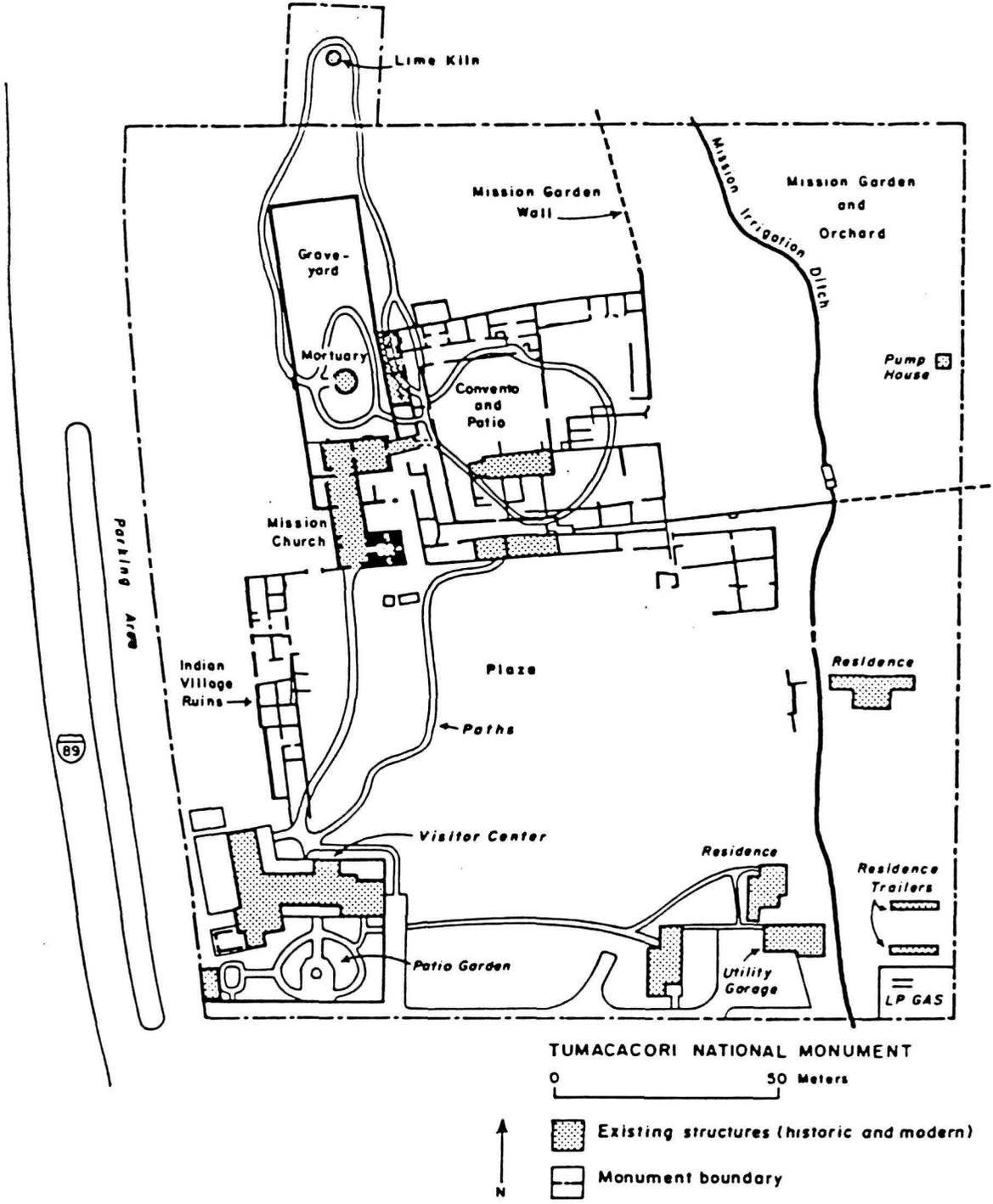


Fig. 3: Existing Monument Development
 (Original Monument Boundaries Shown)

Mission San Jose de Tumacacori was a community occupied by a variety of peoples, representing the cultural diversity of southern Arizona during the historic period. The mission's present location was occupied before its construction and after its abandonment. As a result, the history of the site and its archeology are quite complex.

PAST PROJECTS (1918-1979)

Over the last 50 years, most of the structures and ruin mounds at Tumacacori have been explored archeologically. A survey and seven major excavations were conducted at the mission prior to 1979. These projects are briefly summarized below. Figure 4 shows the areas of Tumacacori that have been excavated, and Shenk (1976) contains an excellent detailed summary of these past projects.

The first archeological excavation at Tumacacori was conducted by Frank Pinkley (Clemensen 1977:57-66). The purpose of these investigations, which began in 1918 and continued into the 1920s, was to find features of the mission ruins that required preservation. He worked in the church, convento, and campo santo; there is little information on the location and extent of his excavations. Pinkley's work led to fairly accurate restoration of many of the mission's ruins including the Franciscan church, mortuary chapel, granary, and campo santo wall (Shenk 1976:23, 66-67).

The most extensive archeological investigation at Tumacacori was conducted in 1934-1935 by Paul Beaubien and Walter Attwell (Beaubien n.d.; Shenk 1976:27). This project involved trenching, mapping, and backfilling a large portion of the site to produce a base map of the architectural features; it is assumed that all the architectural features shown on the base map (figure 5) were trenched. In addition to the base map, valuable architectural details were obtained, and it was shown that the monument boundaries did not encompass the entire extent of the site.

In 1941, Edward Danson conducted a survey of the upper and middle Santa Cruz River Valley, from the river's headwaters to Tubac (Danson 1946). The purpose of this reconnaissance survey was to obtain a general

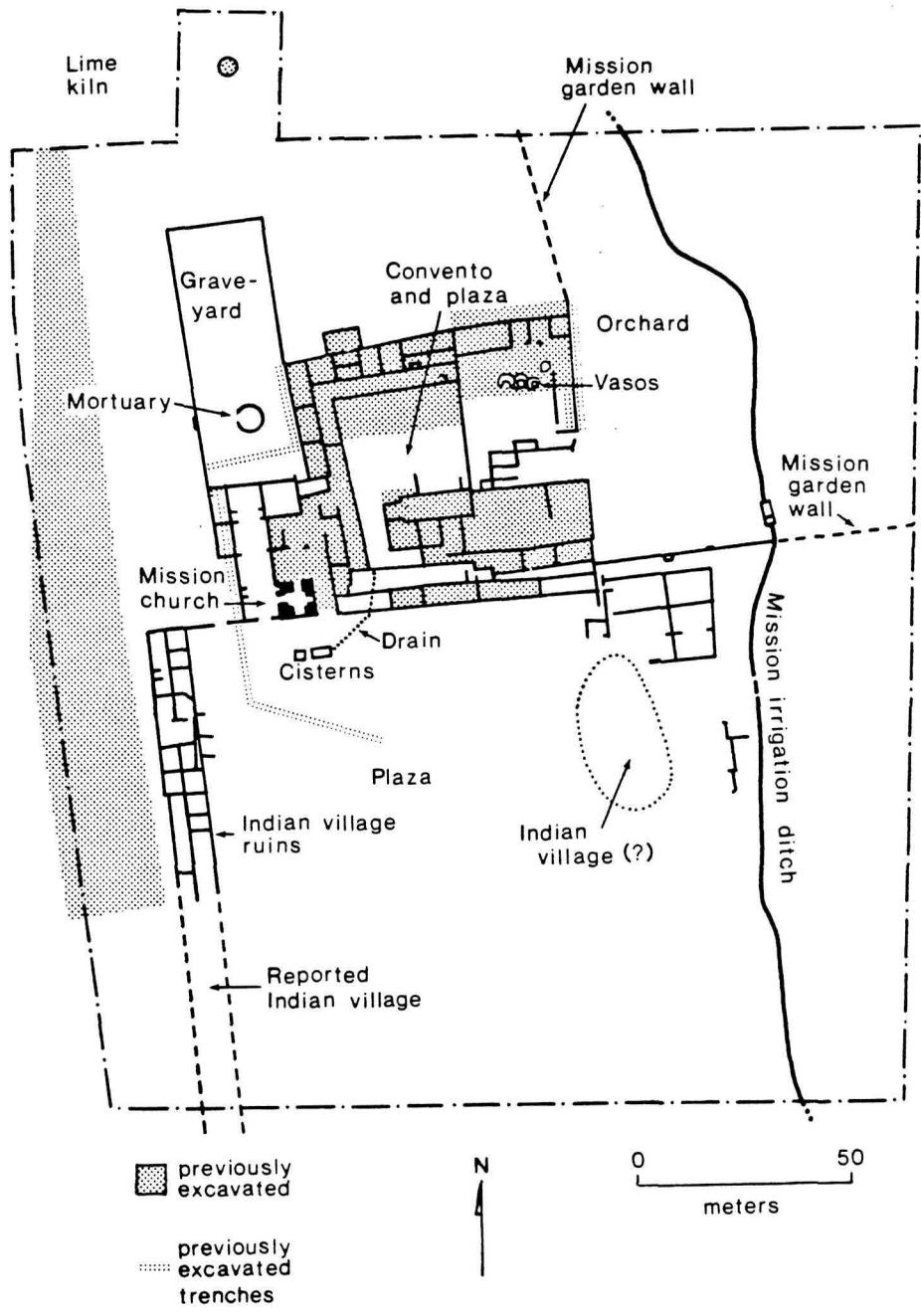


Fig. 4: Areas of Excavation
 (Original Monument Boundaries Shown)

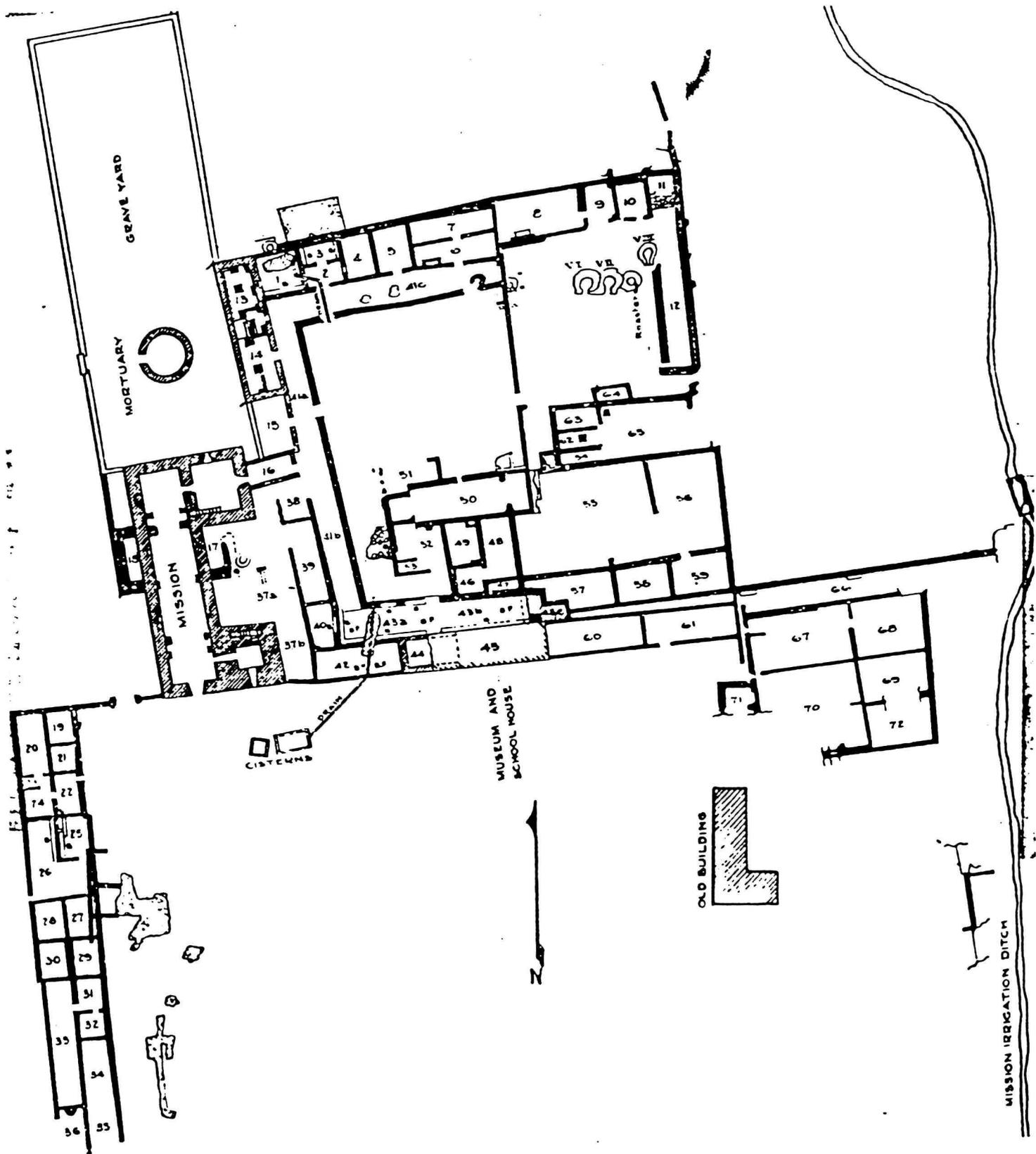


Fig. 5: Rooms Outlined in Beaubien's Excavations (1934-1935)

idea of the archeology in this area. The kinds of sites that Danson identified during the survey include camp sites, house ring sites, rock mound and depression sites, stone house foundations, rock walled sites, cave sites, historic sites and Spanish missions, including Tumacacori (Danson 1946:35-49). At Tumacacori, Danson made collections of unspecified materials and described the site as containing many mounds and trash heaps (Danson 1946:33).

In 1951, prior to a highway realignment, Sallie Brewer (1951) excavated a series of trenches west of the Franciscan church and Indian village mound (figure 6). The purpose of this project was to locate and recover any significant culture material, particularly structural remains and artifacts suitable for museum display. Although she concluded that no significant cultural remains would be affected by the highway realignment, she uncovered intact mission period deposits and described artifacts and their context. Brewer's excavation was the first to be conducted outside of the mission's enclosure (Shenk 1976:47).

Gordon Vivian conducted stabilization related excavations at Tumacacori in 1955 and 1956 (Vivian 1956). In 1955, he trenched the exterior of room 44 and 45 walls prior to construction of a shelter enclosing the ruins (figure 7). In 1956, Vivian excavated room 16 so that the base of its walls could be patched, sealed, and waterproofed (Shenk 1976:57, 69).

Louis Caywood supervised projects in 1964 and 1965 which excavated most of the Franciscan convento to floor level (Caywood 1965a and b; Kayser 1965). Since the main purpose of these projects (figure 4) was to expose and exhibit the convento ruins, the primary concern was with architectural details, especially wall and feature foundations. Although the convento north wing was displayed for a time, in 1969 the architectural features were covered with plastic and backfilled. In April, 1978, a portion of this area was again exposed following heavy rainfall, to investigate an area of water seepage and to check on the condition of the structure. The wall, bench and floor of Room #1 was found to be in good condition (Hunt 1978; Shenk 1976: 52-56, 68).

Also in 1965, Roland Richert supervised the excavation of room 50 and part of the convento's east wall so that replica walls could be constructed above these features (Richert 1965). This work contributed new

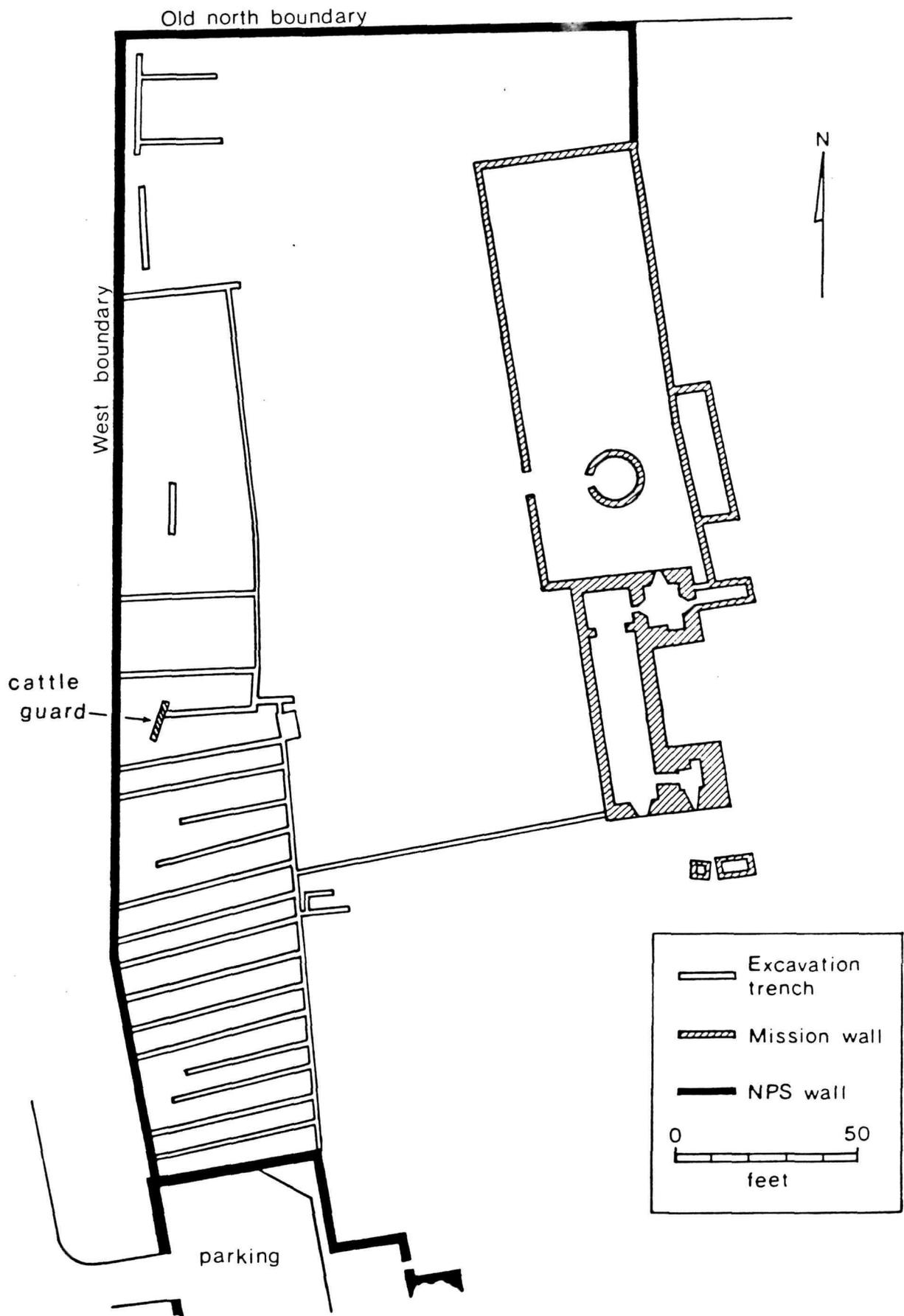


Fig. 6: Excavations by Brewer (1951)

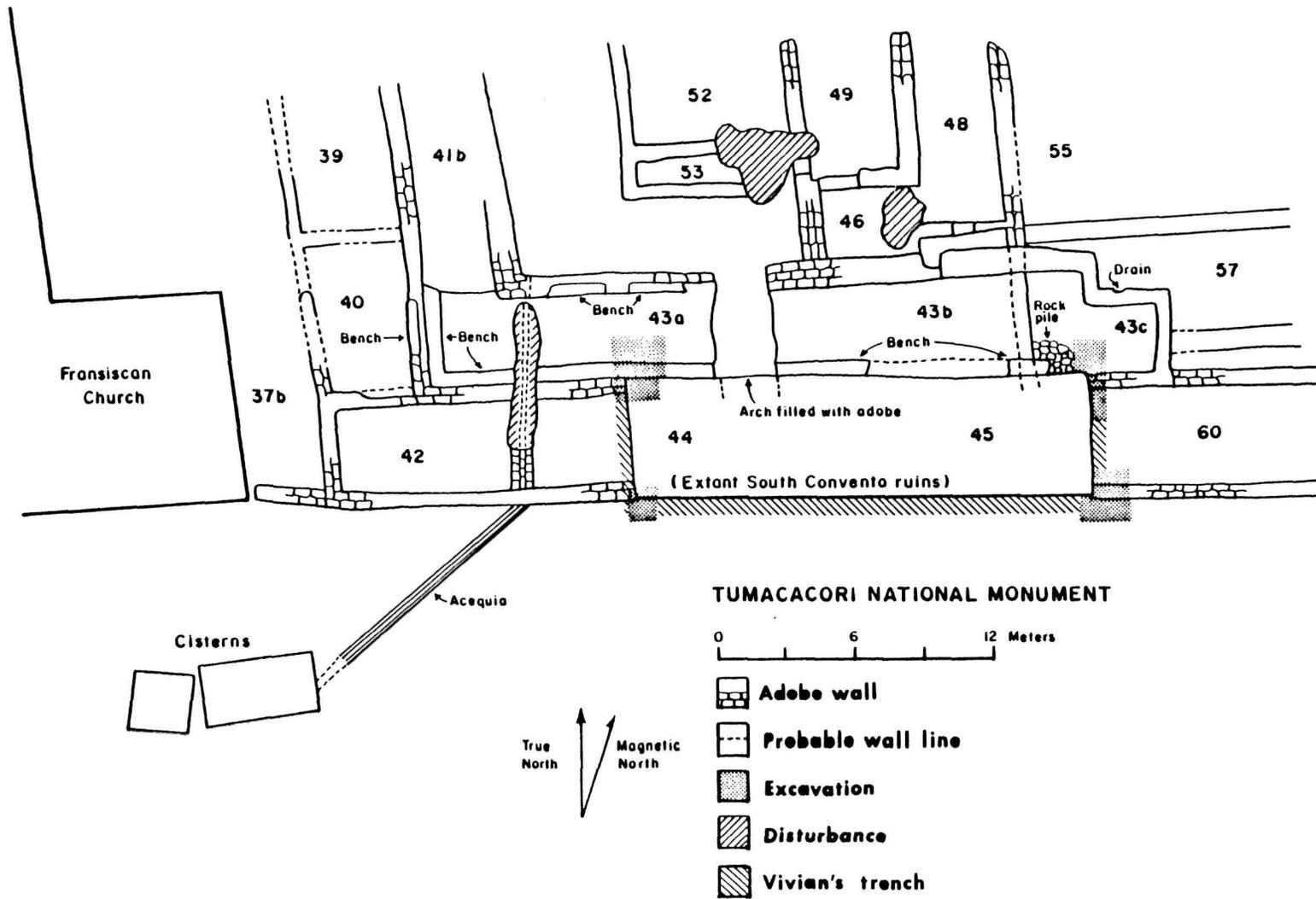


Fig. 7: Excavations at Convento by Vivian (1956) and Fratt (1980)

data supporting the hypothesis that rooms 47-53 and 55-59 constitute the Jesuit mission complex that was razed when the Franciscan structures were built (Shenk 1976:60,69). In 1970, Martin Mayer, Tom Caperton, and Sam Henderson (Mayer et al. 1971) conducted stabilization related excavations in rooms 13 and 14 (convento "granary"), adjacent to the Franciscan church, and in areas 12 and 37a (figures 8 and 10). This work necessitated removal of part of the foundations of the Franciscan church transepts (rooms 17 and 18). Some artifacts were recovered, new architectural information was obtained, and archeomagnetic dates for one of the vasos in area 12 were produced (Shenk 1976:62-69).

Past restoration and stabilization projects have been essential for preserving the mission ruins, and the excavations associated with the projects have increased our knowledge of the site's development. However, these projects have also had a negative impact on much of the site's archeological resources. The main concern of the projects discussed above has been to locate, preserve, or display architectural features. Each project has been carried out independently of the others and conducted as an immediate response to particular stabilization or interpretation needs. These excavations have often not considered archeological research questions or design. Frequently there were no provenience controls or attention to archeological detail or information.

With the exception of Brewer's work, the descriptions of the excavated areas contained in the other project reports are incomplete. They include little or no information on excavation and recovery procedures, exact excavation limits, or cultural resources observed. This situation makes assessment of project findings difficult, and limits their usefulness for subsequent projects. Field notes exist only for the 1956 (Vivian) and 1964-1965 (Caywood) projects, and some data is missing from these. It is impossible to determine the exact location and extent of the excavations conducted by Pinkley, Beaubien, Vivian, and Caywood. However, this information is recorded for Richert's and Mayer's stabilization projects.

Again with the exception of Brewer, artifactual data has been overlooked, since in the past the emphasis has been on obtaining "museum

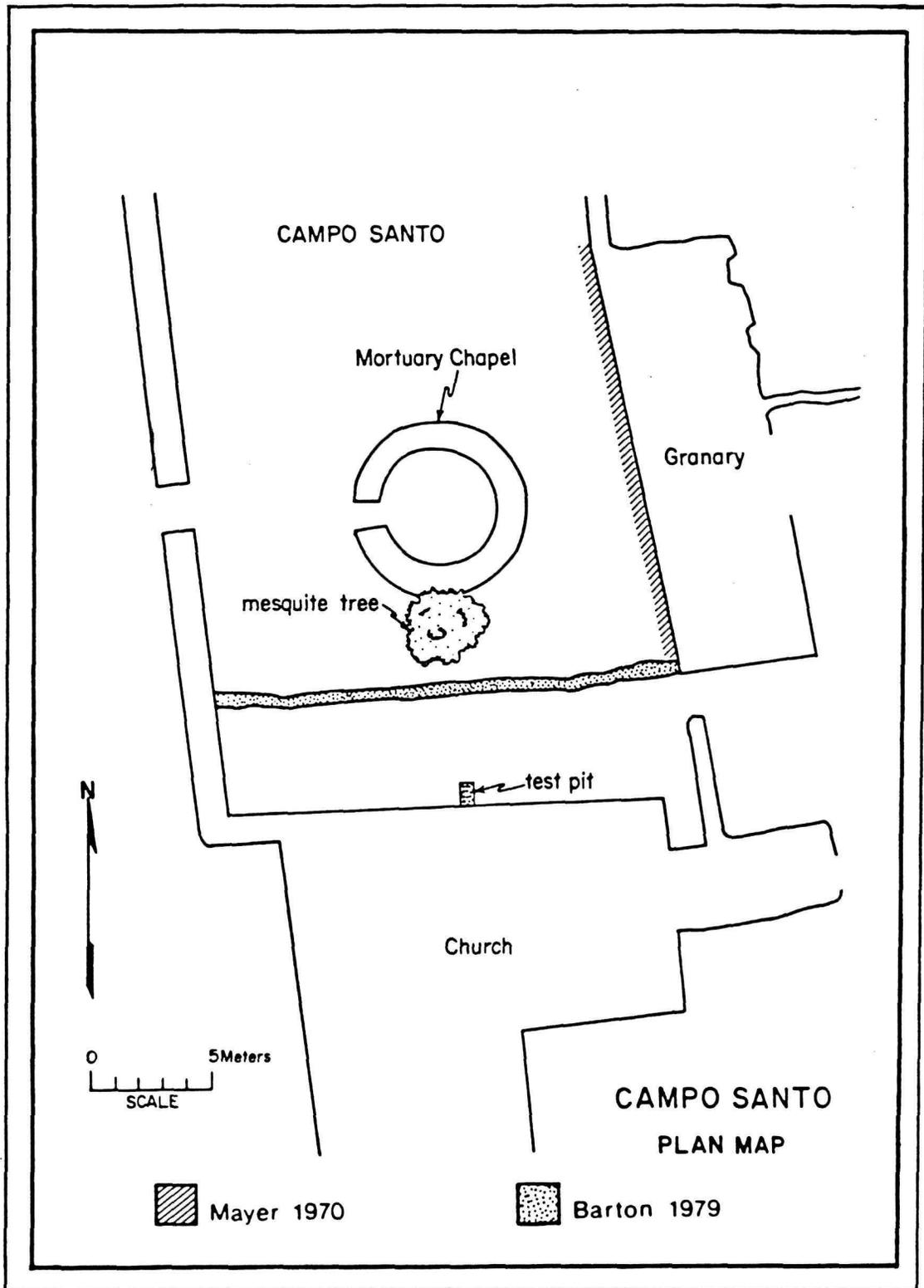


Fig. 8: Excavations in Campo Santo by Mayer (1970) and Barton (1979)

quality" objects. Provenience information for most of the stored artifacts recovered during the 1934-1395, 1964-1965, and 1970 projects has either been lost or is not adequate to relate artifacts to the excavations. No information is available on sampling techniques or recovery methods because of this the collections have limited comparative use and future research value (Shenk 1976:71).

Although the projects discussed have been stimulated by the needs of architectural preservation, few details of construction and information about building sequence have resulted. The information we do have is almost exclusively from studies of the above-ground structures (Jackson 1962). Beaubien's base map serves as an adequate indication of the location of many architectural features but is inaccurate in some minor details.

RECENT EXCAVATIONS(1979-1981)

Recent archeological excavations at Tumacacori have also been related to stabilization projects. Their main purpose has been to salvage data in danger of being destroyed as a result of stabilization. Although not the comprehensive study suggested by Shenk (1976:75), these recent excavations do serve as tests, and the resultant information on deposits and features and extent of disturbance allows a preliminary assessment of the site's remaining resources and their research potential. This section presents a brief description and summary of the 1979-1981 projects and discusses the implications of their results for future excavation at Tumacacori. More detailed information is contained in the individual project reports.

In March 1979, Mike Barton supervised excavation in the Franciscan campo santo (Barton 1981). This work was conducted on short notice when a mesquite tree's roots threatened to damage the Franciscan church's north wall. Barton excavated a test pit (1 m x .5 m x .7 m deep) adjacent to the church's north wall and monitored the excavation of a trench (.5 to 1 m wide and almost 20 m long) between the mortuary chapel and the church's north wall, spanning the campo santo (figure 8). The test pit exposed a series of relatively well-defined, undisturbed cultural strata as well as an adobe wall, roughly parallel to the church's north

wall and possibly part of an earlier sacristy Deposits exposed in the trench may represent the accumulation of living debris. Later (upper) levels suggested earth moving activities rather than trash accumulation, possibly associated with construction and use of the church. Most of the cultural deposits probably date 1753-1796. Barton concludes that extensive, undisturbed cultural deposits do exist in the campo santo and that these may preserve a record of daily Indian life in the early historic period. Additional work is needed in this area to conclusively identify these deposits and features.

Another project was conducted at Tumacacori in 1979 in response to the needs of church stabilization. Lee Fratt (1981a) supervised excavation of a trench, 1 m wide and 65 m long, located adjacent to the Franciscan church's west wall and extending into the plaza, in the area where a drain pipe was to be installed (figure 9). The main purpose of this excavation was to study the deposits and collect artifacts in hopes of identifying the functions and activities that took place in this part of the site. Excavation showed the plaza stratigraphy was complex and deep. Disturbance, though present, was relatively minimal, and mission period deposits and features were found. Associated deposits and features were grouped into four areas and four time periods. The excavated area southeast of the church's front door contained a series of unconsolidated trash deposits representing garbage disposal and possible construction debris accumulation. Most of the deposits south and west of the church's front door were alluvial, although some were from trash disposal. Deposits near the west nave wall of the church and the west transept wall foundations were primarily the result of building construction, maintenance and deterioration. There is some evidence suggesting that the area west of the church may have been used as a corral, after the west transept was removed. Deposits were assigned dates of ca 1750-ca 1800, ca 1800-ca 1850, late 19th-early 20th century and 20th century, on the basis of the dates of associated artifacts and stratigraphic position. Excavation in the plaza yielded information on plaza function, development of transportation and communication on the frontier, acculturation and its results in the lives of Arizona's native population. It also provided information on the daily life at the mission, such as what the residents ate and how they lived. Even the

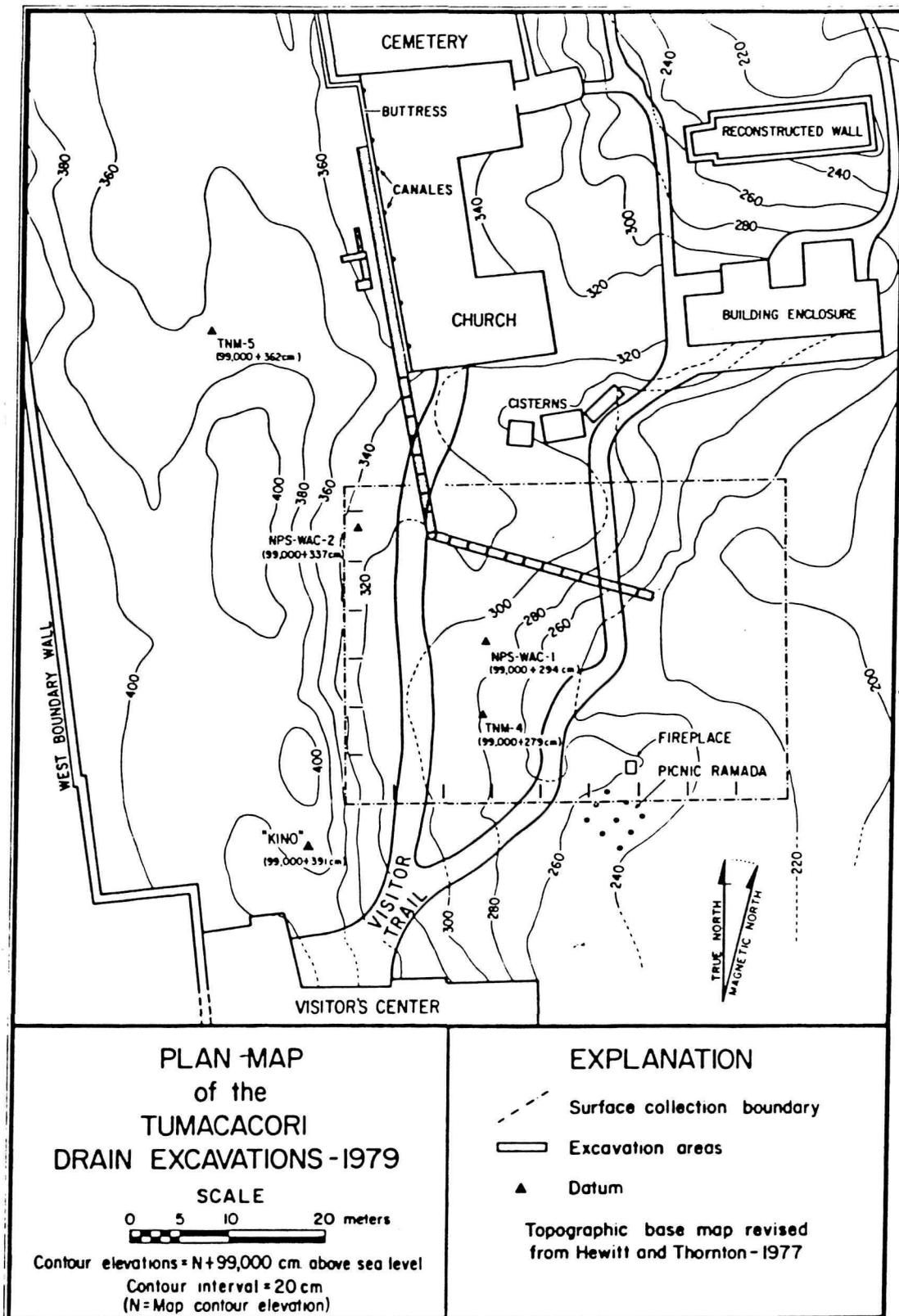


Fig. 9: Plaza Excavations by Fratt (1979)

highly disturbed area adjacent to the church's west wall yielded information on building sequence and the mission's architecture. The most important result of this excavation was to show that intact mission period features and deposits of significant archeological value and research potential remain at Tumacacori.

In March 1980, Kay Simpson supervised excavations in rooms 13 and 14 (convento "granary") prior to installation of floor drains (Simpson 1981). A 1 m x 2 m trench was excavated in each room (figure 10). This project's main objective was to document architectural relationships, determine if intact room fill was present, obtain data on construction phases, and investigate room function. Three construction sequences were identified in room 13 and four construction sequences and evidence of an earlier room were found in room 14. Although the cultural material recovered yielded no information on structure use, evidence of its use for storage was provided by the architectural features. Floors were linked to east and west walls. The building sequence included fill, plastered use surfaces, bricks or cobblestones embedded in a foundation mortar and undisturbed room fill. Simpson concluded that the present structure is one of the convento's latest. The room remains predating the convento are extensively disturbed.

Excavation of the corners of the "schoolhouse" (rooms 44 and 45) in the convento south wing was supervised by Lee Fratt in September and October 1980, prior to modification of the ruin's protective shelter (Fratt 1981b). Parts of the south convento excavated (figure 7) include portions of rooms 42, 60, 44, and 45, and areas 43a through c (cloister). Excavation unit size varied but averaged about 2 m x 2 m and from 1 m - 2 m deep. This project's main purpose was to determine the extent of disturbance in this area, the condition of the architectural features, and to find out if mission period deposits were present. The excavation extent was too limited to determine the functions and activities of the rooms and cloister. However, intact mission period deposits were found beneath the cloister and room 60 floor levels. A study of the architectural features showed that room 60 construction postdated room 45 and cloister construction postdated room 42. The cloister was built to compensate for the southeastern downgrade in this area instead of the grade being leveled before the structure was built. Room 42 has

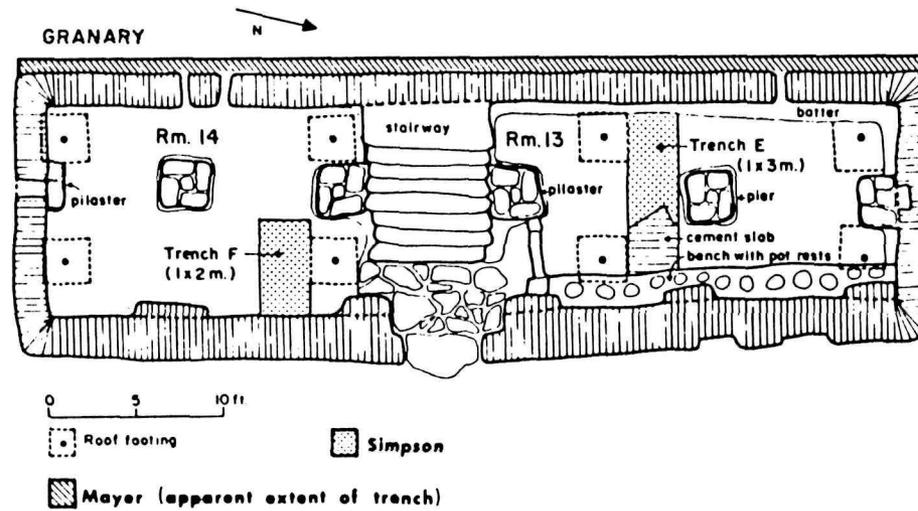
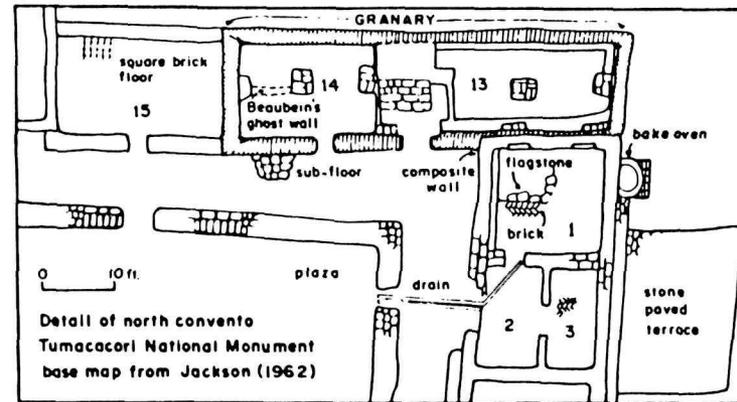


Fig. 10: Granary Excavations by Mayer (1970) and Simpson (1980)

two, and possibly three floors in this area. This project also demonstrated that, despite the highly disturbed condition of this area, intact mission period deposits were present and new information could be obtained from the architectural features.

The 1979-1981 projects all yielded new information about Tumacacori that disproves the earlier accepted assumption that little or no research potential remains. New questions have arisen concerning activities that took place in various parts of the site, details of architectural construction, and building sequence. We now have better knowledge of the extent of disturbance at the site and the condition and nature of remaining archeological resources. Mission period deposits, some apparently intact, were found in all areas investigated. All the excavations terminated in soil containing few artifacts, establishing a base line for cultural extent in these areas.

TESTING AND CLEARANCES (1975-1981)

Figure 11 shows a number of small projects that have recorded the presence or absence of archeological remains.

Subsurface Testing. In April, 1976, George Teague (1976) inspected an area 34m x 12m near the southwest corner of the monument where an evapo-transpiration seepage bed was to be installed. To determine if intact cultural features were present, 11 auger holes and one 1m² test pit were dug in the area. Effective hole depth was 110 cm and depth of the test pit was approximately 12cm². The profiles obtained from the augering showed well-developed soil horizons with a gray-brown sand loam with many pebbles overlying a brown sand loam, which in turn, overlay a tan, hard clay deposit. Cultural deposits showed up in two of the cores. The test pit, placed over core 7 exposed two shallow (12cm deep) cultural deposits containing fired adobe and indigenous ceramics. Teague concluded that the area was probably the location of a 20th century borrow pit, reportedly in this area, that had been used for dumping debris.

Also in April 1976, Barry Thornton (1976) monitored the drilling of test boring west, east and inside the church. The purpose of this test was to obtain soil profiles and drainage data. Depth of the borings

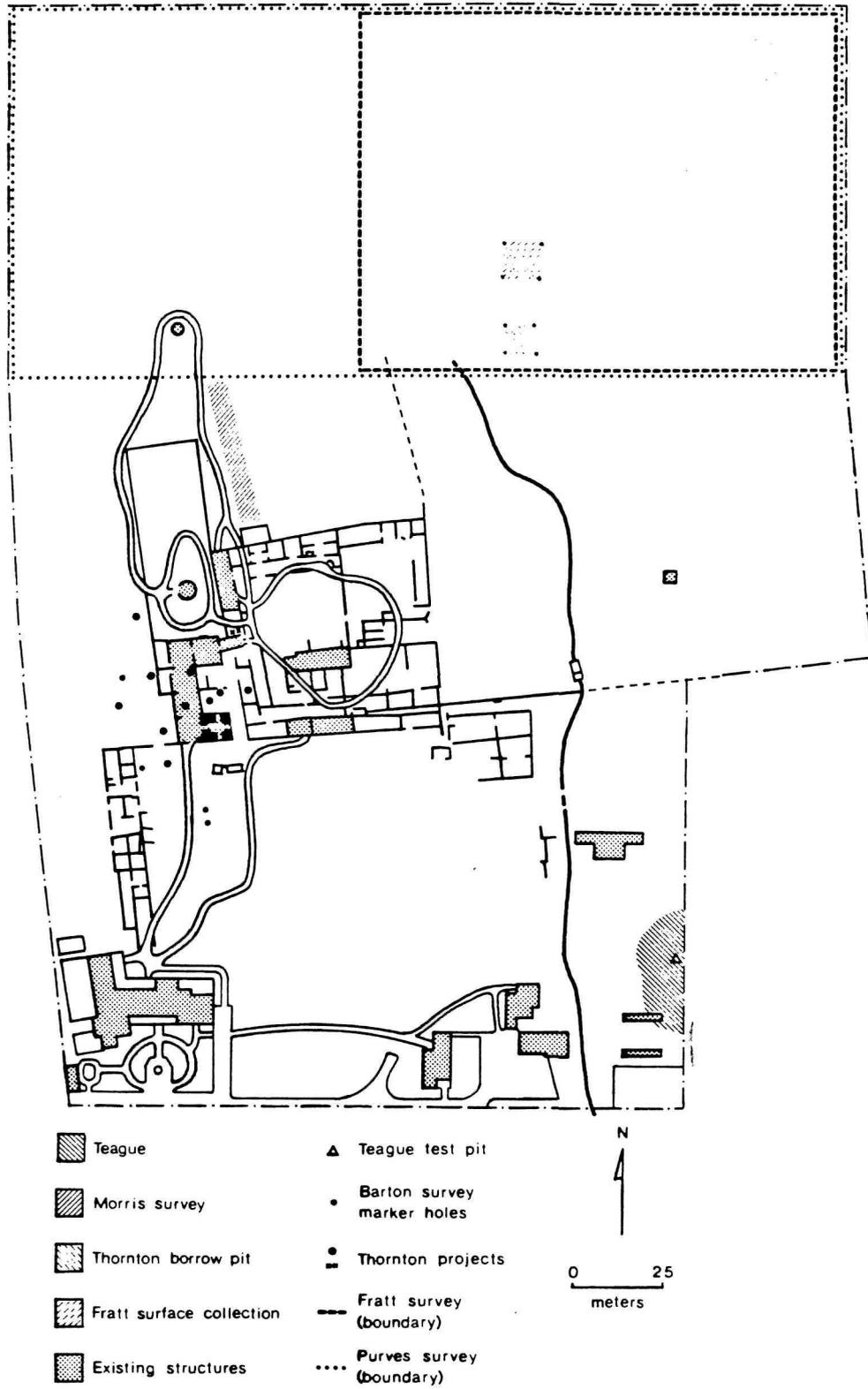


Fig. 11: Surface Inspections and Testing (1975-1981)

varied from 2.5 to 3.0 feet. The five cores located west of the church showed cultural material from 10-75 cm from the ground surface. No cultural material showed up in the cores located east of the church. Human bone was encountered in the two borings inside the church, at a depth of 25 cm below the surface of the floor, suggesting that burials are still present beneath the present church floor.

In October 1977, Thornton monitored additional soil sample testing east of the mission (Thornton 1977). Depth of these holes was three feet. In one hole, directly east of the baptistry, a wall was encountered; otherwise, the test holes were devoid of cultural material.

Thornton (1978a) again went to Tumacacori in June 1978 to monitor excavation of a trench along the inside south wall of Room 15 in the convento. The trench uncovered a fired brick floor reported earlier (Mayer et al. 1971). In July 1978, Thornton (1978b) monitored excavation of a borrow pit north of the north monument boundary. The pit measured 3m x 4m. A small lime pit was excavated adjacent to the borrow pit. Prior to excavation, a 10m² area around two pits were located was surveyed. No information on depth of excavation is available; no cultural material was found.

In July, 1979, Barton monitored excavation of three holes located west and southwest of the church. These holes (Barton 1979) were filled with cement, topped with brass caps and used as permanent survey markers. Hole depth was about 60 cm. In the two holes dug in the plaza, cultural material appeared just below the ground surface and was most concentrated at a depth of 30 cm. Cultural material was found in all four tests but was particularly dense in the plaza and on the Indian village mound.

In 1981, Lee Fratt inspected the eastern half of the parcel of land located north of the monument's original northern boundaries (Fratt 1981c). A surface collection of a 20m x 25m area in the northeast corner and of a 10m² area in the center of the surveyed area as well as excavation of a 1m² test pit was also included in this project. Depth of the test pit was 80 cm.

A medium density of native and imported artifacts was scattered in the area. Although in a plowed field where intact deposits may no longer be present, as indicated by the test excavation, the location is

significant as it is the only definite habitation area known outside the immediate vicinity of the mission structure.

Surface inspections. In September 1975, Susan Purves and three other archeologists inspected the parcel of land north of the monument's original northern boundary to determine if the size of the parcel was adequate to include the mission garden wall, thought to be located in this area (Purves 1975). Although the archeologists attempted to follow out the walls visible within the monument's original boundary, no traces of the feature were found in the area surveyed.

In 1977, Don Morris examined an area 100 feet x 30 feet northwest of the mission convento and adjacent to the north boundary of the monument where test walls were to be located. No cultural resources were found (Morris 1977).

Magnetometer Survey. In 1977, the Midwest Archeological Center ran a magnetometer survey near the visible ruins to explore for subsurface features (Weymouth 1979). Magnetic anomalies indicated buried features in the plaza, west of the church, immediately north of the north wing of the convento, and west of the plaza (Figure 12). Prior to excavation in 1979, the plaza was surveyed and a surface collection made (Figure 9). In the 1979 excavation (Fratt 1981a), a mission period trash dump was discovered in the center of the plaza; this coincided with a surface artifact concentration and a magnetic anomaly. This demonstrated that surface and magnetic surveys can indicate buried archeological deposits. They cannot, however, tell what the archeological feature is.

The projects above indicate that significant information about Tumacacori's archeological resources can be obtained from a variety of different sources. Surface inspection, test borings, surface collections and magnetometer survey can be used to detect probable location, composition and extent of the site's cultural resources. Especially interesting is the correspondence of data from the 1979 surface collection and magnetometer survey which indicates that these two methods could function as a reliable, nondestructive indicator of the presence of subsurface deposits.

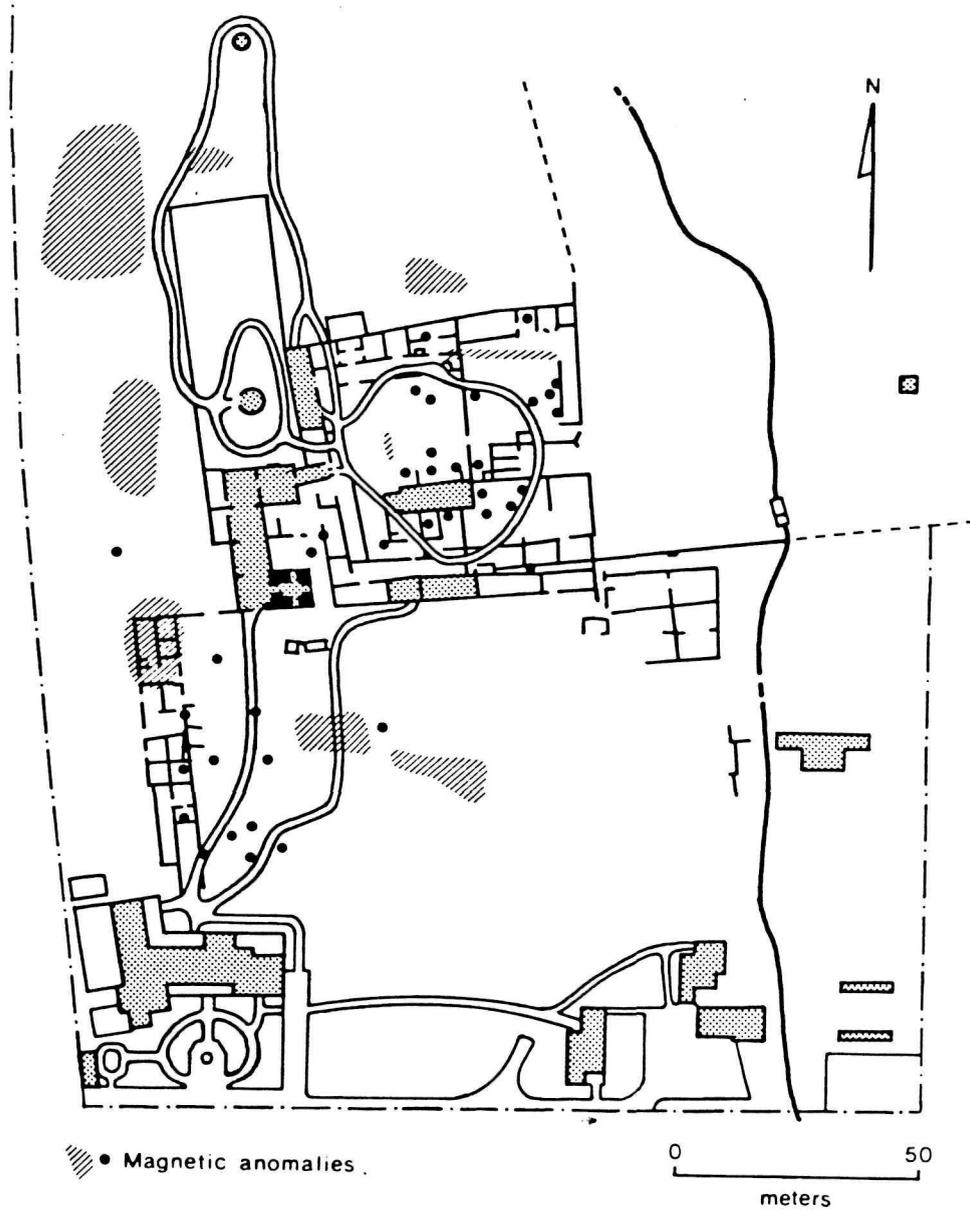


Fig. 12: Magnetometer Survey (1977)

FUTURE RESEARCH POTENTIAL

Excavations to date indicate that Tumacacori's remaining archeology is quite complex, representing as it does, the remains of "an interactive community with a long history of occupation by peoples representing the cultural diversity of southern Arizona during the historic period" (Shenk 1976:11).

Tumacacori has been excavated numerous times and this work has destroyed much of the archeological evidence, making some research questions impossible to pursue. However, recent investigations show that sufficient data may still be obtained to pursue certain research topics. Further research will aid in interpreting the monument's theme to visitors by increasing our knowledge of life at the mission, the establishment and operation of a Sonora mission chain, and Tumacacori as an example of mission architecture and development.

Essential to any research are a number of basic questions, minor architectural problems, identification and dating of various deposits and features, and determination of the functions and activities carried out in parts of the mission. Many details of construction are unknown, though there is data obtained through study of the above-ground structures. The building sequence for much of the site is not definitely known or documented.

General Research Questions

For the most part, research can best be applied to broad topics dealing with the general cultural history of the site, its total content, and its relationships with contemporary localities. Excavation in the convento, presumed to have been the missionaries' main living and working area, is not likely to yield much information on intrasite relationships, such as comparison of the lifestyle of missionaries and neophytes.

Specific questions concerning life during the Jesuit or Franciscan mission periods at Tumacacori may not be answered decisively by archeological investigation. Attributing deposits to one or the other of these time periods is dependent upon associating them with known Jesuit or Franciscan structures, or finding artifacts that can be dated to either period. Results of past excavations indicate this is unlikely

since such relationships are rarely preserved, and distinguishing early, middle, and late 18th century artifacts is difficult.

General Topics. The research topics that can probably be investigated with the data remaining at Tumacacori involve two basic questions; how did the residents interact with the natural environment, and how did they interact with other people (Shenk 1976:76)? Shenk states that special consideration should be given to defining and interpreting the mission complex and the evidence for Spanish-Indian contact with respect to the historic role of the missions on the Spanish frontier. Investigation of some of these topics appears in reports by Fratt (1981a and b), Barton (1981), and Simpson (1981).

Very little information, either documentary or archeological, is available on the mission's economy. We know that farming, ranching, and trading were all practiced; however, little specific information about these activities has been found.

Another topic about which there is only scant information, but which is probably the most important for interpreting the mission ruins, is daily life at Tumacacori and the relationship of daily activities of the mission with life in surrounding settlements. Little factual information is available about the people who lived at the mission, such as what they ate, how they got food, food storage and preparation, household composition, and what kind of farming and building equipment was used. Data on the daily lives of the missionaries must come from trash deposits; the part of the mission presumed to be their living quarters (convento) has been previously excavated. Information about how the Indians (neophytes) lived is almost certainly still present.

Little is known about the actual extent of the mission community, except that it was larger than the present monument boundaries. The functions and activities of various parts of the site, such as where residents cooked or disposed of garbage, have yet to be determined. Since an area with a specialized function would contain a less diverse assemblage than an area having multiple functions, comparison of artifact assemblages may yield information about this topic (Shenk 1976: 82). The mission's irrigation and agricultural systems have yet to have clearly defined. Only a few such features have been identified at pre-

sent, and more information is needed on agricultural methods and kinds of crops grown.

The main purpose of the mission was to Hispanicize the Indians, and the missionaries exerted pressure on the natives to alter their daily lives by introducing new tools, agricultural technology, work habits, and moral discipline. Although we know acculturation took place on the Spanish frontier, few studies have been done on how and under what conditions it occurred. Conclusions concerning acculturation at Tumacacori have been constrained by lack of data. Continuing research on this topic, comparing Tumacacori assemblages with other sites, could increase our understanding of how acculturation occurred on the Spanish frontier.

Further research into the development of communication and trade on the Spanish frontier could also be conducted at Tumacacori. Again, this is an area about which little is known, especially from documentary sources. A preliminary study (Fratt 1981a) suggests that an examination of artifacts' place of manufacture can shed light on communication and trade and on the mission's relationship with other parts of Spain's New World empire.

Specific Questions.

Closer study of convento structures may produce more information on construction techniques and building sequence, data that is almost completely absent from the literature (Shenk 1976: 72-75; Jackson 1962:20).

For example, in room 14, the nature and extent of the earlier structure needs to be defined, and in room 42, the relationship of that room's floors should be clarified. Further investigation of room 45's northeast corner may explain why the subsurface deposits exterior are so unusually damp. The main problem with investigating the mission ruins is that the structures themselves and their immediate vicinity have been the subject of most of the archeological activity at the site. As Simpson (1981) points out, it is difficult to interpret building phases since so much of the mission structure has been excavated without documentation.

The grade from the cisterns to room 1 needs to be checked to determine whether water will flow between these two points. The water source for the cisterns is as yet unknown, and the relationship of the area

thought to be the Jesuit mission complex to the Franciscan structures needs to be clarified and documented (Shenk 1976:83).

Whether the alluvial deposits in the plaza are natural or the result of intentional water control needs to be determined. Their association with arroyos and irrigation features needs to be identified. The relationship of these deposits to anomaly 1-J and should be investigated. The ash and soil lenses and related use surface and charcoal lens (surface 1, feature 6, and level 3 in the plaza need to be identified.

The relationship of the plaza deposits to the Indian village and the Franciscan church and convento requires investigation. It is also important to determine the relationship of the campo santo, plaza, and convento deposits. However, further investigation in the campo santo and plaza will be hampered by modern use and modifications in these areas.

Further investigation is needed to definitely identify and date deposits and features exposed in the campo santo and plaza. Recent excavation in the campo santo suggests this area may have been part of the Jesuit neophyte village or the original Indian community. Further investigations here and in the area west of the Franciscan church are needed to determine the nature and range of activities in these parts of the mission. The existence of a "large enclosure," possibly a workyard, and metallurgical operations, reportedly in the area west of the Franciscan church, has neither been confirmed or denied (Hinton 1954:192).

Other areas needing investigation are the Indian village (rooms 19-36), the southeast and northeast corners of the Franciscan convento (figure 5), areas for which information concerning function and activities is scanty and inclusive. Virtually nothing is known about the patio garden, and subfloor convento deposits could yield valuable environmental information (particularly botanical) depending on the extent of rodent and insect disturbance in this area. These deposits could yield data on site occupation prior to Franciscan mission construction. Brewer's excavation indicated that the area west of the Franciscan church and Indian village was the scene of various activities. Further investigation here could clarify the nature of the activities and the relationship of this area with the rest of the mission complex. Another

part of the Indian (neophyte) village is reportedly located east of the plaza, and archeological work in this area and north of the Franciscan convento north wing could provide information on these area's functions and activities, data that is totally lacking at present. Also, the existence of the kiln for firing adobes, reported to be 200 yards south of the southwest corner of the Franciscan church, needs to be confirmed. (Pinkley n.d.:22).

The Archeological Deposits

This section is a summary of what we know about the nature and condition of the site's archeology, and the cultural resources future excavators are likely to encounter. It is primarily based on findings from recent excavations.

Mission period deposits may be encountered during excavation anywhere on the monument, including areas known to be disturbed. These in the past have been identified by their stratigraphic position and dates of associated artifacts. In recent excavations, deposits ranged in depth from .5 to 2 meters below the surface and averaged 1 meter thick.

A very useful method for distinguishing cultural deposits from sterile soil and architectural features is testing the deposits or features with hydrochloric acid. At Tumacacori, the cultural deposits contain calcium carbonate, probably from lime plaster and mortar, and react to hydrochloric acid. When testing test features, a clean surface should be used. Such architectural features as soil adobe mortar joints and adobe pad foundations in the walls also react to the acid. The sterile strata and soil adobes, apparently lacking calcium carbonates, do not react when tested.

Tumacacori's cultural material assemblage consists mainly of Indian, Hispanic, Oriental, and Anglo-European artifacts and bone; Piman ceramics and bone predominate. Imported artifacts include ceramics, glass, metal, shell, leather, and rubber dating from the early 18th century to the present. Remains of introduced domestic animals (cattle, sheep, horse, dog, and chicken) outnumber native species such as deer, rabbit, and turkey. There are remains of introduced domestic crops (wheat and fruit) and indigenous plants--corn, gourds, cotton, and cactus.

Condition of the excavated architectural features ranges from very poor to good. Architectural remains at the mission have been impacted by natural erosion, as well as by years of preservation activity. So many excavations have taken place without proper documentation that interpretation of the architectural features and evaluation of area sequences is very difficult. Archeological deposits have been separated from architectural features throughout almost the entire mission complex; excavation directly associated with architectural features is likely to yield architectural information, but few artifacts.

Artifacts are most likely to be found in areas away from structural remains, in sheet trash and midden deposits. Room fill may still be present in the area immediately south (rooms 46-53) and northeast (rooms 54, 62-65, and part of area 12) of the apparent Jesuit church (room 50), in the area southeast of the Franciscan convento (rooms 61, 66-72), and in the Indian village southwest of the Franciscan church (rooms 19-36) (figure 5). If present, room fill deposits will probably yield minimal artifactual data, and this data can also not be presumed to be complete for the room excavated.

Because much undocumented digging has taken place at Tumacacori, it is nearly impossible to determine exactly what areas have been previously disturbed, and the extent of the effects on cultural resources. Disturbance at Tumacacori has been both general and restricted. General disturbance results from such activities as regrading, earth moving, and other activities involving heavy equipment and is widely dispersed over the site. Disturbance resulting from specific projects is more contained and usually takes the form of intrusive pits and trenches. Such disturbance may or may not be recorded in project reports, hence, it is very difficult to attribute disturbance encountered during excavation to a specific project.

Excavation along the Franciscan church's west wall and transept indicate that the trenches excavated by Beaubien are about .5 m wide and vary in depth. Vivian's 1955 trenches around rooms 44 and 45 are about .70 m wide and .80 to 1 m deep.

RECOMMENDATIONS FOR MANAGEMENT

The following recommendations are offered to assist in the management of the cultural resources and planning of the development of Tumacacri National Monument. These recommendations are based on the foregoing summary and assessment of Tumacacori's archeology.

Most areas of the site have the potential for yielding new significant data. Except where previous activity in the area is fully documented, existence of intact deposits can only be determined by excavation. Generally, areas away from building remains have the highest potential for yielding archeological information, except for deposits below room floors, or beyond limits of previous excavations. In the area of the convento where both Beaubien and Caywood have excavated and backfilled (see Figure 4), activities involving 2-3 inches of soil disturbance will have no impact. However, deeper disturbance may go through floors into cultural deposits. In the "Indian Village" Beaubien trenched along walls, but left columns of fill inside rooms. This area should be left undisturbed if possible. Other areas to avoid, if possible, are the magnetic anomalies shown in Figure 12; excavations in the plaza clearly connected subsurface archeological features with two of these anomalies.

Future ground-disturbing activities should be located in areas of known disturbance, if possible. However, because so little documentation of past excavations exists, there is a possibility of encountering mission period deposits and features anywhere on the monument. If areas with archeological potential cannot be avoided, they should be excavated in full compliance with the standards established in the NPS-28 Cultural Resource Mangement Guidelines. Excavation should be conducted by a competent, professional archeologist (preferably an historical archeologist) and should be preceded by a research design that will provide for thorough and well-planned recording and interpretation of recovered data. Excavation goals should include consideration and investigation of the site's cultural history. Ideally, the research design should allow enough flexibility so that mission period deposits and features encountered can be adequately identified. A full, professional project report should follow any investigation. The location, extent and

results of any future subsurface investigations, whether archeological or stabilization-related, should be documented in a complete, professional project report and in field notes, maps, profiles, and photographs. A cumulative record of the depth of cultural deposits and underlying sterile soil should be kept, to use for planning archeological excavations.

Instituting a more systematic approach to future excavation at the site would greatly benefit the archeology since the haphazard and isolated nature of past excavations has contributed to the loss of much data. A piecemeal approach to excavation at Tumacacori can expend efforts and funds with limited return, unless guided by an overall research plan. We recommend formulating such a plan.

Since it is often impossible to determine what areas of Tumacacori have been excavated, any future ground-disturbing activity should be monitored by an archeologist. Activities associated with general monument maintenance (installation of sewers, pipelines and electrical cables, construction foundations, septic or other storage tanks, leach fields; planting gardens; digging borrow pits; regrading or laying trails) require archeological clearance and monitoring. During planning, the possibility that archeological testing or salvage will be needed should always be considered. Stabilization decisions should be made with regard not only of the need to preserve the architectural features but also with regard to the impact of the activity on the subsurface features and deposits.

When archeological excavation is needed, excavation should be continued until the sterile level is reached to insure that all cultural material has been recovered and to establish a baseline for the site stratigraphy. All activities of any kind that affect Tumacacori's archeological resources should be completely documented and their location and extent recorded. The present lack of a map showing when and where pipeline and electrical cables were installed, borrow pits dug, or regrading done presents a real problem for the archeologist working at the site.

Tumacacori is a national register site and therefore any activity affecting the site's cultural resources must conform to 36CFR800. Existing section 106 case reports should be reviewed to determine whether

further agreement with the state historic preservation officer or advisory council is necessary. In any case, they should be provided documentation of these activities. Some actions have been included under previous 106 actions; some have not. Any ground-disturbing activity should be documented in an archeological clearance.

Architectural features and preservation of the above ground structures are the focal point of preservation activity at Tumacacori. In architectural studies, the following information should be obtained as baseline data for archeological studies:

1. Measurements of average adobe size and mortar joint thickness and height and thickness of walls.

2. Room dimensions, floor elevations and measurements and description of room fill.

3. Exact location (with sketch map) of where work, conducted either affected the architectural features or subsurface deposits.

4. Before and after photographs, with a verbal description of the features before alteration and modifications to them.

5. Construction materials, such as constituents of adobes, mortar joints and foundations.

6. Information about construction techniques.

7. Information on the relationship of individual structures to each other, including foundation and floor elevations and wall abutments. This data is of considerable value to archeological interpretation of subsurface architectural features and construction levels. It also contributes to our knowledge of the site's development.

An intensive, systematic survey and surface collection of the monument and its surrounding area has not been completed. Careful surface inspection and collection should precede any excavation. Based on the success of the magnetometer and systematic surface collection for predicting subsurface deposits, it is highly recommended that these methods be applied to the rest of the monument. An adequate survey of the monument's environs would produce a more complete and accurate picture of the mission's extent, data which is lacking at present.

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