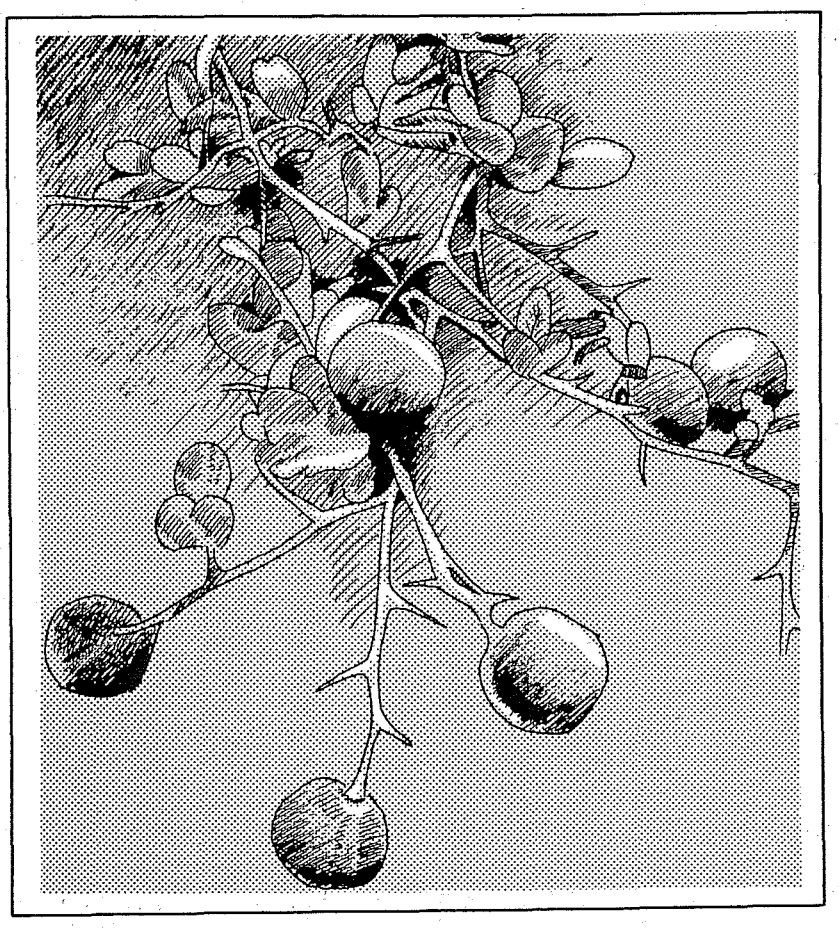
Archaeological Survey And Backhoe Testing For **FLUME NO. 3 RIGHT-OF-WAY AT COLETO CREEK RESERVOIR,** Goliad County, Texas



Kenneth M. Brown

Center for Archaeological Research
The University of Texas at San Antonio
Archaeological Survey Report, No. 128

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Texas Antiquities Committee Permit No. 80
Thomas R. Hester, Principal Investigator

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ABSTRACT

During August 1983, archaeological survey and testing were conducted at Flume No. 3 for the Coleto Creek power plant reservoir in Goliad County, Texas. The work included survey of the entire Flume No. 3 route, testing one site (41 GD 30B) located at the flume outlet on Coleto Creek, survey and testing of an alternate flume route downstream, and testing at another site designated 41 GD 31. The right-of-way survey revealed a historic site (41 GD 48) in the proposed spoil area; no further work is recommended at this site. Testing at 41 GD 30B provided necessary additional information on the site's area and depth. It was judged that the flume outflow could damage the integrity of the site, and that the site should be avoided or the impact mitigated. Survey and testing of the alternate, downstream flume route indicated this route provides the best alternative for reservoir outflow since no cultural resources were found on the surface and a possible buried component at 41 GD 31 would probably be too deeply buried to be affected.

KEYWORDS: Berger Bluff archaeological site, **Angostura** point, historic site, Coleto Creek Reservoir, Goliad County.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

INTRODUCTION

During August 1983, archaeologists from the Center for Archaeological Research (CAR), The University of Texas at San Antonio (UTSA), conducted survey and backhoe testing for the proposed Flume No. 3 right-of-way, including the alternate downstream flume route and testing at two sites, 41 GD 30B and 41 GD 31, at Coleto Creek Reservoir in Goliad County, Texas.

The survey and testing were done under the terms of a contract between the Center for Archaeological Research and the Guadalupe-Blanco River Authority (letter from David Welsch dated June 27, 1983), in compliance with the National Historic Preservation Act of 1966 (as amended) and its implementing regulations, 36CFR800; the National Environmental Policy Act of 1969; and Executive Order 11593. The field work was done by Kenneth M. Brown, research associate, and technical staff assistants Ralph Snavely and Charles Suhler. Overall supervision was provided by Dr. Thomas R. Hester, CAR director, and Jack D. Eaton, associate director. Field notes, photographs, and artifacts collected during the project are housed at the CAR.

Coleto Creek Reservoir was completed in 1980 by the Guadalupe-Blanco River Authority (GBRA) to serve as a cooling reservoir for a coal-fired power generating plant operated by Central Power and Light Company. The addition of a second power plant, scheduled for completion by 1989, will require additional water recirculating capacity to maintain the thermal gradient in the reservoir, and consequently the GBRA plans to construct a large, open canal (designated Flume No. 3) leading from Turkey Creek northeast to Coleto Creek. The flume has no gradient, but under normal flow conditions in the watershed, discharge is expected to be southwest to northeast into Coleto Creek. The planned route of the flume follows a long, straight tributary drainage of Turkey Creek on a north-northeast azimuth as far as Coletoville Road, then continues on a northeasterly course to join another ravine which enters Coleto Creek at Berger Bluff (Fig. 1).

The flume right-of-way is 3.08 km (1.9 miles) long, extending from the normal pool level at 98 feet MSL (above mean sea level) at each end, and is 120 m wide, flanked on each side by an access road and drainage ditch. Because the floor of the flume is level (at 89 feet MSL), with a constant gradient to the sides, the width and depth will vary with topography, from about 25-100 m across and up to 15 m deep. Fill from excavation is to be placed in a spoil disposal area 380 m wide running the length of the flume on the southeast side, bordered by a drainage ditch on the southeast side. The area to be affected is thus 3.08 km long by 390 m wide, or about 120 hectares.

Previous archaeological work in the project area has been done by the Center for Archaeological Research, The University of Texas at San Antonio. In 1975, a phase 1 survey of the reservoir was done (Fox and Hester 1976); in 1976, surveys of the water supply pipeline from the Guadalupe River to Coleto Creek, a Highway 59 relocation, and a railroad spur right-of-way were done; in 1977, phase 2 testing of selected sites, including Berger Bluff (41 GD 30) and 41 GD 31 was done (Fox, Black, and James 1979); testing, architectural recording, and historical research on the Steiner and Schob sites were done (Fox and Livingston 1979); in 1977-1978, excavation for impact mitigation was done at 41 GD 21 (D. Fox 1979), and in 1979, at Berger Bluff in the upper

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deposits (Brown 1983), and later in the lower deposits (the "bench project"). Other recent projects include recovery of a prehistoric burial at the Victoria Regional Wastewater Treatment Plant (Potter and Spencer 1980) and survey and shovel testing of a proposed park trail at Victoria Municipal Park (Taylor 1985).

The research to date on the Berger Bluff site, most of which has been concentrated in Area A, has shown it to be an exceptionally important prehistoric site. As a deeply stratified site with a long record of human occupation and environmental indicators it is essentially unique on the Texas coastal plain. Here over 8.5 m of deposits forming a steep bluff along Coleto Creek contain stratified Late Archaic to Late Prehistoric (ca. 2000-700 B.P.) cultural debris in the upper part; the lowest, or "bench" deposits contain sparse cultural debris of late Pleistocene or early Holocene age. Two radiocarbon dates from these lower deposits, 11,550 ± 800 B.P. and 7770 ± 810 B.P., are in disagreement, and efforts are underway to complete additional radiocarbon or thermoluminescent analyses to resolve the age of the early deposits. If the 11,550 B.P. date is valid, it represents the oldest, or one of the oldest radiocarbon dated human occupations in south Texas. Earlier radiocarbon dates on soil samples are known from a site on Petronila Creek in Nueces County, but how these dates relate to cultural debris at the site is not yet clear (Bob Lewis, personal communication).

In any case, the early deposits, a fossilized spring-margin site, seem to represent a period of somewhat greater effective moisture than now, with a more equable annual distribution of rainfall, probably lacking the seasonal extremes of temperature and precipitation characteristic of most of the Holocene. The uplands, now in post oak-live oak forest/savanna, may have been much the same, but the creek valley was probably much more verdant, with Coleto Creek a rather muddy, meandering stream, deeper, narrower, and with much less flashy discharge than now. The site was occasionally visited by foraging groups of prehistoric Indians, one of which appears to have left the remains of small rodents, salamanders, snakes, fish, and birds near the small fire hearth that provided the earliest radiocarbon date. Research on this microfauna deposit was begun in 1982, funded by a grant from the Texas Archeological Foundation.

Information on environmental change comes chiefly from geologic studies of the sediments and their organic carbon content, from identification of microscopic snails (over 30 taxa have been identified), from studies of the microfauna, and from a few clues of lesser abundance, such as plant pollen (poorly preserved), species identification of charcoal and of freshwater mussel shell, and distribution studies of fossilized plant remains.

The paramount importance of the Berger Bluff site lies in the fact that it seems to contain an unbroken record of environmental change and human occupation that spans most of south Texas' human prehistory. Although the middle 4.5 m of deposits are unsampled and have never been closely examined, I believe the stratigraphic section represents continuous aggradation with no erosional hiatuses. Many other important stratified sites in south Texas or the Lower Pecos region, such as Arenosa Shelter (Dibble 1967), have had deposits removed at intervals by scouring, or do not represent as early a period, or lack as complete a range of environmental indicators (e.g.,

41 LK 31/32, Scott 1982; the Johnston-Heller site, Birmingham and Hester 1976).

SURVEY OF FLUME NO. 3

In May 1983, the GBRA requested a proposal to provide archaeological survey and testing of the flume right-of-way. The proposed work entailed three aspects:

(1) pedestrian survey of the planned flume right-of-way;
(2) pedestrian survey of alternate route 2 (a more easterly route for the exit end, discharging downstream from Berger Bluff) and backhoe testing at 41 GD 31, another site with a possible Late Paleo-Indian component near the outfall; and
(3) backhoe testing at Area B of the Berger Bluff site to determine its spatial limits and depth (Fig. 2).

Pedestrian Survey of the Flume Right-of-Way

The flume survey was done August 8-12, 1983, by Brown, Snavely, and Suhler, and on August 16-17 by Brown and Snavely. Straight-line transects spaced 30-50 m apart were walked the length of the right-of-way, except where impeded by understory vegetation, when meandering transects were followed. Most of the survey area, from sta. 30+00 to sta. 100+00, consists of post oak-live oak woodland ranging in density from open woodland to savannalike habitat. There is little or no understory, and ground cover consists of sparse to heavy grasses; oak leaves and some areas of heavy grass cover were the principal obstruction to ground visibility over much of the area. Some low swales bear small huisache thickets. Most areas are in unimproved pasture, although a few areas appeared to have been partially cleared of timber in the past. The previous statements apply essentially to the northeastern two-thirds of the right-of-way. The portion from sta. 0+00 to sta. 30+00, near Turkey Creek, has dense post oak woodland in most areas, choked with heavy, in some places nearly impenetrable understory. Particular difficulty was experienced in the area at the confluence of Turkey Creek and its southwest-draining tributary, on the east bank of the latter. Understory vegetation was found to be particularly troublesome immediately adjacent to drainages. One area at the confluence of this drainage and Turkey Creek was shovel tested twice to a depth of about 60 cm and screened through 1/4-inch mesh, but nothing was found; the area tested is about 30 m southwest of the turnaround for the west flume access road, at about 102 feet elevation.

One archaeological site (41 GD 48) was found during the survey, a small surface scatter of late 19th-century artifacts located adjacent to the eastern boundary of the spoil disposal area, at 134 feet MSL, at the crest of the eroded Lissie terrace scarp where it begins to slope down to Coleto Creek. The site is about 335 m southwest of the creek, on the former Dietzel property. Surface features include a rectilinear pattern of four large Goliad sandstone blocks, probably foundation supports for a building, and a small pit with some associated boards. Found on the surface were seven plain ironstone sherds (representing plates or saucers[?], cups, and probably a

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teapot; Fig. 3,a,b); one plain porcelain rim sherd; eight clear, aqua (Fig. 3,c,d), or brown (beer/whiskey) bottle glass sherds; a clear glass sherd from a kerosene lamp chimney (Fig. 3,e); a riveted iron pot(?) fragment (Fig. 3,f); another small cast iron fragment (Fig. 3,g); a 3/8-inch diameter iron rod 4-3/4 inches long (Fig. 3,i); a large cast iron machinery part with stamped lettering "__BCPCO" and with the raised letters "B1" below; a brass harness rivet (Fig. 3,h); two small sawed animal bone fragments; six freshwater mussel shell fragments (three are **Amblema plicata**); and a hardwood batten with square (probably machine-cut) nails hammered into it. The assemblage appears to date from the 1880s (Anne Fox, personal communication). Included in the bottle glass is a base sherd (Fig. 3,d) marked

L G Co
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This is a logo used by the Louisville Kentucky Glass Works ca. 1880, and perhaps as late as 1886, on handmade beer bottles (Toulouse 1971:323-324). Also found on the surface were three prehistoric artifacts: a core remnant and two flake fragments. Presumably the mussel shell is historic rather than prehistoric, but its age is uncertain. Some additional material was also found scattered down the terrace scarp north of the main concentration; included are six plain ironstone sherds, one porcelain sherd (possibly a porcelain doll fragment), and a chert biface thinning flake.

In summary, this material presumably represents a small homestead or outbuilding dating around 1880. The site, 41 GD 48, is registered with the Texas Archeological Research Laboratory, but no further field work is recommended because there is little remaining cultural material.

A few isolated finds were noted during the survey. A single isolated chert flake was found in the post oak woodland near the center of the spoil disposal area, northwest of the old fence line, somewhere between stations 72+00 and 80+00. Widely scattered chert flakes were seen in several places on the Lissie terrace scarp due south of Berger Bluff, probably indicating sporadic use of this area associated with occupation of Berger Bluff during the Archaic or Late Prehistoric. A small surface collection from this area was made.

The south end of the spoil disposal area, fronting on Turkey Creek, is relatively close to a site (41 GD 26, Fox and Hester 1976:33-34) reported by the phase 1 survey, but no evidence of this site was seen in our survey area.

Survey of Alternate Flume Route 2 (Downstream) and Backhoe Testing at 41 GD 31

The upstream alternate route 1, originally considered in planning, was omitted from this project. Alternate route 2 is a more easterly alternate route for the Coleto Creek outfall, leaving the original proposed route at sta. 88+00 and entering Coleto Creek about 180 m downstream from the eastern edge of Area A at the Berger Bluff site, and an estimated 10-25 m upstream from the approximate western edge of 41 GD 31. This route was examined on August 16; nothing was found on the surface except a small scatter of chert

flakes exposed in a shallow gully in the Lissie terrace scarp about 120 m south of Area A at Berger Bluff. Six flakes or flake fragments were collected; no other cultural debris was noted.

The site designated 41 GD 31 has been known to Victoria avocational archaeologists for many years. It lies in a thick deposit of Holocene post-Beaumont sediments somewhat like that exposed at Berger Bluff. At this location, the surface of the post-Beaumont terrace lies at an average elevation of about 98.5 to 99 feet MSL, and is approximately delimited from the Lissie terrace by the 100-foot contour line. Ed Vogt of Victoria has reportedly collected a Late Paleo-Indian **Plainview** point from this site. The site was visited by CAR survey teams in 1975 and again in 1977 when a shovel test was dug from the terrace surface to a depth of 1.3 m, finding only sterile deposits. The site was revisited in December 1979 and January 1980 during excavations at the bench area of Berger Bluff. During the latter visit, in 30 minutes' collecting time, 145 pieces of chipping debris, three cores (Fig. 3,j), five fire-cracked chert fragments, three unaltered chert cobbles/pebbles (manuports), two small unidentified bone fragments, a possible **Angostura** point made of chalcedony (Fig. 3,l), over 41 mussel shell valves (tentatively identified as 21 **Amblema plicata**, Fig. 3,k; three **Cyrtonaias tampicoensis**, Fig. 3,m; two **Lampsilis** sp., Fig. 3,n; 15 unidentified, and various fragments), and a small fossilized plant fragment were collected. Mussel shells were very abundant, more so than is indicated by the amount collected; **Rabdotus** and other snails were observed but not collected. The possible **Angostura** point is leaf-shaped, with a more constricted haft element than is typical of the type, and lacks edge smoothing. Flaking is somewhat irregular, and the specimen has pronounced longitudinal curvature. It resembles somewhat a specimen from the Johnston-Heller site (Birmingham and Hester 1976:Fig. 4,a) and another from San Patricio County (Chandler 1982:Fig. 2,c). Turner and Hester (1985) estimate dates of 8500-8000 B.P. for Texas **Angostura** points, although the type is poorly dated except at the Wilson-Leonard site.

All of this material was derived from a chocolate brown, clay-rich stratum about half a meter or more in thickness, very similar in appearance to stratum 3 at Berger Bluff, the most distinctive depositional unit at the site and one which serves as a marker for the top of the bench deposits. In 1979, a long transit shot from the bench area at Berger Bluff to the base of this stratum gave a reading of 93.26 m expressed in terms of the Berger Bluff primary datum. By comparison, the base of stratum 3 over the bench deposits at Berger Bluff averages about 93.00 m. The similarity in elevation, thickness, lithology, and content suggests these units may be stratigraphically correlated at 41 GD 30 and 41 GD 31.

Since filling of the reservoir had drowned this stratum by the time the Flume No. 3 project was done, it was of course no longer possible to measure directly its depth. The phase 1 survey team had estimated that this stratum lay three to four meters below the post-Beaumont terrace surface, but its depth was not actually measured. Based on the single transit shot obtained in 1979, however, I believe the top of the stratum actually lies about 5.8 m below the surface, or at about 79.5 feet MSL. This estimate is based in part on transit work done for the present project and on examination of the two-foot contour GBRA project maps, which were not available during the earlier

Figure 3. **Artifacts from 41 GD 30, 41 GD 31, and 41 GD 48.**

From the surface, 41 GD 48:

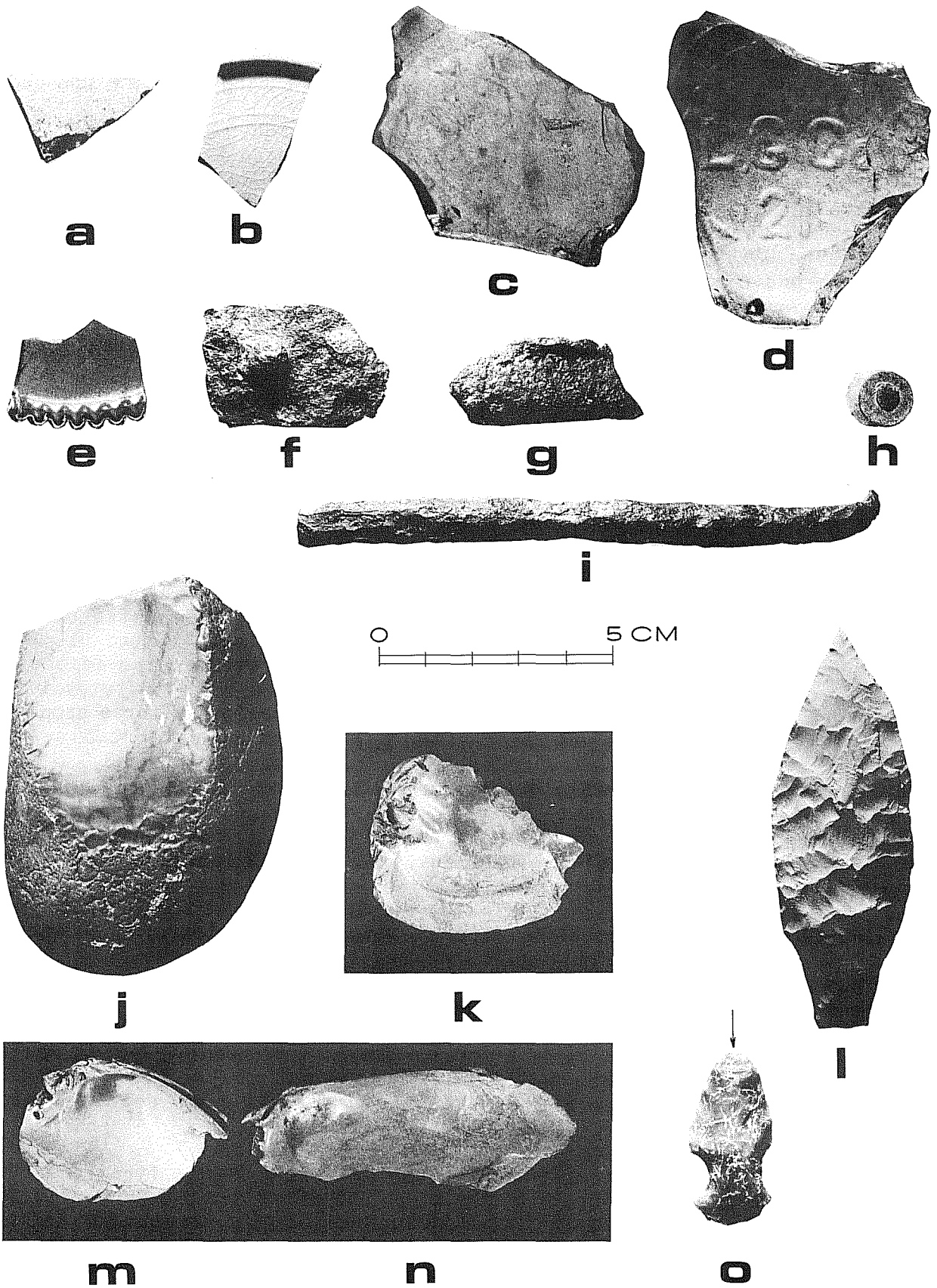
a, plain ironstone rim sherd;
b, plain ironstone footring sherd;
c,d, aqua bottle base sherds;
e, pressed glass kerosene lamp chimney sherd;
f,g, cast iron fragments;
h, brass harness rivet;
i, iron rod.

From outcrop of buried cultural stratum at 41 GD 31 (collection made in 1980):

j, chert cobble core;
k, **Amblema plicata**, right valve;
l, **Angostura** point (opaqued for photography);
m, **Cyrtonaias tampicoensis**, right valve;
n, **Lampsilis** sp., right valve.

Artifact from west profile, backhoe trench 4 at 41 GD 30B:

o, unidentified side-notched dart point (arrow indicates impact fracture).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field work but help to pinpoint the elevation of the terrace surface. The elevation of the base of the stratum, however, still hinges on the unknown accuracy of the single transit shot made in 1979.

Two backhoe trenches (Fig. 2) were dug at the site in an attempt to define the position and extent of the cultural stratum; neither trench was successful in penetrating it. Backhoe trench 1 was oriented due north-south, its north end 16 m south of the present lakeshore, 60 m due east and 78 m due north of the GBRA benchmark at turn point 306. GBRA project coordinates for the north end of the trench are approximately N350,680 E2,586160. This trench was expected to fill with water rapidly because of its proximity to the lake, but as it happened, seepage was slow enough to allow the trench to be entered and inspected. The profile was examined for cultural debris (none was observed). Notes were made on the profile, and seven small soil samples were collected at measured depths before the trench was backfilled. This trench is located in the upper portion of the post-Beaumont deposits, but unlike the upper post-Beaumont deposits at Berger Bluff, the entire section exposed in the trench is extremely clay-rich. No laboratory data on clay content are available, but visual comparison suggests clay content may run 30 to 40% or more. The reason for the difference is unknown, although presumably it represents a facies change rather than a stratigraphic difference. In general, the sediment becomes less gray and more tan in color with depth, and the clay content in the samples collected appears to diminish with depth. In the trench profile a very tight, compact clay stratum was noted at 2.65 m depth, although inspection of the sample collected at that level does not seem to indicate a higher clay content than the adjacent samples. Caliche nodules (true accretional caliche nodules with botryoidal growth structure, not Goliad marl clasts) appear in the lowest three samples collected at 3.0 m and below, suggesting a fluctuating water table and seasonal drying. Snails were noted in the profile from about 3.0 m and below, probably all **Helicina orbiculata tropica.**

Backhoe trench 1 was located approximately in the center of the site as formerly exposed in the Coleto Creek cutbank, yet no cultural debris was found in the trench. Since the maximum depth of the trench was 3.6 m (the limit of the backhoe), if the estimated depth of the top of the cultural stratum (5.8 m, as discussed) is accurate, then our trench stopped about 2.2 m above the surface of the cultural stratum. Even if machinery with greater depth capabilities had been available, it is doubtful whether groundwater seepage would have allowed us to enter a deeper trench. As it was, entering the trenches was risky enough. A soil coring device was used in the bottom of the trench in an effort to sample more deeply, but it would not penetrate more than about 20 cm of the compact clay. The principal finding from backhoe trench 1 is that the upper 3.6 m of deposits are culturally sterile.

Backhoe trench 2 was excavated on the same alignment as the first trench, with its northern end 38 m south of the north end of backhoe trench 1. It is 60 m east of and 40 m north of the GBRA benchmark mentioned earlier and is therefore at the contact between the post-Beaumont and Lissie terraces. The sediments exposed in this trench are markedly different from those exposed in the first trench, but it is unclear whether they represent undisturbed Lissie deposits, or colluvium eroded off the Lissie scarp and mixed with

post-Beaumont alluvium. This trench filled rapidly with groundwater after a fissure between two clay strata was struck, and consequently it was possible to examine only the three meters of deposits near the south end. The deposits here are also culturally sterile. Most of the exposure consists of very light-colored tan, clay-rich sediment; below about 1.86 m moderately abundant **Rabdotus** and **Helicina** snails were noted; the clay is variegated with blue-gray streaks; above this is a zone with small caliche nodules. Eight soil samples were collected from this trench, and the part above water was examined carefully; since the lower 60 cm could not be inspected, the backdirt pile was also checked for cultural debris.

Under the circumstances, it seems doubtful whether any further efforts at machine testing would have been productive. Core drilling might have been tried, but would have proven expensive, and core samples are frequently found to be too small to provide reliable sampling for cultural deposits. Enlarged and deeper trenching might have been attempted, but would also prove expensive, potentially dangerous, and might have been impossible if groundwater conditions were found to worsen markedly below the depth we reached. Under the circumstances, the best and most economical alternative seemed to be to rely on the known extent of the site as plotted in the Coleto Creek cutbank (now underwater) in 1977 and as seen in 1979-1980, and to rely on the 1979 transit shot for an estimate of the depth. These data suggest that only excavations below about 80 feet MSL would disturb the deposits; certainly the upper 3.6 m (11.8 feet) have been shown to be sterile.

As shown on GBRA plans, the outfall for alternate route 2 ends at least 10 m upstream from the western limit of the site as expressed formerly in the cutbank, so unless the site extends farther to the west than the cutbank exposure suggests, the outfall should not impact the site directly, as long as excavation follows the existing plans closely. Whether eddy effects from flume discharge would have any later impact is unknown. As of 1983, the lakeshore at 41 GD 31 had remained quite stable.

Backhoe Testing at 41 GD 30B

Phase 2 testing by the CAR in 1977 at Berger Bluff indicated the site is apparently divided into two areas, A and B. Area A, near the bluff, covers about 2500 m^2 and is the area in which all the intensive investigations have been concentrated; Area B, farther upslope and to the southwest, covers about 1670 m^2 as previously defined. The two areas are separated by a distance of about 25 m in which four shovel tests uncovered very little cultural debris. During the 1977 investigations, five shovel tests and a single 1-m^2 test pit were dug in Area B. The test pit struck Goliad marl at 1.65 m, while the shovel tests encountered it at variable depths. Since this area was to be impacted by the flume outfall, east access road, and drainage ditch, a series of machine tests was placed across the site to define more accurately the boundaries and depth of the archaeological deposits and to verify that the marl deposit encountered in 1977 is bedrock (some cultural debris had been found in pockets in this unit).

Three days were spent digging and recording eight backhoe trenches in and near Area B, on August 9-11, 1983 (Fig. 2). Four trenches (backhoe trenches

1-4) were spaced in a northwest-southeast row across the approximate center of Area B; a fifth, backhoe trench 8, was joined to the north end of backhoe trench 3, running to the west, specifically to investigate the relationship between deposits in backhoe trenches 3 and 4. Backhoe trench 5 was placed at the north edge of Area B. Backhoe trench 6 was placed to the south of Area B, near an area where some surface cultural debris was observed, and backhoe trench 7 was placed well to the south of the site, but again not far from an area where some surface debris was found. Data on the individual trenches are given in Table 1 and will not be presented in any detail here. In general, trenches were about 10 m long, although some were extended to greater lengths to allow better access. All trenches were dug to bedrock (although in backhoe trench 4, the depth of the trench prevented removal of loose fill from the floor), and in some cases the machine was able to penetrate somewhat into the bedrock. Because machine time was limited and because our chief goal was to collect dimensional information on Area B, it was not possible to record fully each trench with thorough geologic profiles. Instead, selected trenches were profiled, and documentation of the others relied on photography and collection of soil samples for archival storage and possible future studies. All trenches, however, were inspected carefully, and brief notes were taken on the profile in each one. Two trenches (backhoe trenches 2 and 3) were profiled completely (Fig. 4); due to lack of time and the difficulty of viewing the profile in such a deep, narrow trench, backhoe trench 4 was only partially profiled: the bottom of the trench and the ground surface were drawn, then notes were taken on a cleaned 50-cm-wide columnar area near the center of the trench. All trenches were photographed in both color and black-and-white. The principal findings from the trenching project at Area B can be briefly summarized as follows.

(1) The uppermost bedrock unit at Area B, encountered in the 1977 tests as well as our own trenching, is a marl zone representing the Goliad formation. In its purest form it is pure white, with a chalky, light, talc or diatomite-like consistency and texture, with dry weight about 1.3 g/ml. Hand specimens contain no visible contaminants, but samples digested in HCl yield about 13% of fine and very fine sand (chiefly 2.0 to 3.0 phi on the Wentworth scale). It occurs as massive, structureless deposits. In most of the trenches, however, the marl occurs as discontinuous masses intermixed with calcareous tan fine sand and fragments of indurated white sandstone. The marl unit is laterally rather variable in composition and thickness (ranging from about 40 to 125 cm thick).

In most of the backhoe trenches an indurated sandstone unit underlies the marl and forms the floor of most of the trenches; its thickness is unknown. This sandstone varies from a friable, gritty rock to a hard, calichelike, fine-grained rock. In general it closely resembles sandstone exposed in the floor of the ravine west of the site, and about three meters lower in elevation. The latter is a well-sorted fine sand, with grain size modes at 2.0 to 2.5, 2.5 to 3.0, and 3.0 to 3.5 phi.

(2) The backhoe testing has confirmed that the previously defined limits of the site (see Fox, Black, and James 1979:Fig. 10) are essentially accurate, but has revealed something that was not apparent before. Over most of Area B, Goliad formation bedrock lies just under the surface, and the archaeological material is confined to a thin deposit overlying it or is

TABLE 1. BACKHOE TRENCHES AT 41 GD 30B

Backhoe Trench	Length (m)	Average Width (m)	Maximum Depth (m)	Soil Samples	Remarks
1	10.4	.85	1.27	5	No cultural debris; soil developed on tan fine sand unit overlying marl.
2	11.9	.80	1.90	6	No cultural debris; soil developed directly on marl unit which overlies fine sand unit with Goliad sandstone fragments.
3	10.25	-	1.55	3	Soil A horizon 50 cm thick, with chert flakes, **Helicina** and **Rabdotus** shells, mussel shell fragments, small chert pebbles, occasional small chert cobbles overlying tan fine sand unit, then mixed with marl and sandstone over indurated sandstone; west wall profiled; backhoe trench 8 joins north end.
4	15.0	.85	3.50	17	Entire profile consists of stratified fine sand, becoming more tan and calcareous toward base; presumably represents colluvium but source of sediment not identified; cultural debris discontinuously distributed through entire section; dart point recorded **in situ** at 1.1 m; indurated sandstone at 3.5 m at base of trench; stratigraphic section broadly resembles strata 5 and 4 at Area A but relationship is presently unclear.
5	10.75	.90	1.5 (N) 1.26 (S)		Backhoe trench and surrounding terrain both slope down to north; cultural debris present in 30 cm thick soil A horizon; soil developed directly on marl at south end, on tan fine sand at north end.
6	9.9	.85	1.47	4	No cultural debris; soil developed on thin Lissie alluvium (60 cm thick) over marl.
7	10.0	.90	1.66		No cultural debris; highly organic soil developed on mixed marl and sandstone; cultural debris visible to west near ravine, on surface, but none visible in profile.
8	13.7	1.20	2.45		No notes taken; joins north end of backhoe trench 3, running west almost to south end of backhoe trench 4; dug to clarify relationship between deposits in backhoe trenches 3 and 4; indicates bedrock dips steeply westward, but vertical scarp is lacking; cultural debris is present.

Figure 4. **Profiles of Backhoe Trenches 2 and 3 at 41 GD 30B.** Numbered squares are soil samples. Circled numbers represent pedogenic/stratigraphic units. Elevations are in terms of arbitrary excavation datum of 100.00 m used at Area A.

Backhoe trench 2:

1. **A zone,** crumbly texture, irregular peds, light gray silty clay (10YR 6/1.5) with rootlets and small calcareous nodules; lower contact irregular and gradational;

2. **pure white marl** (10YR 9/1) variegated with light brownish gray (10YR 6.5/1.5) vertical root molds and irregular horizontal, vertical, or round patches; occasional small pepper flakelike manganese concretions; no visible lamination or stratification; lower contact is irregular, but fairly clear;

3. zone of **indurated white (Goliad?) sandstone,** apparently the same as that in the floor of the trench; shown rather schematically, not well differentiated from the marl;

4. **light gray brown fine sand** (10.5YR 7.5/2), massive, calcareous appearing (probably decomposed Goliad sandstone), containing occasional scattered Goliad sandstone nodules up to 3 cm in diameter;

5. **indurated white Goliad sandstone bedrock** (10YR 8.5/1) forming floor except where penetrated at north end.

Backhoe trench 3:

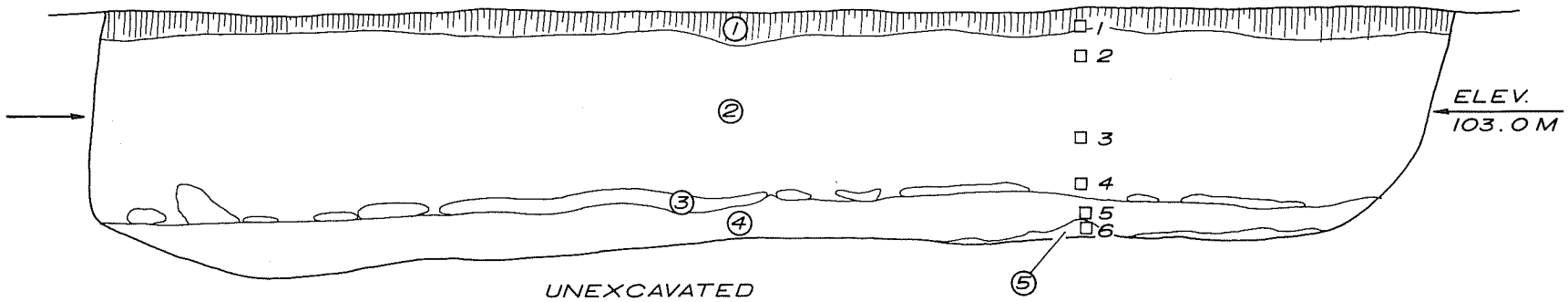
1. **A zone,** medium gray (10YR 4.5/1.5), friable, crumbly texture, clayey silt with rootlets, chert flakes, **Helicina orbiculata tropica** and **Rabdotus** sp. shell, mussel shell fragments, small chert pebbles; lower contact fairly regular, somewhat gradational;

2. **light tan silt** (10YR 7.5/2.5), relatively homogeneous except for widely scattered mottles of white chalky marl averaging about 1-2 cm in diameter; no cultural debris or snails present; has occasional small patches (a few millimeters in diameter) that are 7.5YR 8/5;

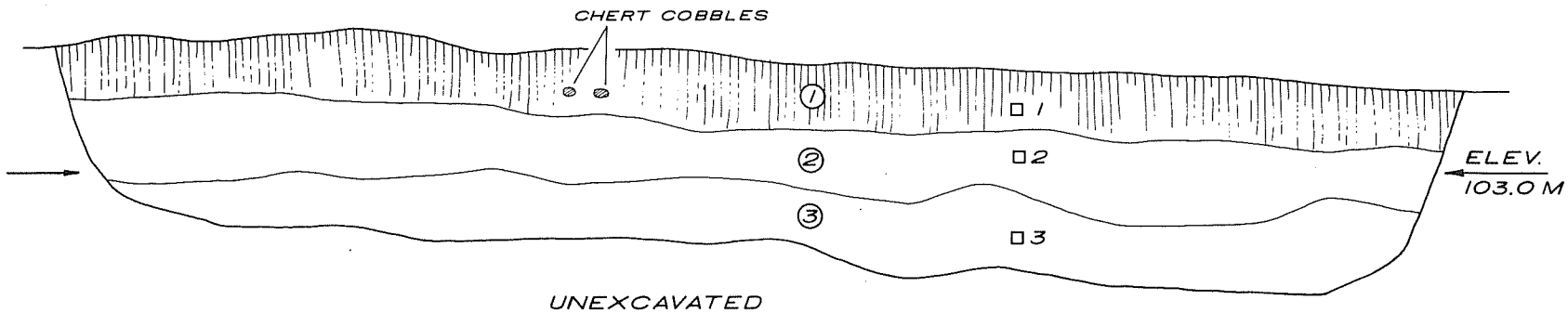
3. **mixed white chalky marl and Goliad sandstone** (10YR 9/1); floor is indurated Goliad sandstone.

N

BACKHOE TRENCH 2



BACKHOE TRENCH 3



0 1 METER

Berger Bluff
41 GD 30B

restricted to a surface scatter; but along the western margin of the site, the bedrock plunges rather sharply and some deep archaeological deposits are present. In particular, the bedrock drops rapidly between backhoe trenches 3 and 4. Traversing southeast to northwest across Area B, for example, backhoe trench 2 contains no archaeological deposits; backhoe trench 3 contains about 50 cm of archaeological deposits (confined here to the A zone in the soil profile); and backhoe trench 4 contains about 3.6 m of archaeological deposits (Fig. 5). Evidently a thick accumulation of sediment has taken place here along the eastern edge of the ravine, mantling a somewhat sloping bedrock scarp. Cultural debris was found distributed discontinuously, essentially throughout the stratigraphic section here. The sediment consists of gray to tan, apparently well-sorted fine sand, becoming less gray and more tan in color with depth, and with diminishing quantities of cultural debris with depth. At about 1.9 m and below is a zone with Goliad marl nodules and masses. The geologic origin of this fine sand deposit is unknown; presumably it is colluvial, at least in the area of backhoe trench 4 where such a thick accumulation is evident, yet no source area for such colluvium can be identified. Because of its elevation (the base of backhoe trench 4, although over three meters deep, nevertheless rests at about 99 to 100 feet MSL), it presumably cannot be Holocene Coleto Creek alluvium; an aeolian or ravine outwash origin also seems unlikely. The number of dart points collected at Area B (Fox, Black, and James 1979:47,ff) and the lack of Late Prehistoric material perhaps suggest this deposit may be somewhat older than the surface of the post-Beaumont terrace at Area A, but this is mostly conjectural. A single side-notched dart point was found **in situ** at 1.1 m in backhoe trench 4 (Fig. 3,o).

In summary, essentially all of 41 GD 30B would be impacted by construction of the flume, access road, and drainage ditch as originally planned. Over much of the area the deposits that would be destroyed are thin and unstratified; in some parts of the site, cultural debris is confined to the soil developed directly on bedrock. However, a thick package of stratified sediments is present along the northwest side of the site, lining the steeply sloping ravine bank. These deposits would be completely removed by excavation of the flume as originally planned, and archaeological excavations to mitigate this loss would be necessary.

SUMMARY AND MANAGEMENT RECOMMENDATIONS

The following observations have resulted from survey and machine testing done for the Flume No. 3 project:

(1) Pedestrian survey of the Flume No. 3 right-of-way located one previously unrecorded historic site (41 GD 48), marked by a small scatter of late 19th-century historic artifacts and sandstone blocks, probably remnants of house or crib piers. No further field work is recommended.

(2) Alternate route 2 (downstream route) will not impact 41 GD 30 and, on the basis of the best available information, should not impact 41 GD 31. Machine testing at the latter site failed to reach the top of the buried cultural stratum there, but if the limits of the stratum as exposed in the Coleto Creek cutbank in 1977 are an accurate indication of its western

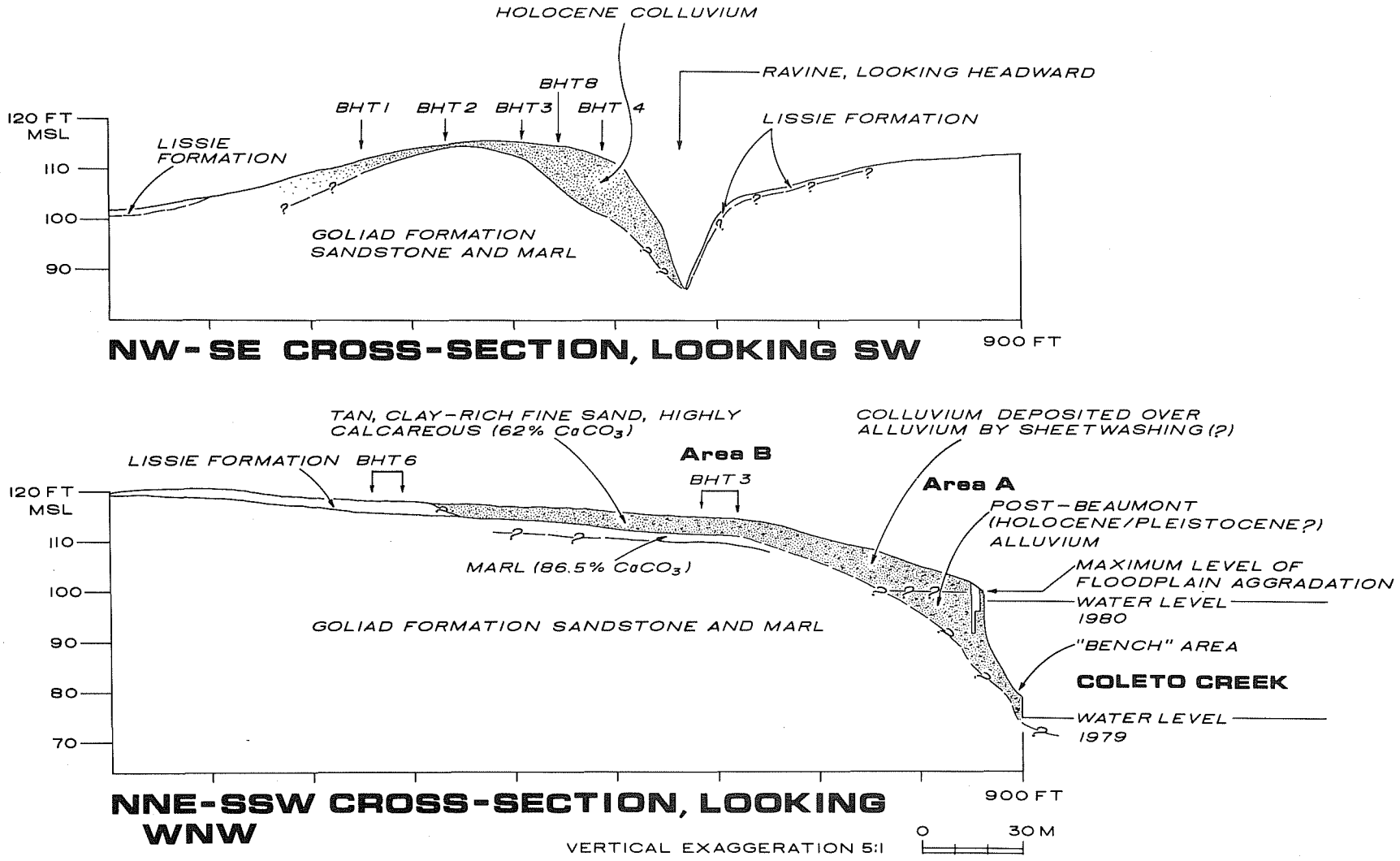


Figure 5. **Cross Sections of Geologic Units at the Berger Bluff Site (41 GD 30), Based on Backhoe Trenching and Hand Excavation.** The lower section is somewhat similar to Figure 3 in Brown (1983) but is based on much more data and is therefore more accurate. Elevations represent feet above mean sea level. The 1979 excavation block is shown near the edge of the bluff. Note vertical exaggeration.

extent, the flume outfall should lie just outside the limits of the site. Of the two alternative routes, route 2 is considered the least likely to damage the archaeological sites in the area, and is therefore the preferred route from that viewpoint.

(3) The primary Flume No. 3 route, which follows the existing ravine to Coleto Creek, would impact essentially all of 41 GD 30B and would destroy the thick section of stratified archaeological deposits located along the east side of the ravine. Further archaeological excavations would be necessary to mitigate this impact. In addition, construction of a caisson or dike at the mouth of the ravine to allow the outfall to be built would probably damage 41 GD 30A as well, depending on the location of the dike and how it is built. The primary route is the least desirable in terms of avoiding impact on the archaeological resources.

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