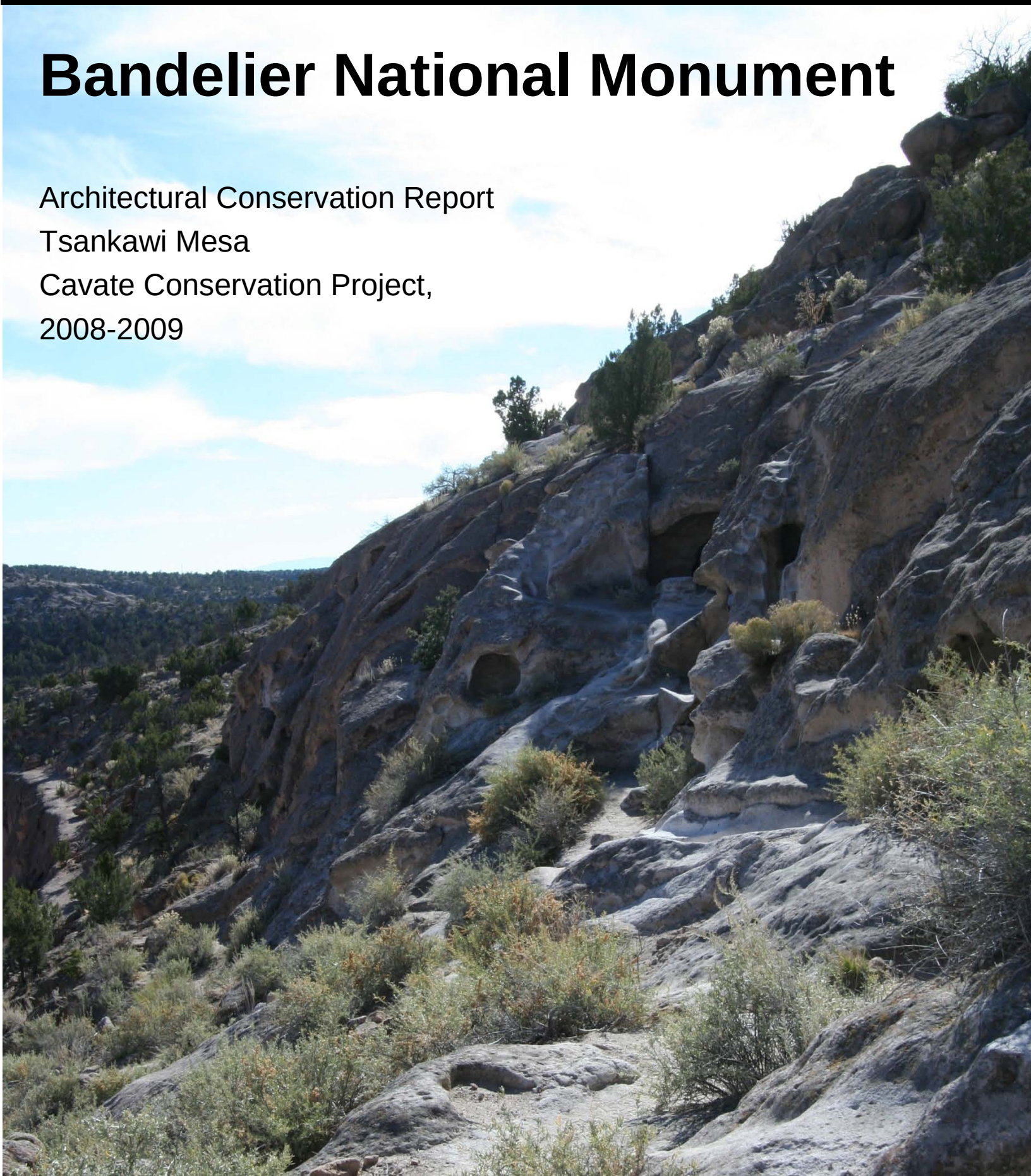
National Park Service

U.S. Department of the Interior

# Bandelier National Monument

Architectural Conservation Report
Tsankawi Mesa
Cavate Conservation Project,
2008-2009



# Bandelier National Monument

## Architectural Conservation Report
## Tsankawi Mesa Cavate Conservation Project, 2008-2009

**Bandelier National Monument**
**New Mexico**

**Vanishing Treasures Program**
**Bandelier National Monument**
**Los Alamos, New Mexico**
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**Tsankawi Mesa Cavate Conservation Project, 2008 - 2009**


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**In 1999, the Vanishing Treasures Program (VT) at Bandelier National Monument (BAND) began a project aimed at documenting and conserving the unique archaeological architecture in the park known as cavates (cliff dwellings). The project is ongoing and its principle aim is to develop appropriate methods to identify, document, conserve, and maintain the cavates as both constructed and natural heritage. Additionally, through Native American consultation and planning, the project aims to create a culturally adaptive management strategy that addresses the physical conservation of the cavates in their constantly changing landscape. Between 2000 and 2008, approximately 1055 cavates in Frijoles Canyon were documented and assessed, and ninety-six cavates were treated with stabilization, drainage modification and graffiti mitigation. In 2008 the management strategy developed for the Frijoles Canyon Cavate Conservation Project was initiated at Tsankawi, and during the 2008 and 2009 seasons, over 300 of the 355 cavates at Tsankawi Mesa were documented and assessed, and 13 cavates were treated. This report summarizes the work carried out in 2008-2009.**

# Tsankawi Mesa Cavate Conservation Project, 2008 - 2009

# TSANKAWI MESA CAVATE CONSERVATION PROJECT

Stephen Merkel

Preservation and protection of the current Tsankawi Unit archaeological area has been the responsibility of the National Park Service and Bandelier National Monument since 1932. Management decisions continue to evolve as more is learned about visitor use, the extent and condition of resources, and the practical applications of conservation and preservation measures. As a continuation of work started in 1998, the Tsankawi Mesa Cavate Conservation Projects aim is to document architecture and trails, and to identify and mitigate the effects of natural erosion and the impact of unrestricted visitor access. The following report describes the documentation of cavates at Tsankawi, their conditions and the treatments that were implemented in the 2008 and 2009 seasons.

## *Project Summary*

The project plan developed for the Tsankawi Mesa Cavate Conservation Project was modeled after Frijoles Canyon Cavate Conservation Project. The project was designed for two seasons of field work. In 2008 season Vanishing Treasures staff and archaeologists from the Office of Contract Archaeology (OCA), University of New Mexico (UNM), focused on gathering information, performing condition assessments, documenting the archaeological features of the cavates and updating maps. Based on the results of the condition assessment and archaeological documentation, cavates were rated by their priority for treatment, determined from a number of factors including archaeological significance, overall condition, treatability of the condition, and amount of visitor use. The rating methodology is explained in depth in the Frijoles Canyon Cavate Conservation Plan.

In 2009 data collected in the assessment was used to develop a treatment plan. Conservation treatments were focused on those cavates categorized as high priority, those that are the most archaeologically significant and in the poorest condition. Additional cavates received some form of preventive conservation to slow rapid deterioration. The majority of cavates were photographed digitally and with film.

*Project Accomplishments*

The following list is a summary of the work performed by VT staff and collaborators during the 2008 and 2009 field seasons:

- 355 cavates were identified, 89 of which were not previously numbered
- Condition assessment and archaeological documentation was completed for 316 cavates
- More than half of the documentation forms have been entered into the Cavate Database (problems with the database and data entry standardization have slowed progress)
- Digital and film photography was completed for 282 cavates and all photographs have been archived
- Sixteen cavate AutoCAD maps were updated to include all newly identified and numbered cavates
- Soils were collected at the Tsankawi Unit and were tested for use in conservation treatments
- A total of fifty-five instances of graffiti were removed from 11 cavates
- As an emergency preservation measure, the floors of two cavates were cleared, documented and backfilled with a layer of protective fill
- A dam was constructed in front of one cavate to redirect damaging water flow
- One cavate, deemed structurally unsafe, was closed by Superintendent order
- LA 50976 was laser scanned and representations in both plan and profile were produced

The results from both phases of the project will be a valuable resource for the preservation of the hundreds of cavates at Tsankawi Mesa and throughout the Bandelier National Monument, it will also serve as valuable resource to the stewards of other Federal and State lands and the Pueblos managing similar resources.

## THE CAVATES OF TSANKAWI MESA

Lauren Meyer and Stephen Merkel

*Site Location*

Tsankawi Mesa is located in the Tsankawi Unit of Bandelier National Monument, which is an 828 acre detached section of the park. It is approximately 15 miles to the northeast of Frijoles Canyon, the Park's main interpretive area. The Tsankawi Unit is bordered to the south and east by the reservation of San Ildefonso and Highways 4 and 502 to the north and west which form a shared boundary with the Los Alamos National Laboratory.

*Cavate Definition*

Cavates are hand-hewn rock chambers that were occupied from the twelfth to the sixteenth century C.E. They are the ancestral dwellings of the Pueblo people that now live in Northern New Mexico. The cavates of the Pajarito Plateau are unique in the architecture of the American Southwest because of their creators' extensive modification and use of the natural environment and geology for habitation, the high number and density of dwellings, and the excellent preservation of some interior architectural features. In the cavates domestic details of the lives of the prehistoric Pueblo people are still visible. Because of their semi-protected location in the cliffs, cavates retain architectural finishes and features that are not often preserved in standing masonry pueblos from the same time period. Floor features such as metate rests and loom anchors, embellishments applied to or incised into the tuff and wall plasters, masonry walls, and plastered doorways, vents and smokeholes are not only intact, they are preserved in high density. At Bandelier National Monument, some features, such as metate rests, are *only* found in cavates.

*Site Description*

The positioning and distribution of cavates on the cliffs of Tsankawi Mesa are distinct from those of Frijoles Canyon due to the undulating nature of the cliffs themselves. The tuff at Tsankawi erodes in a very different manner than that of Frijoles Canyon, creating slopes and short, sheer cliffs with good accessibility to a variety of levels. The combination of gentle slopes and sheer cliffs allowed for the Tsankawi cavates to be constructed in small clusters at varying elevations throughout the cliff face, unlike the cavates of Frijoles Canyon which occur in large linear groups at the base of the cliffs directly above the talus slopes.

A unique feature of Tsankawi Mesa is the extensive network of hand-carved trails. The pre-Hispanic trails that create the circulation pattern through the Tsankawi Mesa archaeological area appear as deep,

linear excavations into the bedrock. These trails wind their way through the cavate groups, across the mesa top and along petroglyph panels. These trails also extend beyond the Tsankawi Unit boundaries, creating travel corridors to the east and west. [1] In addition to the trail system, the cavates are often located in close proximity to several highly detailed petroglyph panels that depict anthropomorphic, zoomorphic and geometric figures. Petroglyph panels typically occur near habitation areas or trails.

*Cavate Groups*

In Bandelier National Monument, cavates appear in three organizational groupings: as isolates, in small clusters or groups that may or may not have contained associated masonry structures, or in large groups that would have resembled the contemporaneous communal pueblos. Many of the cavates in Ancestral Pueblo sites such as Long House in Frijoles Canyon and Puye Cliff Dwellings of the Santa Clara Purblo represent the back rooms of now-collapsed multi-story masonry buildings constructed against the cliff faces. On Tsankawi Mesa it is uncommon to find masonry structural elements enclosing cavates as evidenced by the lack of viga holes on the cavate exteriors. Instead, many cavates existed as fully functional rooms wholly contained within the tuff cliffs. Natural breaks in the canyon formed by drainages or geologic formations separate these clusters or groups of cavates, which were assigned Laboratory of Anthropology (LA) numbers.



**Figure 1: Cavate 026, LA 50976**

*Cavate Conditions*

At both Tsankawi Mesa and Frijoles Canyon, conditions assessments have revealed that the cavates are slowly deteriorating from both environmental and human factors. Chemical and physical deterioration of the cavates occurs as result of complex interrelated factors including:

- Inherent instability of the volcanic tuff
- Erosion from water flowing over surfaces and into openings
- Spalling and disintegration from the crystallization of soluble salts
- Flooding

[1] Snead, 1994.

- Wet/dry and freeze-thaw cycling
- Wind-blown particle abrasion
- Large-scale rock falls
- Human impact

The deterioration of tuff is poorly understood and this problem is being investigated through academic partnerships. What is known is that the two largest contributors to deterioration are water and people. Tsankawi Mesa cavates on the ground level in contact with the talus slope are in the poorest condition from years of access and flooding. A large part of Lister's 1939 cavate preservation program was to redirect water to prevent flooding. Although much of the flooding was halted, some of the constructed dams have failed in the last seventy years. Human use and the use of cavates by domestic animals also caused significant damage. Visitors unknowingly abrade the trails, the floors of cavates and the entrances. Within cavates damage can occur accidently or intentionally at with the case of graffiti. The use of cavates as historic sheep corrals is evident by the abrasion of the walls and floor and the substantial amount of feces left behind.

*Discussion of the Tsankawi Mesa Cavates*

There are approximately 587 cavates within the Tsankawi Unit of Bandelier National Monument: 355 on the south side of Tsankawi Mesa, 117 at North Mesa, 101 spread out between First and Second Mesas, and sixteen solitary cavates elsewhere in the unit. These cavates are generally found along the south-facing cliffs of the mesas, possibly so that occupants could take advantage of solar gain in winter months. At Tsankawi Mesa, cavates are found at varying levels in the cliffs, from ground level to the uppermost portion of the mesa and contain a wide variety of unique features. They exist in a variety of states of preservation and exhibit a wide range of conditions.

The cavates at Tsankawi Mesa are contemporary with those of Frijoles Canyon, and were occupied from the fourteenth to the sixteenth century C.E. The cavates and masonry pueblos associated with the Tsankawi Unit of Bandelier National Monument are most directly affiliated with the people of San Ildefonso Pueblo. The modern Pueblo of San Ildefonso has strong ancestral ties to the Tsankawi architectural remains, petroglyphs, and landscape features.

## CONDITION ASSESSMENT AND ARCHAEOLOGICAL DOCUMENTATION

Stephen Merkel and Lauren Meyer

The first stage of the conservation strategy for Tsankawi Mesa was the systematic documentation and inspection of each cavate unit. The information collected was used to understand the extent of deterioration and to determine treatment priorities. A total of 316 cavate and talus structures at Tsankawi Mesa were documented and assessed in 2008 by field crews from Bandelier's VT staff and the University of New Mexico, Office of Contract Archaeology (OCA) through a cooperative agreement.[2]

Using specially designed documentation methods and forms, the field crews recorded the extent and integrity of existing cavate structures, their physical condition, their archaeological context and the type and severity of threats endangering them. This provided baseline data on the physical characteristics and present condition of each cavate which were used to determine archaeological significance and to prioritize conservation treatments. The work of this project builds upon the work done in the 1980's and 1990's by H. Wolcott Toll and the Bandelier Archaeological Survey and provides a comprehensive written and photographic archive for future study and management of the cavates.

### *Methodology and Terminology*

The form used for the documentation of the cavates of Bandelier National Monument was based on a form developed by F. Matero in the summer of 1998 for use with the cavates of Tsankawi Mesa. A glossary which defines all relevant terminology and offers instructions for filling out the various sections in the form was created to supplement this documentation form. Slight alterations were made over the years that it was used in Frijoles Canyon. Considerations were made for differences in the spatial context of the groups and individual rooms and for unique fabric, features and finishes. Modifications to the form were also made to allow for faster and easier data collection in the field and to make the form more compatible with the database which was developed to manage and analyze the data.

The field form used for the documentation of the cavates is divided into several sections. These sections, designed to facilitate recording, can be described as follows:

1. The *unit summary data* section describes physical characteristics of each cavate, including the orientation of the cavate opening and/or entrances, room and wall dimensions, cavate building materials, and extant features. The feature list is derived

[2] OCA Final Report on file in the VT field office

from H. Wolcott Toll's *An Analysis of Variability and Condition of Cavate Structures in Bandelier National Monument* (1995). Also in this section, plan and elevation sketches are drawn for each cavate which include the location of fractures in the tuff cliff and the general placement and features within each cavate.

2. The *surface finishes* section requires the identification of an overall finish scheme for the cavate being assessed, as well as descriptions of the architectural finishes including type, color, layer structure, and texture. Any embellishments that might be present for the cavate walls, ceiling and floor are also identified here.

3. The *construction details* section allows for the categorization of individual wall segments (including ceiling and floor) and identifies their construction materials (rock and / or masonry) and dimensions.

4. The *existing conditions* section follows *construction details*, and requires the recorder to assess the condition of the individual wall segments previously identified. As such, one must determine the severity and extent of conditions apparent on cavate walls and wall finishes, ceiling and ceiling finishes, floors and floor finishes, and exteriors. Each condition is assigned a value based on the percentage of the substrate or finish affected by the particular deterioration mechanism (N/A, Insignificant <10%; Low 10-25%; Moderate 26-50%; High >50%). The descriptive values assigned to the various conditions also have numerical values associated with them, as certain conditions are weighted more than others according to their potential for causing dramatic change to or loss of original material. These values are calculated as a means of determining which of the cavates require immediate attention.

5. The *treatment recommendations* section allows the recorder to make treatment recommendations based on existing conditions. Types of proposed treatments range from preventive conservation (i.e. drainage control) and physical intervention (plaster and masonry stabilization) to monitoring and routine maintenance (vegetation control). In addition to treatment recommendations, a treatment priority or urgency rating (high/medium/low) is given to the cavate. This priority assignment is based on both the numerical score generated by the existing condition table and the archaeological significance score.

6. The *archaeological significance* section identifies criteria which, in combination, suggest that a cavate is archaeologically significant. Cavates get one point for each criterion met, and the points are totaled to provide a way to compare cavates.

7. At the end of the form, there is a category called *previous documentation* which allows for the recorder to identify references to relevant written and/or photographic materials.

The form covering both the archaeological information and condition assessment was split into two separate forms in 2008 for the documentation of Tsankawi Mesa. During the documentation of Frijoles Canyon it was a single form completed in entirety by VT staff. The Office of Contract Archaeology from the University of New Mexico (OCA) was tasked to systematically examine each cavate and gather archaeological data. They began in LA 50976 and continued to document a majority of the cavates across Tsankawi Mesa.

| | Cavates in BAS - 1989 | Cavates in 2009 | Cavates added |
|---|---|---|---|
| LA 50976 | 121 | 126 | 5 |
| LA 65661 | 7 | 7 | - |
| LA 65662 | 7 | 7 | - |
| LA 65748 | 10 | 12 | 2 |
| LA 65749 | 14 | 14 | - |
| LA 65750 | 10 | 14 | 4 |
| LA 65751 | 11 | 15 | 4 |
| LA 65753 | 20 | 34 | 14 |
| LA 65755 | 22 | 48 | 26 |
| LA 65756 | 19 | 27 | 8 |
| LA 65757 | 1 | 1 | - |
| LA 65758 | 5 | 6 | 1 |
| LA 70955 | 10 | 18 | 8 |
| LA 70957 | 1 | 1 | - |
| LA 128410 | 5 | 16 | 11 |
| LA 128408 | 0 | 4 | 4 |
| No LA | 3 | 5 | 2 |
| Totals | 266 | 355 | 89 |

**Table 1: List of added cavates at Tsankawi Mesa by LA number**

The 1988-89 Bandelier Archaeological Survey (BAS) maps of cavate groups at Tsankawi formed the basis for the documentation in the 2008-2009 field seasons. A number of non-cavates, severely

weathered cavates, and collapsed cavates that were added to the maps, and many backrooms and chambers accessed through larger cavates that were previously unlabeled were given numbers. With these additions the number of structures totals 355, an increase of 33% from the BAS.

Field crew members worked in pairs when collecting archaeological data on the cavates, and the condition assessments were performed individually. Consultation between team members was encouraged to ensure uniformity and congruence with special circumstances, unique features, and conditions.

Each team was supplied with a map of the cavate group being documented, documentation forms and a glossary, a compass to determine the orientation of cavate openings and walls, archival information pertaining to particular rooms, and a tape measure for collecting dimensions of cavate walls and features. Each room was completely documented before moving on to avoid accidental omission of any information requested on the forms. As rooms were recorded, they were added to a documentation completion log.

As of November 2009, 316 cavate structures have received full documentation at Tsankawi Mesa. Difficulty in communication between the groups caused problems particularly with regard to the alterations to the maps and entire western side of the mesa which had not been mapped at the time of documentation. In addition to this a number of cavates were discovered since the initial survey. All of the cavates have now been mapped, but 39 still need complete documentation. All of these cavates are in poor condition with little archaeological value or are questionable cavates that are either collapsed or obscured by erosion or vegetation. The documentation of the remaining cavates was not as high of a priority as the treatment and photography of threatened cavates.

*Photography*

For the majority of cavates, little can be done to slow deterioration. Photography is a tool used to visually record the current state of a cavates condition. Photography of cavate entrances began with the initial documentation in 2008; in 2009, a more intensive photography campaign was undertaken to document interiors, exteriors, and unique features. Training began at the start of the 2009 field season and was led by Johnny Holdsworth and Stephen Merkel. The single-day field training covered camera use, lighting, the use of flash, reflectors, and field recording methods. Several challenges regarding the photography of the cavates were identified during this training, including the following:

- Cavates are irregularly shaped and often very small;
- They are often dark, with soot-blackened walls and/or ceilings;
- They are often difficult to access, and have fragile floors and wall plasters; and
- They are located in a dry, dusty environment, requiring that extreme care be taken when handling camera equipment.

A methodology for photographing the cavates was developed (see Appendix N) in previous field seasons. This methodology provides an overview of camera use, responds to the challenges previously described, and identifies the proper settings for each camera when used for interior photography and exterior photography.

During the documentation process, exterior and interior walls, cavate features and embellishments were photographed with a 35mm camera (a Nikon FM 10, a Nikon FG 20 or a Pentax ZX-5) equipped with a 24mm lens using black and white 400 ISO film, and a 12MP digital camera (Cannon EOS Digital Rebel XT) equipped with a wide angle lens. The flash was rarely used; natural light was preferred. If additional light was needed, a light diffuser was used to reflect natural light or, in a few instances, an external light source. A tripod was often used as well. Some ingenuity was required to set up the camera due to the size constraints in many rooms. Most rooms could be accessed from the ground; some required crawling. For this reason, a minimum of equipment was brought into each room.

In order to capture all details of an individual cavate, each wall face was photographed in one to three sections, depending upon the width of the wall. Individual features were usually captured in one photograph each. A signboard with the Laboratory of Anthropology (LA) site number for the group, the room number, the wall identification (north, west, east, south, ceiling, floor), the date (month and year), and a scale was placed in each wall shot. Because many of the features are very small, only a scale bar was placed in the associated images. Photo logs were kept while in the field in order to record the shot number (for print photography) and the digital file number (for digital photography), as well as a description of each photograph. Digital images were downloaded each day onto an office computer and were saved in their original file format. Film was labeled with roll numbers and developed throughout the season.

Cavate structures at Tsankawi Mesa were photographed systematically starting with the highest priority and those identified for treatment. Lower priorities were also photographed as time allowed. Film prints

and negatives are on file at Bandelier and digital images are stored on two Bandelier servers (the U and Q drives).

| | Photographed | Not Photographed | Total |
|---|---|---|---|
| High Priority | 9 | 0 | 9 |
| Medium Priority | 31 | 3 | 34 |
| Low Priority | 201 | 45 | 246 |
| Unknown Priority | 16 | 15 | 29 |
| N/A | 25 | 10 | 35 |
| Totals | 282 | 73 | 355 |

**Table 2: Cavates photographed during the summer season in 2009.**

All high priority cavates were documented and nearly all medium priority cavates were as well. In all, 80% of the cavate structures were photographed. The quality of the photographs collected in the 2009 season need to be assessed, and the out-of-focus photographs and those with incorrect sign board information should be reshot at a future date. A list of completed cavate photography is in **Appendix O**.

## DATA MANAGEMENT

Stephen Merkel

*Introduction*

Data describing the architecture and conditions of the cavates at Tsankawi Mesa were collected on paper forms to be transferred later into a Microsoft Access database. The database allows all the information concerning each individual cavate, such as its treatment history, features, conditions, archival documentation and photograph status to be stored in one place, and also allows for the analysis of trends over a larger scale. Developing the database is an important goal of the VT program at Bandelier, and data entry is ongoing.

*Data Entry*

Archaeological documentation and conditions assessment forms must be entered manually into the database. This is a time consuming and tedious process. In addition to this, multiple users, all of whom may enter data differently, have created confusion and inconsistency, requiring the re-entry of a majority of the forms. To prevent this from happening again, the guidelines for data entry must be carefully followed.

The database, adapted for the cavates of Frijoles Canyon, requires a Group letter that stands in for its LA number. To conform to the structure of the database, each cavate requires a group letter, an LA number and a unique three-digit cavate number. In Frijoles Canyon the cavates are separated into 13 groups, labeled alphabetically from A-M, each one with a five or six digit LA number. At Tsankawi Mesa these group letters had to be created solely to fit the mold required by the database. Each LA number was given a T (for Tsankawi) and a group letter so that there would be no overlap with the letters of Frijoles Canyon.

| Group Letter | LA Number |
|---|---|
| TA | 128410 |
| TB | 65661 |
| TC | 65662 |
| TD | 65748 |
| TE | 65749 |
| TF | 65750 |
| TG | 65751 |
| TH | 65753 |
| TI | 65755 |
| TJ | 65756 |
| TK | 65757 |
| TL | 65758 |
| TM | 50976 |
| TN | 70955 |
| TO | 70957 |
| TP | 128408 |
| TQ | No # |
| TR | No # |

**Table 3: Group letters and LA numbers for Cavate Database**

Few cavate groups have more than one hundred cavates, but it is imperative that the cavate database ID has three-digits so that the record can be found in database searches and also to avoid duplicate entries with two variants of the same cavate number.

Often, any discrepancies between the archaeological documentation and the condition assessment form need to be sorted out before a cavate can be entered into the database. For example when two forms were filled out by different people, walls may be labeled with differing cardinal directions, or they may even represent two completely different cavates (which requires the consultation of photographs to clarify). Although rare, the misidentification of cavates in the field has been known to happen.

*Objectives*

The Tsankawi Mesa data entry is not yet complete, and it has been inhibited by the instability of the Microsoft Access database itself. This is an issue that must be resolved in the near future in order to meet the fundamental objectives of the data collection project.

Upon completion of the data entry, a study of cavate architecture and conditions that incorporates both Frijoles Canyon and the Tsankawi Mesa cavates can be undertaken. The data fields collected are similar to Toll but on a larger scale, and the analysis of the archaeological data may reveal significant patterns and differences in the cavate groups. For instance, the study of ceramic forms hints at functional differences within cavate groups.[3] Findings like this may be corroborated or expanded upon with the study of the variation of cavate architecture.

The compilation and analysis of cavate conditions is important for the informed management of the site. Drainage issues and visitor impacts will be readily apparent in each cavate and cavate group, and the large scale effects of various management strategies on the cultural resources may also come to light through data analysis.

[3] McKenna, 1995: 71.

## GRAFFITI MITIGATION

Stephen Merkel, Molly Ray, Lauren Meyer

Few cavates at Tsankawi Mesa retain their original applied earthen plasters and soot finishes. Of those that do, some have modern graffiti carved into or applied onto their interior walls and ceilings. The highest concentration of graffiti appears to be in cavates that are highly significant in terms of preserved finishes, embellishments and features, as well as those that are easily visible and accessible from the visitor trail. Graffiti is treated by infilling and inpainting incised areas with physically and visually compatible materials, primarily tuff-lime mortars, earthen plasters, and pigments. Besides concealing and discouraging graffiti, infilling also helps prevent additional disintegration and loss of the plaster and the tuff, which easily erodes once the surface has been broken. No binders (other than lime for the tuff/lime infill) are used with the natural and mineral pigments, and the clay, dirt and stone used for infilling was collected locally from the Tsankawi Mesa area. To help prevent further damage and vandalism, the Vanishing Treasures Program is mitigating some of the modern graffiti.



**Figure 2: Erin Tyson infilling graffiti in Cavate 009, LA 128410**

Generally, cavates are selected for graffiti mitigation if:

1. The cavate has high integrity and retains a high percentage of original architectural materials and features.
2. Significant amounts of graffiti are determined to be from the 20th or 21st centuries, due to imagery, word, and letter usage. Graffiti mars the intact original materials and impacts the archaeological significance of the cavate.
3. Graffiti mitigation measures would not only serve to restore the visual integrity of the plasters and walls, but would also help prevent additional erosion of the damaged areas.
4. The cavates are located near public trails or are frequently visited.

*Graffiti at Tsankawi Mesa*

The principal objective of graffiti mitigation is to obscure modern graffiti and therefore reduce the rate of its recurrence. The vast amount of graffiti at Tsankawi is in LA 50976 and has accumulated since Bob Powers' video documentation in 1986. Few instances of graffiti at Tsankawi Mesa have associated dates, or other diagnostic features, that indicate of exact age of the 20th/21st century of the graffiti. For this reason the age of the graffiti that is clearly 20th/21st century played little to no role in the treatment priority, which is mostly based on severity, treatability, and visibility to the public.

Based on the 2008 condition assessment, fifteen cavates showed significant damage due to graffiti. Cavates exhibiting graffiti were prioritized using the criteria identified above.

| | LA # | RM # | Cond. As. Priority | Severity of Graffiti | Finish Impacted | | | Treated |
|---|---|---|---|---|---|---|---|---|
| | | | | | Tuff | Plaster | Soot | |
| **1** | **LA 50976** | **66** | **High** | **High** | **2** | **6** | **1** | **X** |
| **2** | **LA 50976** | **64** | **High** | **High** | **1** | **1** | **3** | **X** |
| **3** | **LA 50976** | **59** | **High** | **High** | **6** | **4** | **1** | **X** |
| **4** | **LA 65751** | **9** | **High** | **High** | **2** | **2** | **8** | **X** |
| **5** | **LA 128410** | **9** | **Medium** | **Medium** | **1** | **5** | | **X** |
| **6** | **LA 50976** | **27** | **Medium** | **Medium** | **4** | **1** | | **X** |
| **7** | **LA 65751** | **10** | **Medium** | **Low** | **1** | **3** | | **X** |
| **8** | **LA 65755** | **18** | **High** | **Low** | **1** | **1** | | **X** |
| **9** | **LA 50976** | **55** | **Low** | **Low** | **3** | | **2** | **X** |
| **10** | **LA 50976** | **54** | **Low** | **Low** | | **1** | | **X** |
| **11** | **LA 50976** | **56** | **Low** | **Low** | **1** | | | **X** |
| 12 | LA 128410 | 2 | Medium | Low | 1 | | | |
| 13 | LA 65756 | 7 | Medium | Low | | | 1 | |
| 14 | LA 65661 | 4 | Medium | Low | 1 | | | |
| 15 | LA 128410 | 13 | Low | Low | 1 | | | |

**Table 4 List of cavates with graffiti compiled Spring 2009**

*Evaluation of Past Treatments*

Graffiti mitigation at Tsankawi Mesa was performed in 1998 and 2001 by the University of Pennsylvania and the Bandelier VT crew (see **Appendix J & K**). The earlier graffiti mitigation projects focused on

four of the highly significant cavates: RM 59, RM 64, and RM 66 in LA 50976 and RM 9 in LA 65751. The 2008 Condition Assessment identified all four cavates as high priority and the graffiti was retreated in 2009. Over the years the graffiti mitigation efforts of 1998 and 2001 have been found to be ineffective due to poor aging of the acrylic binders used for inpainting, in addition to the earlier guiding principle that fills should be readily visible as not to mislead visitors with respect to its authenticity. Previously treated graffiti was reevaluated based on the effectiveness of the treatment, and it was retreated if it was clearly visible.

The plaster infill material used in 1998 and 2001 was a combination of sediment from the mesa top, arroyo sand and cavate sediment, and despite expressed concerns for matching color and texture in their written reports, these fills poorly match the surrounding plaster by our current standards. Over the last eleven years the desired aesthetic for fills has evolved. We no longer use homogenous fills on heterogeneous surfaces. A great deal of labor is put into matching specific colors and textures that can vary within a single incised letter. This requires a diverse palette of clays, tuffs and pigments. No specific locations for sources were documented previously at Tsankawi, so before treatment could begin, materials were collected from several areas around Tsankawi Mesa and tested by forming sample blocks of plasters and tuff-lime mortars.

*Training and Production*

Training for seasonal employees included both theoretical and practical issues. Prior to conducting treatments, the seasonal VT staff met to discuss the graffiti mitigation strategy. A working document was produced which explained the criteria for treating graffiti (see **Appendix I**). The crew helped with scouting and testing of local sources of clays and tuffs. Examples of early graffiti mitigation treatments were examined in Group B (Frijoles Canyon) to discuss aging and effectiveness of treatments. The crew also visited Group J (Frijoles Canyon) for a hands-on training session with Larry Humetewa and Conor McMahon, conservators from the Museum of New Mexico. The seasonal training clearly defined the objectives of the graffiti mitigation program while informing the staff of the complex decisions that must be made before treatments are applied. Graffiti mitigation was conducted from June to September, 2009, by crew leaders Stephen Merkel and Erin Tyson, and archaeological technicians Molly Ray, Mae Colburn, and Michael Tomiak, with some contributions by Karim Hassanein, and Johnny Holdsworth.

*Graffiti Mitigation Materials and Sources*

At the beginning of the field season the crew collected several different types of clay, dirt, and tuff in the Tsankawi Mesa area.[4] Several types of clays and dirts for plaster fills were collected in order to identify soils of the same hue, saturation and texture as the wall surfaces in the cavates. A chart of the samples with Munsell numbers was created which identifies the relationship of color between each sample.[5] Most of the materials were collected in the second week of June. Samples were prepared and applied as thick coats onto cakes made of a gray lime-tuff mixture.[6] Project staff was then able to determine which materials were best suited for use, comparing color, texture and friability.

**1. "Gray Pumice"** (Figure 3; Source 1) *Munsell #: 7.5 YR (6/1) gray*
**2. "Gray Dirt"** (Figure 4; Source 2) *Munsell #: 10 YR (6/2) light brownish gray*
**3. "Gulch Clay"** (Figure 5 & 6; Source 3) *Munsell #: 10 YR (5/4) yellowish brown*
**4. "Red-Yellow Dirt"** (Figure 7 & 8; Source 4) *Munsell #: 10 YR (6/4) light yellowish brown*
**5. "Red Levigated Clay"** (Figure 9; Source 5) *Munsell #: 7.5 YR (7/4) pink*
**6. "Flesh Levigated Clay"** (Figure 10; Source 6) *Munsell#: 7.5 YR (8/4) pink*
**7. "Tan Levigated Clay"** (Figure 11; Source 7) *Munsell#: 10 YR (6/3) light brown*
**8. "Tan Tuff"** (Figure 12; Source 8) *Munsell #: 7.5 YR (8/2) very pale brown*
**9. "White Tuff"** (Figure 12; Source 8) *no sample available to determine Munsell number*
**10. "White Tuff 2"** (Figure 4; Source 2) *Munsell #: 2.5 Y (8/1) white*
**11. "Buff Tuff"** (Figure 13; Source 9)*Munsell #: 7.5 YR (7/3) pink*
**12. "Gray Tuff"** (Figure 3; Source 1) *Munsell #: 2.5 Y (7/1) light gray*
**13. "Red Tuff"** (Figure 9; Source 5) *Munsell #: 5 YR (6/8) reddish yellow*
**14. "Group A Tuff"** *Munsell #: 10 YR (6/2) light brownish gray*
**15. "Group M Tuff"** *Munsell #: 7.5 YR (7/2) pinkish gray*
**16. "Group M Tuff 1"** *Munsell#: 7.5 YR (7/3) pink*

By the end of the season, 16 materials had been collected for use in infilling. Most of these samples were used on a regular basis for treatments. The "White Tuff" and "Tan Tuff" were the materials most often used for mortar fills. The "Gray Tuff" and "Gray Pumice" were not used as often due to the fact that they

[4] See **Appendix H**, **Figures 1-13** for detailed locations

[5] See **Appendix H**, **Figure 14**

[6] See **Appendix H**, **Figure 15**

were not collected until late in the season. These were very helpful materials and have the potential to be used for mortar infill treatments in future field seasons. This type of medium gray color is rare and difficult to find within the deposits of Tuff at Bandelier. Additionally, the "Group M" and "Buff Tuff" were useful when a warmer color was needed. For the plaster fills, the "Tan Clay," "Gulch Clay" and especially the "Red-Yellow Dirt" proved to be the best base colors to which other clays could be added. The "Red" and "Flesh" clays as well as the "White Tuff" were also essential in modifying the mixtures to attain the desired saturation, value and hue.

The "Flesh", "Red", and "Tan" clays were originally components of dirt of heterogeneous grain size. In order to achieve a smoother texture, the dirt was levigated so that the finer clay and silt materials could be extracted. This was accomplished by suspending the fine grains in water and drying. A generous amount of water is poured onto the dirt (about three times as much water as dirt) and thoroughly mixed. The finer material is suspended in the liquid and the water was then poured into a separate container and left for three to four days to dry. When dry, the remaining clay was fine and powdery, ultimately better suited for our treatments. We used the levigated clay as a fill and as an in-painted slip over plaster fills.

The "Gray Dirt" [7] was collected later in the season during the week of July 13th. This material was mostly used for the small sanidine rocks found in it. We sieved the sanidine rocks from the "Gray Dirt" and used them in our mixtures to achieve a rougher texture. The insertion of these small rocks into plaster and mortar fills proved to be a very effective method of creating the proper texture.

The following materials proved to be the most useful samples collected from this season and should be considered for treatments in future field seasons: White Tuff; Gray Tuff; Red-Yellow Dirt; Red Levigated Clay; Flesh Levigated Clay; Tan Levigated Clay; and Gulch Clay.

We regularly used "White Tuff" mixed with the clay samples to create a plaster fill. This material was often essential in achieving the desired color for treatments. However, the Tuff created a gritty texture even when sieved. Perhaps in the future a mortar and pestle could be used to further grind the Tuff into a finer powder, making it more effective for plaster fills.

[7] What is now known as "Gray Dirt" was first mislabeled as "Gray Tuff." The error was corrected in the graphic documentation and notes. "Gray Tuff" only refers to tuff that is a gray color and "Gray Dirt" refers to the sand found in a wash near LA 50976 that is mostly quartz, feldspar and pumice grains.

*Graffiti Mitigation Methods and Techniques*

Prior to treatment, each instance of graffiti was photographed with a digital camera. Areas affected by graffiti were mapped on acetate sleeves by tracing over the printed photographs. Once the graffiti was fully documented, conservators discussed the extent of treatment and selected appropriate materials and methods. Incised plaster was filled with clays and dirt collected from the Tsankawi area. Deep gouges in tuff were filled with a mixture of ground tuff and hydrated hydraulic lime. Since the original plasters and the tuff substrate vary in color and texture in each cavate, a range of different earthen fill materials were used.

A new approach to plaster fills was implemented this season. In previous seasons at Tsankawi, a mixture was created that moderately matched the surrounding materials and was applied to numerous cavates. In 2009, unique mixtures of fill materials were created for individual pieces of graffiti in order to disguise the graffiti incisions. This required additional labor to develop and modify complex mixtures that would match specific instances of graffiti. The crew developed their skills throughout the season and learned various techniques to improve the results of tests.

For the most part, the application method for earthen plaster fills remained the same throughout the season. The dry materials were measured[8] and mixed together with just enough water to be cohesive. The treatment area was lightly wetted, and an inconspicuous spot was filled first as a test for staining and color matching. When dry, the test fill was evaluated to decide whether its appearance was appropriate. The infill material was then applied to the incised graffiti by hand or with a small spatula, and was firmly pressed into the void. Generally, the void was filled flush with the surrounding surface and modified as needed.

Where additional color matching or inpainting was needed, dry pigments, crushed charcoal, or fine soil collected from the cavate floor were blown onto the fills or mixed with water and applied with brushes.

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[8] Smaller measuring devices could be purchased for future field seasons. This season, we developed new techniques for plaster fills which involved creating mixtures with multiple clay samples. We estimated the ratio of each part of the samples using micro-spatulas. While this proved to be effective, more accurate measurements could be taken for future treatments. The volume of our plaster mixtures was very small in comparison to the mortar fills; therefore a small measuring device would be more useful. Miniature measuring spoons can be ordered from NORPO, or other kitchen utensil suppliers.

Pigments used in the 2009 season included Ivory Black, Vine Black, Burnt Umber, Burnt Sienna, Yellow Ochre, Raw Sienna, and Van Dyke Brown. In some cases, a slip made from soil, clay, water, and dry pigment was applied to the surface of the fill to tone the repair. The "Vine Black" pigment should be avoided as it has a bluish tint when dry. We used this pigment to treat graffiti in Cavate 09 from LA 65751 but did not use it again for the rest of the season. Instead, "Ivory Black" was used.

Our methods of application were consistent for most of our treatments; however, we developed several techniques for "rock insertion" later in the season. While working in Cavate 27 during the week of July 13th we sieved out the sand, rich in sanidine crystals, from the Gray Dirt and inserted the coarse sand and crystals into mortar mixtures. We also applied the rocks directly onto a mortar mixture using fingers and micro-spatulas. We continued to use the sanidine crystals in several other cavates for both mortar and plaster fills to match the texture of the surrounding materials.

In Cavate 55, LA 50976, water from the infill mixture mobilized soluble compounds in the soot or from the surrounding rock, causing a yellow stain on the surface. To prevent further staining in areas where staining was likely to occur, Cyclododecane, a wax-like cyclic hydrocarbon solid, was applied as a barrier layer to the rock and plaster around the treatment area. When applied as a liquid to the surface, Cyclododecane blocks the migration of soluble compounds from reaching the surface, preventing a stain. The Cyclododecane sublimates (passes from a solid to a vapor state) in one to seven days depending on thickness of application and ambient temperature and relative humidity. No trace of Cyclododecane residue or staining was visible following treatment. Cyclododecane was used for treatments applied to one piece of graffiti in cavate 18 from LA 65755.

Once completed, all treatments were recorded graphically on acetate sleeves. Written descriptions of the graffiti mitigation methods and materials used for each piece of graffiti are included in **Appendix G**. The descriptions are also entered into the Access database.

It should also be noted that field records were not consistent at first, but improved over time. Cavates 09 and 10 in LA 65751 were especially lacking in field notes. These were the first two cavates that were treated and where seasonal training was conducted. There were also several conservators simultaneously working on single instances of graffiti. Therefore, the notes were scattered and multiple methods of application were implemented. Once the crew split up into smaller groups, work was done individually and the notes and methods became more consistent and detailed.

It is recommended that in future seasons, field notes should be emphasized with detailed instructions and examples provided during seasonal training. It was also observed that confusion can arise when multiple conservators are working on a single piece of graffiti. In this case, the conservators should remember to write their notes onto the acetate sleeves as well as field note books and regularly communicate with the other crew members conducting treatments. Alternatively, a graffiti treatment form could be developed.

## FLOOR MAPPING AND BACKFILLING, LA 50976

Stephen Merkel

The preservation of cavate floor plaster and features varies significantly. While some are buried and others are worn away, many have excellent preservation of unique floor features. A number of original floors in LA 50976 are in a precarious situation and are adversely being impacted by visitation. Exposed cavate floors with irreplaceable features are open to the public, and there is evidence that the floors are being vandalized and are constantly damaged by foot traffic. An instance of damage was documented by Toll in the winter of 1986 when a wooden loom anchor was broken, perhaps unknowingly, by a visitor exploring Cavate 59 in LA 50976.[9] More recently a loom anchor in the same cavate was vandalized being pulled from the floor socket. Toll was concerned about the low fill levels of the cavates of LA 50976 due to their preserved floor features and high visitation. He recommended that the floors be documented and covered with protective fill so that loom anchor loops and floor plaster are no longer exposed to foot traffic.




**Figure 3: Vandalized loom anchor loop removed from the floor of Cavate 059, LA 50976, 2009**

An important facet of the 2009 field season at Tsankawi was the detailed mapping and photography of floor features in some of the most heavily visited cavates in order to record the condition of archaeological features. After documentation, a layer of protective fill was added to cover the floors. A number of floors were identified in the condition assessment performed in 2008. Cavates 059 and 064 in LA 50976 were cleared, mapped and had fill added because they were determined to be at highest risk due to frequent visitation, extremely low fill level, and a high number of intact and sensitive floor features. The floor maps, descriptions and analysis of floor features can be found in **Appendices L & M**.

[9] Toll, 1995: 148.

*Methodology for Clearing, Mapping and Backfilling*

The floor mapping project started on June 24th with the brushing off of the floor of Cavate 59. The floor fill, composed of fine sediment and organic materials, was put into buckets by Stephen Merkel and Ashley Crossen. Soft hand brushes were used and care was taken not to abrade the tuff or damage the floor plaster. Only windblown sediment was brushed, and no subterranean features were brushed out or excavated. Respirators were worn to protect the two excavators from dust and possible airborne diseases. About 8 full five-gallon buckets of fill were removed from the floor and temporarily stored in nearby cavate 56.

The mapping of the floor of Cavate 59 was undertaken by Mae Colburn and Johnny Holdsworth. The map was drawn to scale on a 22" x 22" sheet of metric graph paper. Two tape measures were laid down with a compass and crossed the center of the cavate marking the cardinal directions. Masking tape was used to mark the locations of the tapes so that they could be replaced in the same exact location for the duration of the project. Floor features were mapped from the axis using smaller tape measures. Depressions, plaster, loom anchors, ceiling features and other unusual features were identified and included. Features on the ceiling such as indeterminate drilled holes and deep holes thought to be loom support sockets were mapped on a trace sheet using a plumb-bob to show their relationship to floor features. Due to the variation in the topography of the floor and the imprecision of using tape measures, there is a slight error of up to 5cm.



**Figure 4: William Goumas, Michael Tomiak, and Johnny Holdsworth hauling**

Narrative descriptions of floor and ceiling features were written, and the floor was photographed both digitally and with film. Detail photographs were taken for significant floor features. The photo points are marked on the map as are the descriptions.

After documentation, the first backfilling effort was organized on July 15th. Sterile crushed tuff from the excavation of bedrock from under the entrance road was used for fill. The crushed rock was sieved with ¼" screens beforehand and allowed to dry in the sun in the maintenance area. About three-quarters of a

yard of dry dirt were transported to the Tsankawi Unit. By midmorning the buckets were fitted to pack-frames with rubber bungee cords and soft packs were filled with dirt and carried to Cavate 59 in LA 50976. The original sediment from the floor was put back in and we placed a layer of geo-textile down to separate the original fill from the sterile fill. A light-weight geotextile (Typar 3401) that is breathable and water resistant was used between the different fills for several reasons: it better protects the floor by dispersing weight, it prevents water from seeping through the fill, it prevents visitors from digging, and it makes uncovering the floor easier by allowing it to be pulled up. In hindsight, this did not work as planned. Within weeks visitors began pulling up the geotextile, which eventually had to be removed from the cavate.

During the heat of the day the crew of VT staff and volunteers were only able to carry one to two loads of fill from the staging area by the parking lot to LA 50976. In all about twenty loads were carried out to the cavate in a single day, which is a little under half a yard. The last quarter yard was carried by the field crew gradually over the following two weeks.

The floor map of Cavate 64 in LA 50976 was started during the week of July 20th. Wearing respirators, M. Ray, E. Tyson, M. Colburn and M. Tomiak cleared the floor of sediment depositing the fill in nearby cavate 63.[10] A grid was set up using a compass to align the tape measures. Features were mapped using two tape measures at right angles to the axis. E. Tyson, M. Tomiak, M. Ray and M. Colburn all worked on the map. The map was completed by August 4th, following the conventions of the previous map. The accuracy of this map is likely to be higher than that of the previous map as the measuring techniques became more refined and individuals involved gained experience. On August 4th and 5th features were photographed individually and descriptions were written for a majority of the features.

As a precautionary measure, after documentation the original fill was placed back over the floor. The original fill did not completely cover the sensitive areas so a small amount of fill from nearby Cavate 65 was added.[11] The cavate was closed to the public until the floor was covered with protective fill on August 15th. The second backfilling effort was better organized than the first, and the screened fill was

[10] Note: Cavate 63 is a sheltered cavate with poor preservation. The interior of the cavate is entirely worn of finishes and the floor was bare.

[11] Note: The fill from Cavate 65 was used because it was felt that there was no danger of impacting archaeological deposits. The cavate was half submerged in alluvium that entered the cavate through cracks in the ceiling and walls. The fine silt was sterile of artifacts, though contained rodent burrows. Only the first ten centimeters were used.

staged at Tsankawi a few days before allowing for an early start. A total of 30 loads of fill were transported to LA 50976. Most was deposited in Cavate 64, but some went to Cavate 59. About two-thirds of a yard of dirt was moved into the cavates.

The fill level in both cavates was increased by 1.5" to 2", and there are no longer any exposed areas on the floors. It was originally planned that 3" of fill would be added, requiring 2 yards of dirt to be sifted and moved, but we quickly realized our limitations. More may be added in the future, but as it stands now, all sensitive areas of the floor are protected by a significant layer of fill.

*Recommendation for Future Work*

Two more cavates in LA 50976, Cavate 66 and Cavate 27, were also determined to be high priority for documentation and backfilling because of their high traffic, low fill levels and evidence of loom features. However, they are less of a priority because preliminary investigation did not reveal intact fragile floor features. These high traffic floors should still be mapped in the future to document the condition of the floor plaster and to provide a comparison for the floor features of other cavates. In addition, Cavate 66 may yield some significant cultural information because it appears to have a unique construction sequence that may be visible in the floor.

On North Mesa, Cavate 15 in LA 65743 has an exposed floor with peculiar and unique floor features. It is called "Moccasin Cave" because there are several depressions in the floor in the shape of footprints. There are a number of other pits and grooves that may be better understood through mapping. There is little fill or windblown sediment on the floor and no remnants of plaster. It is recommended that the floor be documented and possibly backfilled.

## INFILL TREATMENT IN CAVATE 50, LA 50976

Shannon Dennison

*Introduction*

Cavate 50, located in the lower tier of LA50976, is a rectangular medium priority cavate exhibiting a moderate level of preservation. Interior features consist of a heavily sooted ceiling, eroded wall plaster, a large intact wall niche, two entrances on the east wall, and several small holes and vents. The cavate is flanked by large geologic cracks in the cliff that channel moisture into the north and south interior walls. This has resulted in granular deterioration on the north wall, causing plaster loss and increased friability of the tuff adjacent to the crack. The structural crack bisects the end of the south wall, creating an arched opening that allows water and sediment to flow over the interior wall surface. The crack existed during the period of occupation, and ongoing patching efforts are evidenced by remnants of ancient mortar inside the crack. The length and shape of the north crack precludes effective treatment, and since the north interior wall has already lost a great deal of architectural material, it was not treated. The shape of the south crack is conducive to treatment and was infilled from the interior and exterior to divert drainage away from the cavate.

*Infill Treatment, South Wall Interior*

Prior to treatment, the interior surface of the crack was sprayed with 5% v/v El Rey acrylic emulsion in water, taking care to avoid over-spraying the ancient mortar remnants. Multiple (<10) built-up layers of acrylic emulsion were required to achieve sufficient surface hardening, representing a higher than normal number of applications due to the extremely soft nature of the tuff substrate. A relatively soft fill mixture was selected to achieve maximum compatibility with the soft tuff. Several test samples were evaluated for color and texture matching, and the final mix consisted of 3 parts soil to 1 part lime. The sediment was collected from alluvial deposits and decomposed tuff below the cavate, and consisted of 50% dark brown sediment and 50% lighter grey decomposed tuff. The 50/50 soil mixture was passed through a 1/8" sieve to remove large rocks and debris. The resulting mixture had too many fine particles and was subsequently sieved through a 1/16" screen to create a sandier mix.

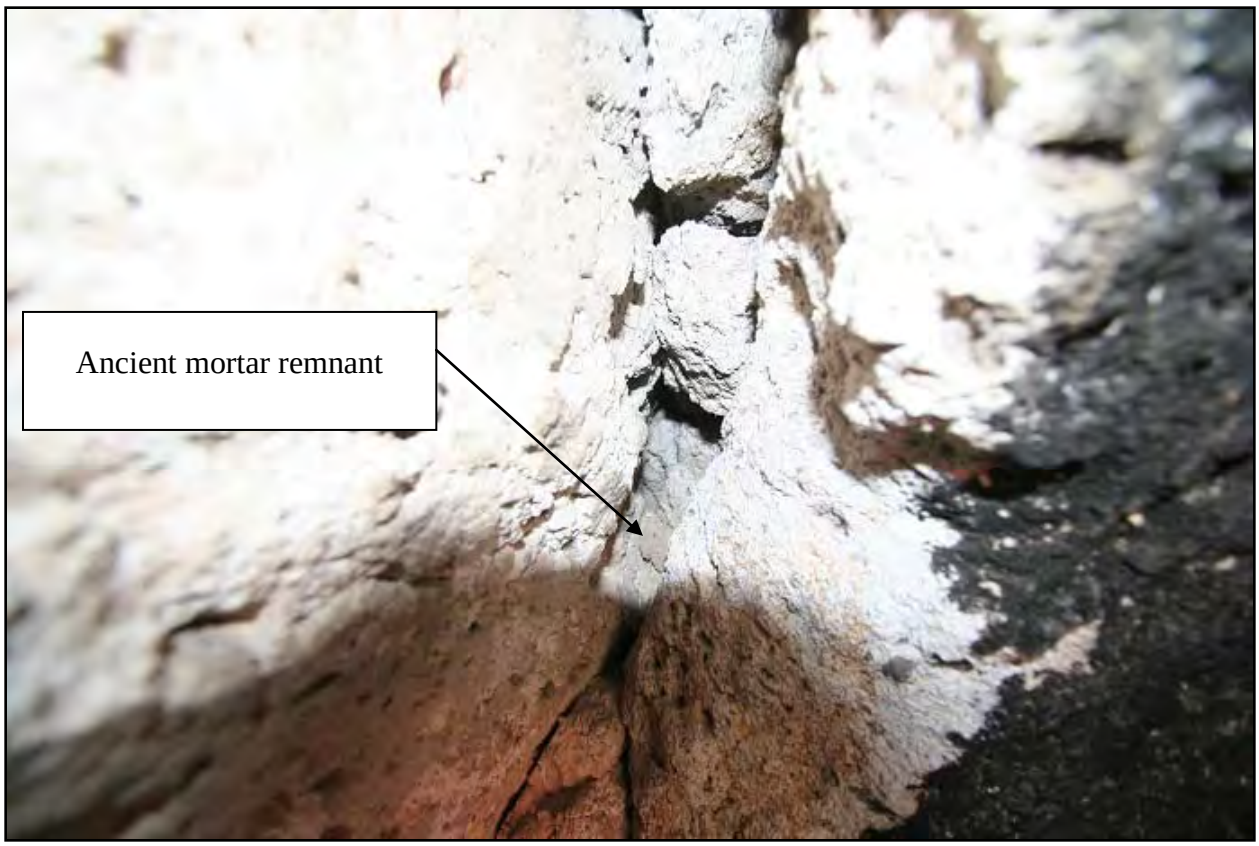



**Figure 5: LA50976, Cavate 050 crack detail, before treatment**

Immediately prior to application of the fill material, the interior surface of the crack was sprayed with water and acrylic emulsion, and the fill mortar was then applied by hand. A particularly large void in the crack was filled with two chunks of wetted tuff collected from wall-collapse on the north end of the cavate.[12] The fill layer was recessed behind the wall surface in order to conceal the treatment.

*Infill Treatment, South Wall Exterior*

Two sections of the south exterior crack were filled to prevent further moisture ingress. A harder fill was chosen for increased durability and to match the strength of the case-hardened surface of the surrounding exterior tuff. Because the exterior surface was sufficiently stable, it was not sprayed with acrylic emulsion. Several test samples were evaluated for color and texture matching, and the final mix consisted of 2 parts dark brown alluvial sediment collected below the cavate to 1 part lime. The soil was passed through a 1/8" screen to remove large rocks and debris.

[12] Note: The tuff did not exhibit cultural features such as plaster or soot.



**Figure 6: LA50976, Cavate 050, exterior crack infill**

The resulting fill mixture was applied in two layers and textured to resemble the surrounding tuff. To camouflage the treatment, the surface of the fill was painted with pigments to mimic the heavily lichen-covered stone. Natural pigments in unlabeled jars (probably raw sienna, burnt sienna, burnt umber, and ivory black) were mixed with hydrated hydraulic lime in a ratio of approximately 3 parts pigment to 1 part lime for increased durability. The pigment/lime mixture was wetted and applied by hand with a natural bristle brush in a stippled pattern to resemble lichen. The application of pigment in this manner is intended to be an interim treatment designed to conceal the underlying fill, and it may or may not last long enough to allow the treatment to weather-in naturally. This treatment should be monitored as a test area to determine the longevity of surface-applied pigment mixed with lime.



**Figure 7: LA50976, Cavate 050, inpainting exterior crack**

*East Wall Drainage Modification*

Adjacent to the southernmost cavate entrance is a small vent hole on the floor level. The vent is located directly underneath the south exterior crack, which channels water and sediment through the vent and into the cavate. The treatment objective was to divert the water while maintaining the integrity of the vent as a cultural feature, which included the transmission of light into the cavate interior. This was achieved by clearing the accumulated sediment from the base of the vent, applying a very hard 1:1 soil to lime mortar base (using the same soil as the exterior crack infill), and setting in a stone collected from the talus slope below the cavate. The selected stone was semi-triangular in shape, covered in lichen for durability and visual compatibility, and did not fully block the vent opening. Once the bedding mortar was dry, the stone was backfilled so that only the uppermost portion showed. The stone created a diversion sufficiently high to redirect water, but small enough to maintain the physical integrity of the vent.



**Figure 8: LA50976, Cavate 050 interior, vent before treatment**




**Figure 9: LA50976, Cavate 050 interior, south wall before treatment**



**Figure 10: LA50976, Cavate 050 exterior, before treatment**

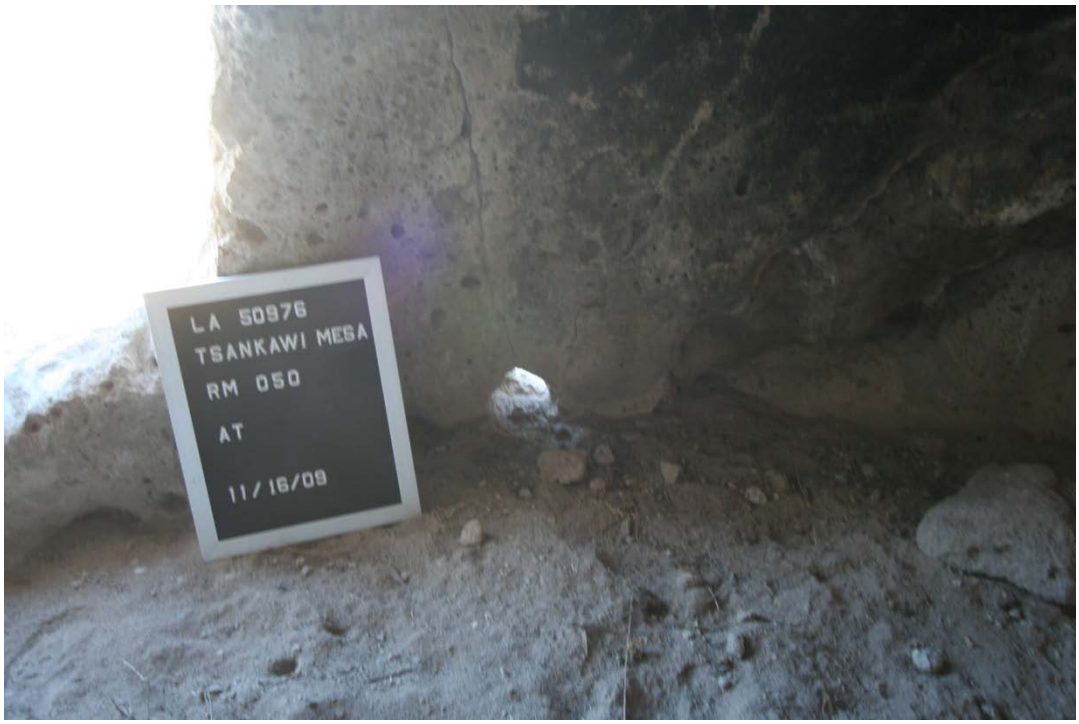



**Figure 11: LA50976, Cavate 050 interior, after treatment**




**Figure 12: LA 50976, Cavate 050 exterior and interior, after treatment**

## DRAINAGE CONTROL FOR CAVATE 13, LA 65755

Stephen Merkel and Shannon Dennison

Like many of the cavates at Tsankawi Mesa, LA65755, Cavate 013, is located mid-slope, placing the cavate in the middle of the mesa's drainage pattern. Lister identified a problem back in 1939, and he built a small dam in the entrance, which is still visible today. The dam has failed due to years of debris accumulation and erosion in and around the doorway of Cavate 013 and a channel has formed that directs water through the cavate door. During heavy rain events water flows through Cavate 013 and into room 14, leaving visible "tide lines" on the lower walls of room 14 and causing considerable damage to wall plaster exposed to such high moisture levels.



**Figure 13: LA 65755, Cavate 013 before treatment**

To prevent water from flowing into the cavates, three measures were taken. Vegetation to the right of the doorway was removed in order to regrade the slope. The fill out side of the cavate was graded as to keep water from flowing near the entrance of the cavate. Buried stones were left undisturbed and water was channeled away from them. The final modification was the addition of a slab that partially covered the exterior of the doorway and was mortared into place with 5:1 soil cement. Water flow tests were performed shortly after treatment to insure positive water flow away from the entrance. As of Fall 2010, the drainage modifications are still effective.




**Figure 14: Cavate 13 before treatment**



**Figure 15: Cavate 13, LA 65755 showing water flow**



**Figure 16: Cavate 14, LA 65755 showing water flow coming from Cavate 13**



**Figure 17: Cavate 15, LA 65755, showing water flow originating in Cavate 13, flowing through Cavate 14.**




**Figure 18: Cavate 13 after treatment**

## CAVATE CLOSURE, CAVATE 16, LA 65755

Shannon Dennison and Stephen Merkel

*Introduction*

During the course of routine condition assessments at Tsankawi Mesa, the Vanishing Treasures crew found cavate LA65755 room 16 to be in unstable condition. Although in varying states of deterioration, most cavates at Tsankawi are sufficiently stable to accommodate public access without excessive risk. LA65755 Cavate 016, however, exhibits signs of active ceiling collapse, posing a safety risk to individuals entering the cavate. It is apparent that much of the ceiling has collapsed since the cavate was last photographed in 1939 (see **Figure 20**), and this process is ongoing. The hazardous interior environment is evidenced by an unstable boulder situated precariously above the entrance and multiple large boulders strewn across the floor. Despite the obvious signs of ongoing collapse, the worn surface of fallen interior roof debris is clear evidence that visitors enter the cavate with some regularity.



**Figure 19: Cavate 16, LA 65755, precarious boulder situated above entrance.**

*Consultation and Plan of Action*

On November 10th, 2009 safety concerns were discussed at the site of Cavate 16, LA 65755 at Tsankawi. The meeting with representatives from the Park Service and Brian Montoya, cultural resource advisor to San Ildefonso, was held to inspect the situation first-hand and to come to a consensus on what should be done to mitigate the hazard to visitors. A number of issues were considered. Whatever the solution:

- it must not incite curiosity or attract visitors to the site
- it should not be visually distracting from a distance
- it should have as little impact on the archaeological features or bedrock as possible
- must not hinder exiting the cavate in emergency
- it must state that there is a dangerous condition and a fine for non-compliance on any signage
- any signs must be secure

All participants agreed that the situation at Cavate 16 was unsafe for employees and the public. Closure of the cavate was recommended. Several ideas were put forth about the construction of physical barriers such as masonry, loose stone or railings. Past experiences with masonry enclosures at Tsankawi showed that they only incite curiosity, give visitors false impressions, and are generally ineffective at keeping visitors out. Installing bars over the openings was suggested as an alternative, but this was also rejected, as it would negatively impact the archaeological integrity of the cavate openings. A railing around the cavate, no matter how well camouflaged, would be distracting and would attract visitor attention.

In the end, it was decided that signs would be bolted to large boulders on the interior of the cavate that are visible from both entrances warning visitors of the hazardous conditions within and that a fine will be incurred by anyone caught disturbing or entering the cavate. The signs should be made out of a durable material that is bolted to the large collapsed slabs of ceiling. In addition to this, a large boulder should be moved to partially cover the southeast entrance in order to prevent adults from possibly dislodging a precariously situated boulder over this entrance. It was proposed that after these measures are in place, in the spring, once visitation increases, someone should observe the behavior of visitors in this area and judge the effectiveness of these deterrents.

*Implementation*

During the winter of 2009-2010 this plan was implemented. In order to reduce the level of risk to the public, the cavate was closed by order of the Superintendent. Two small and unobtrusive but clearly visible signs were mounted to fallen ceiling debris to warn visitors of the danger and unlawful nature of entering the cavate. Previous attempts to install physical barriers in the form of masonry enclosure walls at Tsankawi Mesa have resulted in destruction of the barrier by individuals' intent on gaining access, probably believing the interior to retain archaeological material of special significance. Rather than

deterring access, the installation of an enclosure wall may invite vandalism, which in turn, could trigger further ceiling collapse. By leaving the cavate and its entrances open, visitors will still be able to look into the cavate, and adverse impacts to archaeological material will be avoided.



**Figure 20: Cavate 16, LA 65755, after treatment, Lister 1939**



**Figure 21: Cavate 16, LA 65755, condition in 2009**

## TRAIL MAINTENANCE IN LA 65755 / 65756

Stephen Merkel

*Introduction*

In 1999, a number of trail sections at Tsankawi Mesa were fitted with a sacrificial layer of stone and gravel to protect the bedrock from further damage by foot-traffic.[13] After ten years of wear many of the stone and gravel fills are still in place, with the exception of one particularly steep section of trail where the stones have come loose. Although there is an alternative route around the degraded section of trail, it does pose a safety concern.

*Treatment Recommendation*

A considerable amount of planning and labor will be necessary to repair this section of trail. A quick attempt to reset the loose stones failed within a week of visitor use and exposure to weather. A foundation must be prepared at the base of the slope, the stones specifically shaped to fit the shape of the channel which they are to be placed, and the stones then stacked so that those above hold the those below in place.




**Figure 22: Trail between LA 65755/65756 before treatment, during treatment and after treatment. This treatment was temporary and did not last long. This section of trail needs special attention for long-term stability.**

[13] S. Provencher, *Tsankawi Project Completion Report* (Santa Fe: Intermountain Support Office, National Park Service, 1998), and Matero, et al., 1998.

## MAPPING AND LASER-SCANNING OF LA 50976

Lauren Meyer and Stephen Merkel

*GIS Mapping of the Tsankawi Unit*

Through a contract awarded to 4G / Western Mapping Company of Tucson, Arizona, the cavate pueblos of Tsankawi Mesa, as well as all associated archaeological and architectural features were mapped through photogrammetry and GPS. Aerial photographs were taken for the entirety of Tsankawi Mesa in November of 2007, and processing of these photographs and map production were completed in 2009. These products will allow Bandelier staff to more accurately locate cavate sites, as will they serve as a base layer to a Geographic Information System into which all architectural and condition assessment information will be entered. A system such as this will facilitate monitoring of site conditions and conservation of resources around Tsankawi Mesa.

*Laser Scanning of LA 50976*

Additionally, one cavate group, LA 50976, was recorded and mapped through laser scanning. Laser scanning was selected for the documentation of the cavates and associated features of LA 50976 because it will produce more accurate topographic representations of the area, as well as highly accurate documentation of its fragile cavate resources. LA 50976 includes the most significant and intact of the cavate structures and related features found within the Tsankawi Unit.

LA 50976 is a complicated group at the landscape level, and previous mapping campaigns have failed to produce materials that capture all available information or accurately depict the group in profile view. The goals of this project are to:

- Develop an alternative methodology for mapping cavate architecture in the park;
- Document, in detail, the cavates and all associated features in LA 50976, one of the most significant cavate groups in the park and one which is highly visited by the public; and
- Produce field maps and GIS data that will be useful in future management, including detailed monitoring, documentation, and conservation of the cavate pueblos at Tsankawi Mesa.

Mapping of the cavate groups at Bandelier National Monument is complicated because of their three-dimensional nature. They exist on a vertical plane, and they are wholly or partially integrated into the natural landscape and, as a result, maps are often unreliable. Until now, maps have been generated by hand and are often lacking details that allow for ease of use. In addition, it has been impossible to integrate maps depicting individual cavate units into the larger base maps of the park because they are not tied to geographic locations, nor are they contextualized. The primary goal of this project is to develop a standard methodology for mapping cavate resources that would allow for easy identification and location of these resources, and would tie into the larger mapping products that are being generated for the park.

*Products*

The products of the LA 50976 laser scan were received in September 2010:

- Topographic plan views of the cavates, trails and terrain
- Unfolded profile view of the cliff-face with cultural features overlaid on the 3D model frame
- Low resolution interactive 3D model

The incomplete nature of the maps is due to time constraints during field work. Gaps where trees blocked the scanner could not be filled, and the terrain restricts the view so that not all the cavates could be scanned in the time allotted. The preliminary maps were ground-truthed and cavate numbers were added. All cavates within view of the laser-scanner have been outlined on the map and are numbered. Cavate representations that did not provide enough geographical information to accurately depict were omitted. The maps, despite being incomplete, are more user-friendly, particularly in the complex cavate groups, than the hand-drawn maps. This mapping tool may be utilized more extensively in the future. All data from the laser scanning will be integrated into the Tsankawi photogrammetric map which was completed in 2009. The products are on file in the VT field office.

## PROJECT CONCLUSIONS

Stephen Merkel

*Summary of Recommendations for Future Treatments and Research*

This project accomplished almost all of the goals identified at its beginning. However, due to lack of time and staff, there are a number of areas that did not receive the attention they require. The following is a summary of the recommendations for future work at Tsankawi Mesa.

- Drainage control of cavate 21, LA 65755: This high priority cavate is in dire need of intervention. It appears that this cavate regularly floods with several inches of standing water. The moisture greatly impacts the multi-layered wall plasters and the imagery they contain. A dam needs to be constructed at the entrance to prevent water from flowing into the cavate. This treatment should be done as soon as possible to prevent further loss of plaster.
- Repoint the masonry enclosure at Cavate 20, LA 50976: The enclosure wall, constructed in 1999 over the entrance of Cavate 20, may become unstable in the next few years if the mortar is not replaced. The mortar is washed out particularly at the base of the wall and around the edges of where the masonry meets the cliff. This wall section is narrow, perhaps up to a meter wide, and about three meters tall. The job will require 10-15 gallons of mortar to complete.
- Floor clearing, mapping and backfilling of Cavates 27, 66, and 15, LA 50976: Each of these cavates is likely to have complex floor features that are being heavily impacted by visitation. There is little protecting the floors which have either shallow wind-blown sediment or are exposed. Steps should be taken to document and preserve the floors of these often visited cavates.
- Finish cavate documentation: Only 316 of the 355 cavates at Tsankawi Mesa received full documentation. 20 are partially complete and 19 need both condition assessment and archaeological documentation. Of the 39 incomplete cavate records, 34 cavates only need archaeological documentation forms to be completed, and 28 cavates still need condition assessments. Many of these are low priority or questionable cavates that are either collapsed or obscured by erosion or vegetation and have been missed in past surveys.
- Finish the cavate photography: Approximately 80% of the cavates at Tsankawi Mesa have been photographed. All high priority cavates have been photographed, but a few medium and many low priority and un-assessed cavates need to be shot. A list of these cavates is in **Appendix O**.
- Lister stabilized 120 of the 181 cavates he identified at Tsankawi Mesa. In some instances dams and other drainage modifications can still be found, but certainly some have failed or have been

dislodged. The scale of his map and generic nature of his descriptions make it difficult to be sure which specific cavate he is referring to. An attempt was made to reconcile his list of cavates with the 2009 list (see **Appendix C**), but this may not be completely accurate, particularly between LA 65751 through LA 65748. LA 50976 should be accurate because Lister made a detailed map of the area. More work could be done to ground-truth the treatments Lister implemented and to make sure the concordance list is accurate.

- The closure of Cavate 16, LA 65755: The closure has been implemented and it should be monitored every year to check that the closure signs are there and to look for signs of access.

*Conclusion*

It was determined early on that the focus of work at Tsankawi Mesa would be to mitigate the impacts of visitation. Unrestricted access to the fragile resources has taken its toll. The Tsankawi Mesa Cavate Conservation Project was successful in concealing more than 90% of the graffiti in the cavates, introducing protective fill over two of the most sensitive floors, modification of the drainage in two cavates, thereby increasing the lifespan of the original surfaces and features, and closed a dangerous cavate in the midst of collapse. The trail infill treatments done in 1999 have performed excellently, but in some areas there are signs of failure. The next project at Tsankawi Mesa will be to re-evaluate the trail system, repair damaged trail infills and add protective fill to trails in need.

Maintenance of the site is an ongoing process, and many of the cavates treated in this season will need to be revisited in the next five to ten years.

# Appendix A:

# Working Photos




Graffiti mitigation in RM 059, LA 50976, with Erin Tyson and Molly Ray



Floor mapping in RM 059, LA 50976, with Johnny Holdsworth and Mae Colburn



Cavate photography with Moe Nadel



Archaeological documentation and conditions assessment of RM 003, LA 65686, with Lauren Meyer and Stephen Merkel




Backfilling of RMs 059 and 064, LA 50976



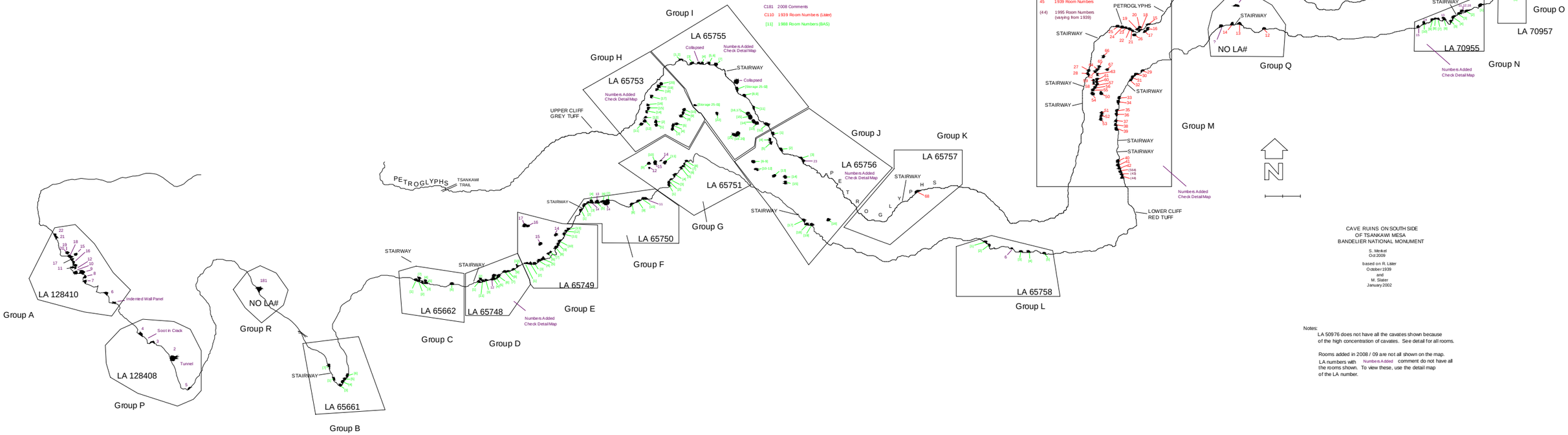
Photo montage by Molly Ray

# Appendix B:

# Maps of Tsankawi Mesa Cavate Groups, 2009

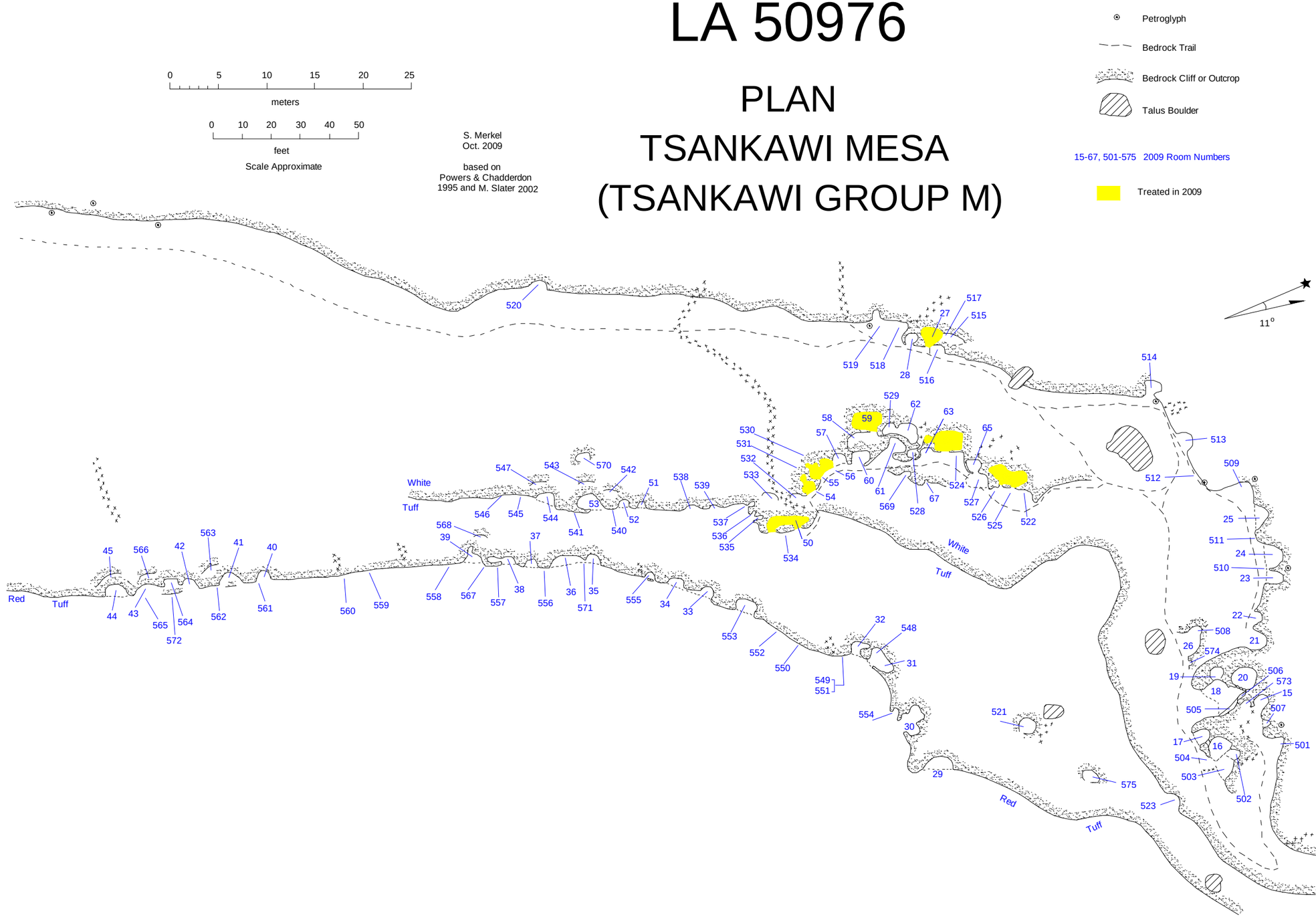
# TSANKAWI MESA: SOUTH END

## (NUMBERS USED IN 2009)



# LA 50976

## PLAN
## TSANKAWI MESA
## (TSANKAWI GROUP M)



# LA 65661
# PLAN
## TSANKAWI MESA
## (TSANKAWI GROUP B)

S. Merkel
Oct. 2009

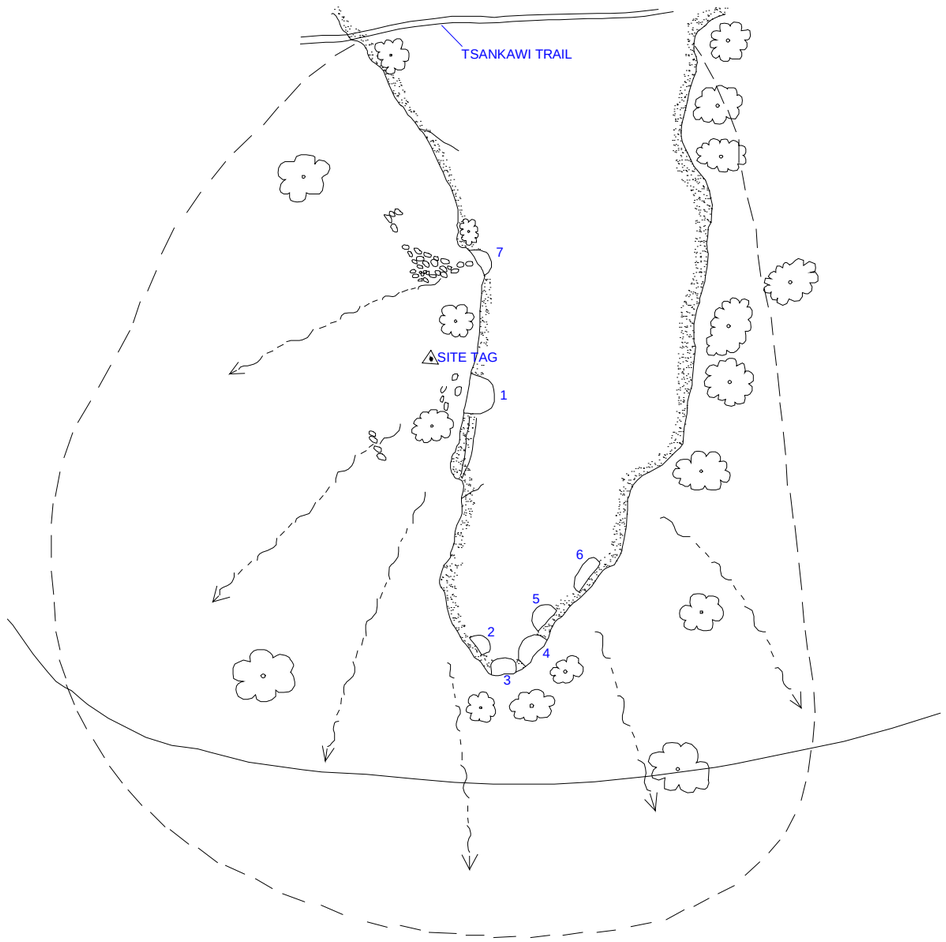
based on
T. Chadderdon
August 1988
M. Slater
February 2002

TN

0 2 4 6 8 10 M

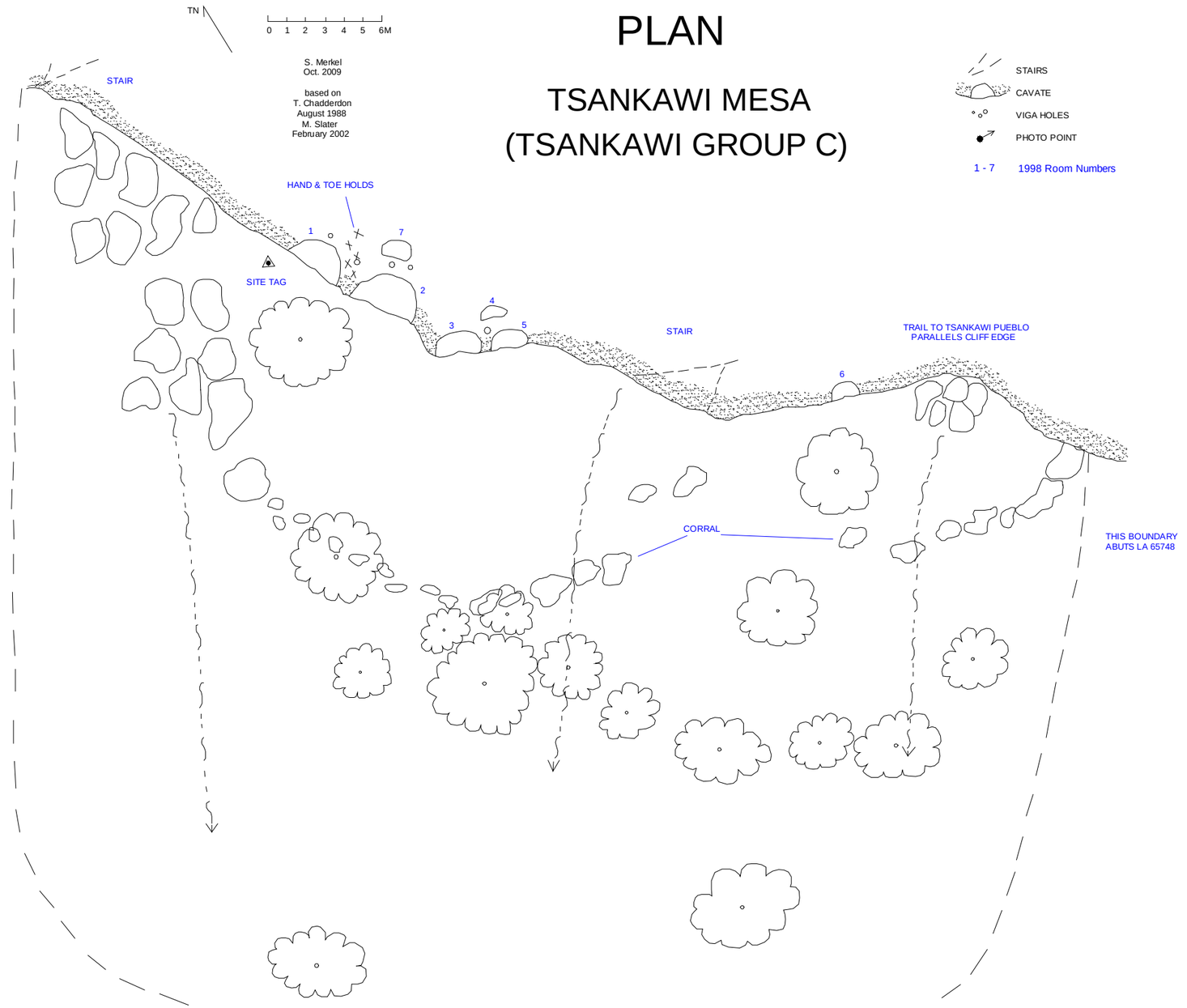
TREE
CAVATE
CONSTRUCTION RUBBLE
PHOTO POINT

1 - 7 2009 Room Numbers



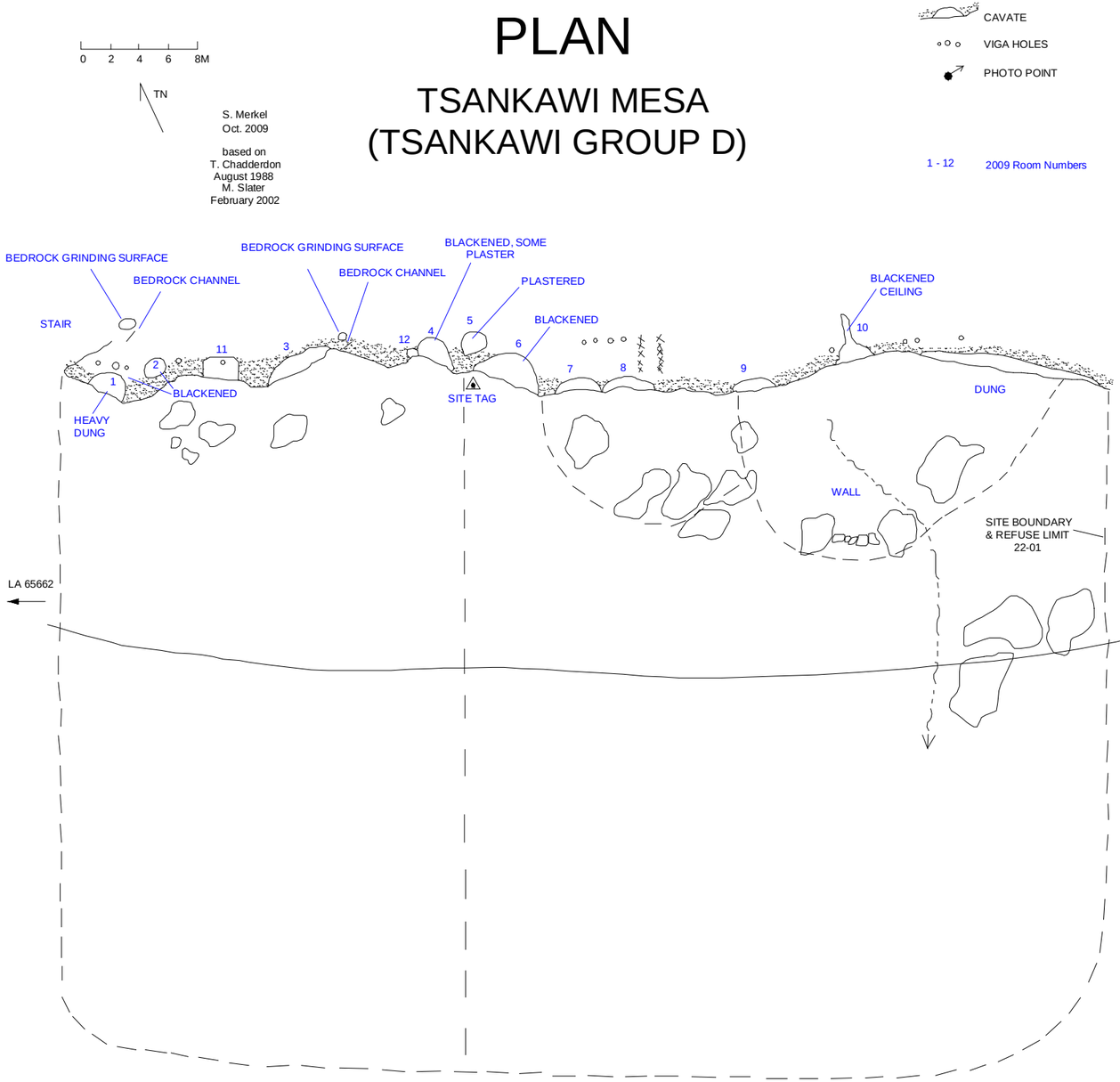
# LA 65662
# PLAN

## TSANKAWI MESA
## (TSANKAWI GROUP C)



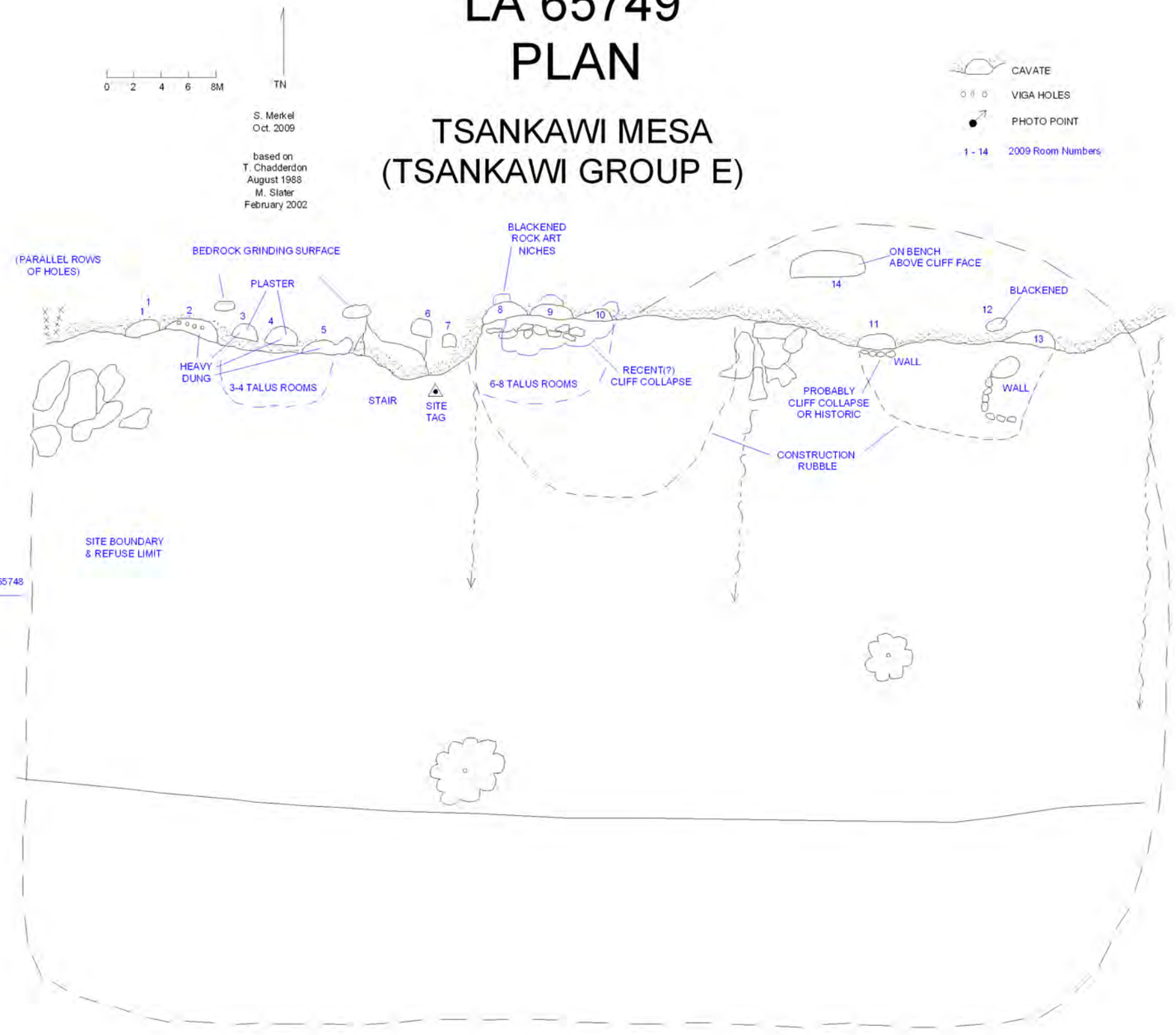
# LA 65748
# PLAN

## TSANKAWI MESA
## (TSANKAWI GROUP D)



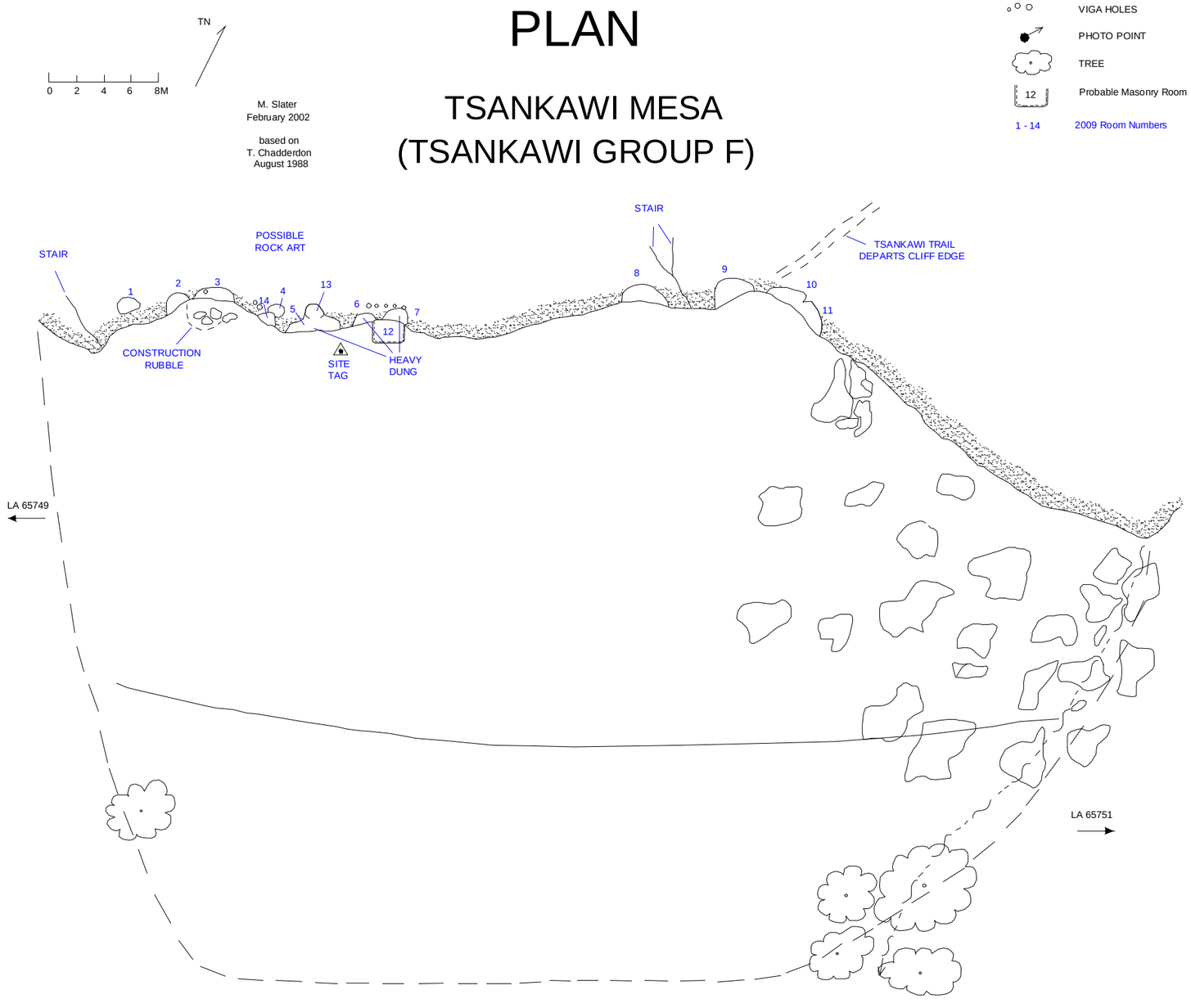
# LA 65749
# PLAN

## TSANKAWI MESA
## (TSANKAWI GROUP E)



# LA 65750
# PLAN

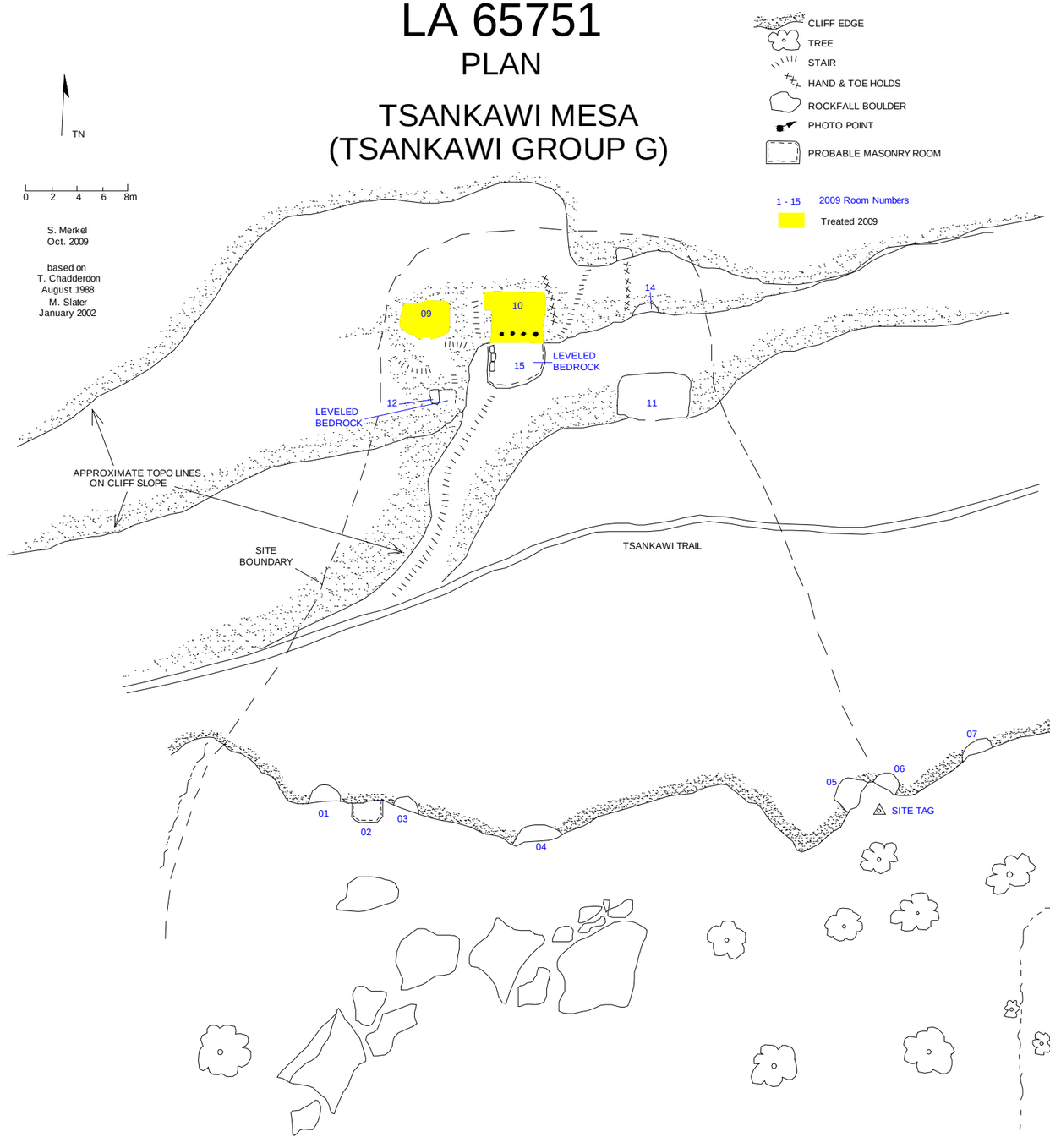
## TSANKAWI MESA
## (TSANKAWI GROUP F)



# LA 65751

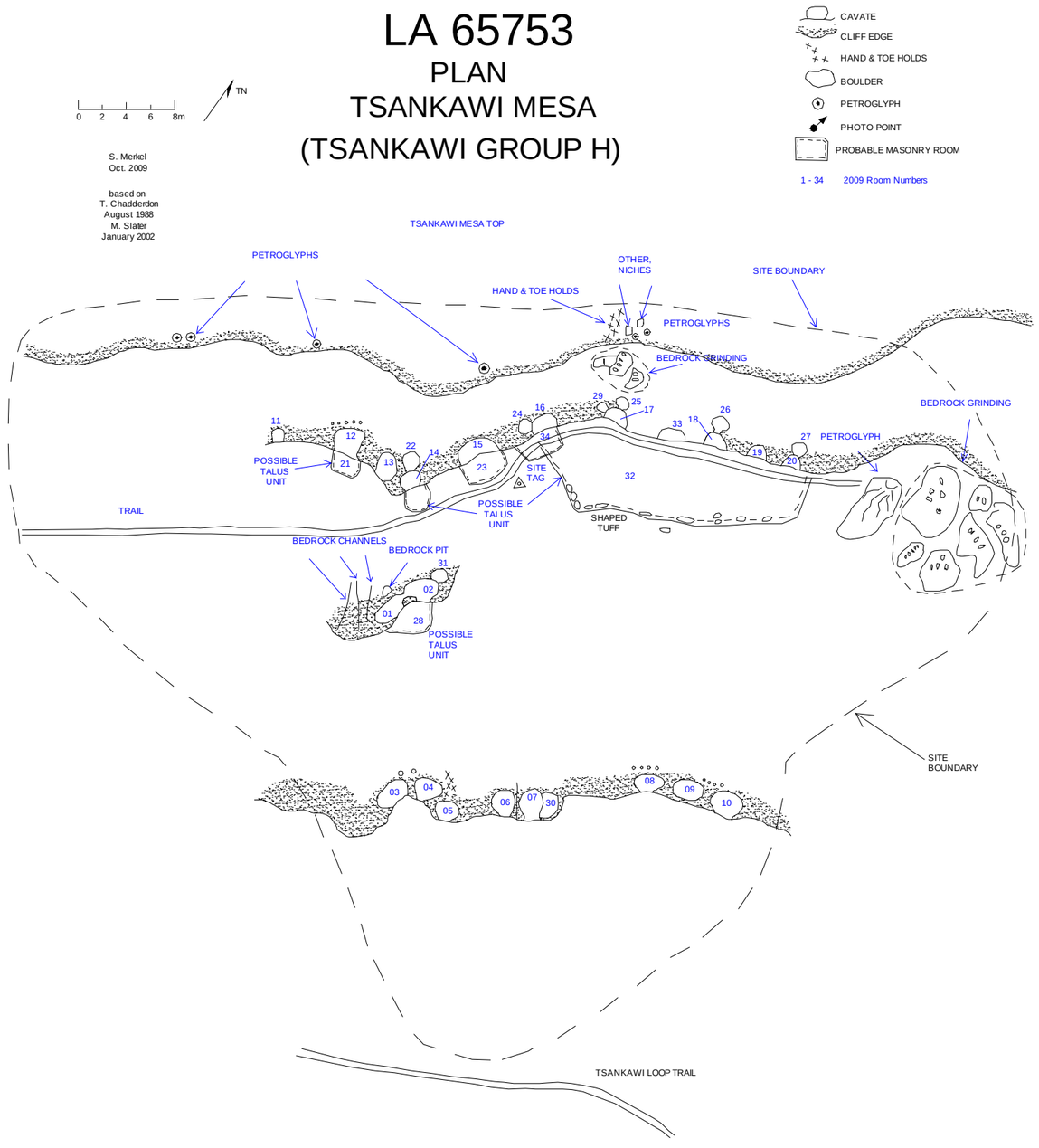
## PLAN

## TSANKAWI MESA
## (TSANKAWI GROUP G)



# LA 65753

## PLAN
## TSANKAWI MESA
## (TSANKAWI GROUP H)



# LA 65755

## PLAN

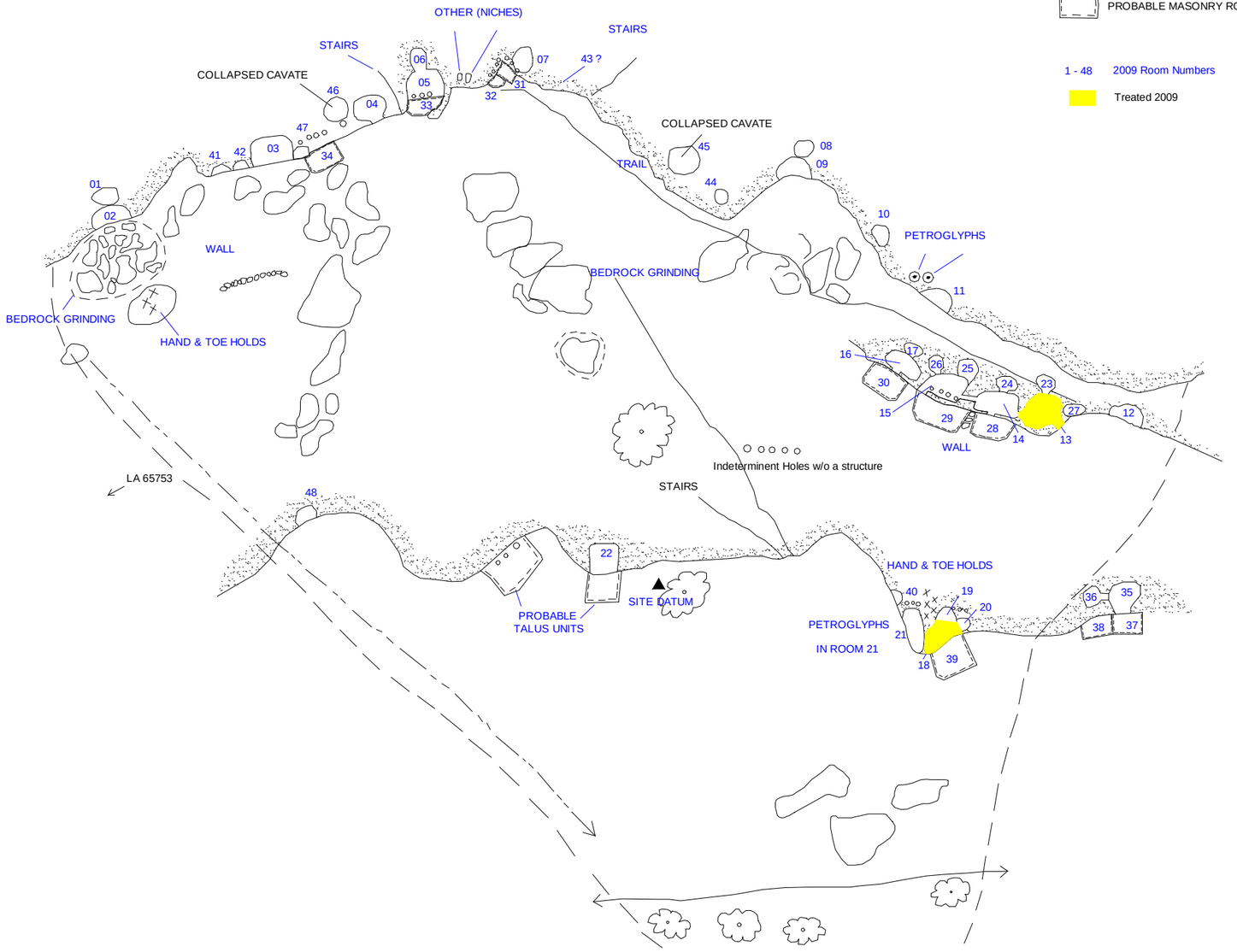
## TSANKAWI MESA
## (TSANKAWI GROUP I)

TN

0 5 10m

S. Merkel
Oct. 2009

based on
T. Chadderdon
August 1988
M. Slater
January 2002

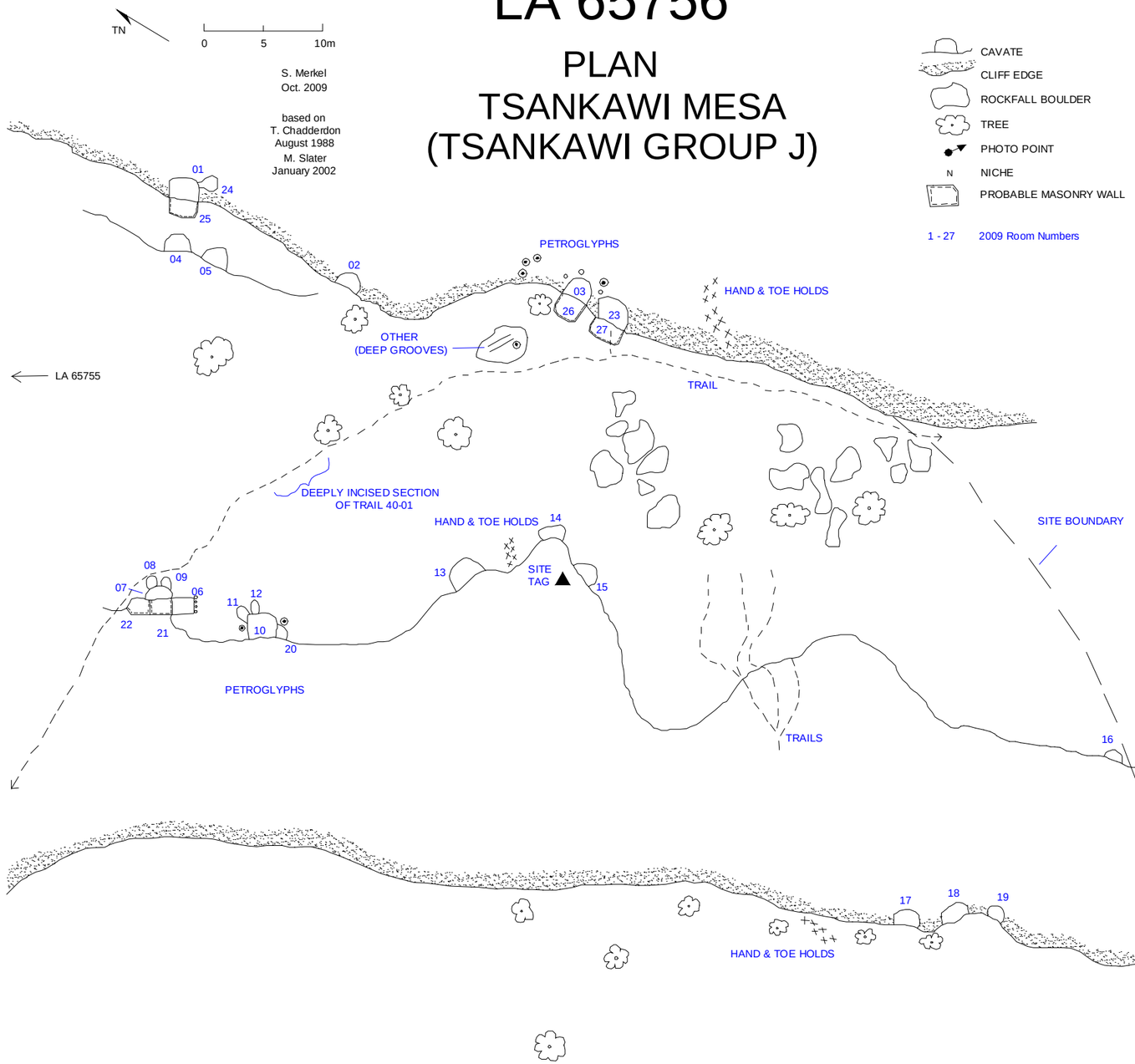



CAVATE
TREE
ROCKFALL BOULDER
DRAINAGE
VIGA SOCKETS
PHOTO POINT
N NICHE
PROBABLE MASONRY ROOM

1 - 48 2009 Room Numbers
Treated 2009

# LA 65756

## PLAN
## TSANKAWI MESA
## (TSANKAWI GROUP J)



# LA 65758
# PLAN

## TSANKAWI MESA
## (TSANKAWI GROUP L)

S. Merkel
Oct. 2009

based on
K. Harry
August 1988
M. Slater
March 2002

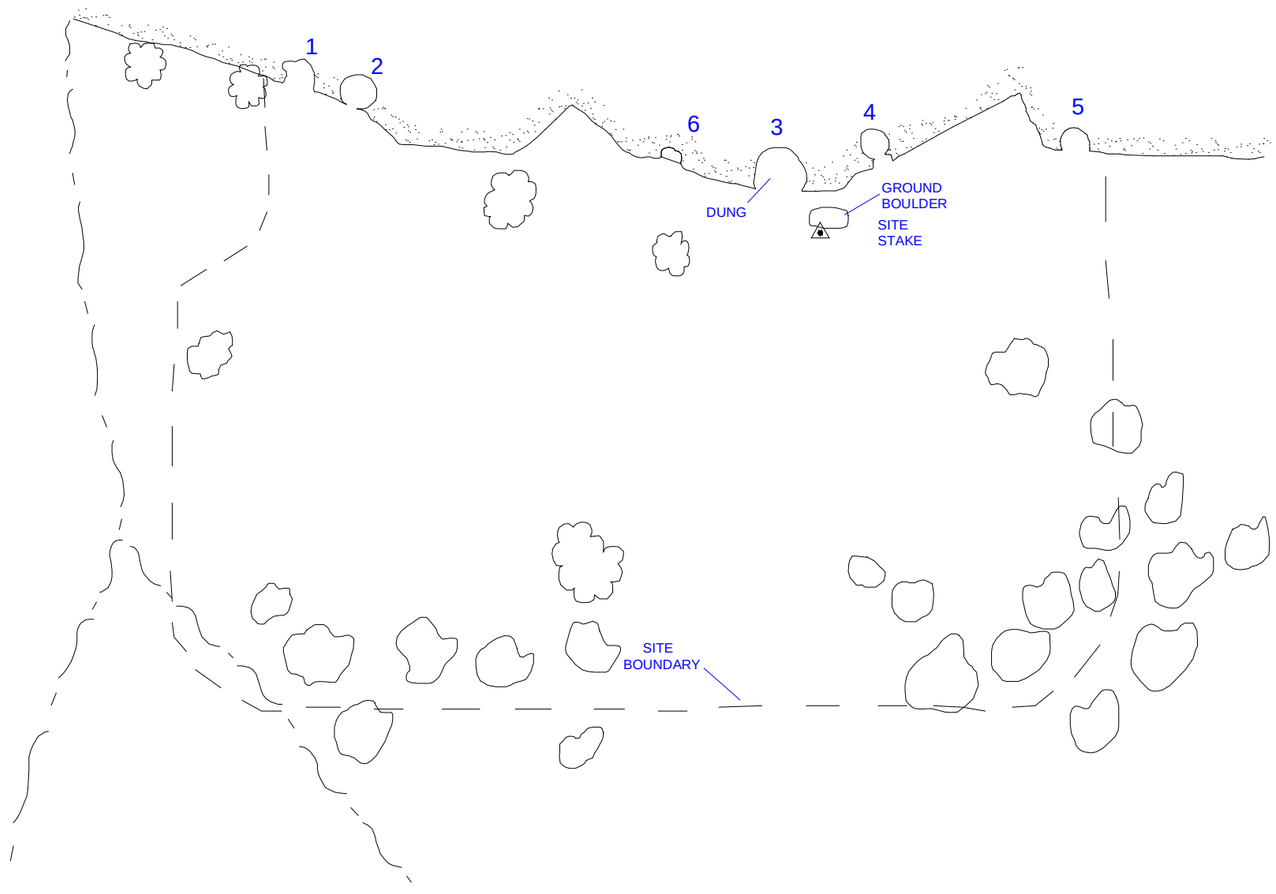
TN

0 10
METERS

CAVATE

PHOTO POINT

1 - 6 2009 Room Numbers



# LA 70955
# PLAN

## TSANKAWI MESA
## (TSANKAWI GROUP N)

S. Merkel
Oct. 2009

based on
BAS
August 1989
M. Slater
March 2002

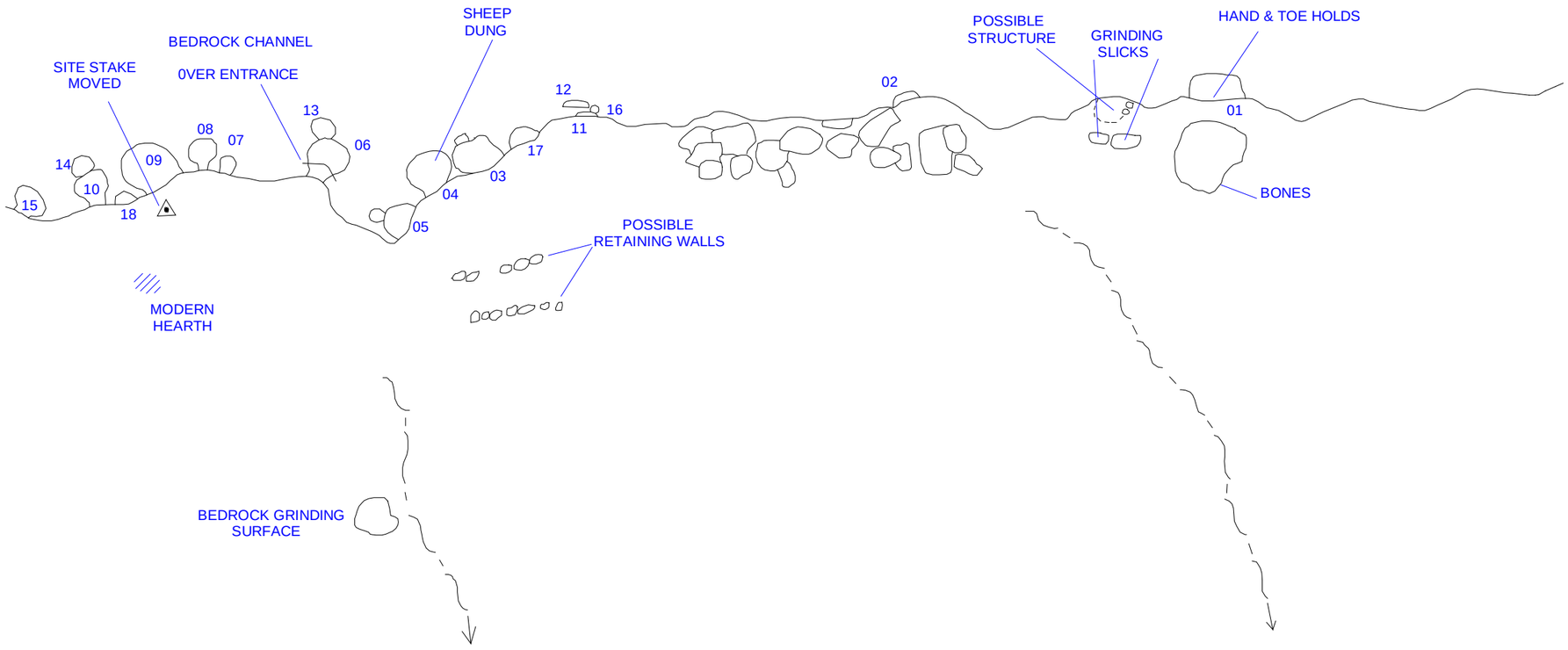
TN

0 5 10
METER

CAVATE

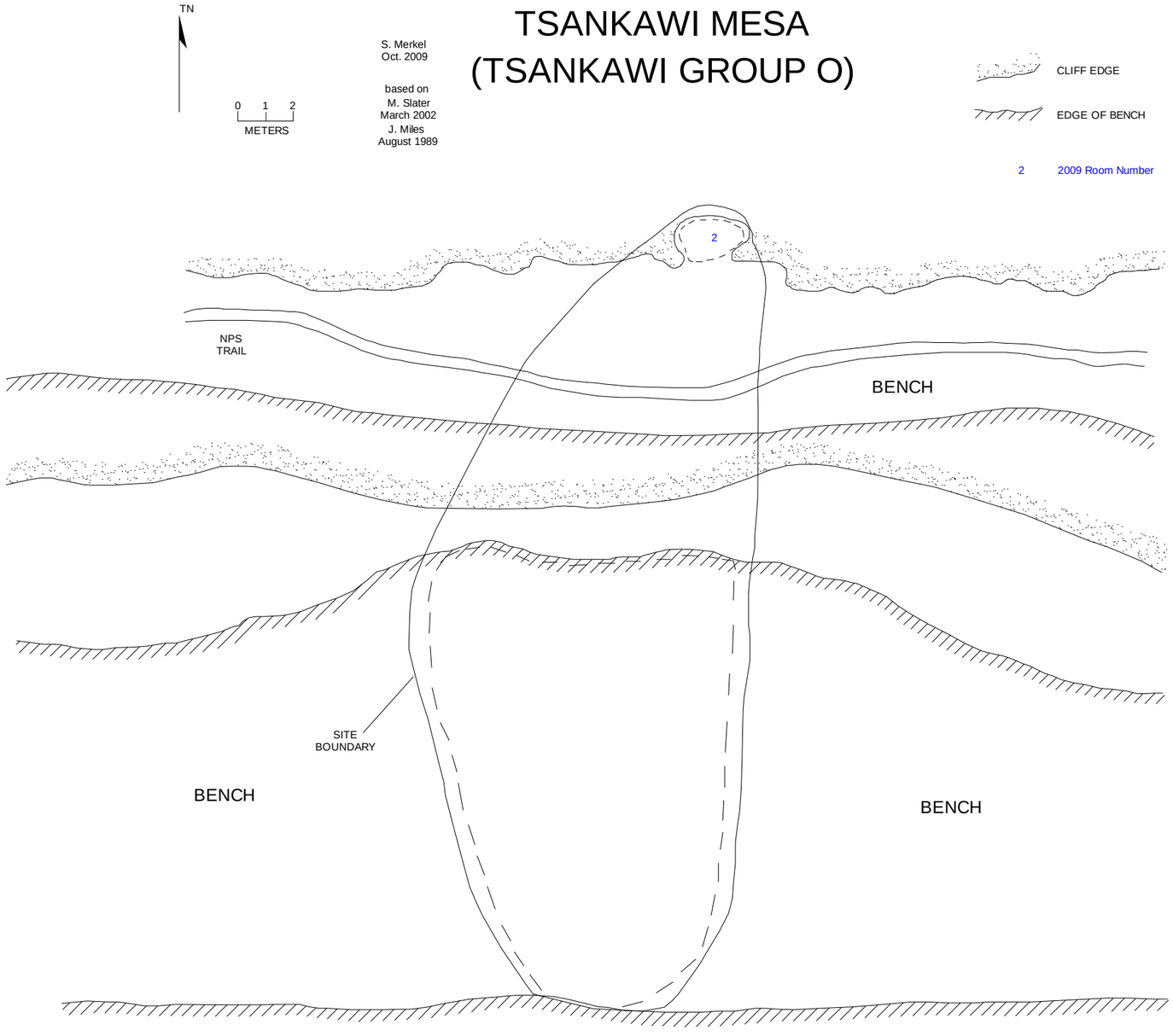
PHOTO POINT

1 - 18 2008 Room Numbers



# LA 70957
# PLAN

## TSANKAWI MESA
## (TSANKAWI GROUP O)



# LA 128410

NOT TO SCALE

## PROFILE

S. Merkel
Oct. 2009

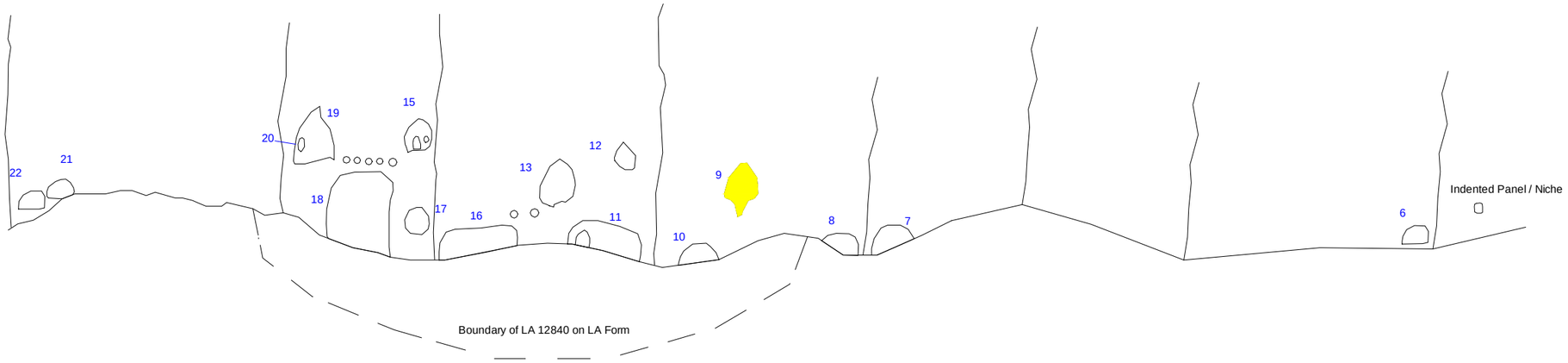
based on S. Merkel
October 2008

## TSANKAWI MESA
## (TSANKAWI GROUP A)

○○○○○ VIGA SOCKETS

CAVATE

7 - 22 2009 Room Numbers

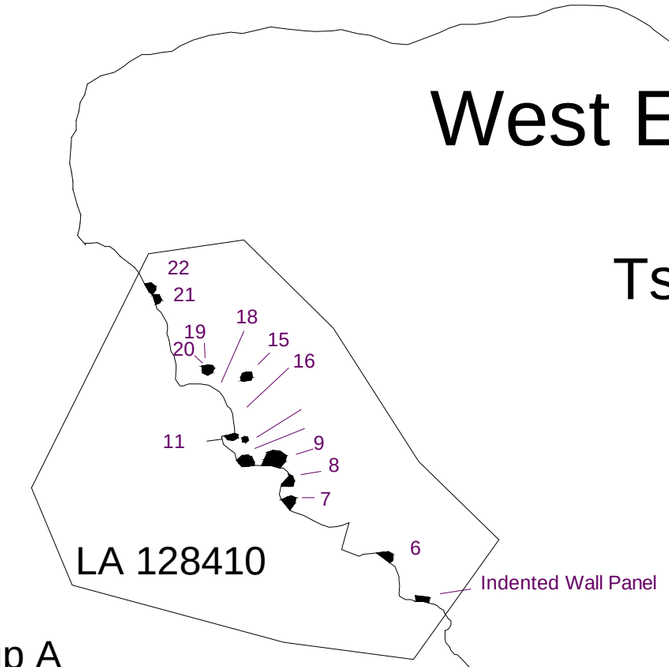


# West End Cavate Groups Plan

## Tsankawi Mesa

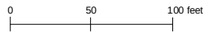
22 2008 Room Numbers

[11] 1988 Room Numbers (BAS)




Group A

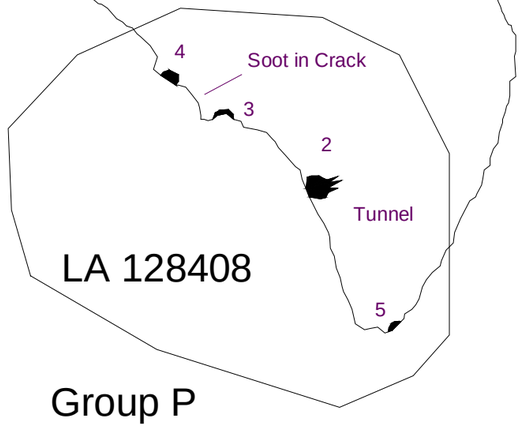



CAVE RUINS ON SOUTH SIDE
OF TSANKAWI MESA
BANDELIER NATIONAL MONUMENT

S. Merkel
Oct 2009

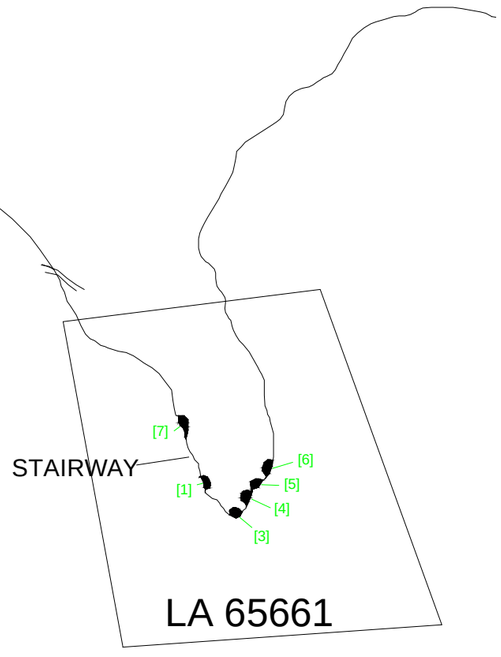
based on R. Lister
October 1939
and
M. Slater
January 2002




Group P




Group R




Group B

# Appendix C

# Concordance List for Cavate Numbers

## CONCORDANCE LIST FOR CAVATE NUMBERS

| LA | RM (2009) | RM (1939) | RM (1988) | RM (1995) | RM (1998) | Lister Photo (1939) |
|---|---|---|---|---|---|---|
| 65753 | 1 | 106 | 1 | | 1 | |
| 65753 | 2 | 105 | 2 | | 2 | |
| 65753 | 3 | 110 | 3 | | | |
| 65753 | 4 | | 4 | | | |
| 65753 | 5 | 109 | 5 | | 3 | yes |
| 65753 | 6 | | 6 | | | |
| 65753 | 7 | | 7 | | | |
| 65753 | 8 | 108 | 8 | | | yes |
| 65753 | 9 | | 9 | | | |
| 65753 | 10 | 107 | 10 | | | |
| 65753 | 11 | 104 | 11 | | 4 | |
| 65753 | 12 | 103 | 12 | | 5 | |
| 65753 | 13 | 102 | 13 | | | |
| 65753 | 14 | 101 | 14 | | 6 | yes? |
| 65753 | 15 | 100 | 15 | | 7 | yes? |
| 65753 | 16 | 99 | 16 | | | |
| 65753 | 17 | 94 | 17 | | | |
| 65753 | 18 | 95 | 18 | | 8 | |
| 65753 | 19 | 96 | 19 | | | |
| 65753 | 20 | 97 | 20 | | 9 | |
| 65753 | 21 | | | | | |
| 65753 | 22 | | | | | |
| 65753 | 23 | | | | | |
| 65753 | 24 | | | | | |
| 65753 | 25 | | | | | |
| 65753 | 26 | | | | | |
| 65753 | 27 | | | | | |
| 65753 | 28 | | | | | |
| 65753 | 29 | | | | | |
| 65753 | 30 | | | | | |
| 65753 | 31 | | | | | |
| 65753 | 32 | | | | | |
| 65753 | 33 | | | | | |
| 65753 | 34 | | | | | |
| | | | | | | |
| 65755 | 1 | | 1 | | | |
| 65755 | 2 | 93 | 2 | | 1 | |
| 65755 | 3 | 92 | 3 | | 2 | |
| 65755 | 4 | 91 | 4 | | 3 | |

| LA | RM (2009) | RM (1939) | RM (1988) | RM (1995) | RM (1998) | Lister Photo (1939) |
|---|---|---|---|---|---|---|
| 65755 | 5 | 90 | 5 | | 4 | |
| 65755 | 6 | | 6 | | | |
| 65755 | 7 | 87 | 7 | | | |
| 65755 | 8 | | 8 | | | |
| 65755 | 9 | 85 | 9 | | 5 | |
| 65755 | 10 | | 10 | | | |
| 65755 | 11 | 84 | 11 | | | |
| 65755 | 12 | | 12 | | 6 | |
| 65755 | 13 | 79 | 13 | | 7 | |
| 65755 | 14 | 80 | 14 | | 8 | |
| 65755 | 15 | 81 | 15 | | 9 | |
| 65755 | 16 | 83 | 16 | | 10 | yes |
| 65755 | 17 | | 17 | | | |
| 65755 | 18 | 117 | 18 | | 12 | yes |
| 65755 | 19 | | 19 | | | |
| 65755 | 20 | 118 | 20 | | 11 | |
| 65755 | 21 | 116 | 21 | | 13 | |
| 65755 | 22 | 115 | 22 | | 14 | |
| 65755 | 23 | | | | | |
| 65755 | 24 | | | | | |
| 65755 | 25 | | | | | |
| 65755 | 26 | | | | | |
| 65755 | 27 | | | | | |
| 65755 | 28 | | | | | |
| 65755 | 29 | | | | | |
| 65755 | 30 | | | | | |
| 65755 | 31 | | | | | |
| 65755 | 32 | | | | | |
| 65755 | 33 | | | | | |
| 65755 | 34 | | | | | |
| 65755 | 35 | | | | | |
| 65755 | 36 | | | | | |
| 65755 | 37 | | | | | |
| 65755 | 38 | | | | | |
| 65755 | 39 | | | | | |
| 65755 | 40 | | | | | |
| 65755 | 41 | | | | | |
| 65755 | 42 | | | | | |
| 65755 | 43 | | | | | |
| 65755 | 44 | | | | | |

| LA | RM (2009) | RM (1939) | RM (1988) | RM (1995) | RM (1998) | Lister Photo (1939) |
|---|---|---|---|---|---|---|
| 65755 | 45 | | | | | |
| 65755 | 46 | | | | | |
| 65755 | 47 | | | | | |
| 65755 | 48 | 114 | | | | yes |
| | | | | | | |
| 70957 | 2 | 1 | | | | |
| | | | | | | |
| 70955 | 1 | 2 | 1 | | | |
| 70955 | 2 | | 2 | | | |
| 70955 | 3 | 5 | 3 | | | yes |
| 70955 | 4 | 6 | 4 | | | yes |
| 70955 | 5 | 7 | 5 | | | |
| 70955 | 6 | 8 | 6 | | | |
| 70955 | 7 | | 7 | | | |
| 70955 | 8 | 9 | 8 | | | |
| 70955 | 9 | 10 | 9 | | | |
| 70955 | 10 | 11 | 10 | | | |
| 70955 | 11 | 3 | | | | yes |
| 70955 | 12 | 4 | | | | |
| 70955 | 13 | | | | | |
| 70955 | 14 | | | | | |
| 70955 | 15 | | | | | |
| 70955 | 16 | | | | | |
| 70955 | 17 | | | | | |
| 70955 | 18 | | | | | |
| | | | | | | |
| | | | | | | |
| No LA | 12 | 12 | | | | |
| No LA | 13 | 13 | | | | |
| No LA | 14 | 14 | | | | |
| No LA | 181 | 181 | | | | |
| No LA | 182 | | | | | |
| | | | | | | |
| 50976 | 15 | 15 | 2 | 15 | 2 | |
| 50976 | 16 | 16 | 4 | 16 | 4 | |
| 50976 | 17 | 17 | 5 | 17 | 5 | yes |
| 50976 | 18 | 18 | 8 | 18 | 8 | yes? |
| 50976 | 19 | 19 | 9 | 19 | 9 | yes? |
| 50976 | 20 | 20 | 7 | 20 | 7 | yes? |
| 50976 | 21 | 21 | 10 | 21 | 10 | yes? |

| LA | RM (2009) | RM (1939) | RM (1988) | RM (1995) | RM (1998) | Lister Photo (1939) |
|---|---|---|---|---|---|---|
| 50976 | 22 | 22 | 96 | 22 | 96 | yes? |
| 50976 | 23 | 23 | 13 | 23 | 13 | yes |
| 50976 | 24 | 24 | 14 | 24 | 14 | yes |
| 50976 | 25 | 25 | 15 | 25 | 15 | |
| 50976 | 26 | 26 | 11 | 26 | 11 | |
| 50976 | 27 | 27 | | 27 | | |
| 50976 | 28 | 28 | 17 | 28 | 17 | |
| 50976 | 29 | 29 | 61 | 29 | 61 | |
| 50976 | 30 | 30 | 59 | 30 | 59 | yes? |
| 50976 | 31 | 31 | 58 | 31 | 58 | |
| 50976 | 32 | 32 | 57 | 32 | 57 | |
| 50976 | 33 | 33 | 56 | 33 | 56 | |
| 50976 | 34 | 34 | 55 | 34 | 55 | |
| 50976 | 35 | 35 | 54 | 35 | 54 | |
| 50976 | 36 | 36 | 53 | 36 | 53 | |
| 50976 | 37 | 37 | 72 | 37 | 72 | |
| 50976 | 38 | 38 | 52 | 38 | 52 | |
| 50976 | 39 | 39 | 49 | 39 | 49 | |
| 50976 | 40 | 40 | 48 | 40 | 48 | |
| 50976 | 41 | 41 | 47 | 41 | 47 | |
| 50976 | 42 | 42 | 46 | 42 | 46 | yes |
| 50976 | 43 | 44 | 44 | 43 | 44 | |
| 50976 | 44 | 45 | 43 | 44 | 43 | |
| 50976 | 45 | na | 42 | 45 | 42 | |
| 50976 | 50 | 50 | 22 | 50 | 22 | |
| 50976 | 51 | 51 | 21 | 51 | 21 | |
| 50976 | 52 | 50 | 20 | 50 | 20 | |
| 50976 | 53 | 53 | 19 | 53 | 19 | yes |
| 50976 | 54 | 54 | 28 | 54 | 28 | |
| 50976 | 55 | 55 | 27 | 55 | 27 | |
| 50976 | 56 | 56 | na | 56 | na | |
| 50976 | 57 | 57 | 24 or 25 | 57 | 24 or 25 | |
| 50976 | 58 | 58 | 88? | 58 | 88? | |
| 50976 | 59 | 59 | 33 | 59 | 33 | |
| 50976 | 60 | 60 | 24 or 25 | 60 | 24 or 25 | |
| 50976 | 61 | 61 | 26 | 61 | 26 | |
| 50976 | 62 | 62 | 34 | 62 | 34 | |
| 50976 | 63 | 63 | 35 | 63 | 35 | |
| 50976 | 64 | 64 | 36 | 64 | 36 | |
| 50976 | 65 | 65 | 39 | 65 | 39 | yes |

| LA | RM (2009) | RM (1939) | RM (1988) | RM (1995) | RM (1998) | Lister Photo (1939) |
|---|---|---|---|---|---|---|
| 50976 | 66 | 66 | 40 | 66 | 40 | |
| 50976 | 67 | 67 | na | 67 | na | |
| 50976 | 501 | | 1 | 501 | 1 | |
| 50976 | 502 | | 91 | 502 | 91 | |
| 50976 | 503 | | 92 | 503 | 92 | |
| 50976 | 504 | | 93 | 504 | 93 | |
| 50976 | 505 | | 94 | 505 | 94 | |
| 50976 | 506 | | 95 | 506 | 95 | |
| 50976 | 507 | | 6? | 507 | 6? | |
| 50976 | 508 | | 12 | 508 | 12 | |
| 50976 | 509 | | na | 509 | na | |
| 50976 | 510 | | na | 510 | na | |
| 50976 | 511 | | na | 511 | na | |
| 50976 | 512 | | na | 512 | na | |
| 50976 | 513 | | 97 | 513 | 97 | |
| 50976 | 514 | | 98 | 514 | 98 | |
| 50976 | 515 | | 99 | 515 | 99 | |
| 50976 | 516 | | 101 | 516 | 101 | |
| 50976 | 517 | | 16 | 517 | 16 | |
| 50976 | 518 | | 102 | 518 | 102 | |
| 50976 | 519 | | na | 519 | na | |
| 50976 | 520 | | 89 | 520 | 89 | |
| 50976 | 521 | | 41 | 521 | 41 | |
| 50976 | 522 | | 104 | 522 | 104 | |
| 50976 | 523 | | na | 523 | na | |
| 50976 | 524 | | 38 | 524 | 38 | |
| 50976 | 525 | | 104 | 525 | 104 | |
| 50976 | 526 | | 104 | 526 | 104 | |
| 50976 | 527 | | na | 527 | na | |
| 50976 | 528 | | na | 528 | na | |
| 50976 | 529 | | 105 | 529 | 105 | |
| 50976 | 530 | | 32 | 530 | 32 | |
| 50976 | 531 | | 29 | 531 | 29 | |
| 50976 | 532 | | 31 | 532 | 31 | |
| 50976 | 533 | | 88 | 533 | 88 | |
| 50976 | 534 | | 83 | 534 | 83 | |
| 50976 | 535 | | 84 | 535 | 84 | |
| 50976 | 536 | | 85 | 536 | 85 | |
| 50976 | 537 | | 86 | 537 | 86 | |
| 50976 | 538 | | 81 | 538 | 81 | |

| LA | RM (2009) | RM (1939) | RM (1988) | RM (1995) | RM (1998) | Lister Photo (1939) |
|---|---|---|---|---|---|---|
| 50976 | 539 | | 82 | 539 | 82 | |
| 50976 | 540 | | 78 | 540 | 78 | |
| 50976 | 541 | | 77 | 541 | 77 | |
| 50976 | 542 | | 78 | 542 | 78 | |
| 50976 | 543 | | 79 | 543 | 79 | |
| 50976 | 544 | | 18 | 544 | 18 | |
| 50976 | 545 | | na | 545 | na | |
| 50976 | 546 | | na | 546 | na | |
| 50976 | 547 | | na | 547 | na | |
| 50976 | 548 | | 109 | 548 | 109 | |
| 50976 | 549 | | na | 549 | na | |
| 50976 | 550 | | 74 | 550 | 74 | |
| 50976 | 551 | | na | 551 | na | |
| 50976 | 552 | | 75 | 552 | 75 | |
| 50976 | 553 | | 62 | 553 | 62 | |
| 50976 | 554 | | 110 | 554 | 110 | |
| 50976 | 555 | | 73 | 555 | 73 | |
| 50976 | 556 | | 90 | 556 | 90 | |
| 50976 | 557 | | 51 | 557 | 51 | |
| 50976 | 558 | | 71 | 558 | 71 | |
| 50976 | 559 | | 69 | 559 | 69 | |
| 50976 | 560 | | 68 | 560 | 68 | |
| 50976 | 561 | | 67 | 561 | 67 | |
| 50976 | 562 | | 66 | 562 | 66 | |
| 50976 | 563 | | 65 | 563 | 65 | |
| 50976 | 564 | | 45 | 564 | 45 | |
| 50976 | 565 | 43 | na | 565 | na | |
| 50976 | 566 | | 63/64 | 566 | 63/64 | |
| 50976 | 567 | | 70 | 567 | 70 | |
| 50976 | 568 | | ? | 568 | ? | |
| 50976 | 569 | | na | 569 | na | |
| 50976 | 570 | | 80 | 570 | 80 | |
| 50976 | 571 | | | | | |
| 50976 | 572 | | | | | |
| 50976 | 573 | | | | | |
| 50976 | 574 | | | | | |
| 50976 | 575 | | | | | |
| | | | | | | |
| 65756 | 1 | 76 | 1 | | 1 | |
| 65756 | 2 | 75 | 2 | | 2 | |

| LA | RM (2009) | RM (1939) | RM (1988) | RM (1995) | RM (1998) | Lister Photo (1939) |
|---|---|---|---|---|---|---|
| 65756 | 3 | 69 | 3 | | 3 | |
| 65756 | 4 | 77 | 4 | | 4 | |
| 65756 | 5 | 78 | 5 | | 5 | |
| 65756 | 6 | na | 6 | | 6 | |
| 65756 | 7 | 119 | 7 | | 7 | yes |
| 65756 | 8 | na | 8 | | na | |
| 65756 | 9 | na | 9 | | na | |
| 65756 | 10 | 120 | 10 | | 8 | yes |
| 65756 | 11 | na | 11 | | na | |
| 65756 | 12 | na | 12 | | na | |
| 65756 | 13 | 73 | 13 | | 9 | |
| 65756 | 14 | 72 | 14 | | 10 | |
| 65756 | 15 | 71 | 15 | | 11 | |
| 65756 | 16 | 74 | 16 | | 12 | |
| 65756 | 17 | 122 | 17 | | na | |
| 65756 | 18 | 121 | 18 | | na | |
| 65756 | 19 | na | 19 | | na | |
| 65756 | 20 | | | | | |
| 65756 | 21 | | | | | |
| 65756 | 22 | | | | | |
| 65756 | 23 | | | | | |
| 65756 | 24 | | | | | |
| 65756 | 25 | | | | | |
| 65756 | 26 | | | | | |
| 65756 | 27 | | | | | |
| | | | | | | |
| 65757 | 1 | 68 | | | | |
| | | | | | | |
| 65758 | 1 | 49 | 1 | | | |
| 65758 | 2 | 48 | 2 | | | |
| 65758 | 3 | 47 | 3 | | | |
| 65758 | 4 | | 4 | | | |
| 65758 | 5 | 46 | 5 | | | |
| 65758 | 6 | | | | | |
| | | | | | | |
| 65751 | 1 | 130 | 1 | | | |
| 65751 | 2 | | 2 | | | |
| 65751 | 3 | 129 | 3 | | | |
| 65751 | 4 | 127 | 4 | | 8 | |
| 65751 | 5 | 126 | 5 | | 7 | |

| LA | RM (2009) | RM (1939) | RM (1988) | RM (1995) | RM (1998) | Lister Photo (1939) |
|---|---|---|---|---|---|---|
| 65751 | 6 | 125 | 6 | | 6 | |
| 65751 | 7 | 124 | 7 | | 5 | |
| 65751 | 8 | 123 | 8 | | | |
| 65751 | 9 | 113 | 9 | | 2 | |
| 65751 | 10 | 112 | 10 | | 3 | |
| 65751 | 11 | 111 | 11 | | | yes |
| 65751 | 12 | | 25-01 | | 1 | |
| 65751 | 13 | | 25-02 | | | |
| 65751 | 14 | | | | | |
| 65751 | 15 | | | | | |
| | | | | | | |
| 65750 | 1 | 144 | 1 | | | |
| 65750 | 2 | 143 | 2 | | | |
| 65750 | 3 | 142 | 3 | | | |
| 65750 | 4 | 141 | 4 | | | |
| 65750 | 5 | 140 | 5 | | | |
| 65750 | 6 | 138 | 6 | | | |
| 65750 | 7 | 136 | 7 | | | |
| 65750 | 8 | 135 | 8 | | | |
| 65750 | 9 | 134 | 9 | | | |
| 65750 | 10 | 133 | 10 | | | |
| 65750 | 11 | 132 | | | | |
| 65750 | 12 | 137 | | | | |
| 65750 | 13 | 139 | | | | |
| 65750 | 14 | | | | | |
| | | | | | | |
| 65749 | 1 | | 1 | | | |
| 65749 | 2 | 156 | 2 | | | |
| 65749 | 3 | 155 | 3 | | | |
| 65749 | 4 | 154 | 4 | | | |
| 65749 | 5 | 153 | 5 | | | |
| 65749 | 6 | 152 | 6 | | | |
| 65749 | 7 | 151 | 7 | | | |
| 65749 | 8 | 150 | 8 | | | |
| 65749 | 9 | 149 | 9 | | | |
| 65749 | 10 | 148 | 10 | | | |
| 65749 | 11 | 147 | 11 | | | |
| 65749 | 12 | | 12 | | | |
| 65749 | 13 | 145 | 13 | | | |
| 65749 | 14 | | 14 | | | |

| LA | RM (2009) | RM (1939) | RM (1988) | RM (1995) | RM (1998) | Lister Photo (1939) |
|---|---|---|---|---|---|---|
| 65748 | 1 | 164 | 1 | | | |
| 65748 | 2 | | 2 | | | |
| 65748 | 3 | 163 | 3 | | | |
| 65748 | 4 | 162 | 4 | | | |
| 65748 | 5 | 161 | 5 | | | |
| 65748 | 6 | 160 | 6 | | | |
| 65748 | 7 | | 7 | | | |
| 65748 | 8 | 159 | 8 | | | |
| 65748 | 9 | 158 | 9 | | | |
| 65748 | 10 | 157 | 10 | | | yes? |
| 65748 | 11 | | | | | |
| 65748 | 12 | | | | | |
| | | | | | | |
| 65662 | 1 | 174 | 1 | | | |
| 65662 | 2 | 173 | 2 | | | |
| 65662 | 3 | 171 | 3 | | | |
| 65662 | 4 | 170 | 4 | | | |
| 65662 | 5 | | 5 | | | |
| 65662 | 6 | 165 | 6 | | | |
| 65662 | 7 | 172 | 7 | | | |
| | | | | | | |
| 65661 | 1 | 180 | 1 | | | |
| 65661 | 2 | | 2 | | | |
| 65661 | 3 | 179 | 3 | | | |
| 65661 | 4 | 178 | 4 | | | |
| 65661 | 5 | 177 | 5 | | | |
| 65661 | 6 | 176 | 6 | | | |
| 65661 | 7 | 175 | 7 | | | |

# Appendix D

# Land Use and Management History of Tsankawi Mesa

**LAND USE AND MANAGEMENT HISTORY OF TSANKAWI MESA**

Stephen Merkel

As a detached portion of Bandelier National Monument, the Tsankawi Unit represents the prehistoric community of Tsankawi. The name "Tsankawi" (*saekewikwaje onwikege*)[1] is Tewa in origin and translates as "pueblo ruin of the gap of the sharp round cactus" or "pueblo ruin above the gap of the sharp round cactus."[2] The name first appeared in Adolph Bandelier's journal entry of July, 1885.[3] The orthography of the word has changed significantly with older versions including *Sankawi, Sankewi, Saekewi, and Saekewi'i*. Contemporary spellings include *Tsankawi* and *Tsankawi'i.*[4]

## *Prehistory*

The prehistoric communities of what is now the Tsankawi Unit were a part of the Tshirege Group, and were socially and politically aligned with three other large, linguistically related Classic pueblos nearby: Potsuwi (Otowi), Tsirege (Tshirege), and Navawi. [5] All four of these pueblos are located in a curving alignment, 6.3 km (3.9 mi) in length, along the eastern edge of the Pajarito Plateau. The four pueblos are

[1] For the remainder of this report all words in Tewa will be italicized.

[2] J. P. Harrington, *Ethnogeography of the Tewa Indians*, Bureau of American Ethnology 29th Annual Report (Washington, D.C., Smithsonian Institution, 1916), 82, 93, 273-274.

[3] C. H. Lange, C. L. Riley, and E. M. Lange, eds., *The Southwestern Journals of Adolph F. Bandelier* (Albuquerque, University of New Mexico Press, 1975), 58.

[5] Bandelier National Monument, *Resources Management Plan: Bandelier National Monument* (Los Alamos, NM: National Park Service, 1995), 7.

[4] F. G. Matero, S. Provencher, M. Kelleher, S. Kreilick, R. Preucel and A. Freitag, *Trail Preservation Study: Tsankawi Mesa, Bandelier National Monument, Los Alamos County, New Mexico, National Park Service, USDI* (Philadelphia, PA: Architectural Conservation Laboratory, Graduate Program in Historic Preservation, Graduate School of Fine Arts, University of Pennsylvania, 1998).

[5] E. L. Hewet, "Archaeology of Pajarito Park, New Mexico," *American Anthropologist*, N. S. Vol. 6 (1904), 639-649; and J. E. Snead, "Trails, Interaction, and integration in the Eastern Pueblo World, AD 1200-1550," *Papers Presented at the 1994 Chacmool Conference* (Calgary, Alberta: University of Calgary, 1994).

evenly spaced at intervals of approximately 2.9 km (1.8 mi). Additional outstanding cultural resources are located just beyond the borders of the Tsankawi Unit in all directions.[6]

It is believed that in the late Twelfth Century the Tsankawi area was settled by Ancestral Puebloans living in small pueblos and hand-carved rooms known as cavates, excavated into the cliff-face. Over a period of two hundred years, populations on the Pajarito Plateau gradually converged to create large settlements, such as Tyuonyi, Tshirege, and Tsankawi Pueblo. At its peak in the Classic Period, A.D. 1400 to 1600, Tsankawi Pueblo developed into a large residential complex consisting of several room blocks, numerous kivas, and a central plaza. The cavates in the cliffs below also experienced a peak in habitation and use. During this time period it is estimated that the Tsankawi pueblo supported a maximum of 200 individuals.[7] A population decline followed in the late Sixteenth Century. McKenna argues that the cavates of Tsankawi Mesa fell into disuse slightly before the mesa-top Pueblo based on the study of surface-collected ceramics.[8] By the mid-Seventeenth Century, Tsankawi Mesa was mostly uninhabited. The spread of foreign diseases, the exhaustion of agricultural soils, and a 21-year drought extending from the 1570s to the 1590s may all be factors in the depopulation of Tsankawi and the Southern Pajarito Plateau.[9]

### *Historic Period*

Prior to its acquisition by the U.S. Forest Service in 1916, Tsankawi and its surrounds were sparsely inhabited for centuries. The land was used primarily for grazing sheep and cattle, hunting, and the collection of firewood and lumber by the Pueblo of San Ildefonso and Hispanic landholders. Historical records show



**Figure 1: View from Tsankawi Pueblo, unknown photographer and date (negative 1090)**

[6] Snead, 1994.

[7] Rory Gauthier, personal communication, 2010.

[8] P. J. McKenna, "Analysis of Surface Ceramics from the Study Areas," *An Analysis of Variability and Condition in Cavate Structures in Bandelier National Monument*, Intermountain Cultural Resources Center Professional Paper No. 53, ed. W. Toll (Santa Fe: National Park Service, 1995), 64-71.

[9] R. P. Powers and J. D. Orcutt. *The Bandelier Archaeological Survey: Volumes I and II*, Intermountain Cultural Resources Management, Professional Paper No. 57, (Santa Fe: National Park Service, 1999), 582-587.

that Ramón Vigil built his house at the junction of Pueblo and Los Alamos Canyons, north of Tsankawi Mesa, even though this was well to the north of his land grant.[10] The remains of this structure have yet to be found.[11] The construction of the Buckman Crossing in 1898, spanning the Rio Grande and connecting the Pajarito Plateau to the Santa Fe Railroad, opened the region to more intensive logging, mining and grazing.[12] The infrastructure development by logging and mining companies also opened up the Pajarito Plateau to tourists interested in experiencing the cliff dwellings, ruins and natural scenery. This significant shift in focus from extraction to tourism is highlighted by an early account of the Pajarito Plateau given by Harry Field in 1900 who described his excursion into "the heart of the region at one time most thickly populated by the cave dwellers".[13] The archaeology and natural beauty of the area was brought to national attention by photographer George Beam in an article in National Geographic Magazine featuring the prehistoric trails at Tsankawi Mesa.[14]

In the sixteen years under Forest Service management, grazing, logging and firewood collection continued to be prominent activities, although there was a budding tourism industry as evidenced by interpretive brochures from the era.[15] During this time the complex of buildings now known as 'Duchess Castle' was built just north of Tsankawi Mesa and was inhabited intermittently between 1916 and 1929 by Madame Verra von Blumenthal and Ms. Rose Dougan, who formed a pottery workshop for the residents of nearby Santa Clara and San Ildefonso pueblos.

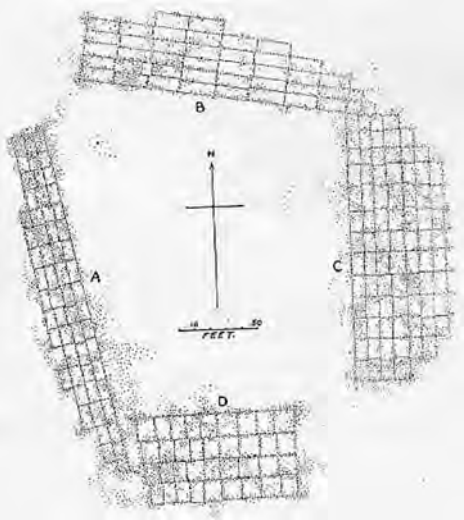



**Figure 2: Hewett's ground plan of Tsankawi Pueblo, 1906**

[10] J. P. Sanchez and B. A. Erickson, *Sources for the History of Bandelier National Monument* (1999). MS is on file at Bandelier National Monument.

[11] Rory Gauthier, personal communication, 2010.

[12] M. L. Smith, "Writing History at Bandelier," *The Peopling of Bandelier*, ed. R. Powers (Santa Fe: School of American Research Press, 2005), 106.

[13] H. Field, *The account of trip made to Bandelier National Monument vicinity* (1900). MS is on file at Bandelier National Monument.

[14] G. L. Beam, "The Prehistoric Ruins of Tsankawi," *National Geographic Magazine* 20 (1909): 807-822.

[15] *In the Land of the Ancient Cliff Dweller* (Santa Fe: Dept. of Agriculture,1923).

Bandelier became a unit of the National Park Service in 1932, and for Tsankawi, this drastically changed the way the land was used. Evidence of historic land use practices of the prior to Park Service management can still be seen throughout the landscape,[16] and it is particularly well preserved in the cavates in the form of sheep dung, nails and wire for corrals, and historic graffiti and imagery. Finally, in the late Nineteenth and early Twentieth Centuries the cultural resources of Tsankawi and the rest of the Pajarito Plateau began to be explored, investigated, and published, bringing the archaeology of the Ancestral Puebloans into the public eye.

### *Archaeology, Stabilization, Documentation and Visitation*

Despite never having visited Tsankawi, Adolph Bandelier is credited with the first historic mention of the mesa in his 1885 journals.[17] Fourteen years later, in 1899, while working in the southwest for the Smithsonian Institution, Edgar Lee Hewett sketched a ground plan and wrote an above-ground description of the Tsankawi Pueblo, which was included in his 1904 article *Archaeology of the Pajarito Park, New Mexico* (see Figure 2). He describes the pueblo as a "sky city" with "ten kivas…a large number for the population, which probably never exceeded 300 to 400 people…The ground plan of Tsankawi pueblo embraces about 200 rooms."[18] However, Hewett did not conduct any excavations at that time.



**Figure 3: Prehistoric trails at Tsankawi Mesa taken by H. Reed, 1942 (Negative BANC_1069)**

In 1905 Hewett returned to Tsankawi to excavate for the Smithsonian Institution. He stated that two mounds were excavated, but it is unclear from his documentation which mounds or even how many were excavated. Mound C, to the south of the pueblo, was definitely excavated according to his 1905 field notes[19], but in his 1938 book *The Pajarito Plateau and its Ancient People* he marked the excavated mounds as

[16] C. Allen, "A Thousand Years in the Life of a Landscape," *The Peopling of Bandelier*, ed. R. Powers (Santa Fe: The American School of Research, 2005), 11-17. And Smith, 2005: 103-109.

[17] Lange, et al., 1975: 58, 107.

[18] Hewett, 1904: 644-645.

[19] E. L. Hewett, *Santa Fe, Otowi, Chama Valley, Expedition for Smithsonian Institution*, Field Notes Transcription, F.W. Mathien, LA/ARMS (1905). MS is on File at Bandelier National Monument.

those in the southeast (Mound A) and northwest (Mound B). [20] In any case, the excavated areas were backfilled in the winter of 1941.[21]

In 1930 a panel of NPS Superintendents created a report recommending the incorporation of Bandelier National Monument into the National Park Service. Development of Tsankawi was encouraged in this report, recommending road construction, greater interpretation, and the full excavation of Tsankawi Pueblo to attract visitor interest. The only recommendation eventually carried out regarding Tsankawi was that the road stopped short of the Mesa because the "visitors should approach the ruins on foot, over the worn trails used by the prehistoric inhabitants."[22]

In the 1930s research was undertaken to better understand the chronology and distribution of ceramic styles of the Pajarito Plateau. H.P. Mera conducted a surface survey of ceramics at Tsankawi in 1935.[23] He had studied Biscuit Ware sites in northern New Mexico for the Laboratory of Anthropology in the early 1930's to determine their geographical extent, the physical setting of the sites, and the occupational histories. Mera also produced a map of Tsankawi Pueblo which, despite more accurate measurements and the inclusion of an exterior room block, omitted a number of kivas, mounds, and reservoirs included in Hewett's notes.[24]

In 1939 Robert H. Lister worked at Tsankawi documenting cavates. He mapped much of the south side of Tsankawi Mesa and led the first stabilization efforts for the cavates at Tsankawi Mesa. A monthly report during his field work states:

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[20] E. L. Hewett, *The Pajarito Plateau and its Ancient People* (Albuquerque: University of New Mexico Press, 1938), 133.

[21] "Bandelier National Monument," *Southwestern National Monuments, Monthly Report* (Dec. 1941).

[22] M. Kelleher, "Changing Approaches to Management at the Tsankawi Mesa of Bandelier National Monument," *The George Wright FORUM*, Vol. 20, No. 1 (2003): 60-61. And J. Nussbaum, and M. R. Tillotson. *Report on the Bandelier National Monument and proposed Cliff Cities National Park* (1930). MS is on file at Bandelier National Monument.

[23] H.P. Mera, *Field Survey, Tsankawi, Sheetmap 777/20,* ARMS (c. 1935).

[24] The LA211 [Tsankawi Pueblo] file mentions a 1934 publication by Reiter describing 40' square test pits in the northwest and southeast trash mounds. As mentioned above, this file and reference are unchecked.

…a survey of the cave ruins on the monument were made. The results of the survey show that after a rain, water runs into many of the caves and sometimes stands several inches deep in the caves after a hard shower. The caves at Tsankawi appear to be in the worst condition, so work has been started there.

Before the actual work of arranging the drainage around the cave mouths begun, a map was prepared showing the 181 cave ruins on the south side of the Tsankawi mesa. In front of a great many of the Tsankawi caves, dirt and rocks have accumulated so that the debris is much higher than the cave fill. Where this condition exists, water easily flows into the caves, damaging the walls and any cultural material that might be in the cave fill. Some of the dirt from in front of many of the caves is being removed so that the water will flow away from, and not into, the caves; in other cases, drainage ditches or small diversion dams are employed to keep the water out of the caves. To date, 70 cave fronts and entrances have been cleared.[25]

A total of 120 cavates at Tsankawi Mesa were treated by Lister in 1939.[26] Lister modified the drainage of cavates that would or could potentially benefit from it. Fill levels were often modified, small earth dams were placed across or on both sides of entrances, and in six instances smoke holes were plugged to prevent water infiltration. Two sheep herder corrals were torn down and the stones were scattered,[27] and a single cavate with camping debris was cleaned.[28] Lister's report identifies each cavate specified on the map and gives short descriptions of the work (or lack of work) performed at each cavate.



**Figure 4: C109 (Cavate 005, LA 65753) before treatment, Lister, 1939**

Although many cavates truly benefitted from the work performed by Lister and his crew in 1939, his treatments usually involved the excavation and removal of fill, ceiling collapse and occasionally cultural deposits. With the sheer quantity of stones and dirt moved in and around the cavates by Lister it is possible that some evidence of collapsed walls was inadvertently destroyed. Another unintentional, or perhaps intentional, consequence was that cavates formerly protected by fill and debris were now open to the visiting public. Evidence of Lister's dams, ditches and drains can occasionally be seen, and a

[25] R. Lister, "Bandelier Ruins Stabilization," *Southwestern National Monuments, Monthly Report* (Oct. 1939): 293.

systematic survey of the cavates at Tsankawi would be useful in identifying the success and durability of the treatments.

Lister was the first to attempt to map the cavate groups at Tsankawi. He produced two maps: a large scale map showing much of the southern side of Tsankawi Mesa and a map of the east-facing rincon group (LA 50976) which received significant attention and was the only cavate group to be mapped in detail. Both maps have been digitized, modified, and updated over time, but they remain the foundation for the maps currently in use. The stabilization of the cavates at Tsankawi Mesa was concluded in the Fall of 1939, and a number of years passed before the cavate sites were revisited by archaeologists or conservators.

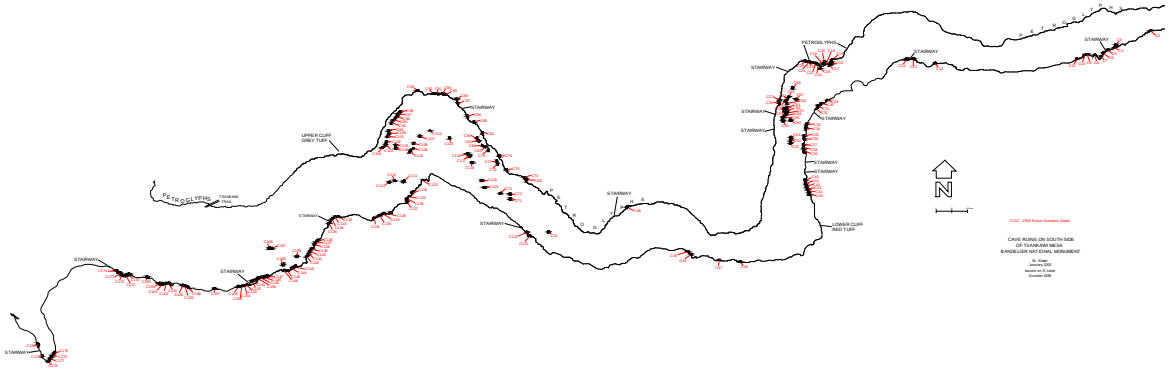



**Figure 5: Digitized version of Lister's 1939 map of the south side of Tsankawi Mesa with 181 cavates identified.**

The open, unrestricted nature of Tsankawi caused concern among park managers as visitation increased at Tsankawi in the 1950s.[29] The development of Tsankawi was identified as the "most important part of the Mission 66 program for Bandelier" and plans for a visitor center along the highway near Tsankawi, along with the excavation of Tsankawi Pueblo, were revisited.[30] The proposed development would provide an official presence for the protection of cultural resources, interpretation, and information to benefit of the

[26] R. Lister, *Stabilization of Cave Ruins, Bandelier* (Santa Fe: Southwestern National Monuments, National Park Service, 1940). MS is on file, Bandelier National Monument.

[27] Corrals were at the base of the cliff in LA 65750 and LA 65662

[28] Lister, 1940.

[29] "Bandelier National Monument," *Southwestern National Monuments, Monthly Report* (Jan. 1950).

[30] Kelleher, 2003: 61-2. And *Mission 66 in Bandelier National Monument* (National Park Service, undated). MS is on file at Bandelier National Monument.

visitor experience, and much needed relief for overcrowded Frijoles Canyon. These plans for the Tsankawi Unit were never carried out, although talk of excavation of Tsankawi Pueblo continued into the late 1970s. The importance of Tsankawi to the monument, as demonstrated by the park's retention of the Tsankawi Unit during the 1963 land trade with LANL, is evident, but the management strategy for the unit was still clearly under-developed.

While indecision about whether and how to develop the Tsankawi Unit continued, the next stage in the story began with the comprehensive inventory of the cultural resources. The Bandelier Archaeological Survey (BAS), begun by Robert Powers in the 1980s, produced detailed maps of the cavates and pueblo area with features not previously documented.[31] This was the most systematic survey of the archaeological sites at Tsankawi, and specific attention was paid to documenting cavate structures. The cavate groups were hand-drawn, showing a plan view of the cavate entrances, floor plans, possible masonry talus features and historic structures. The maps produced by the BAS continue to serve as the base-maps for a majority of the cavate groups at Tsankawi.

During the years of the BAS, a methodology for the documentation and study of cavates was developed. The cavate maps produced during Lister's 1939 survey and the BAS provided a framework for the study of individual cavates in a geographic space, and paved the way for H. Wolcott Toll's in-depth analysis of a selection of cavates in Frijoles Canyon and at Tsankawi from 1986-1995. This report strove to serve "two main purposes: adding to archaeological knowledge of these features and assessing their current condition as a means of caring for them."[32]

Toll's cavate analysis compared cavate groups A, F, I, and M in Frijoles Canyon and a single group at Tsankawi (LA 50976). He studied dimensions and features, and used statistics to understand the variability of cavate architecture and its function. The cavate study provided a foundation for systematic, intensive documentation of cavate groups in Frijoles Canyon and the Tsankawi Unit by the Vanishing Treasures program in the 2000s.

Although Toll's focus was primarily archaeological, he also addressed the management and preservation of Tsankawi cavates. Tsankawi Mesa is heavily impacted by visitor use, and the human threat is more focused on, and destructive to, archaeological information than any other type of damage. Toll notes the

[31] Powers and Orcutt, 1999.

[32] Toll, 1995: 2.

lawlessness and disregard for the fragile cultural resources by some visitors of Tsankawi due the lack of supervision and law enforcement. Besides recommending the closure of Tsankawi during periods of high visitation, he specifically mentions floor clearing, documenting and backfilling cavates with shallow fill levels as an important preservation measure.[33] [34]

The intensive documentation of cavates and trails by the BAS was a vital step towards understanding the extent of the cultural resources of the Tsankawi Unit. In the 1990s the importance of developing and implementing a management plan for Tsankawi came to the forefront.

### *Preservation of a Cultural Landscape*

The undeveloped nature of Tsankawi was acknowledged as an asset by the NPS in the 1990s. The interpretive plan from 1992 clearly reflects a shift in paradigm from earlier decades:[35]

> In contrast to the paved trails, full-service, multi-media facilities of Frijoles Canyon, Tsankawi will not be developed for mass visitation. Instead, it will remain a less developed discovery site where people can have the thrill of walking in paths used by prehistoric people. In the quiet, unexcavated site it is easy to have a personal encounter with the cultural resources, maybe even sense the presence of the former inhabitants. It is an aesthetic and emotional experience rather than an intellectual one, or has been one in the past[36]

With the cultural resource inventory of the 828 acre Tsankawi Unit near completion,[37] several parties began working together in the late 1990s to develop strategies for managing and preserving the unit's unique cultural resources while maintaining an untouched, unrestricted visitor experience. It has been noted that the past management strategy of passive and minimal intervention has led to considerable damage to the site.[38] Beginning in 1997, Frank Matero of the University of Pennsylvania, the

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[33] Ibid, 101-102.

[34] Toll's report also states that in 1960 C. Johnson, a graduate student at the University of New Mexico, performed a small excavation in Cavate 54, LA 50976, finding extremely sensitive archaeological deposits inches below the floor surface deposits. P. 11

[35] Kelleher, 2003: 63.

[36] *Interpretive Prospectus, Bandelier National Monument New Mexico* (Santa Fe: National Park Service, 1992).

[37] M. L. Elliot, *Tsankawi Preservation Project Cultural Resources Inventory and Site Relocation* (Los Alamos: Bandelier National Monument, 1998). MS is on file at Bandelier National Monument.

[38] Matero, et al., 1998: 84.

Intermountain Support Office in Santa Fe, and the staff of Bandelier National Monument, in collaboration with affiliated pueblos and Navajo, started to develop management strategies focused on mitigating visitor impacts to the cultural and natural resources. The project planners sought ways to more actively encourage visitor compliance by inconspicuously restricting access so that visitors would only use the main interpretive trail, and developed conservation treatments to preserve the prehistoric trail system and the cavates.

In 1998, the entire trail system at Tsankawi was considered to be in poor condition. Over the last century of visitation, the prehistoric trails had been worn in some areas to six feet in depth, original foot holds had been destroyed, and new routes had been created. In addition, a network of unofficial trails had developed, causing damaging natural and cultural resources. They cut through culturally sensitive areas, destroy vegetation, cause erosion, facilitate artifact collecting and give access to fragile resources otherwise out of view of the public.

In 1998 a project was undertaken to preserve the prehistoric trail system, which is among the most significant resources of Tsankawi Mesa. An infill treatment was planned, tested, and carried out by Shaun Provencher with the assistance of Pueblo participants, the Intermountain Regional Santa Fe Office, and Frank Matero of the University of Pennsylvania. Heavily damaged trail sections were identified, and pathways were fitted with tuff blocks and compacted tuff gravel to provide a physically and visually compatible, durable, yet reversible, walking surface.[39] More than ten years later, much of the trail fills are still intact, and only one small section has failed and needs retreatment (see section on Trail Maintenance in LA 65755 / 65756).

### *Cavate Preservation Project, 1998-1999*

During discussion of management concerns, the need for a cavate preservation plan for the Tsankawi Unit was reiterated. Toll's survey examined only a small portion of cavates at Tsankawi. In 1997 a team from the University of Pennsylvania re-examined a number of these cavates identifying conditions such as plaster detachment and tuff disintegration that were not previously documented.[40] In 1999 a more

[39] S. Provencher, *Tsankawi Project Completion Report* (Santa Fe: Intermountain Support Office, National Park Service, 1998), and Matero, et al., 1998.

[40] Matero, et al., 1998: 70.

comprehensive cavate survey was carried out by Shawn Provencher and Janet.[41] In the survey 140 cavates in high visitor impact areas were assessed.[42]

The cavate condition assessment had three major objectives:

1. To provide a baseline conditions assessment of the cavates along the main Tsankawi Mesa circulation route
2. Identify structural and surface finish deterioration mechanisms for cavates
3. Define prioritized preservation recommendations on both the landscape and cavate level

The forms used in this survey included architectural documentation, sketches, and information on the conditions of architectural elements. Surface finishes, particularly plaster, were a major concern because of their rarity, fragility, and treatability. Photographs were taken in cavates exhibiting unique finishes, structural elements, and conditions. [43]

Recommended actions were designed to be reversible, temporary, and of low physical, visual, and interpretive impact, in keeping with the park management policy for the Tsankawi Unit. In total, 14 cavates at Tsankawi Mesa were recommended for immediate conservation measures, 87 were recommended for future measures, and 39 cavates required no action. Treatment recommendations mainly focused on two separate areas:

- Restricting access either by directing visitors away from cavates with the strategic placement of slash or the closure of sensitive or dangerous cavates, and
- The conservation of finishes, through plaster reattachment, edging and graffiti mitigation

*Treatment Implementation, 1998-1999*

The first wave of treatments occurred concurrently with the initial documentation. Implementation of graffiti mitigation treatments began in the summer of 1998. Graffiti carved into the plaster of Cavates 59 and 66 in LA 50976 was infilled with an acrylic modified earthen mixture, and graffiti carved into smoke-blackened areas in Cavate 66 were inpainted with black acrylic paint.[44] Two cavates were enclosed with

[41] S. Provencher, *Tsankawi Unit Conditions Assessment and Treatment Recommendation* (Santa Fe: Intermountain Support Office, National Park Service, 1999), and J. Barrow, S. Provencher, and A. Bass Rivera, *The Cavate Preservation Project Scope of Work* (Santa Fe: Intermountain Support Office, National Park Service, 1999).

[42] These areas include LA 128410, 65751, 65753, 65755, 65756, 50976, 65742, and 65743

[43] 1998 Tsankawi Unit condition assessment forms and the 1999 photographs are held in the VT Field Office

[44] Provencher, 1998: 9-11, or see **Appendix J**

masonry walls.[45] The masonry enclosure built over the entrance to Cavate 60 in LA 50976 was a training exercise for the field crew. The cavate was heavily weathered and does not contain any unique or well preserved features. The enclosure wall showed considerable erosion of the mortar by August, 1999, and was damaged by vandals shortly after that. The enclosure built in front of Cavate 20, though showing some erosion of the mortar, is still intact in 2010. This cavate was walled because of substantial damage to the entrance, floors and finishes caused by visitors accessing and vandalizing the cavate. Although slash was used to close pathways and trails, it appears that in 1998 slash was not applied to direct visitors away from the cavates, but to keep people on the main trail on the mesa top. Little is known about where or if slash was used to restrict access to cavates because it seems to have been undocumented and none remains to be seen today.

In 1999, graffiti mitigation and plaster stabilization was performed by Angelyn Bass Rivera, Patrick Cruz and Naomi Naranjo. Two cavates were selected for pilot treatments: Cavate 14, LA 65755 and Cavate 1, LA 65743. Condition assessments were performed on sections of walls and were documented graphically prior to treatment. Graffiti in Cavate 1 was infilled with a soil mixture modified with acrylic. Delaminating plaster in Cavate 14 was reattached using a modified acrylic solution, and edging was performed with a mixture of soil, lime and ceramic microspheres.[46]

Graffiti mitigation was performed again at Tsankawi in 2001. Three additional cavates were selected for treatment: Cavates 59 and 64 in LA 50976, and Cavate 9 in LA 65751. Cavate 59 had been vandalized since the 1998 treatment and the new graffiti was treated. Acrylic-amended earthen fills were used, along with inpainting, to obscure graffiti.[47]

### *Conclusions*

The current preservation strategy for the Tsankawi Unit was a long time in the making. Lister in 1939, Toll and the BAS in the 1980s and early 1990s, Jake Barrow, Shawn Provencher, Frank Matero, Angelyn Bass Rivera and others around the turn of the 21st century, all recognized the need for documentation, protection and preservation of the cultural resources of the Tsankawi Unit, particularly the cavates. The cavate condition assessment performed in 1998 was meant to be a preliminary step in a larger project to develop a comprehensive cavate preservation plan for Tsankawi and Frijoles Canyon. The work done by

[45] Ibid, 7-9

[46] A. Bass Rivera, *Conservation Treatment Report, Cavate Preservation Project, Bandelier National Monument* (Santa Fe: Intermountain Support Office, National Park Service, 1999).

[47] See **Appendix K** for the 2001 graffiti mitigation report.

VT in 2008-2010 will play a large role in fulfilling the goals set forth in 1998, including the consolidation of archival resources, systematic recordation of all cavates, updating and digitizing cavate maps, entering data into the cavate database, and interpreting conservation work to the public. The development of the treatment strategy developed in 2009 reflects recommendations proposed in past surveys and in the 2008 condition assessment and utilized low-impact, highly successful treatments that have been tested over the last ten years.

# Appendix E

# Physical Characteristics of Cavate Pueblos

## PHYSICAL CHARACTERISTICS OF CAVATE PUEBLOS

Lauren Meyer and Stephen Merkel

The Ancestral Puebloans of the Northern Rio Grande made use of the natural resources of the region in order to create and embellish their architecture. In Bandelier National Monument, masonry pueblos were built of shaped blocks of tuff quarried from the cliffs; cavates were excavated directly into the soft volcanic cliff faces through the use of hand tools; mortars and plasters, including decorative elements such as pictographs, were created from and colored with earth pigments such as clays and other natural pigments like soot and gypsum; and wood was collected from local sources and hand-hewn into beams and other support systems. The attributes inherent in each of the building materials have caused them to deteriorate and erode in different ways, and the current condition of the architecture is largely a direct result of the environment acting upon these materials.

### *Tuff*

The Bandelier Tuff is a sequence of rhyolitic ignimbrite, or ash-flow tuff, which is divided into three members: the Otowi (1.6 Ma[1]), the Cerro Toledo Interval, and the Tshirege (1.22 Ma) which includes several distinct cooling units.[2] These members were laid down as a result of the volcanic cycles of eruption from what is now the Valles Caldera.[3] All cavates at Tsankawi were carved into the Tshirege member. Unlike Frijoles Canyon, cavates at Tsankawi can be found in several of the cooling units within the Tshirege member. At the lowest level, the cavates are excavated into the *Qbt-1g (g* for glassy)[4] unit of the Tshirege member of the Bandelier tuff, a unit to which the following refers:

> *Outcrop surfaces in unit 1g typically weather to a pale orange color. Weathered cliff faces have a distinctive swiss-cheese appearance because large holes penetrate case-hardened cliff faces and expose the soft underlying tuffs to wind and water erosion.*[5]

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[1] *Ma* refers to mega annum, or million years.

[2] D. E. Broxton, et al., "Stratigraphy, Petrography, and Mineralogy of the Bandelier Tuff and Cerro Toledo Deposits," *Earth Science Investigations for Environmental Restoration – Los Alamos National Laboratory Technical Area 21,* Los Alamos National Laboratory Report LA-12934-MA (Los Alamos: LANL, 1995), 38.

[3] William D. Purtymun and Howard Adams, *Geohydrology of Bandelier National Monument, New Mexico*, Los Alamos National Laboratory Report LA-8461-MS, (Los Alamos: LANL, 1980), 2-3; Communication with Steven Reneau, Geologist, Los Alamos National Laboratory, 19 March 2003.

[4] Communication with Steven Reneau, Geologist, Los Alamos National Laboratory, 19 March 2003.

[5] Broxton, et al., 1995: 46.

The *Qbt-1g* sub-unit, the orange tuff layer at the base of Tsankawi Mesa, is unwelded and makes it predisposed to weathering and erosion. The deterioration of this tuff occurs through small-scale spalling or granular erosion, called loss of substrate material or friability in this report, or by large-scale detachment of blocks bounded by fractures or joints which are inherent in the material.



**Figure 1: Qbt-1g sub-unit of the Tshirege Member, RM 040, LA 50976**

According to a preliminary geomorphic assessment of cavates and cliff bases in Frijoles Canyon conducted by geologist Doug Oliver the primary processes contributing to the erosion of cavates in contact with the talus slope are runoff and rising damp in conjunction with other processes such as soluble salts dissolution and crystallization, freeze-thaw cycling, and wind-blown particle erosion. It appears that the source of the water is not just unsaturated flow from the top of the mesa, but also capillary rise from soil at the base of the cliff.[6] Isolated and catastrophic rock-falls also occur, though they are infrequent and tend to happen in areas of anthropogenic disturbance or areas of waterflow.[7]




**Figure 2: Qbt-1v sub-unit of the Tshirege Member, RM 063, LA 50976**

Immediately above the *Qbt-1g* is the white slope-forming tuff of the Qbt-1v cooling unit. Many cavates in the South Rincon and in LA 50976 are carved into this cooling unit. It is slightly more welded than the lower section, but it is still friable and predisposed to weathering.

[6] Communication with Doug Oliver, Geologist, 2003.

[7] Communication with Steven Reneau, Geologist, Los Alamos National Laboratory, 19 March 2003.

The upper level of Tsankawi Mesa is composed of the *Qbt-2* cooling unit, which is pinkish to white in color and is significantly more welded than the lower tuffs. This level tends to break along vertical fracture planes formed during cooling, and vapor-phase crystallization (formed by higher amounts of steam, heat, and pressure) is evident. At Tsankawi many of the collapsed cavates are found at the boundary of the *Qbt-1v* and the *Qbt-2* formations. Collapse occurs when cavates carved into the upper *Qbt-1v* undermine the stability of the large welded columns of the *Qbt-2* which then fall, breaking along vertical fracture planes in the rock.



**Figure 3: Transition between Qbt-1v (below) and Qbt-2 (above), RM 511, LA 50976**

Stone masonry units which are incorporated into cavate construction (both as foundation walls of structures, and as entrances and partition walls within cavates) are found within the *Qbt-1g, Qbt-1v* and *Qbt-2* units of the Tshirege tuff, although the tuff masonry blocks appear to have been quarried from material which originated in the highest stratigraphic section, the *Qbt-2* unit. Much of the quarried material is pink to red in color as opposed to the gray/white tuff of most of the cavates, and is more resistant to erosion. The *Qbt-2* unit is extremely porous and does appear to be eroding, but it tends to be significantly less friable than the tuff of the lower units.

*Earthen materials*

Earthen materials were often used by the Ancestral Puebloans in the construction and decoration of architectural elements. The earthen materials found in the cavates, which include mortars and plasters, probably came from local sources at Tsankawi, likely from the arroyo found to the south of the mesa. These materials were composed of varying amounts of clay-rich soil, sand, pumice gravel and wood ash, which would have been mixed with water or collected while wet. Deterioration of mortars and plasters vary, with interior or protected materials faring better than those on or in exterior or exposed walls. Intact, unstabilized masonry walls, interior finishes and applied decoration add to the significance of individual cavates.

*Mortar*

As a result of hundreds of years of neglect, most of the masonry walls and the mortars which held them together have crumbled, leaving nothing but rubble. Much of the masonry which remains intact serves to define cavate openings such as smoke holes and entrances. Few examples of original masonry remain at North Mesa, and most of it is unstablized. One example of an unstabilized masonry wall is at Cavate 1, LA 65743 in North Mesa. This enclosure wall is protected from above by a slight overhang. Although some stones are missing and some of the mortar has been lost, much of the wall is intact.

*Finishes*

Earthen finishes found in the cavates are sometimes well preserved, as most are found on cavate interiors and are somewhat protected from the elements. Common earthen finish types are applied plasters and washes. Applied plasters are defined as discrete layers of plaster greater than 1mm thick applied over masonry or tuff which are worked to create a continuous, relatively uniform surface. Plasters are a typically made from a tan or gray clay-rich material that can vary greatly in texture. Some contain inclusions of pumice, quartz and feldspar grains greater than 2mm while others are fine consisting primarily of clay and silt. Washes are defined as discrete layers of thinly applied earthen finish less than 1mm thick which are applied directly over plaster, masonry, or tuff. Colors of earthen finishes include shades of white, grey, tan, brown, pink and red, resulting from the use of mineral pigments or additives. Applied (painted) embellishments include colors such as red, blue, green, and yellow, all of which have been found in Frijoles Canyon cavates, but only red has been identified at Tsankawi.




**Figure 4: Plaster in RM 015, LA 65755**

Common plaster deterioration conditions include:

- partial loss - loss of one or more layers from the existing finish, leaving earlier layers exposed
- disintegration/friability - granular disaggregation of the finishes
- detachment - voids between finish layers, at the rock/plaster interface, or within the rock
- delamination / flaking, or the separation and lifting of discreet layers of finishes from each other

- blistering - localized, small scale swelling and/or rupturing of the finish layer
- blind voids - voids between plaster layers or at the rock/plaster interface which have no visible edges but which can be detected when a hollow sound is produced by tapping on the surface
- cracking, map and structural
- graffiti / vandalism - modern, intentionally inscribed or applied markings on the rock or finishes

*Wood*

Wood in the cavates was used not only as architectural elements, but also as fuel for puebloan and historic occupants of the structures. Hand-cut and hewn pieces would have been used as:

- large diameter beams (vigas) and roof supports for external pueblo rooms;
- latillas for the ceilings of the external pueblo rooms;
- support systems on the interior of rooms;
- loom supports and anchors;
- features of doorways and other wall openings; and
- wall pegs and loops.

Very little original wood material remains in the cavates of Tsankawi, either because it has deteriorated or has been removed. At Tsankawi Mesa examples of wooden wall pegs, ceiling pegs and loom anchor loops can be found.

# Appendix F:

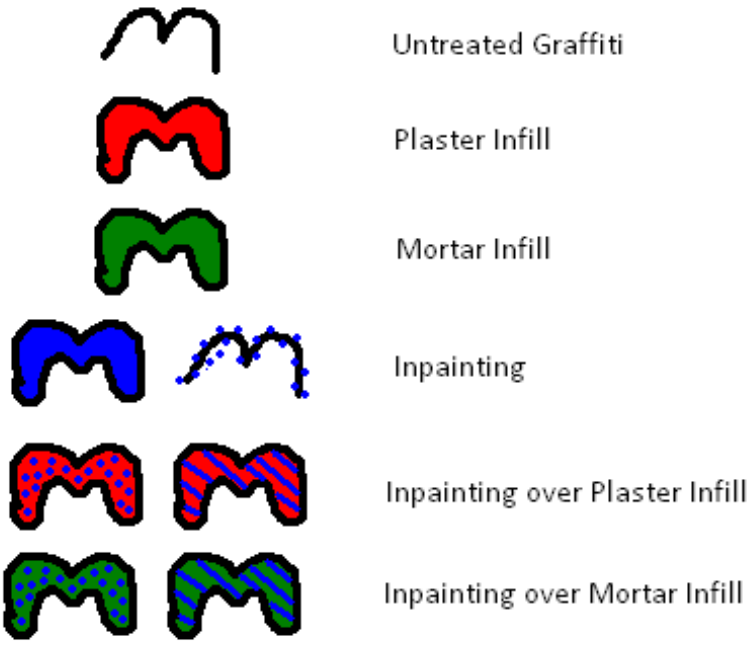
# Instructions for Graphic Documentation

## INSTRUCTIONS FOR GRAPHIC TREATMENT DOCUMENTATION FOR GRAFFITI MITIGATION

*General Procedure*

- Digitally photograph the graffiti with a sign board showing the LA and RM number, TSANKAWI, BEFORE TREATMENT, and the date
- Print the photo taken before treatment, place in acetate sleeve
- Annotate drawing, labeling the LA and RM number, wall face and date
- Outline all graffiti in black
- Fill in graffiti with the appropriate color/pattern
- Provide notes and mixture formulas used; circle prominent mixtures
- Re-photograph with sign board showing AFTER TREATMENT or AT, and frame the photograph similarly to the before treatment photo
- Print photo taken after treatment, place in acetate sleeve with the before treatment photograph

*Graphic Documentation Symbols and Meanings*



*Recommendations for Future Graffiti Mitigation Graphic Documentation*

- Problems arose with the legibility of the graffiti documentation because of the amount of information on them. Early on in the season, nearly all notes and testing areas were documented on the graphic documentation sleeve and complex treatments were documented as they progressed, creating multiple layers of polychrome markings get muddled and mixed. It is suggested that the graphic documentation sleeve only be filled out once the treatment is complete so that the final sheet is free of extraneous information and multi-staged treatments can be depicted without having to use multiple layers of marker. It is a requirement that the notes be stored on another sheet of paper, either a notebook or a loose printout of the Before Treatment that can be used as a worksheet. The worksheet option allows the information to be transferred to other workers easily, permitting multiple conservators to work on the same piece of graffiti.

- In the 2009 season confusion resulted when conservators referred to the same piece of graffiti with different names in their documentation. Each piece of graffiti should be given a name that specifically refers to it. This will allow for easy identification and communication and will also help when consolidating the notes of several conservators.

# Appendix G

# Graffiti Mitigation Report 2009

## GRAFFITI MITIGATION REPORT - 2009

In 2009, graffiti mitigation was completed in eleven cavates. In LA 50976 the following cavates were treated: cavate 27, 54, 55, 56, 59, 64, and 66. Cavates 09 and 10 from LA 65751 were also treated. Additionally, cavate 18 from LA 65755 was treated as well as cavate 09 from LA 128410. Graffiti mitigation was conducted during June–September 2009. The employees who contributed to the mitigation project included Stephen Merkel (project director), Erin Tyson (crew leader), and archaeological technicians Molly Ray, Mae Colburn, Michael Tomiak, with some contributions by Karim Hassanein, and Jonny Holdsworth.

Prior to conducting treatments, the seasonal VT staff met to discuss the graffiti mitigation strategy. A working document was produced which explained the criteria for treating graffiti outlined in a flow chart (see Appendix F). Stephen Merkel showed the crew treatments in Group B that were effective as well as materials that aged poorly and became ineffective over time. The crew also visited Group J for a training session and to observe conservators Larry Humetewa and Conor McMahon at work. The seasonal training clearly defined the objectives of the graffiti mitigation program while informing the staff of the complex decisions that must be made before treatments are applied.

*Schedule of Graffiti Mitigation Treatments:*

Room 09: LA 65751 *(06/11–06/22/2009)*

Tests were conducted on Thursday, June 11th and treatments continued the following week. The work was complete by Monday, June 22nd. The graffiti in this cavate took about two weeks of work to complete treatments. The after treatment photos for this cavate were taken on Tuesday, June 23rd.

Room 10: LA 65751 *(06/11–06/22/2009)*

Tests were conducted on Thursday, June 11th and treatments continued the following week. The work was complete by Monday, June 22nd. The graffiti in this cavate took about two weeks of work to complete treatments. The after treatment photos for this cavate were taken on Tuesday, June 23rd.

Room 66: LA 50976 *(06/22–07/14/2009)*

Tests were applied on Monday, June 22nd and work continued the following week of the 29th. Treatments were completed on the 13th and 14th of July. Conservators spent about two weeks completing the treatments in this cavate.

Room 64: LA 50976 *(06/23–07/08/2009 and 4/22/2010)*

Tests were applied on Tuesday, June 23rd by Molly and Erin, while Mae and Jonathan began mapping in cavate 59. Treatments continued for a few days and after photos were taken on July 8th. The graffiti in this cavate only took a few days to treat. A solitary instance of graffiti was treated in April, 2010 during a site inspection.

Room 27: LA 50976 *(07/13–09/08/2009)*

Tests were applied on the 13th and 14th of July. Some of the Tyuonyi masonry crew came to Tsankawi on Tuesday, July 14th for cross-training and applied tests in cavate 27. Work halted in this cavate on Monday, July 20th due to the odor from a large pile of animal droppings and the presence of bats in the ceiling. The crew came back to this cavate (wearing respirators) and applied tests the week of August 24th as well as the first week of September. The graffiti mitigation was complete on Tuesday, September 8th and the after treatment photos were taken on Tuesday, September 22nd. Treatments were applied sporadically over the span of several weeks.

Room 59: LA 50976 *(07/20–08/26/2009)*

Graffiti mitigation in this cavate started on Monday, July 20th. Several tests were applied early in the week and conservators moved to cavate 64 to assist with mapping. The crew returned to this cavate on August 17th and worked steadily throughout the week. Treatments were also applied the following week and mitigation was complete on August 26th. The graffiti mitigation in this cavate took about two weeks to complete.

Room 54: LA 50976 *(08/04–09/10/2009)*

Several preliminary tests were applied to the graffiti in this cavate on August 4th. Work halted for a week due to the mapping and backfilling of cavate 64 and the VT training field trip at Mesa Verde. Some tests were applied the week of August 24th and most of the treatments were applied on September 1st, 2nd, and 8th. The graffiti mitigation was finalized on Thursday, September 10th.

Room 55: LA 50976 *(08/04–09/08/2009)*

Conservators applied tests in this cavate on Tuesday, August 4th and most of the treatments were completed on this date. In-painting was conducted throughout the week of August 24th as well as September 1st and 2nd. The graffiti mitigation for this cavate was completed on Tuesday, September 8th. Although the treatments continued in this cavate over several weeks, most of the work was completed in two to three days.

Room 56: LA 50976 *(08/26–09/08/2009)*

Initial tests were conducted on Wednesday, August 26th. Treatments continued on the 1st and 2nd of September. The mitigation for this graffiti took several days to complete and the treatments were finalized on Tuesday, September 8th.

Room 18: LA 65755 *(09/14/2009-11/16/09)*

Conservators applied treatments in this cavate the week of September 14th. The mitigation was complete within two days of work, and the cyclododecane was nearly gone by 11/16/09.

Room 09: LA 128410 *(09/14–09/18/2009)*

Preliminary tests were conducted on Monday, September 14th. Treatments continued on Thursday, September 24th and were completed the following week. Conservators spent a two to three days completing the graffiti mitigation in this cavate.

## LA 50976; Room 27

**"LI LII E" (north wall)** LA 50976; Room 27

*Conservator: Molly Ray*

This piece of graffiti was treated with a lime/tuff mortar fill. The incisions were relatively deep and required several layers of mortar fill. Two mixtures were used throughout the graffiti: (2 parts group M tuff, 2 parts white tuff, 1.5 parts lime, .5 part sanidine rock) for the lighter areas. The mixture (2 parts tan tuff, 1 part white tuff, 1 part lime, .5 rock) was applied where a darker color was needed. The texture of the surrounding tuff was rough and rocky. In order to duplicate this type of texture sanidine rocks were added into the mixture and the tuff was not sieved. When applying the mortar, the surface was wet thoroughly, then the conservator inserted the mortar with their fingers, and rewet the surface. Gaps and voids were created throughout the graffiti in order to blend in with the original fabric of the wall.

| ***Mixtures*** | ***Comments*** |
|---|---|
| 4 white tuff, 3 lime, 1 tan tuff, 3 sanidine rock | Too rocky and bright |
| 1 group M tuff, 1 white tuff, 1 lime | Texture is too smooth, the color is a close match |
| 2 group M tuff, 2 white tuff, 2 lime, 1 rock | A little too rocky, and slightly too white |
| 2 group M tuff, 2 white tuff, 1.5 lime, .5 sanidine rock | Very good color match and good texture<br>I used this mixture to fill most of the graffiti. This mixture worked best in lighter areas. |
| 2 tan tuff, 1 white tuff, 1 lime, .5 rock | Good mixture,<br>I used this mixture in several sections of the graffiti. This mixture worked best in darker areas. |

**"LII E ^^^" (west wall)** LA 50976; Room 27

*Conservator: Molly Ray*

This piece of graffiti consisted of several lines and triangular markings. While the graffiti did not spell any word, the shapes and lines were still recognizable and needed treatment. A lime/tuff mortar was applied into the incisions using standard application methods. There were two mixtures used to treat various areas of the graffiti: (3 parts white tuff, 1 part tan tuff, 2 parts lime, 1 part sanidine rock) and (3 parts white tuff, 1 part tan tuff, 2 parts lime, .75 part sanidine rock). The dirt was not sieved and sanidine rocks were added to the mixture in order to achieve a rough texture. Gaps and voids were created in order to mimic the surrounding surface.

| ***Mixtures*** | ***Comments*** |
|---|---|
| 2 white tuff, 1 tan tuff, 1 lime | Not rocky enough, even when left un-sieved<br>Not bright enough |
| 4 white tuff, 1 tan tuff, 3 lime, 3 sanidine rock | Too rocky, not a good color match |
| 3 white tuff, 1 tan tuff, 2 lime, 1 sanidine rock | Good texture and color<br>I used this to fill most of the graffiti |
| 3 white tuff, 1 tan tuff, 2 lime, .75 sanidine rock | Better texture<br>I also used this mixture in several parts of the graffiti |

**"F" (west wall)** LA 50976; Room 27

*Conservator: Molly Ray, Michael Tomiack*

This piece of graffiti was treated with a lime/tuff mortar mixture. The mixture included: 3 parts white tuff, 1 part tan tuff, 2 parts lime, and 1 part sanidine rock. Standard methods of application were used to treat this graffiti. Michael Tomiack also assisted with this treatment as part of his graffiti mitigation training.

**"K k" (west wall)** LA 50976; Room 27

*Conservator: Molly Ray*

The incisions from this vandalism were not very deep and required a small amount of mortar in-fill. The mortar fill included: 3 parts white tuff, 1 part tan tuff, 2 parts lime, and 1 part sanidine rock. The entirety of the graffiti was not filled, but was completely disguised.

**"DANJ" (west wall)** LA 50976; Room 27

*Conservator: Erin Tyson*

This instance of graffiti consists of the letters "DANJ" carved into a plaster fragment on the western wall of the cavate. It required clay fills so that it would be camouflaged within the surrounding plaster. The area around the graffiti contains gritty, absorbent, ochre stains across the surface, perhaps a result of efflorescence, as well as discreet patches of soot. These elements called for in-painting of the clay fills for continuity of the marks across plaster panel.

After testing five different colors of plaster, the conservator found two particular combination that appeared most visually compatible with the primary background colors of plaster (mixture one for the "DA": 1 flesh levigated clay, 2 white tuff, 1 gulch clay, 1 red levigated clay, 1 tan levigated clay; mixture two for the "NJ": 1 flesh levigated clay, 2 white tuff, 1 red/yellow clay). Only fragments of the incised letters needed to be filled in order to obscure the graffiti so that it was no longer visible.

The conservator in-painted with burnt sienna and black to imitate the dirt and soot marks appearing on plaster surrounding the graffiti. Ochre was used to conceal the areas of fill adjacent to the staining.
It should be noted the graffiti is located just above an area on the cavate floor presumably used as a latrine by animals. The crew spotted a colony of bats living in a large crack between the cavate ceiling and back wall the week of July 20th. We halted work on this cavate until the bats vacated, but guano and a strong urine odor remained. A respirator should be worn when working in this cavate.

| *Mixtures* | *Comments* |
|---|---|
| 1 gulch clay, 1 white tuff | Too dark |
| 1 gulch clay, 2 white tuff | Too dark and cool, needs brightness |
| 1 gulch clay, 2 white tuff, 1 flesh levigated | Is now light enough but still lacking warmth |
| 1 flesh levigated, 2 white tuff, 1 red/yellow | Good match for the "NJ" in the right extent of the graffiti |
| 1 flesh levigated, 2 white tuff, 1 gulch clay, 1 red levigated, 1 tan levigated | Good match for the "DA" in the left extent of the graffiti |

**"SUNBURST SOUTH" (west wall)** LA 50976; Room 27

*Conservator: Erin Tyson*

A modern carving of a sunburst (a recessed circle with deep, short radiating lines) constitutes this instance of graffiti. It was incised and gauged into tuff on the western wall near the southwest corner of the cavate. Although this instance does not meet the criteria for graffiti selected for treatment, we decided to mitigate it because the sunburst image misrepresents the imagery commonly found in pertroglyphs at Bandelier.

No tests were conducted before applying the mortar fill because Molly Ray had already found a close color match for another instance of graffiti nearby. The mixture (2 group M tuff, 1 white tuff, 1 ½ lime, ½ rock) was used to fill all of some of the sunburst rays and just fragments of some of the rays. It was not necessary to fill any of the recessed circle at the center of the sunburst in order to obscure it.

As the mortar was applied, it was modeled to emulate the surface of the surrounding area. Many ridges and voids were created in the fill.

| *Mixtures* | *Comments* |
|---|---|
| 2 group M tuff, 1 white tuff, 1 ½ lime, ½ s. rock | Good match |

**"SUNBURST NORTH" (west wall)** LA 50976; Room 27

*Conservator: Erin Tyson*

Most of the description of "SUNBURST SOUTH" explains the context of "SUNBURST NORTH". The same mixture (2 group M tuff, 1 white tuff, 1 ½ lime, ½ rock) was used to fill it, and, similarly, it was applied mostly in the rays. This application turned out to be too light and smooth. However, in the "SUNBURST NORTH" case the graffiti was still very visible because the central circle of the sunburst is so deep and well defined. The mixture was modified, eliminating the white tuff, and was applied over all the areas where the first batch of mortar was filled. A large portion of the central circle was also filled with the new mortar. The appearance has improved with the addition of the second mortar, but traces of the lighter, original mortar remain in discreet areas. These should be in-painted. Also, more mortar could be applied in the central circle of the sunburst to further conceal it.

| ***Mixtures*** | ***Comments*** |
|---|---|
| 2 group M tuff, 1 white tuff, 1 ½ lime, ½ rock | Too light and smooth, needs more rock for texture |
| 3 group M tuff, 1 ½ lime, ½ rock | Good match |

**"Y A JA" (south wall)** LA 50976; Room 27

*Conservator: Stephen Merkel*

A mortar fill was applied in discreet areas of this graffiti to break up lines and recognizable patterns. The grooves were wetted with water by a small brush before the mortar infill was added, and afterwards the mortar infill was re-wetted with a brush to expose the rock inclusions in the mortar mixture. The mortar mixture used was 3 white tuff, 1 tan tuff, 2 lime, and 1 sanidine rock, a mixture developed by M. Ray and was used in other areas of the cavate.

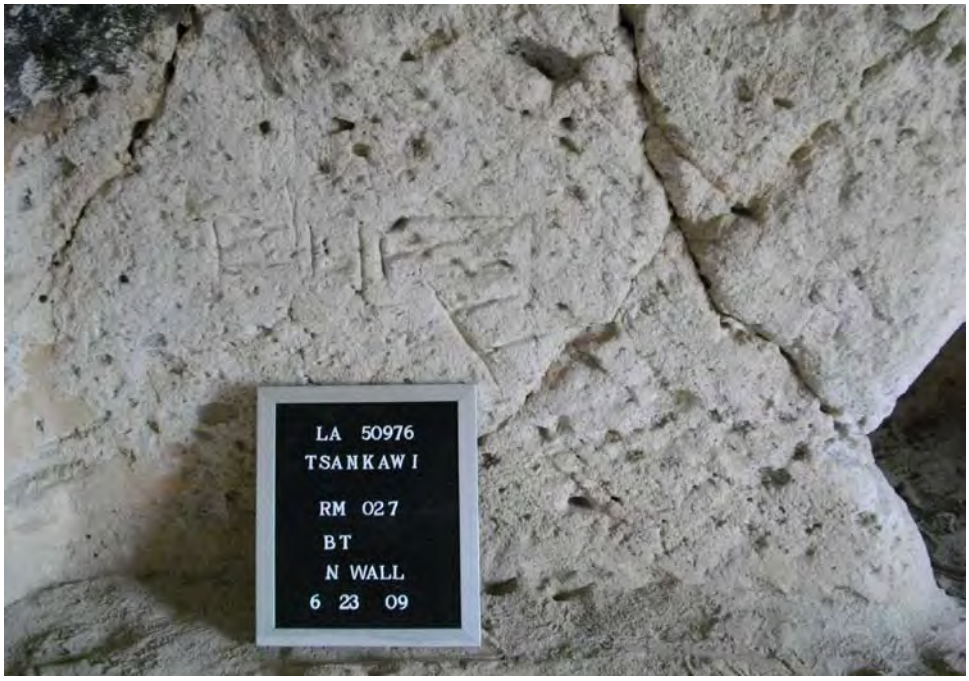
| ***Mixtures*** | ***Comments*** |
|---|---|
| 3 white tuff, 1 tan tuff, 2 lime, 1 sanidine rock | Good texture and color |

**"M" (south wall)** LA 50976; Room 27

*Conservator: Michael Tomiak*

The instance of this graffiti required in-painting. A mortar fill was not necessary due to the shallow nature of the incisions. The graffiti was camouflaged by applying black and brown pigments.

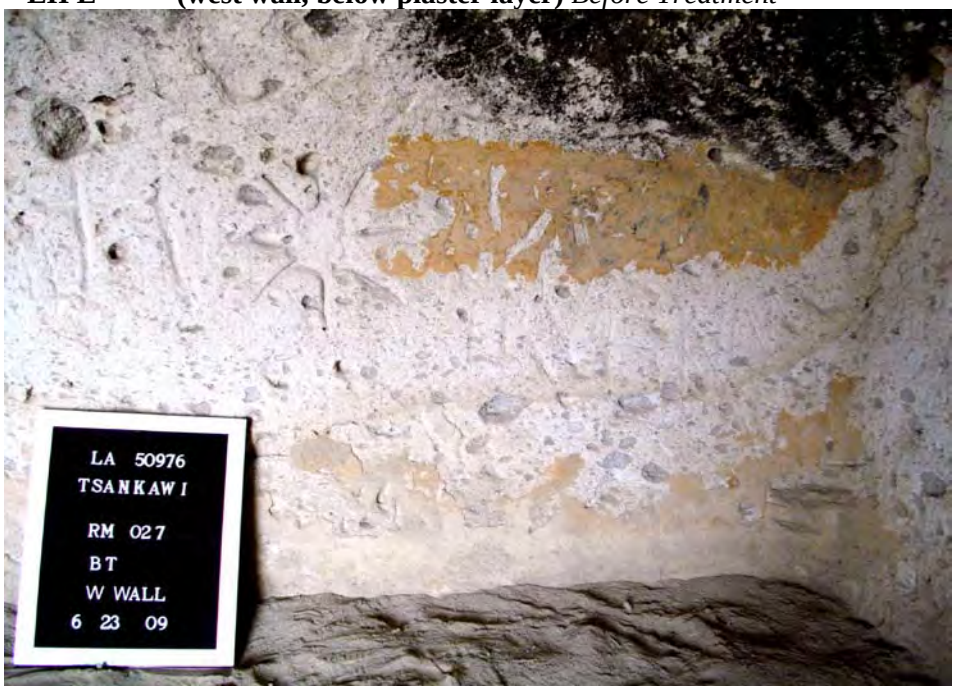
**"LI LII E" (north wall)** *Before Treatment*



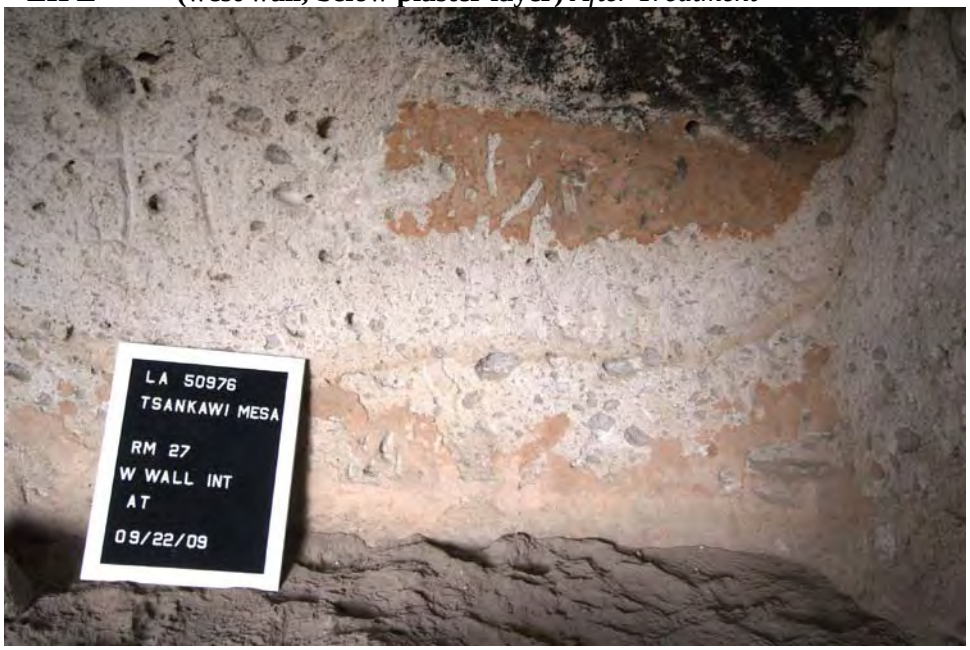

**"LI LII E" (north wall)** *After Treatment*



**"SUNBURST NORTH" (west wall, top left)** *Before Treatment*
**"DANJ" (west wall, top right in plaster)** *Before Treatment*
**"LII E ^^^" (west wall, below plaster layer)** *Before Treatment*



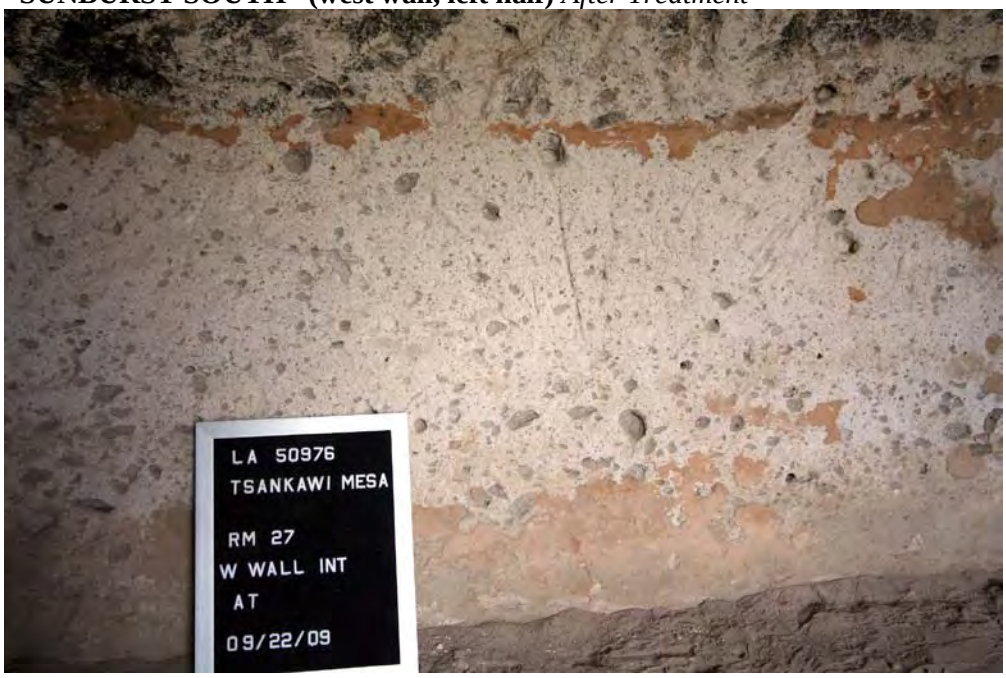

**"SUNBURST NORTH" (west wall, top left)** *After Treatment*
**"DANJ" (west wall, top right in plaster)** *After Treatment*
**"LII E ^^^" (west wall, below plaster layer)** *After Treatment*



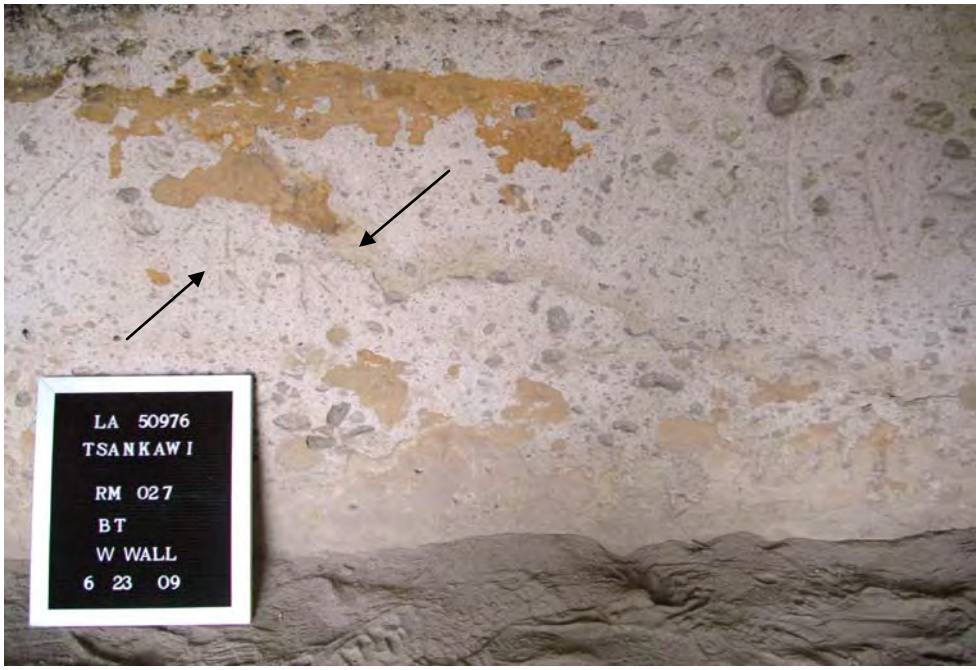
**"F" (west wall, right half)** *Before Treatment*
**"SUNBURST SOUTH" (west wall, left half)** *Before Treatment*



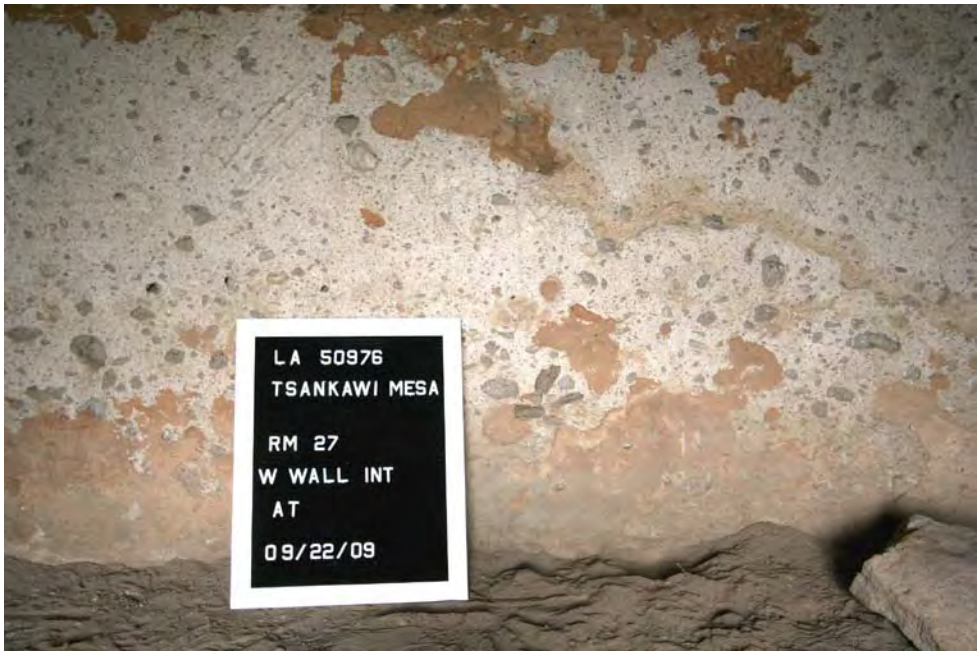

**"F" (west wall, right half)** *After Treatment*
**"SUNBURST SOUTH" (west wall, left half)** *After Treatment*



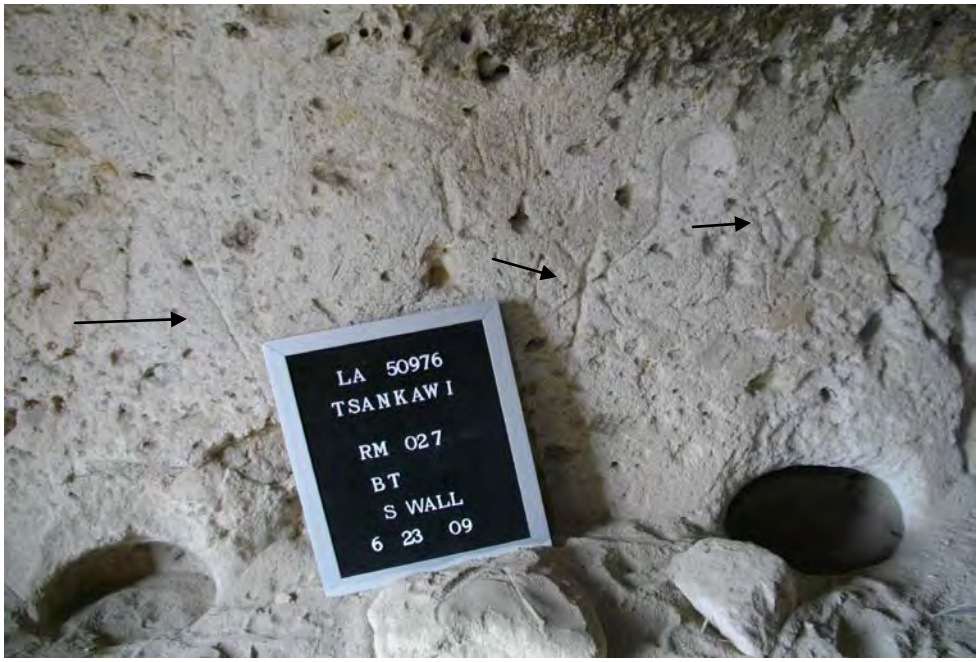
**"K k" (west wall)** *Before Treatment*




**"K k" (west wall)** *After Treatment*



**"Y A JA" (south wall)** *Before Treatment*




**"Y A JA" (south wall)** *After Treatment*



**"M" (south wall)** *Before Treatment*




**"M" (south wall)** *After Treatment*



## LA 50976; Room 54

**"Kokopelli figure" (northeast platform)** LA 50976; Room 54

*Conservators: Erin Tyson, Molly Ray, Stephen Merkel, Michael Tomiak*

A modern line drawing resembling a kokopelli is incised into the tuff surface on the top of a platform near the entrance of the cavate. Due to the placement of the kokopelli on a surface below eye-level and near the trail, the great depth of the incisions and the popularity of kokopelli images in the Southwest, this instance of graffiti is very prominent. The tuff on which it's drawn is dark gray in color and contains extensive black biological growth.

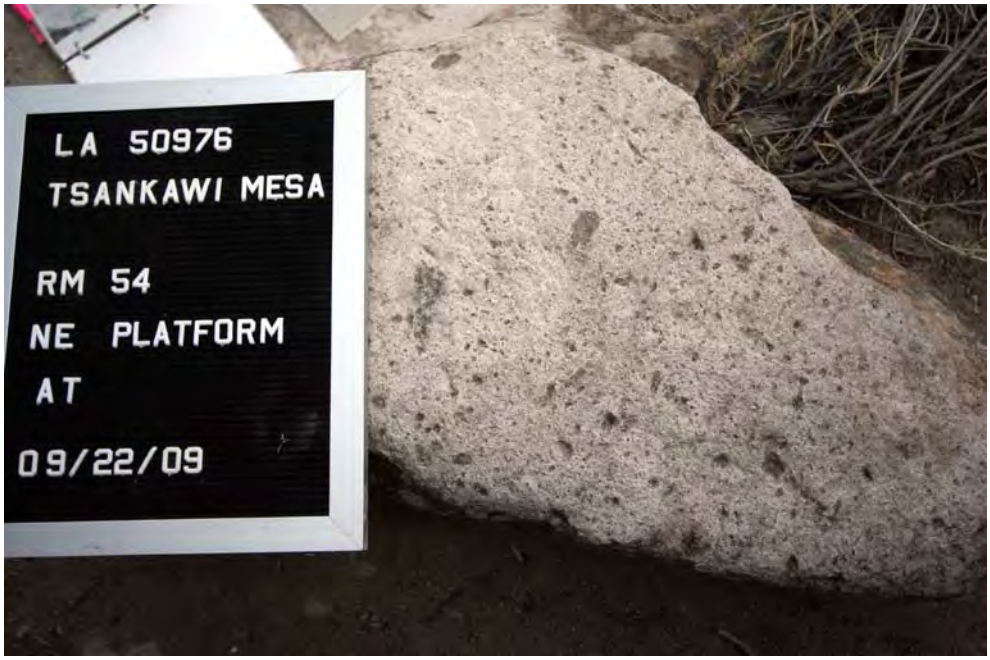
Treatment of this graffiti calls for a mortar fill and in-painting. At least five mortar mixtures were tested for color matches. Erin's final test (2 white tuff, black pigment, 1 lime) yielded the best results but still was not close enough. Molly continued testing and treated the graffiti over the entirety of the incisions with 1 part gray tuff, 1 part gray pumice, ½ part sanidine rock, and 1 part lime. She also in-painted the graffiti with Ivory Black and Burnt Umber pigments. She applied the pigments as dots over most of the mortar fill. A very thin and faint black pigment was mostly used, and in some areas a darker and thicker mixture was applied. Some hydraulic lime was mixed into the black pigment and applied on the "legs" of the kokopelli figure.

| ***Mixtures*** | ***Comments*** |
|---|---|
| 2 ½ Group M tuff, 1 lime | Too tan and light |
| 2 ½ white tuff, 1 lime | Too light |
| .7 tan tuff, .7 Group M tuff, .7 gray dirt, 1 lime | Too brown, not dark enough |
| 2 gray dirt, 1 lime | Close in hue but still not dark enough |
| 2 white tuff, black pigment, 1 lime | A good match but I added a little too much pigment |
| 2 white tuff, 2 lime, 1 rock, 6 pinches of black pigment, 1 pinch of burnt umber | Too dark |
| 2 white tuff, 1.5 lime, 1 rock, 3 pinches of black pigment | Not a good color match |
| 1 gray tuff, 1 gray pumice, .5 rock, 1 lime | Very good color and texture match |

**"Kokopelli" (northeast platform)** *Before Treatment*




**"Kokopelli" (northeast platform)** *After Treatment*



## LA 50976; Room 55

**"A" (northwest wall)** LA 50976; Room 55

*Conservators: Erin Tyson, Mae Colburn, Molly Ray*

This instance of graffiti consists of the letter "A" in the elevated wall niche in the northwest wall of the cavate. It is deeply incised in the sooted tuff and required a mortar fill and in-painting. As the mortar was applied, it was modeled to emulate the surface of the surrounding area. After the mortar dried, the fill was painted with mostly black pigment and small amounts of ochre in discreet areas. An issue with staining did arise during this conservation treatment. After filling the incision with mortar, a yellow halo appeared around the outer extent of the fill. Also, the color of the mortar was slightly more yellowish-tan than the tuff wall.

Erin and Mae applied black pigments in an attempt to conceal the staining and mismatched mortar hue. The first application of black pigment was unsuccessful in doing so. In response to the staining, Molly applied charcoal in several sections of the graffiti by carefully grinding it into the surface. This helped to disguise the graffiti without causing further staining from the application of moisture. However, the charcoal did not adhere very well to the surface of the mortar fill. In this case a very thick coat of Vine Black pigment was applied, which did not cause staining.

| ***Mixture*** | ***Comments*** |
|---|---|
| 2 ½ white tuff, 1 lime | When the mortar dried, it appeared darker and more yellow than the tuff substrate. This was not too problematic since the fill was in-painted. Staining , appearing as an ochre line and halo, occurred around the mortar fill. |

**"R" (southwest wall)** LA 50976; Room 55

*Conservators: Erin Tyson, Mae Colburn*

This instance of graffiti is a carved "R" or possible "P" in the southwest wall of the cavate. It is incised in the tuff and required a mortar fill. Four mortar mixtures were tested for color matches with the combination: 2 gray dirt, 1 lime proving to be the best fit. Only filling fragments of the graffiti was necessary to obscure it. As the mortar was applied, it was modeled to emulate the surface of the surrounding area.

| ***Mixture*** | ***Comments*** |
|---|---|
| 2 ½ Group M tuff, 1 lime | Too tan and dark |
| 2 ½ white tuff, 1 lime | Too light |
| 1 ¼ white tuff, 1 ¼ Group M tuff, 1 lime | Too tan |
| 2 gray dirt, 1 lime | Good color match and texture |

**"M" (southwest wall)** LA 50976; Room 55

*Conservators: Erin Tyson, Mae Colburn, Molly Ray*

This instance of graffiti is a carved "M" in the southwest wall of the cavate. It is incised in the tuff and required a mortar fill. Five mortar mixtures were tested for color matches with the combination: 2 gray dirt, 1 lime proving to be the best fit. As the mortar was applied, it was modeled to emulate the surface of the surrounding area. After the fill dried it looked too light, so it was in-painted with burnt umber and very diluted black.

| ***Mixture*** | ***Comments*** |
|---|---|
| 2 ½ Group M tuff, 1 lime | Too tan and dark |
| 2 ½ white tuff, 1 lime | Too light |
| 1 ¼ white tuff, 1 ¼ Group M tuff, 1 lime | Too tan |
| 2 tan tuff, 1 lime | Still too tan |
| 2 gray dirt, 1 lime | Good color match and texture. Ended up being too light and therefore was inpainted |

**"M" (east entrance platform)** LA 50976; Room 55

*Conservators: Erin Tyson, Mae Colburn*

This instance of graffiti is a carved "M" on the exterior of the eastern platform near the entrance of the cavate. It is incised in the tuff and required a mortar fill and in-painting. Four mortar mixtures were tested for color matches with the combination: 2 gray dirt, 1 lime proving to be a very good fit. As the mortar was applied, it was modeled to emulate the surface of the surrounding area. Raw umber, sienna, ochre and black pigments were used in the in-painting to replicate the dirt and biological growth occurring in the surrounding areas.

| ***Mixture*** | ***Comments*** |
|---|---|
| 2 ½ Group M tuff, 1 lime | Too tan and dark |
| 2 ½ white tuff, 1 lime | Too light |
| 1 ¼ white tuff, 1 ¼ Group M tuff, 1 lime | Too tan |
| 2 gray dirt, 1 lime | Good color match and texture |

**"HIA" (east wall)** LA 50976; Room 55

*Conservators: Erin Tyson, Mae Colburn*

This instance of graffiti consists of the letters "HIA" carved onto the eastern wall near the entrance of the cavate. It is incised in the tuff and required a mortar fill. Two mortar mixtures were tested for color matches with the combination: 2 gray dirt, 1 lime proving to be a very good fit. As the mortar was applied, it was modeled to emulate the surface of the surrounding area.

| ***Mixture*** | ***Comments*** |
|---|---|
| 2 ½ white tuff, 1 lime | Too light |
| 2 gray dirt, 1 lime | Good color match and texture |

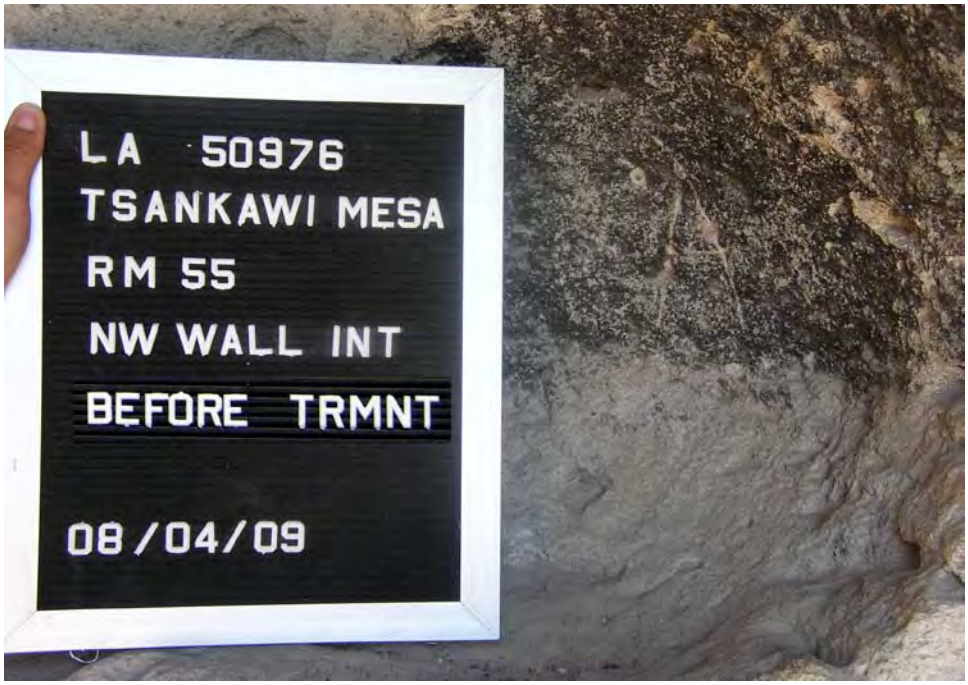
**"MINA" (north wall entrance)** LA 50976; Room 55

*Conservators: Erin Tyson, Mae Colburn*

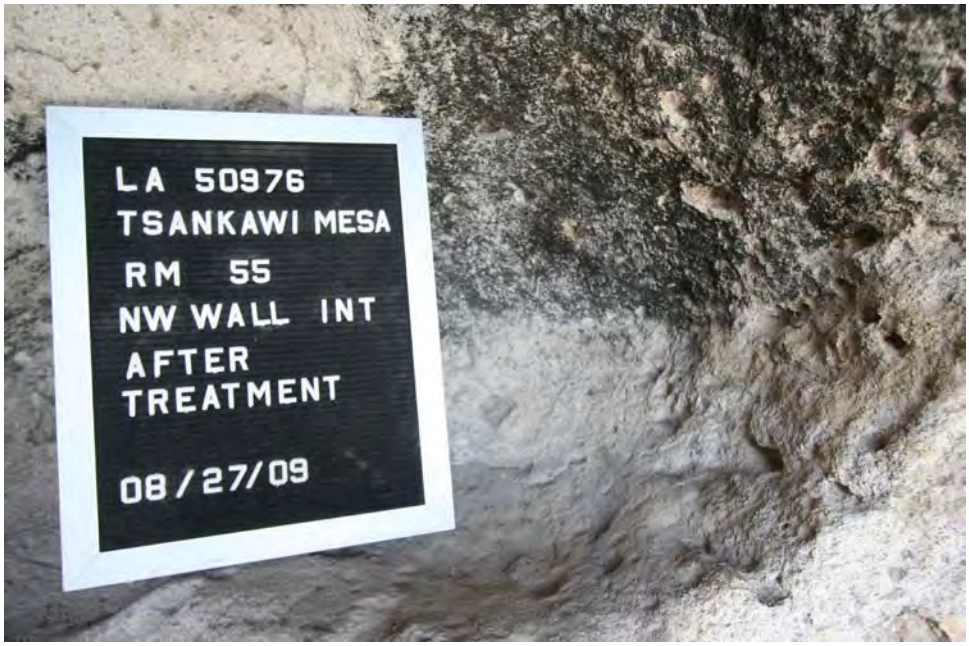
This instance of graffiti contains letters resembling "MINA" on the exterior of the northern wall near the entrance of the cavate. It is composed of very narrow incisions in the tuff and was thought to require a mortar fill and in-painting. Five mortar mixtures were tested for color matches. Before a good fit was found, it became evident that the lines of the graffiti are too narrow and shallow for a mortar fill and only in-painting would be necessary. All the test mortar fills were scraped out and ochre, raw umber, sienna and black pigments were used to paint inside the incisions. The conservator applied the pigments as small dots in order to mimic the biological growth patterns surrounding the graffiti.

| ***Mixture*** | ***Comments*** |
|---|---|
| 2 ½ Group M tuff, 1 lime | Too tan and dark |
| 2 ½ white tuff, 1 lime | Too light |
| 1 ¼ white tuff, 1 ¼ Group M tuff, 1 lime | Too tan |
| 2 tan tuff, 1 lime | Still too tan |
| 2 gray dirt, 1 lime | Better match but it was decided to scrape out all the mortar and rely only on in-painting for the treatment. |

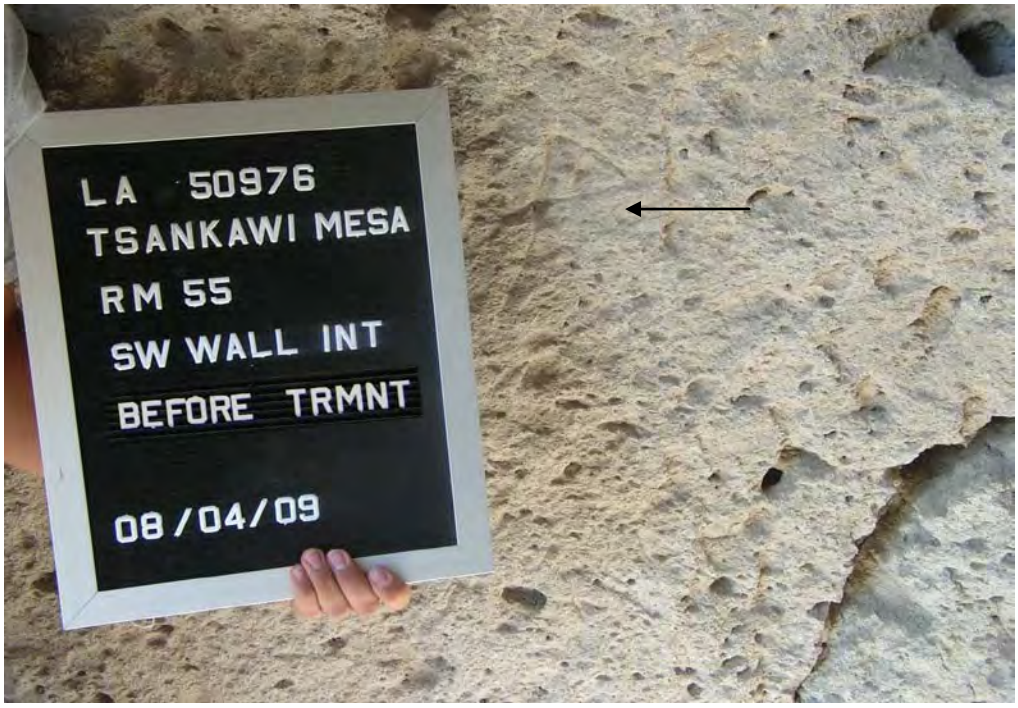
**"A" (northwest wall)** *Before Treatment*



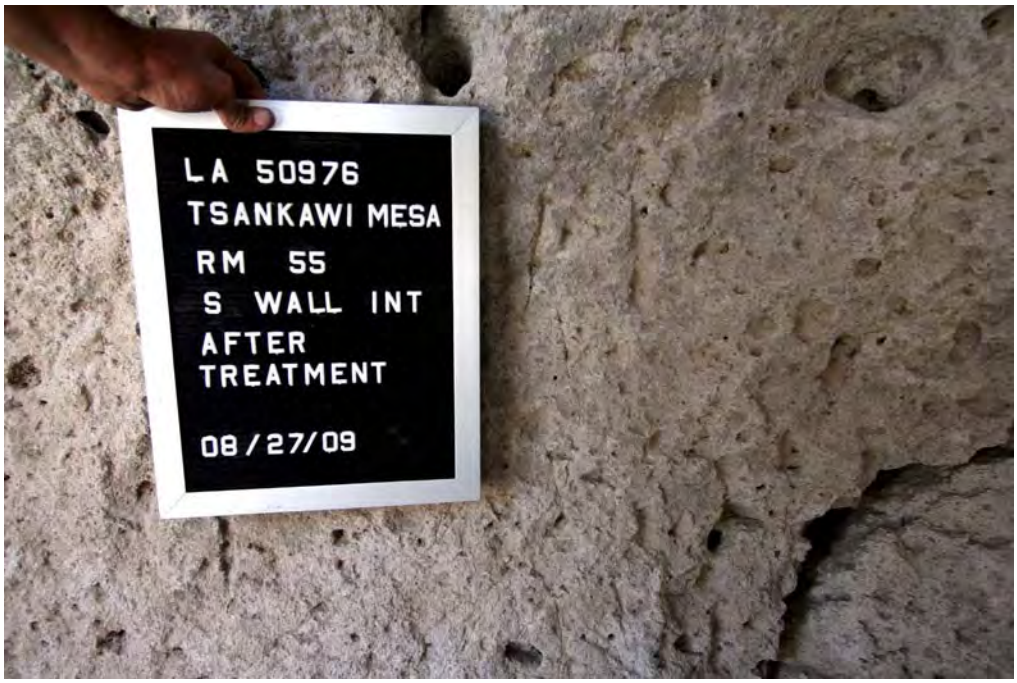

**"A" (northwest wall)** *After Treatment*



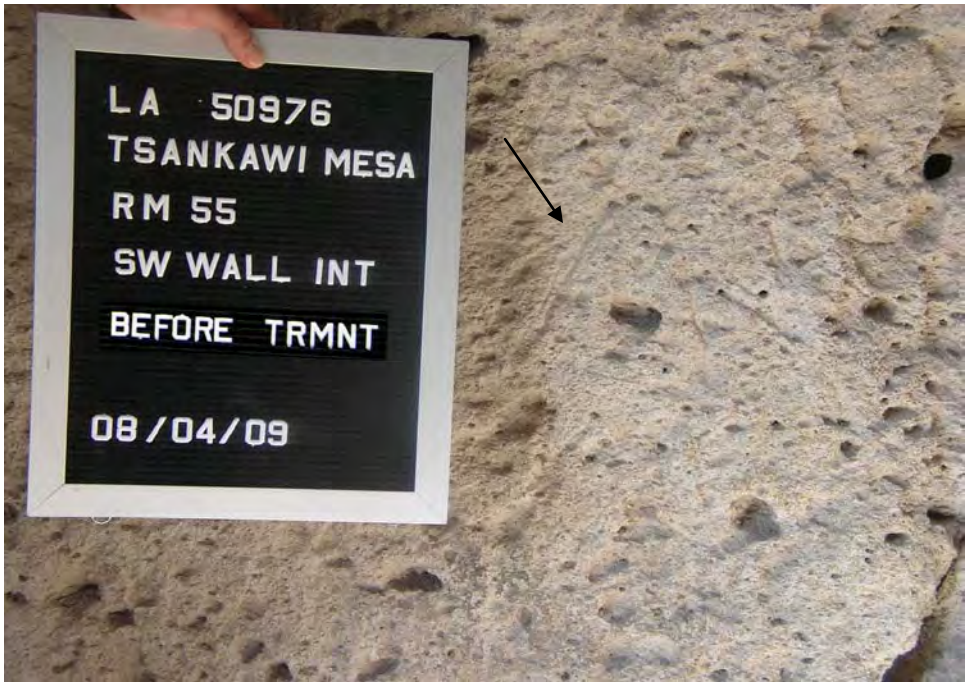
**"R" (southwest wall)** *Before Treatment*




**"R" (southwest wall)** *After Treatment*



**"M" (southwest wall)** *Before Treatment*




**"M" (southwest wall)** *After Treatment*



**"M" (east entrance platform)** *Before Treatment*




**"M" (east entrance platform)** *After Treatment*



**"HIA" (east wall)** *Before Treatment*




**"HIA" (east wall)** *After Treatment*



**"MINA" (north wall entrance)** *Before Treatment*




**"MINA" (north wall entrance)** *After Treatment*



## LA 50976; Room 56

**Joey (north wall exterior)** LA 50976; Room 56

*Conservator: Molly Ray*

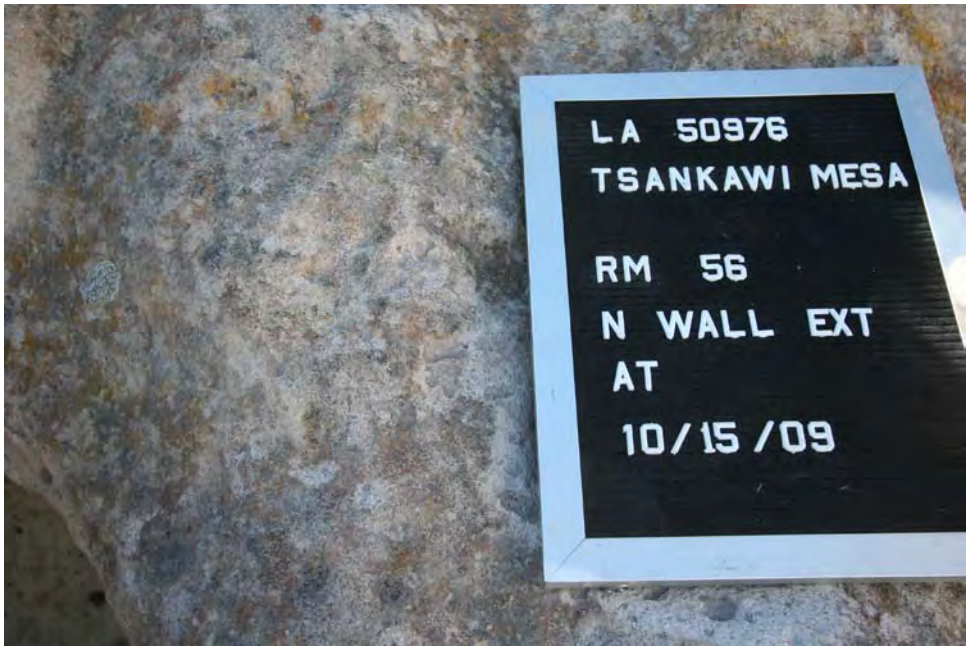
This instance of graffiti was very deeply incised and required a mortar fill and in-painting for treatment. Two mixtures were used to treat the graffiti: (1 part group M tuff, 1 part tan tuff, 1 part lime, .5 part sanadine rock) and (1 part group M tuff, 1 part gray tuff, 1.5 parts lime, .5 part rock). The mortar was applied in sections of the graffiti and several holes and gaps were left to mimic the surrounding surface. Several coats of pigments were also applied including Ivory Black, Burnt Umber, Yellow Ochre, Burnt Sienna, and Raw Sienna. The Burnt Umber was applied as a very thin and watery mixture as a base coat. Small scattered dots were then applied in an attempt to mimic the surrounding biological growth using the red, yellow, and black pigments.

| ***Mixtures*** | ***Comments*** |
|---|---|
| 2 white tuff, 1.5 lime, 1 rock, 3 pinches of black pigment | Too light, also needs more warmth |
| 1 tan tuff, 1 gray tuff, 1 lime, .5 rock | Okay match but needs to be a bit warmer<br>good texture |
| 1 group M tuff, 1 tan tuff, 1 lime, .5 sanadine rock | Good color match and good texture match |
| 1 group M tuff, 1 gray tuff, 1.5 lime, .5 rock | Very good color match<br>Good texture |

**Joey (north wall exterior)** *Before Treatment*



**Joey (north wall exterior)** *After Treatment*



**LA 50976; Room 59**

**"Anarchy symbol" (northwest wall)** LA 50976; Room 59

*Conservator: Molly Ray*

This instance of graffiti consisted of a large anarchy symbol about *two feet in length and two and a half feet wide*. There had been a previous treatment in 1998 which consisted of a homogonous color and texture that was slightly recessed from the original plaster (see **Appendix H** for the description of treatments from this field season). Since the graffiti covered such a large space and had been previously treated, it required many different color mixtures and textures for a successful treatment.

The graffiti was treated with a plaster fill and in-painting. Over ten mixtures were tested which are listed in the chart below. The use of multiple colors and textures was necessary to completely disguise the graffiti. The conservator started with a few basic mixtures by combining two colors at a time. This helped me to single out the red/yellow dirt as a very good color for the treatment; it also became obvious that the tan levigated dirt and red levigated clay were very bad colors for this treatment.

The mixture that was mostly used to treat the graffiti consisted of: 2 parts red/yellow dirt and 1 part flesh levigated clay. Another mixture that was used throughout the graffiti was 1 part red/yellow dirt, 1 part flesh levigated clay, and 1 part white tuff. The white tuff was essential to lightening the mixture, yet it made the texture very gritty. To solve this problem, the conservator watered down the mixture and applied it as a slip in the areas where a very smooth texture was desired. Applying it as a slip made a powdery texture and it could easily be smoothed out and blended in with the surrounding plaster.

In order to achieve a rougher texture, small sanidine rocks were applied in a variety of ways. First, a small amount of rocks were mixed into the plaster fill. The best way to apply this type of mixture was to first apply a plain plaster mix and reapply water to make it very malleable and moist, then the rocky plaster mix was easily applied by firmly pressing down on the plaster. When it was necessary to have more control on the placement of the rocks, the conservator would insert the rocks onto a moist plaster with a micro-spatula and palette knife. The surface was always rewet after applying rocks to ensure that it would set into the plaster.

A variety of pigments were applied to further blend the graffiti in with the surrounding surface. The pigments that were applied included burnt umber, yellow ochre, raw sienna, and vine black. The conservator used the flat surface on the palette to mix the pigments with water. The flat surface allowed for the desired consistency to be maintained. Small organic shapes were painted on in several sections of the graffiti. Faint undercoats of colors were first applied, and darker mixtures were added as needed.

| ***Mixture*** | ***Comments*** |
|---|---|
| 1 red/yellow dirt, 1 white tuff | Somewhat dark, but okay color match for darker areas, the texture is gritty |
| 1 tan levigated, 1 white tuff | Too tan and gritty |
| 1 red/yellow dirt, 1 flesh levigated | A little too peach, but I was able to use this in sections of the graffiti |
| 1 tan levigated, 1 flesh levigated | Too peach and dark |
| 1 red/yellow dirt | Good match for darker areas; It is obvious that the red/yellow dirt is a good base to add other colors to |
| 1 red/yellow dirt, 1 flesh, 1 red levigated clay | Too warm |
| 2 red/yellow dirt, 1 red levigated | Too warm; obvious that the red levigated clay is not a good match with any combination of materials |
| 2 tan levigated, 1 tuff, 1 flesh levigated, 1 red levigated clay | Too tan and warm |
| 2 red/yellow dirt, 1 flesh levigated | Very good match, somewhat dark,<br>I used this mixture for a large portion of the treatment; It was a good smooth texture |
| 1 tan levigated, 1 flesh levigated, 1 white tuff | Too tan, obvious that the tan levigated is not a good match with any combination of materials |
| 1 red/yellow dirt, 1 flesh levigated, 1 white tuff | great mixture to lighten up surface; I used this mixture all throughout the graffiti |
| 2 white tuff, 1 red/yellow dirt | Good mixture for light areas; gritty texture |
| 2 red/ yellow dirt, 1 white tuff | Too dark, not a good match for most areas |
| 2 red/yellow dirt, 1 white tuff, 1 flesh levigated | Very good match, this was good to transition in between dark and light areas |
| 2 red/yellow dirt, 1 white tuff, 1 flesh levigated, 1 red levigated | Too red |

**"Pearl" and "ThE BIG O" (northwest wall)** LA 50976; Room 59

*Conservators: Erin Tyson, Molly Ray, Michael Tomiak*

Both of these pieces of graffiti have been treated from previous field seasons (see **Appendices H** and **I** for the description of treatments from these field seasons). What was identified as "Pearl" in 1998 was treated that season with a soil/acrylic emulsion mixture. A new instance of graffiti identified as "THE BIG O" was carved on top of "Pearl" sometime in between the 1998 and 2001 field seasons. This new piece of graffiti, "THE BIG O" was treated in 2001. From these two previous treatments what remained visible included "Pea" from "Pearl" and "eE BIG O" from "THE BIG O." Both of these instances of graffiti were retreated in 2009. The previous treatments left the letters recessed and applied a mixture that had a homogenous color and texture compared to the surrounding area. The "O" at the northwestern (right) extent of the graffiti is the most prominent element and appears to be the most challenging to treat.

Several color matches were attempted in plaster tests on "BIG O". Erin conducted the first set of tests which were too dark, but a good match was found for the "P" (2 white tuff, 1 tan levigated, 1 red levigated, 1 red/yellow, 1 flesh levigated, 1 gulch clay) on the upper row. This mixture was used to fill the entirety of the letter "P".

Michael Tomiak mixed several other test combinations at a later date. Most of Michael's mixtures appeared to be much too chalky and light compared to the surrounding plaster, however, one very good match did exist. Michael's mixture was identified as I part red yellow dirt, 1 part flesh levigated clay, and 1 part white tuff. Applying this mixture in this graffiti did not yield the same results as Michael's test and did not seem to be consistently a good match.

Molly found that applying Michael's mixture (1 flesh levigated, 1 red/yellow, 1 white tuff) was effective, as long as it was applied as a thin slip rather than a thick plaster. The application of a watered down mixture dried as a powdery texture and was easily blended into the surrounding surface. Erin found that the standard procedure of pre-wetting the surface before applying the clay was not necessary in certain areas. The 1 red/yellow, 1 white tuff, 1 flesh levigated (1-1-1) mixture was relied upon as a base for most of the wall. Then a mixture composed of 1-1-1 + tan levigated + raw umber was used for in-painting. Small pebbles from the gray dirt were also inserted into the in-painting mixture and pressed into the surface of the plaster wall. This helped to maintain continuity in the texture of the surrounding areas.

Finally, small black dots were painted over parts of the fills to imitate the soot patterning present in neighboring areas of the wall.

*See table on next page*

| ***Mixture*** | ***Comments*** |
|---|---|
| 1 gulch, 1 red levigated, 1 flesh levigated, 2 white tuff, 2 red/yellow | Too warm and bright |
| 1 gulch, 1 red levigated, 1 flesh levigated, 2 white tuff, 2 tan levigated | Too gray and gritty |
| 1 red/yellow, 1 red levigated, 1 flesh levigated, 1 white tuff, 1 tan levigated | Added more necessary warmth but still too gray |
| 2 red/yellow, 1 flesh levigated | Much too warm and bright |
| 1 white tuff, 1 flesh levigated, 1 red/yellow dirt | Getting better but still too warm and bright |
| 2 white tuff, 2 tan tuff, 1 flesh levigated | Too gray and gritty |
| 2 white tuff, 1 tan levigated, 1 red levigated, 1 flesh levigated, 1 gulch | Good match; Used to fill the "P" the first letter appearing in the top row of the graffiti |
| 1 red levigated, 1 flesh levigated, 1 white tuff | This is the formula interpreted from Michael Tomiak's notes which I had difficulty reading; Much too pink, bright and saturated |
| 1 flesh levigated, 1 red/yellow levigated, 1 tan levigated | Too dark and brown |
| 1 flesh levigated, 1 white tuff, 1 tan | Still too brownish and the texture is not smooth enough compared to surrounding area |
| 1 flesh levigated, 1 white tuff, ½ red/yellow | Much closer match yet it's still a little too pale and not warm enough |
| 1 red/yellow, 1 flesh levigated, 1 white tuff | Good match when applied as a thin slip; Use this for most of "Big O" |

**"↑ ⌒ ↑" (northwest wall)** LA 50976; Room 59

*Conservators: Stephen Merkel, Molly Ray*

The graffiti was filled with 2:1:1 (red yellow dirt, white tuff, flesh levigated) and 2:1 (red/yellow dirt, flesh levigated). The mixture 1:1:1 (red/yellow dirt, flesh levigated, white tuff) was then applied as a slip, covering most of the graffiti. This 1:1:1 mixture was a good color match with the surrounding plaster. Black and yellow ochre pigments were also used to in-paint the graffiti.

| ***Mixture*** | ***Comments*** |
|---|---|
| 2 red/yellow dirt, 1 white tuff, 1 flesh levigated | Very good match, this was good to transition in between dark and light areas |
| 2 red/yellow dirt, 1 flesh levigated | Good smooth texture for filling matching the sub-surface plaster |
| 1 red/yellow dirt, 1 flesh levigated, 1 white tuff | Good light color match for the plaster finish on the surface |

**"H A ve" (northwest wall)** LA 50976; Room 59

*Conservators: Stephen Merkel, Molly Ray*

The letter "A" was the only part of the graffiti that was treated with a plaster infill using 2:1 (red/yellow dirt, flesh levigated) and 1:1 (red/yellow dirt, white tuff). The mixture 1:1:1 (red/yellow dirt, flesh levigated, white tuff) was then applied as a slip, covering most of "A" and some other small sections of the graffiti. This 1:1:1 mixture was a good color match with the surrounding plaster. Black and yellow ochre pigments were also used to in-paint the graffiti.

| ***Mixture*** | ***Comments*** |
|---|---|
| 2 red/yellow dirt, 1 flesh levigated | Good smooth texture for filling |
| 1 red/yellow dirt, 1 white tuff | |
| 1 red/yellow dirt, 1 flesh levigated, 1 white tuff | Good color match for plaster, applied as a slip |

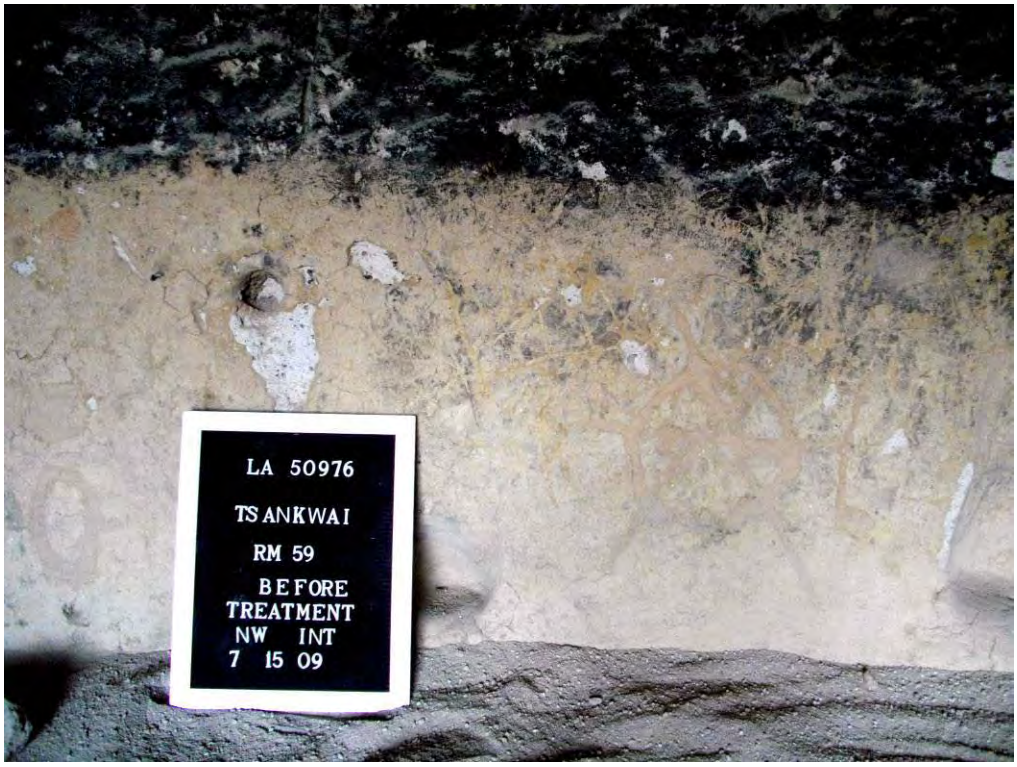
**"M" (southeast wall)** LA 50976; Room 59

*Conservators: Erin Tyson, Michael Tomiak*

Erin completed the mortar fill for this piece of graffiti. Detailed notes for this treatment do not exist, however it is likely that a 2:1 (white tuff, lime) mixture was used. This mixture was often used as a fill for areas that would inevitably be covered over with in-painting.

Michael Tomiak completed the in-painting for this treatment. He camouflaged the graffiti using black, brown and a mustard color pigments.

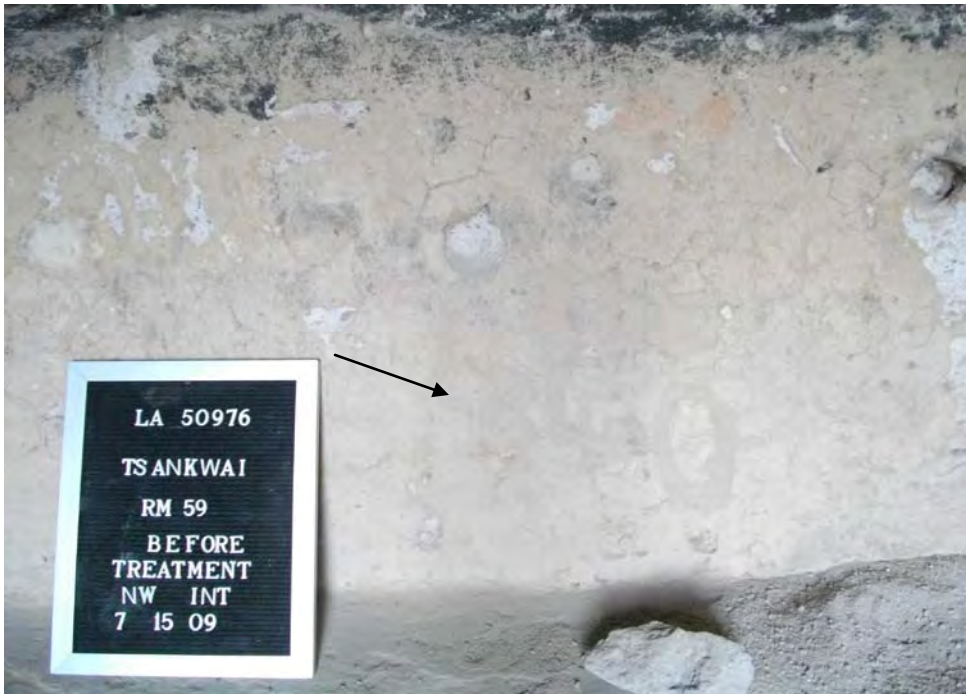
**"Anarchy symbol" (northwest wall)** *Before Treatment*




**"Anarchy symbol" (northwest wall)** *After Treatment*



**“Pep” and “ThE BIG O” (northwest wall)** *Before Treatment*




**“Pep” and “ThE BIG O” (northwest wall)** *After Treatment*



**“H A ve” (northwest wall)** *Before Treatment*



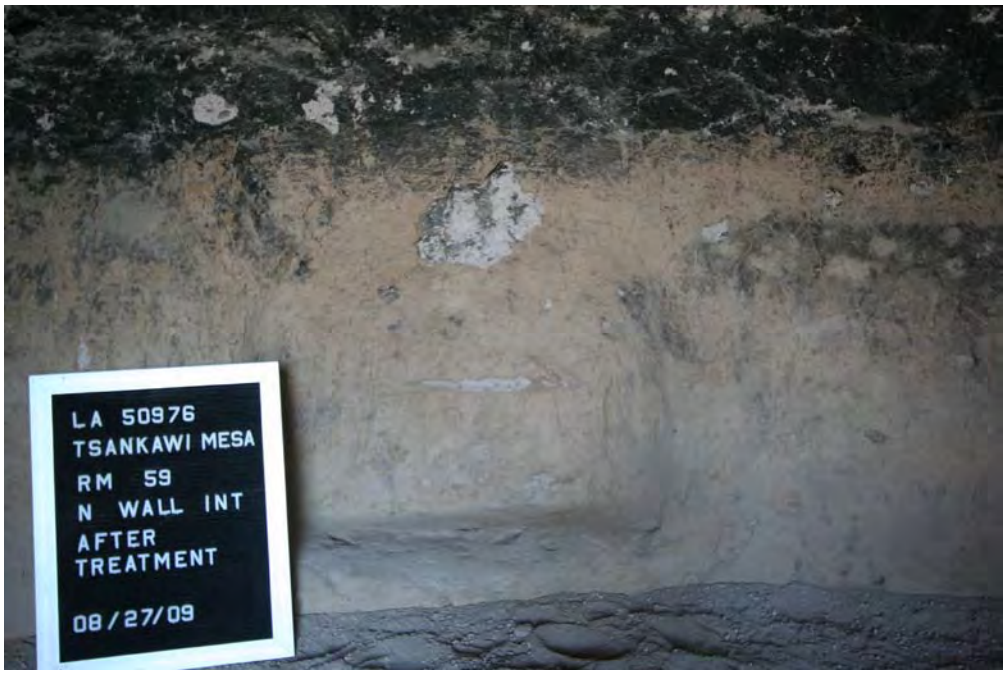

**“H A ve” (northwest wall)** *After Treatment*



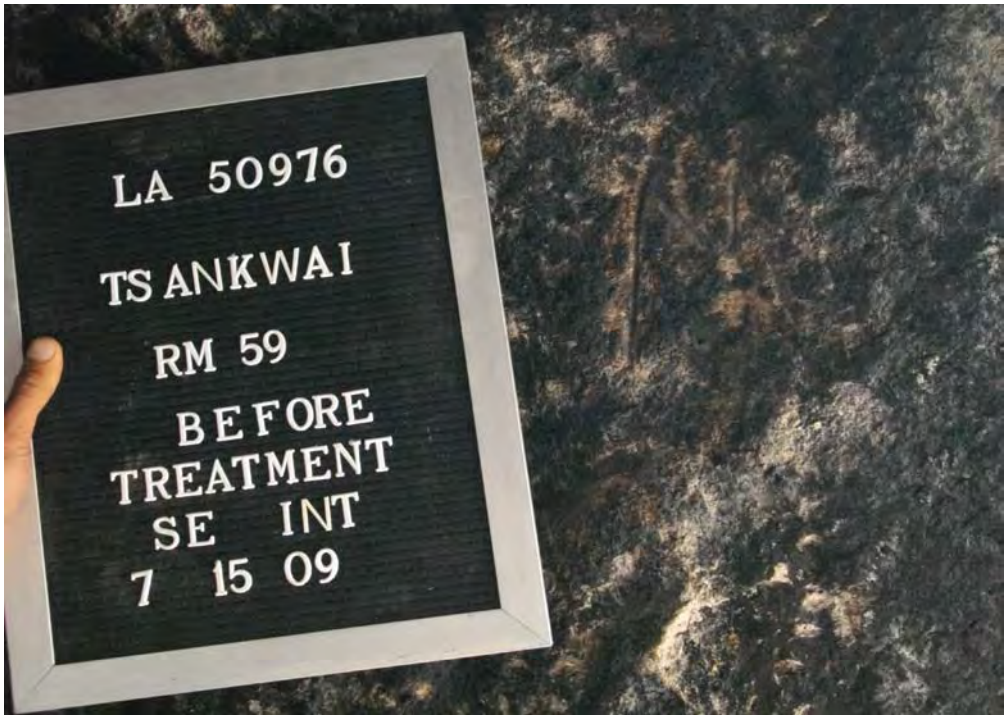
**"↑ ⌒ ↑" (northwest wall)** *Before Treatment*



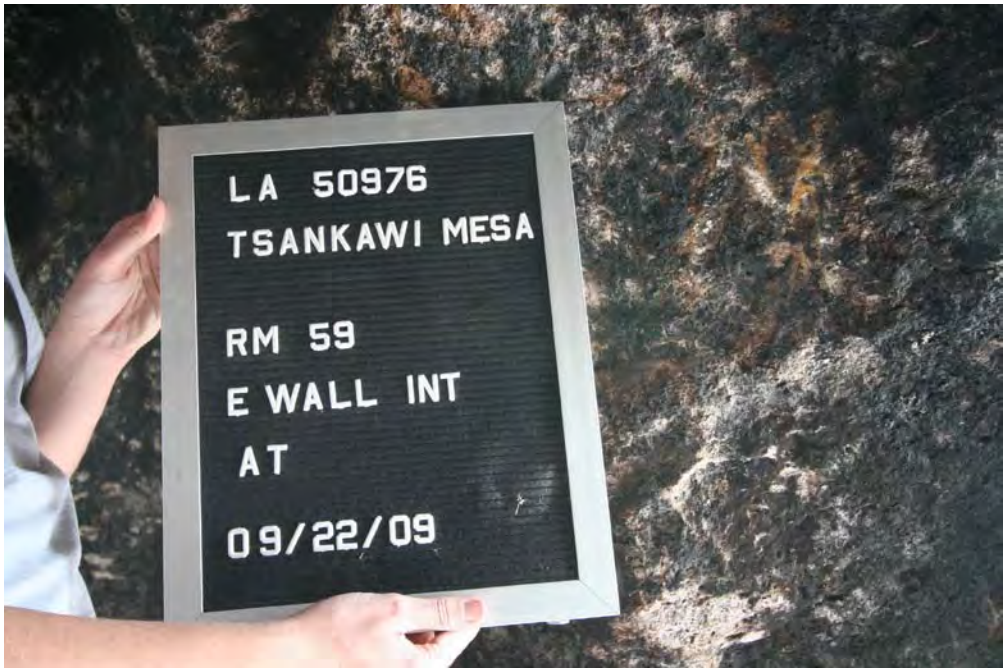
**"↑ ⌒ ↑" (northwest wall)** *After Treatment*



**"M" (southeast wall)** *Before Treatment*




**"M" (southeast wall)** *After Treatment*



## LA 50976; Room 64

**"D" (south wall)** LA 50976; Room 64 ***INCOMPLETE***

*Conservator: Erin Tyson*

This instance of graffiti consists of three lines incised in the plaster, resulting in the appearance of the letter "D", on the southern wall of the cavate. Three different plaster tests were applied to find a mixture that matches the wall plaster. The graffiti mitigation in this cavate ceased after the tests, and the plaster fill was never completed. The following mixture was found to be a good match and should be used for later treatment: 2 parts gulch clay, 3 parts red/yellow dirt.

| ***Mixtures*** | ***Comments*** |
|---|---|
| gulch clay | |
| 1 white tuff, 1 red tuff, 3 gulch clay | |
| 2 gulch clay, 3 red/yellow dirt | Very good match |

**"a" (west wall)** LA 50976; Room 64

*Conservators: Erin Tyson, Molly Ray, Stephen Merkel*

This instance of graffiti consists of the letter "a" incised into the sooted tuff on the west wall of the cavate. The shallow carving did not require a mortar fill, so only in-painting was necessary. We used black pigment to in-paint the graffiti, attempting to replicate the appearance of soot.

**↓ (west wall)** LA 50976; Room 64

*Conservators: Erin Tyson, Molly Ray*

This instance of graffiti was a shallow incision of a "down arrow" that only required in-painting to complete the treatment. A thin watery mixture of Vine Black pigment was applied in several sections of the graffiti. Several thick coats were then applied by painting on dots and organic shapes. Several small white spaces were left, exposing the tuff, to ensure that the graffiti blended in with the surrounding surface.

**"AS" (north wall)** LA 50976; Room 64

*Conservator: Stephen Merkel*

This piece of graffiti consisted of the letters "AS." A mortar mixture was used to treat this graffiti which consisted of 2 parts tan tuff, 2 parts white tuff, 1 part lime. Standard methods were used to apply the mortar for this treatment. Small areas were filled to break up lines and patterns and the mortar was used sparingly to lessen the chance of staining. Black and brown pigments were also applied to further disguise the graffiti.

| ***Mixtures*** | ***Comments*** |
|---|---|
| 2 parts tan tuff, 2 parts white tuff, 1 part lime | Fairly similar to the underlying tuff |

**"SAI" (south wall)** LA 50976; Room 64

*Conservator: Stephen Merkel*

This instance of graffiti consisted of carving that resembled the letters "SAI." The following mortar mixture was used to treat the graffiti: 2 parts tan tuff, 1 part white tuff, 1 part lime. Standard methods were used to apply the mortar for this treatment. Small areas were filled to break up lines and patterns and the mortar was used sparingly to lessen the chance of staining. Black and brown pigments were also applied to further disguise the graffiti.

| ***Mixtures*** | ***Comments*** |
|---|---|
| 2 parts tan tuff, 1 part white tuff, 1 part lime | Fairly similar to the underlying tuff |

**"VW" (west wall)** LA 50976; Room 64

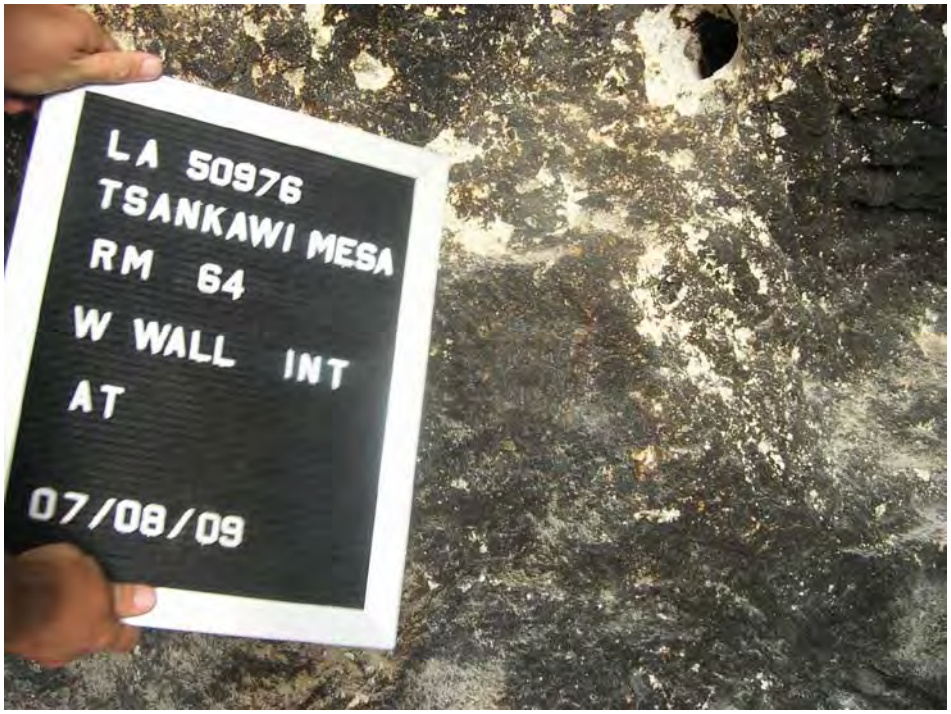
*Conservator: Stephen Merkel*

The incised graffiti was discovered in April, 2010 and was inpainted using ivory black, yellow ochre and raw sienna.

**“a” (west wall)** *Before Treatment*



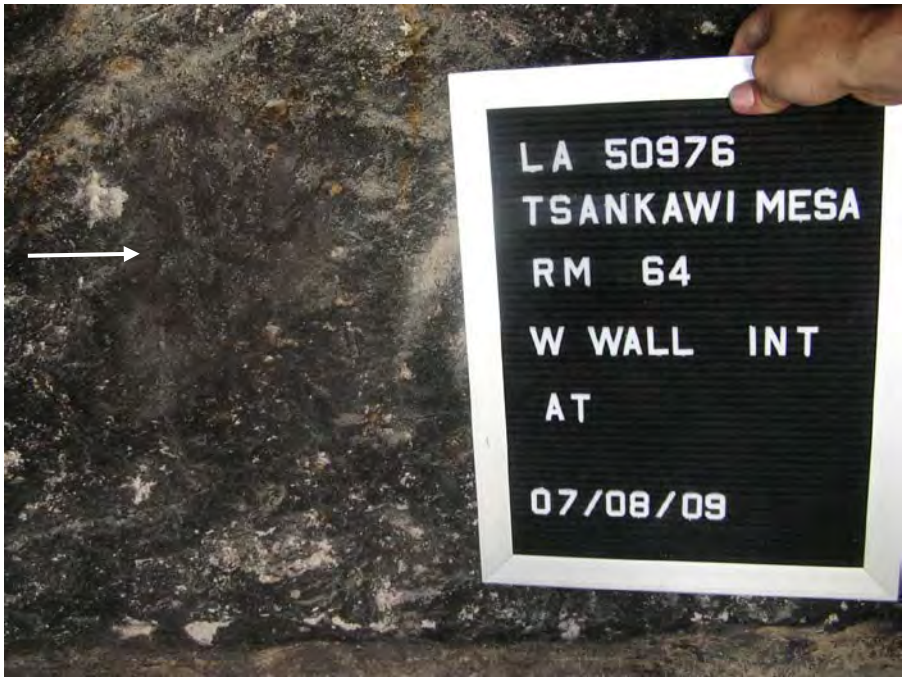

**“a” (west wall)** *After Treatment*



↓ **(west wall)** *Before Treatment*



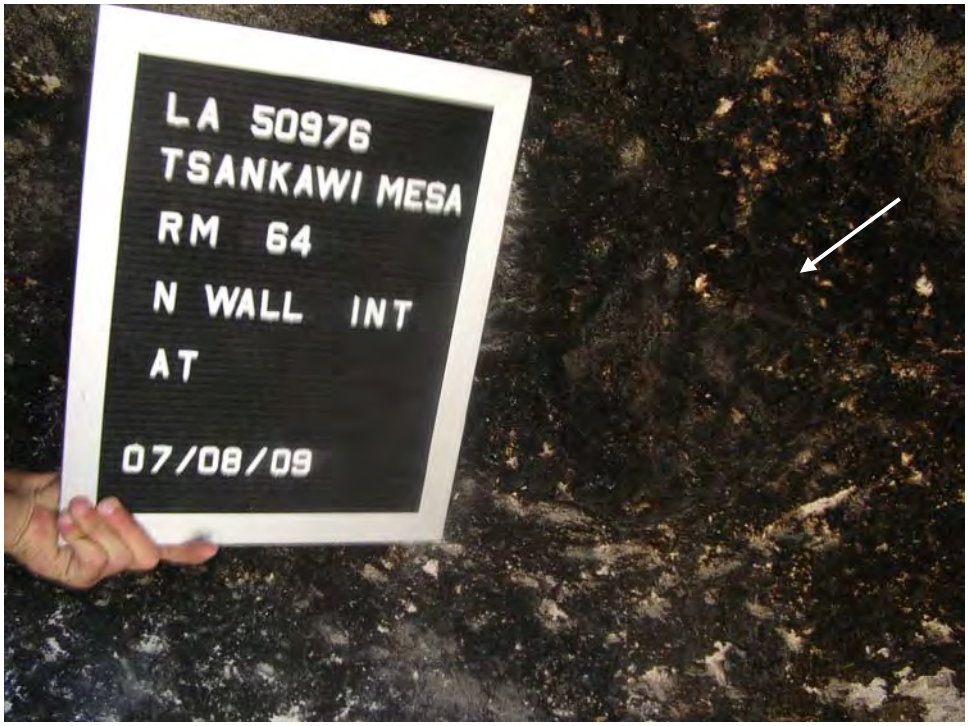

↓ **(west wall)** *After Treatment*



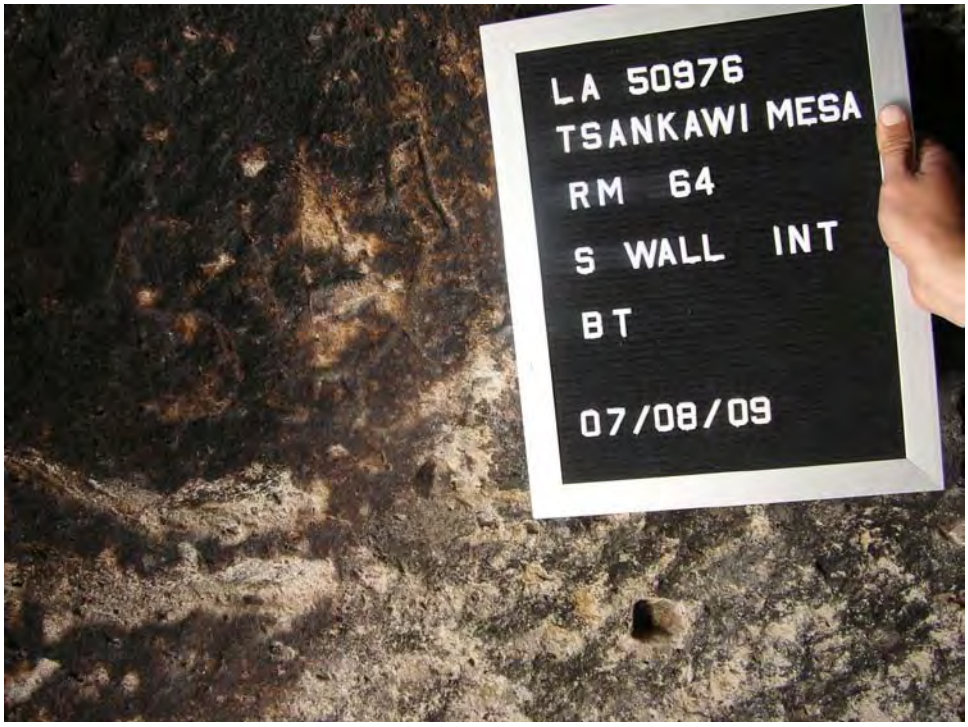
**"AS" (north wall)** *Before Treatment*




**"AS" (north wall)** *After Treatment*



**"SAI"(south wall)** *Before Treatment*



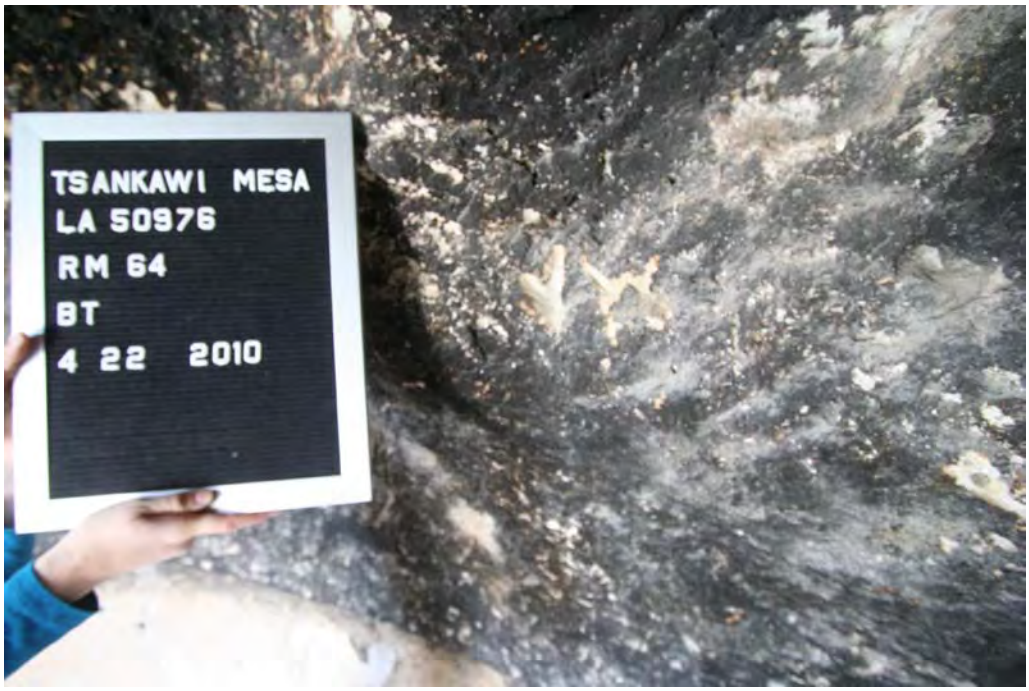

**"SAI"(south wall)** *After Treatment*



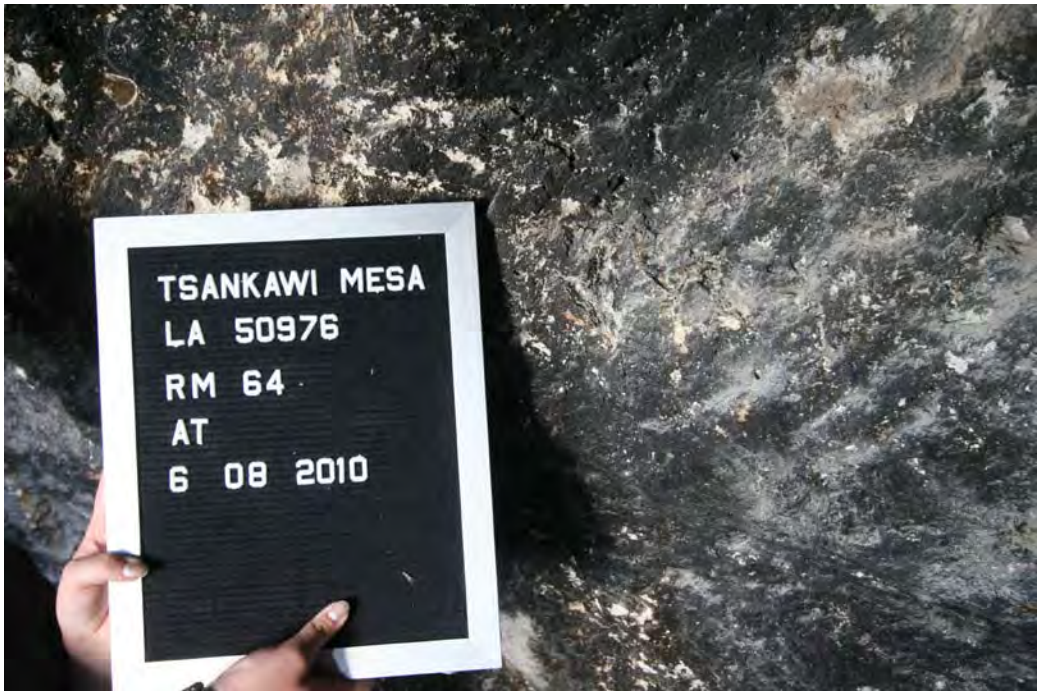
**“D” (south wall) *INCOMPLETE*** *Before Treatment*




**“VW” (west wall)** *Before Treatment*



"**VW" (west wall)** *After Treatment*




## LA 50976; Room 66

**"NEIL" (northwest wall)** LA 50976; Room 66

*Conservator: Molly Ray*

The incisions in the "NEIL" graffiti were very deep and required a mortar fill for treatment. Although there are seven test areas, one mixture was used to treat most of the graffiti: 2 parts tan tuff, 2 parts white tuff and one part lime. In order to match the surrounding rocky texture the tuff was not sieved before mixing with the lime. Most of the incisions were filled however several gaps and voids were created in order to achieve visual continuity with the surrounding surface. The conservator wet the surface thoroughly, applied the mortar with fingers and a micro-spatula, and rewet the mortar with a paintbrush. Reapplying water to the material was the most effective way to blend the mortar in with the surrounding surface.

The interior walls are heavily coated with windblown dirt and there was a need for soil to be applied on top of the mortar fill. Dry dirt from the floor was applied with a large paintbrush. A burnt umber pigment was also applied in some areas.

| *Mixtures* | *Comments* |
|---|---|
| 2.5 tan tuff, 1 white tuff, 1 lime | Too pink |
| 2 tan tuff, 1 white tuff, 1 lime | This sample appeared to match but was too pink/tan in the afternoon sunlight |
| 1 tan tuff, 2 white tuff, 1 lime | Too light, still has a peach tone |
| 2 tan tuff, 2 white tuff, 1 lime | Very good match; I used this mixture to fill most of the graffiti<br><br>Several more mixtures were tested after finding this one in an effort to get a grayer color. In the end, this mixture with dirt and pigment applied on the surface was the best treatment. |
| 2 gray dirt, 2 white tuff, 1 lime | Too dark, bad texture |
| 1 gray dirt, 1 white tuff, 1 lime | Still too dark, bad texture |
| 2.5 group M tuff, 1 lime | Too peach |

**"NNA" (northeast wall)** LA 50976; Room 66

*Conservator: Molly Ray*

The "NNA" on the northeast interior wall was treated with a plaster fill and in-painting. The previous treatment left a distinct halo of grainy plaster around the original incision. The remaining incised areas were filled in various sections and the older treatment was mostly covered over.

The following mixture was used to fill most of the graffiti: 2 parts levigated tan, 1 part white tuff, and 1 part levigated red clay. In the darker sections, a second fill was applied: 2 parts levigated tan and 1 part flesh.

The conservator found that some staining did occur and was cautious when applying water to the surface. When the plaster dried it had a chalky texture and was easily blended by using fingers to spread it over the "halo" of the older treatment. This proved to be the most effective method for softening the lines and blending all of the materials together. Raw sienna and raw umber pigments were applied throughout the

graffiti. Small dots were applied towards the top of the graffiti and larger organic shapes were painted on at the middle and bottom sections.

| ***Mixtures*** | ***Comments*** |
|---|---|
| 1 tan levigated, 1 white tuff, 1 red/yellow dirt | Too dark |
| 1 tan levigated, 1 white tuff | Close match but needs to be a little more pink |
| 1 tan levigated, 1 white tuff, 1 flesh levigated | Too peach |
| 1 tan levigated, 1 white tuff, 1 red levigated | Too red |
| 2 white tuff, 1 gulch clay | Too gritty and tan |
| 2 white tuff, 1 red yellow dirt | Too gritty and light |
| 2 tan levigated, 2 white tuff, 1 flesh levigated | Too dark and gritty, but close match |
| 3 tan levigated, 1 flesh | Still very dark but close to a good match |
| 2 tan levigated, 1 flesh | Very good match for darker areas |
| 2 tan levigated, 1 white tuff, 1 flesh levigated, 1 red levigated clay | Good match for lighter areas |

**"DEMOLITION" (northwest wall)** LA 50976; Room 66

*Conservator: Erin Tyson*

This instance of graffiti consisted of a series of inscriptions superimposed onto one another on a plaster panel along the northwest wall. One of the inscriptions appears to have been treated previously, as the letters contain a recessed fill with a distinct color and texture. The vastness of the treatment area, the great depth, the numerous layers of inscriptions as well as the presence of deteriorating prior fills constitute a challenging case for graffiti mitigation.

The conservator applied a plaster infill in the graffiti and in-painted over the fill with a slip. After testing five different colors of plaster, the conservator found one particular combination that appeared most visually compatible with the incised plaster: 1 part white tuff, 2 parts levigated tan clay, 1 part levigated red clay, 1 part levigated flesh clay. The same components were used in the slip for in-painting, but the amount of each was modified based on changing colors across the plaster panel. Many variations exist in the vast expanse.

Standard methods were used in the application of these materials. First the area of plaster to be filled was carefully wet with water using a small paintbrush. The water application was repeated three times, waiting 30 seconds between, to ensure a moist plaster surface to which the fill would adhere. The plaster fill was then applied using the microspatula and small palette knife. Afterward the conservator softly pressed and dabbed the fill with her finger so that it would be flush with surrounding area. The sections of the graffiti containing prior treatments required abundant fill material. A slip was then applied using a variety of brushstrokes to imitate the plaster texture. The interior walls are heavily coated with windblown dirt and there was a need for soil to be applied on top of the plaster fill. The conservator applied dry dirt from the floor by blowing it onto the wall from the palm of her hand.

| ***Mixtures*** | ***Comments*** |
|---|---|
| 2 white tuff, 1 gulch clay | Too gray and pale, not peach enough |
| 1 white tuff, 1 tan levigated, 1 red levigated, 1 flesh levigated, 1 gulch clay | Too dark, still not peach enough |
| 2 white tuff, 1 tan levigated, 1 red levigated, 1 flesh levigated, 1 gulch clay | Too gray and pale, need for more saturation in color |
| 1 white tuff, 3 tan levigated, 1 red levigated, 1 flesh levigated | Getting closer but still needs to be a little darker |
| 1 white tuff, 2 tan levigated, 1 red levigated, 1 flesh levigated | Good match |

**"AES JRALEX" (west wall)** LA 50976; Room 66

*Conservator: Erin Tyson*

This graffiti consists of at least two inscriptions with "AES" above the letters "JRALEX." There also appears to be previous treatments, as some of the letters are recessed and filled with a smooth and homogenous plaster compared to the surrounding areas.

The graffiti was treated with a plaster fill consisting of the following mixture: 1 part white tuff, 1 part red levigated clay, 1 part flesh levigated clay and 2 parts tan levigated clay.

It was necessary to fill only fragments of the incised and previously treated graffiti. By carefully applying the plaster with a small palette knife in particular areas, the graffiti was highly obscured and no longer legible as graffiti. The filled areas were carefully wet with water using a small paintbrush beforehand. After the fills were completed, dirt from the cavate floor was blown over the plaster to emulate the surrounding area, which appears to be covered with windblown dirt.

| ***Mixtures*** | ***Comments*** |
|---|---|
| 1 white tuff, 1 red levigated, 1 flesh levigated, 2 tan levigated | Good match |

**"DG" (northwest wall)** LA 50976; Room 66

*Conservator: Erin Tyson*

The initials "DG" along with a cross shape and a couple of vertical lines occupy the west wall of the cavate near the floor. The graffiti was treated with a plaster fill and in-painted it with slip. The conservator tested five different colors of clay while simultaneously attempting color matches on the nearby "DEMOLITION" panel, in which a good match was found. This mixture was used to fill "DG." It is as follows: 1 part white tuff, 1 part red levigated clay, 1 part flesh levigated clay and 2 parts tan levigated clay. The same components were used in the slip for in-painting, but the amount of each was modified based on changing colors across the plaster panel. Many variations exist in the vast expanse. The filled areas were carefully wet with water using a small paintbrush beforehand. After the fills were completed, dirt from the cavate floor was blown over the plaster to emulate the surrounding area, which appears to be covered with windblown dirt.

| *Mixtures* | *Comments* |
|---|---|
| 3 gulch clay, 1 red tuff, 1 white tuff | Too dark and reddish-yellow compared to surrounding area |
| 2 gulch clay, 1 red tuff, 1 white tuff | Still too dark and does not contain enough peach-tan tones |
| 1 tan levigated | Too brown |
| 2 tan levigated, 1 red levigated | Becoming closer in necessary warmth, but still too dark |
| 2 tan tuff, 1 flesh levigated | Getting closer |
| 1 white tuff, 1 red levigated, 1 flesh levigated, 2 tan levigated | Good match |

**"DR" (northeast wall)** LA 50976; Room 66

*Conservator: Erin Tyson*

This instance of graffiti consists of the initials "DR" incised into the sooted tuff on the northeast wall of the cavate. The shallow carving did not require a mortar fill, so only in-painting was necessary. Black and ochre pigments were used to in-paint the graffiti, attempting to replicate the appearance of soot.

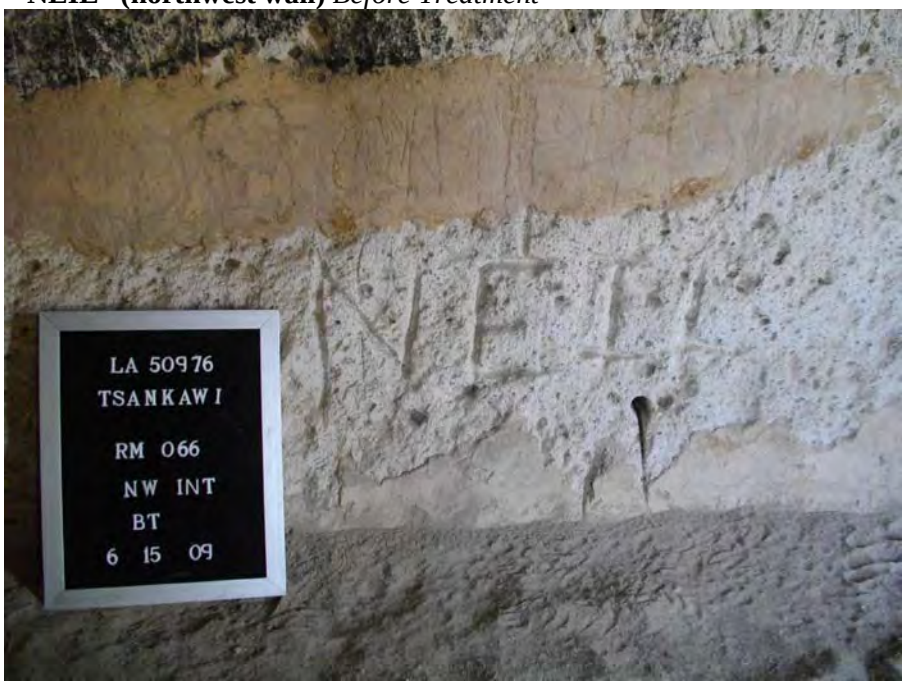
**"A" (southwest wall)** LA 50976; Room 66

*Conservators: Erin Tyson, Stephen Merkel, Michael Tomiak*

This piece of graffiti required a mortar fill (2 parts tan tuff, 1 part white tuff, 1 part lime) and in-painting with an ivory black pigment to complete treatments. All conservators used standard methods of application when treating this graffiti.

| *Mixtures* | *Comments* |
|---|---|
| 2 tan tuff, 1 white tuff, 1 lime | Too dark and tan, but still a decent match, more white tuff would be better |
| Ivory black pigment | |

**"DEMOLITION" (northwest wall, upper half)** *Before Treatment*
**"NEIL" (northwest wall)** *Before Treatment*



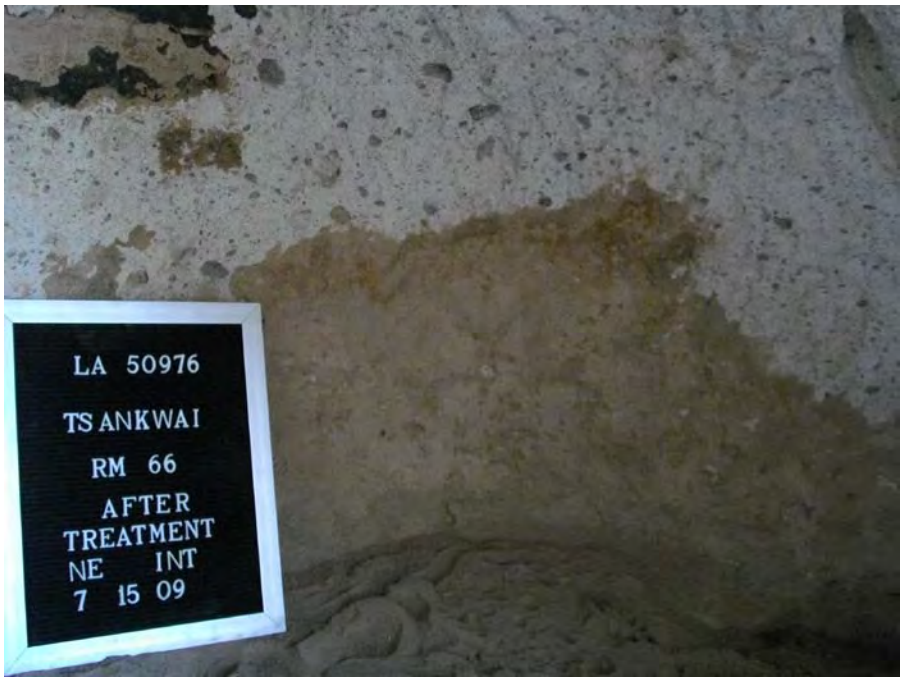

**"DEMOLITION" (northwest wall, upper half)** *After Treatment*
**"NEIL" (northwest wall)** *After Treatment*



**"NNA" (northeast wall)** *Before Treatment*




**"NNA" (northeast wall)** *After Treatment*



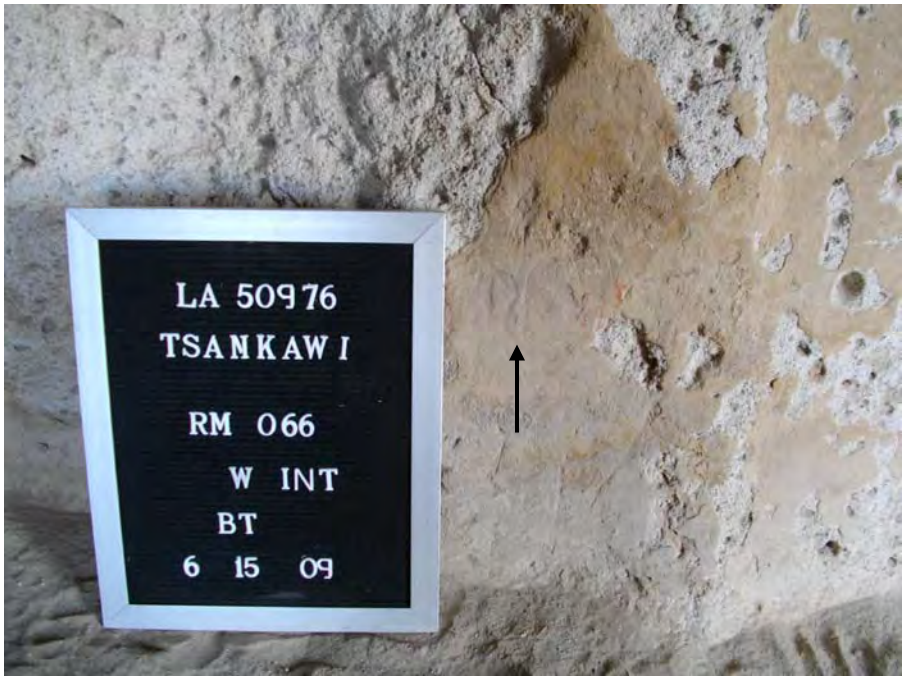
**"AES JRALEX" (west wall)** *Before Treatment*



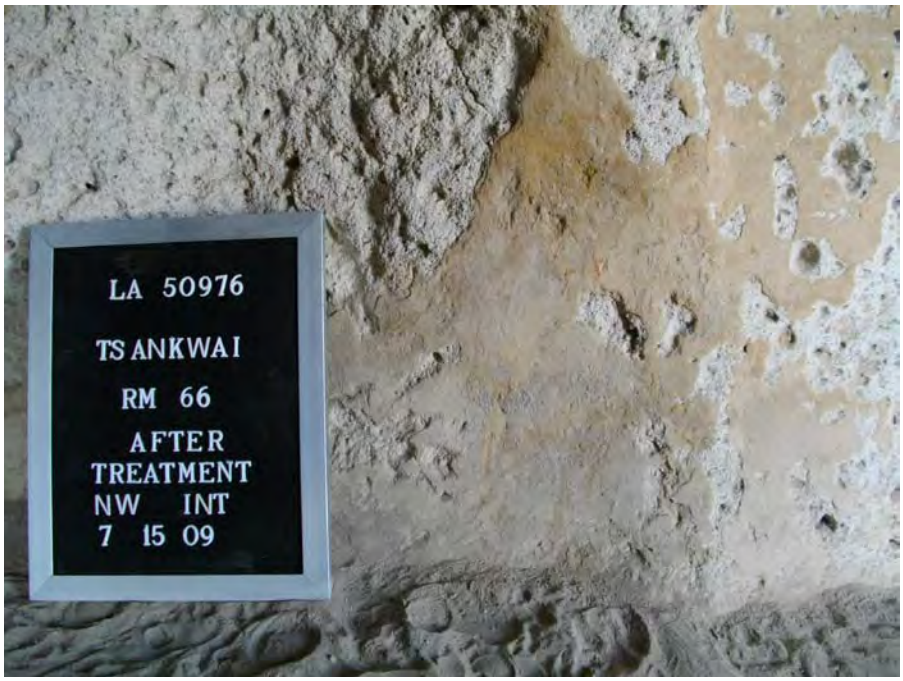

**"AES JRALEX" (west wall)** *After Treatment*



**"DG" (northwest wall)** *Before Treatment*



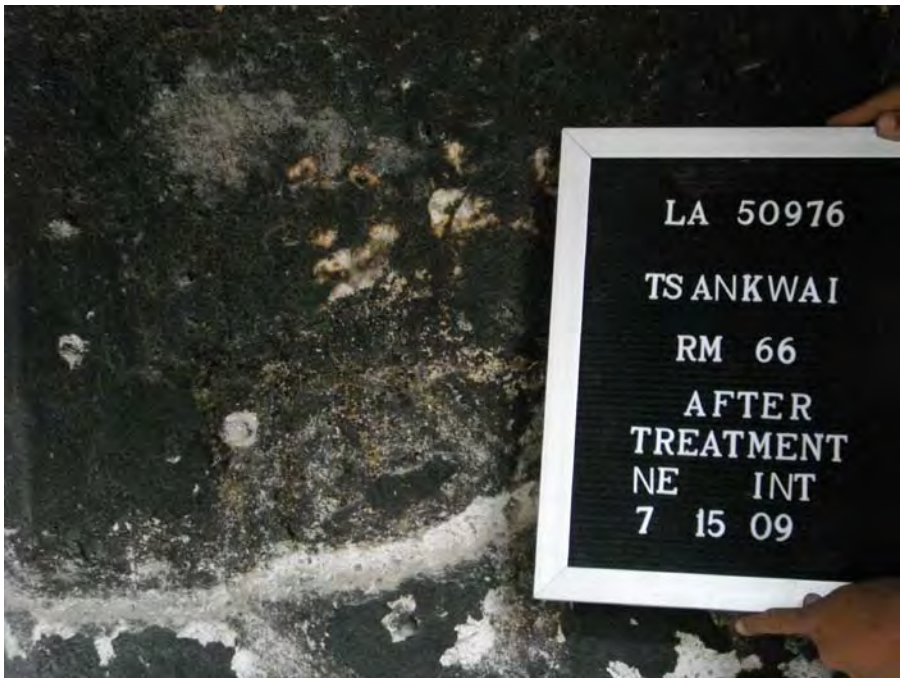

**"DG" (northwest wall)** *After Treatment*



**"DR" (northeast wall)** *Before Treatment*



**"DR" (northeast wall)** *After Treatment*



**"A" (southwest wall)** *Before Treatment*




**"A" (southwest wall)** *After Treatment*



## LA 65751; Room 09

**It should be noted that relatively few notes were documented during treatment on this cavate, as it was executed early in the summer before note-taking standards had developed. Several crew members helped to treat the graffiti in this room. Therefore, different materials and techniques were used to treat single instances of graffiti.*

***The wall plaster in this cavate contained a brightness that was not achievable in our test fills using the clay collected in the gulch. We assumed there must have been nearby sources with the same hue, value and saturation as the existing wall plaster, and therefore collected "flesh", "red", and "tan" clay and levigated it during treatment on this cavate. Its most effective application is as an in-painted slip over plaster fills.*

**"I WAS HER" (south wall)** LA 65751; Room 09
*Conservator: Erin Tyson*

This instance of graffiti consists of the letters "I WAS HER" carved into the plaster on the southern wall of the cavate. It required a clay fill so that it would be camouflaged within the surrounding plaster. In-painting of the clay fills was also necessary to achieve continuity of the marks across plastered wall. Additionally, the texture of the plaster surrounding the graffiti called for abrading the surface of the in-painted plaster fills.

After testing several mixtures, a combination was found that appeared most visually compatible with the wall plaster: 3 gulch clay, 1 red tuff, 1 white tuff. Only fragments of the incised letters needed to be filled in order to obscure the graffiti so that it was no longer visible.

Erin in-painted with a mixture composed of 1 red levigated clay, 1 tan levigated clay, 1 flesh levigated clay, and 1 white tuff. A small twig was used to lightly incise the fills with small hatches in order to texture the surfaces. The interior walls are heavily coated with windblown dirt and there was a need for soil to be applied on top of the plaster fill. Dry dirt was applied from the floor and blown onto the wall.

| *Mixtures* | *Comments* |
|---|---|
| 3 gulch clay, 1 red tuff, 1 white tuff | Good match for plaster fill |
| 1 red levigated, 1 tan levigated, 1 flesh levigated, 1 white tuff | Good match for inpainted slip |

**"MEDARD" (east wall)** LA 65751; Room 09

*Conservator: Erin Tyson*

This instance of graffiti consists of inscriptions arranged in four rows carved into the plaster on the eastern wall of the cavate. "MEDARD" appears on the first row, "CHAMM" on the second, "TNM" on the third and "TNIK" on the fourth. It required a clay fill so that it would be camouflaged within the surrounding plaster. In-painting of the clay fills was also necessary to achieve continuity of the marks across the plastered wall. Additionally, the texture of the plaster surrounding the graffiti called for abrading the surface of the in-painted plaster fills.

After testing several mixtures, a combination was found that appeared most visually compatible with the wall plaster: 3 gulch clay, 1 red tuff, 1 white tuff. Only fragments of the incised letters needed to be filled in order to obscure the graffiti so that it was no longer visible.

Erin in-painted with a mixture composed of 1 red levigated clay, 1 tan levigated clay, 1 flesh levigated clay, and 1 white tuff. A small twig was used to lightly incise the fills with small hatches in order to texture the surfaces. The interior walls are heavily coated with windblown dirt and there was a need for soil to be applied on top of the plaster fill. Dry dirt was applied from the floor and blown onto the wall.

| *Mixtures* | *Comments* |
|---|---|
| 3 gulch clay, 1 red tuff, 1 white tuff | Good match for plaster fill |
| 1 red levigated, 1 tan levigated, 1 flesh levigated, 1 white tuff | Good match for inpainted slip |

**"A7 CACPH NF" (east wall)** LA 65751; Room 09

*Conservator: Erin Tyson*

This instance of graffiti consists of inscriptions arranged in three rows carved into the plaster on the eastern wall of the cavate. "A7" appears on the first row, "CACPH" on the second, and "NF" on the third. It required a clay fill so that it would be camouflaged within the surrounding plaster. In-painting of the clay fills was also necessary to achieve continuity of the marks across the plastered wall. Additionally, the texture of the plaster surrounding the graffiti called for abrading the surface of the in-painted plaster fills.

After testing several mixtures, a combination was found that appeared most visually compatible with the wall plaster: 2 gulch clay, 1 red tuff, 1 white tuff. Only fragments of the incised letters needed to be filled in order to obscure the graffiti so that it was no longer visible.

Erin in-painted with flesh levigated clay. A small twig was used to lightly incise the fills with small hatches in order to texture the surfaces. The interior walls are heavily coated with windblown dirt and there was a need for soil to be applied on top of the plaster fill. Dry dirt was applied from the floor and blown onto the wall.

| ***Mixtures*** | ***Comments*** |
|---|---|
| 2 gulch clay, 1 red tuff, 1 white tuff | Good match for plaster fill |
| flesh levigated | Good match for inpainted slip |

**"A" (south wall)** LA 65751; Room 09

*Conservator: Erin Tyson*

This instance of graffiti consists of a large "A" incised into the sooted tuff on the southern wall near the entrance of the cavate. The shallow carving did not require a mortar fill, so only in-painting was necessary. Black and ochre pigments were used to in-paint the graffiti, attempting to replicate the appearance of soot.

**"AAA" (north wall)** LA 65751; Room 09

*Conservators: Erin Tyson, Molly Ray, Stephen Merkel*

This piece of graffiti consisted of three "A" characters carved in a triangular shape, with two "A's"below and one "A" hovering above. The letters were incised into the sooted tuff on the northwest wall near the ceiling of the cavate. The shallow carving did not require a mortar fill, so only in-painting was necessary. Black and ochre pigments were used to in-paint the graffiti, attempting to replicate the appearance of soot.

**"SK" (north wall)** LA 65751; Room 09

*Conservator: Erin Tyson*

This instance of graffiti consists of the initials "SK" incised in the sooted tuff into the northwest wall near the ceiling of the cavate (just beneath "AA"). The carving required a mortar fill and in-painting. The mortar mixture was not recorded. Black and ochre pigments were used to in-paint the mortar fill, attempting to replicate the appearance of soot.

**"SLAYA" (west wall)** LA 65751; Room 09

*Conservators: Erin Tyson, Stephen Merkel, Molly Ray*

This instance of graffiti consists of the letters resembling "SLAYA" incised in the sooted tuff into the west wall near the ceiling of the cavate. The shallow carving did not require a mortar fill, so only in-painting was necessary. Black and ochre pigments were used to in-paint the graffiti, attempting to replicate the appearance of soot.

**"JCL" (southwest wall)** LA 65751; Room 09

*Conservators: Erin Tyson, Stephen Merkel, Molly Ray*

This instance of graffiti consists of the initials "JCL" incised into the sooted tuff on the southwest wall near the ceiling of the cavate. The carving required a mortar fill and in-painting. The mortar mixture was not recorded. Black and ochre pigments were used to in-paint the mortar fill, attempting to replicate the appearance of soot.

**"M" (northeast wall)** LA 65751; Room 09

*Conservators: Erin Tyson, Stephen Merkel, Molly Ray*

The letter "M" incised on the northwest wall was not very deep or thick. Therefore, only a small amount of in-painting was needed to disguise the graffiti. Several coats of the Vine Black pigment was applied using various consistencies, from thin to thick. Small to medium sized dots were painted on throughout the graffiti and many white spaces were left unpainted in order to blend in with the surrounding suface.

**"Phil" (north wall interior)** LA 65751; Room 09

*Conservators: Mae Colburn, Molly Ray*

This instance of graffiti consisted of carvings that resemble the name "Phil". The incisions were relatively deep and required a mortar fill along with in-painting. The incised areas were filled with a mortar mixture 2:1 (white tuff, lime). The graffiti had a pre-existing halo of brown and tan colors directly surrounding the incisions. Black and ochre pigments were applied, but were not dark enough when they dried. The pigments also had a negative reaction with the tuff, turning the surface odd colors of brown and a faint green. Multiple thick coats of pigment were applied in an attempt to disguise the odd colors; however the texture was too smooth after these applications dried. A micro-spatula was used to carefully remove some of the pigments that had been applied. This allowed for some of the white mortar to remain exposed and create a speckled black and white pattern. Charcoal was applied by slowly grinding it into the mortar fill which had positive results. The Van Dyke Brown pigment and a thick mixture of Vine Black pigment were also applied in some areas.

| ***Materials*** | ***Comments*** |
|---|---|
| Van Dyke Brown pigment | Helps to add a richer and darker color when combined with the black pigment |
| Vine Black pigment | Okay with many layers, but too much use of pigment can cause unwanted smooth texture |
| Charcoal | By grinding this into the mortar fill, you can achieve a dark color without disrupting the desired gritty texture |

**"Asteric symbol" (north wall)** LA 65751; Room 09

*Conservators: Stephen Merkel, Mae Colburn, Molly Ray*

This piece of graffiti consists of a carving that resembles an asteric symbol. The incision was not very deep but required a plaster fill and in-painting to complete the treatment. This was one of the earliest plaster infills of the season and required quite a bit of experimentation. The mixture of 3 parts gulch clay, 1 part red tuff, 1 part white tuff was tested in multiple locations and appeared to be the closest match. To further disguise the graffiti an equal combination of the levigated clays (red, tan and flesh) was painted on as a slip to break up the appearance of lines and patterns. The mixture used for the infill was 3 parts gulch clay, 1 part red tuff, and 1 part white tuff. A slip of made from 1 part of Red, Flesh and Tan levigated clays was used to inpaint over the fill in order to blend in with the original plaster.

| ***Mixtures*** | ***Comments*** |
|---|---|
| 4 parts red/yellow dirt, 1 part white tuff | |
| 3 parts gulch clay, 1 part red tuff, 1 part white tuff | Good color match for the plaster immediately beneath the surface |
| 3 parts red/yellow dirt, 2 parts gulch clay | |
| 2 parts gulch clay, 1 part red tuff, 1 part white tuff | Too light |
| 1 part gulch clay | Too dark and pale |
| 1 part red/yellow dirt, 1 part gulch dirt | |
| 1 Red Lev., 1 Flesh Lev., 1 Tan Lev. | Good slip used to inpaint |

**"ELI" (east wall)** LA 65751; Room 09

*Conservators: Molly Ray, Mae Colburn, Karim Hassanein*

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This instance of graffiti covered a large area that was *two feet in length and three feet wide*. The graffiti resembled the name "ELI" and was carved on the sooted tuff ceiling of the east wall.

This graffiti was treated by infilling the incisions with a lime/tuff mortar and in-painting. The mortar mixture consisted of two parts white tuff and 1 part lime. Most of the treatment involved in-painting, as the incised areas were not very deep. A watered down vine black pigment was initially used and painted

small dots over a test area. This thin coat of Vine Black was too pale and had a blue tint when dried. Several layers of black pigment were then applied in an attempt to darken the color. The van dyke brown and ochre pigments were also applied to add warmth to the black which had a positive result.

The pigments were applied in several ways. Thin coats were applied as small dots, while thicker coats were also applied in some sections. In order to blend in these darker sections a gradation of light to dark areas were created. The conservator pinched the base of the brush to fan out the bristles; this helped to disperse the spots of pigment. Additionally, white spaces were left visible on the tuff and dark veins of pigment were created that ran from the top to bottom edges of the graffiti. The application of the "veins" of pigment was essential in disguising the graffiti.

| ***Mixtures*** | ***Comments*** |
|---|---|
| Van Dyke Brown pigment | Good dark brown color, adds warmth to black pigment |
| Vine Black pigment | Okay when applied in several layers, or as a very thick coat |
| 2 parts white tuff, 1 part lime | Good match for surrounding tuff, this fill was further disguised with in-painting |

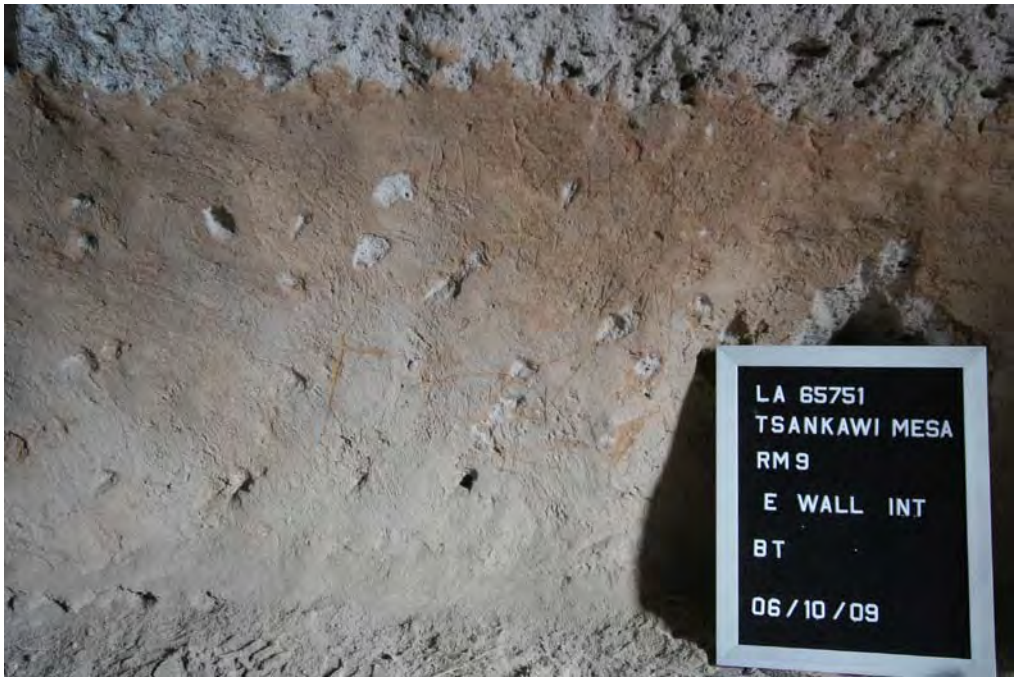
**"I WAS HER" (south wall)** *Before Treatment*



**"I WAS HER" (south wall)** *After Treatment*



**"MEDARD" (east wall)** *Before Treatment*




**"MEDARD" (east wall)** *After Treatment*



**"A7 CACPH NF" (east wall)** *Before Treatment*




**"A7 CACPH NF" (east wall)** *After Treatment*



**"A" (south wall)** *Before Treatment*




**"A" (south wall)** *After Treatment*



**"JCL" (southwest wall)** *Before Treatment*




**"JCL" (southwest wall)** *After Treatment*



**"Phil" (north wall interior)** *Before Treatment*



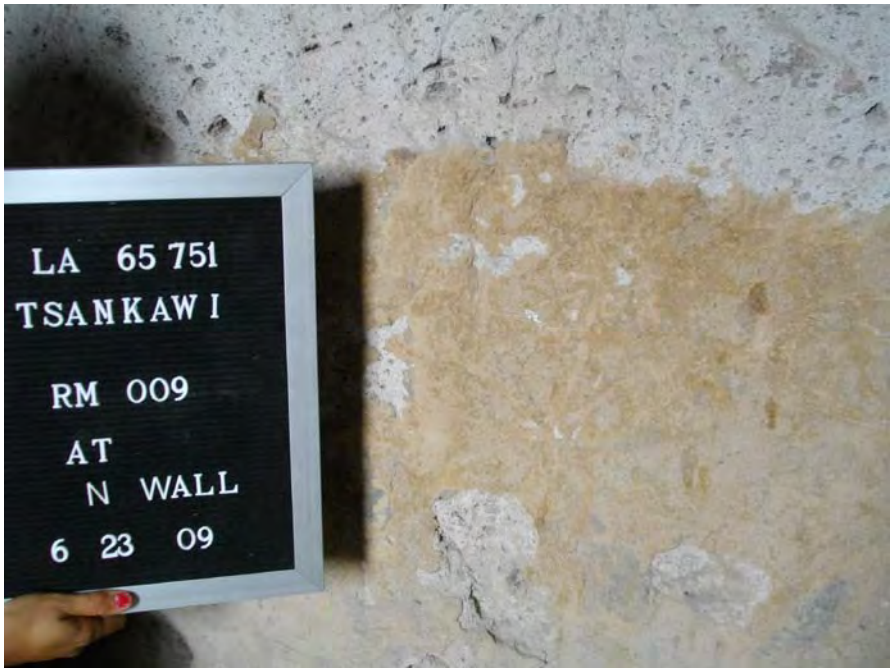

**"Phil" (north wall interior)** *After Treatment*



**"Asteric symbol" (north wall)** *Before Treatment*




**"Asteric symbol" (north wall)** *After Treatment*



**"M" (northeast wall interior)** *Before Treatment*




**"M" (northeast wall interior)** *After Treatment*



**"AA" (northwest wall)** *Before Treatment*
**"SK" (northwest wall)** *Before Treatment*




**"AA" (northwest wall interior)** *After Treatment*
**"SK" (northwest wall interior)** *After Treatment*



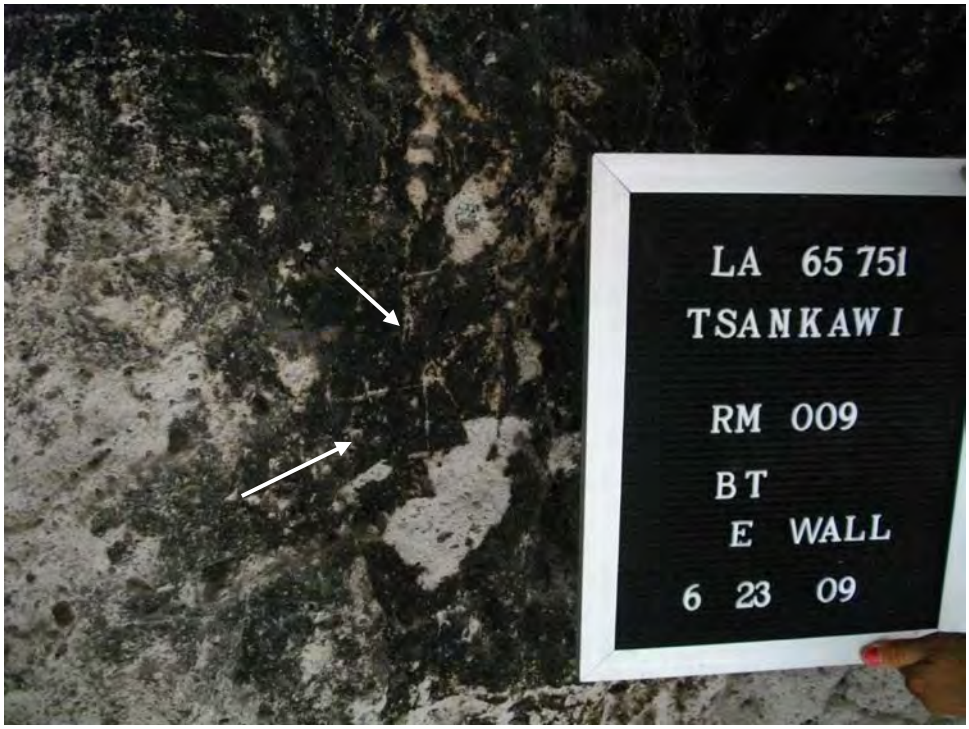
**"ELI" (east wall)** *Before Treatment*



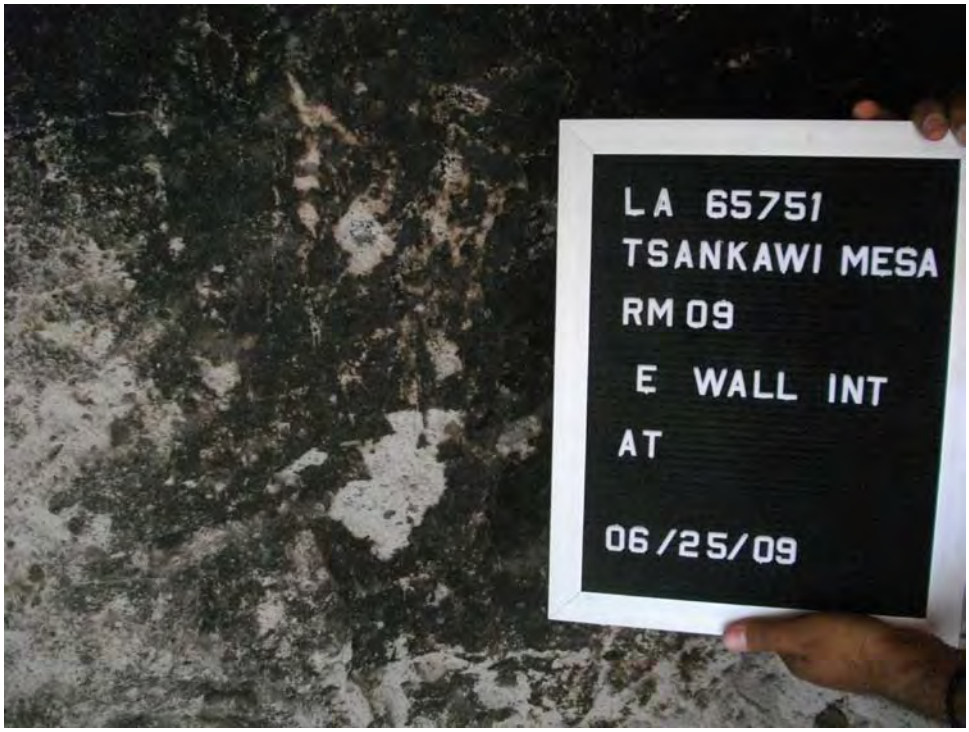

**"ELI" (east wall)** *After Treatment*



**"AAA" (east wall)** *Before Treatment*



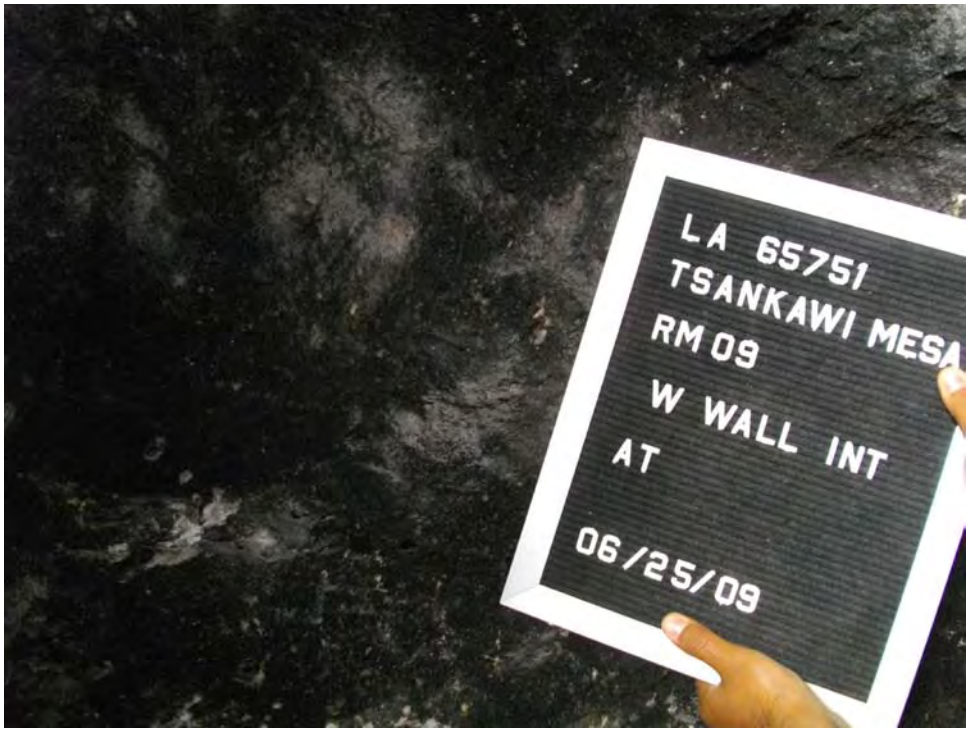

**"AAA" (east wall)** *After Treatment*



**“Slaya” (west wall)** *Before Treatment*




**“Slaya” (west wall)** *After Treatment*



## LA 65751; Room 10

**"Hi" (east wall)** LA 65751; Room 10

*Conservator: Mae Colburn, Jonny Holdsworth*

This piece of graffiti was treated with a plaster fill (3 parts gulch clay, 1 part red tuff, 1 part white tuff). Some black and brown pigments were applied to further disguise the graffiti. Extra caution was taken when applying the fill, as the incised lines were very thin and the plaster was delicate. The conservator found that mixing black pigment and water on a flat surface (rather than in cups or bowls) allows for more control over the shade of the paint. The conservator finished the treatment by blowing floor dirt over on the wall. Standard methods of application were used when treating this graffiti. The treatment was successful overall.

| ***Mixtures*** | ***Comments*** |
|---|---|
| 3 parts gulch clay, 1 part red tuff, 1 part white tuff | |

**"MVH" (north wall)** LA 65751; Room 10

*Conservator: Mae Colburn*

This piece of graffiti was treated with a plaster fill (3 parts gulch clay, 1 part red tuff, 1 part white tuff). Some black and brown pigments were applied to further disguise the graffiti. Standard methods of application were used when treating this graffiti.

| ***Mixtures*** | ***Comments*** |
|---|---|
| 3 parts gulch clay, 1 part red tuff, 1 part white tuff | |

**"A" (southeast wall)** LA 65751; Room 10

*Conservators: Molly Ray, Mae Colburn*

This instance of graffiti was deeply incised and required a mortar fill and in-painting for treatment. The following mixture was used to treat most of the graffiti: 3 parts tan tuff and 1 part lime. Gaps and voids were left in order to replicate the surrounding surface. Standard methods were used to apply the mortar by pre-wetting the surface, pressing firmly down on the mortar, and re-wetting the mortar. The tuff was not sieved before mixing it with the lime so that it would maintain a rocky texture. Mae completed the in-painting for this piece of graffiti after it was filled with mortar. She carefully applied small dots of black, brown, and yellow pigments to replicate the surrounding lichen.

| ***Mixtures*** | ***Comments*** |
|---|---|
| 4 parts tan tuff, 1 part lime | Too tan, too soft |
| 3 parts tan tuff, 1 part lime | Good color and texture |

**"MVH" (north wall)** *Before Treatment*




**"MVH" (north wall)** *After Treatment*



**"Hi" (east wall)** *Before Treatment*




**"Hi" (east wall)** *After Treatment*



**"A" (southeast wall)** *Before Treatment*




**"A" (southeast wall)** *After Treatment*



**LA 65755; Room 18**

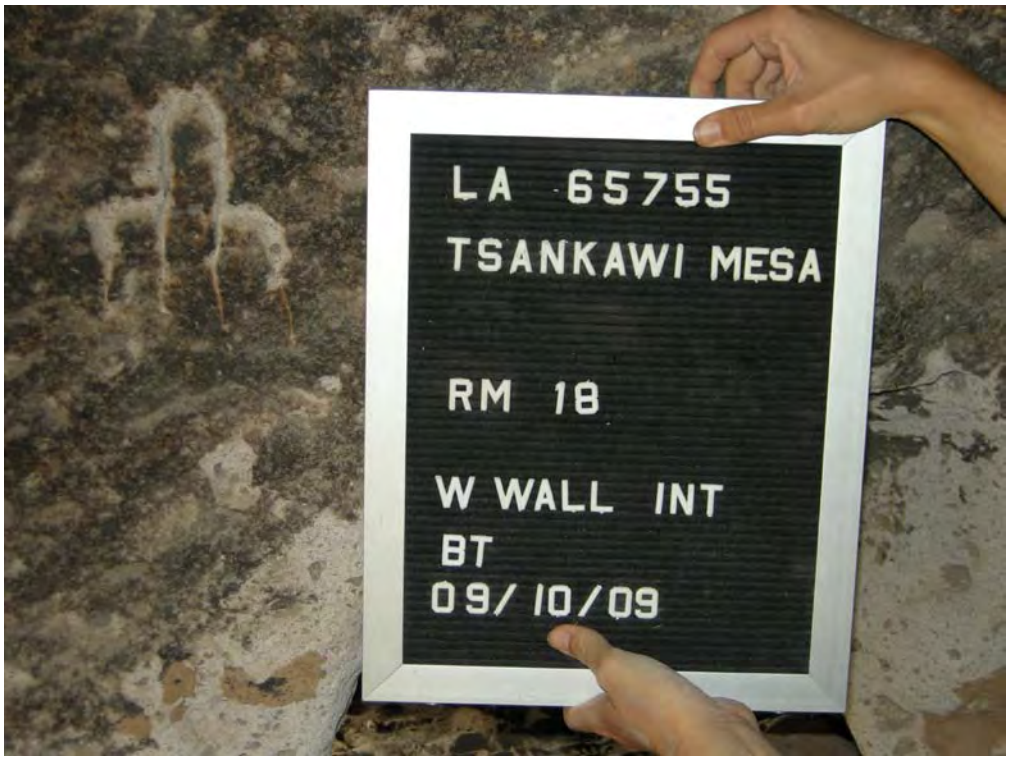
*Conservators: Erin Tyson, Stephen Merkel, Molly Ray*

"Middle Finger" (west wall) LA 65755; Room 18

Since the treatment of this graffiti would require a large amount of fill in a heavily sooted area of the wall, it was decided that cyclododecane should be used to mitigate the impact of water-caused staining. The graffiti was surrounded by a 1-3mm thick coat of cyclododecane. The cyclododecane was heated over a lit sterno can in an enameled metal cup and was applied by a dabbing on with a brush. Immediately after the application, a tuff-lime mortar was mixed and used to infill the deep incisions. The mixture used was 3 parts white tuff, 1 part tan tuff, 2 parts lime, and 1 part sanidine rock. After a day or two the fill was impainted using Ivory Black, Van Dyck Brown and Yellow Ochre. After two months, about 95% of the cyclododecane had sublimated. As the cyclododecane sublimated, the fill required more inpainting to match the color around it. This was done on 11-10-09. The cyclododecane successfully prevent staining from occurring, but it did pose some problems around the edge of fill where the fill accidentally overlapped the cyclododecane. In some cases, this lip was gently broken off to lessen the discontinuity between the fill material and the surrounding substrate. More inpainting may yet be required once the cyclododecane is completely gone and all the ledges around the edges of the fill are broken. As of 11-12-09 the Post Treatment photo has not been taken.

| ***Mixtures*** | ***Comments*** |
|---|---|
| 3 white tuff, 1 tan tuff, 2 lime, 1 sanidine rock | Good texture and color |

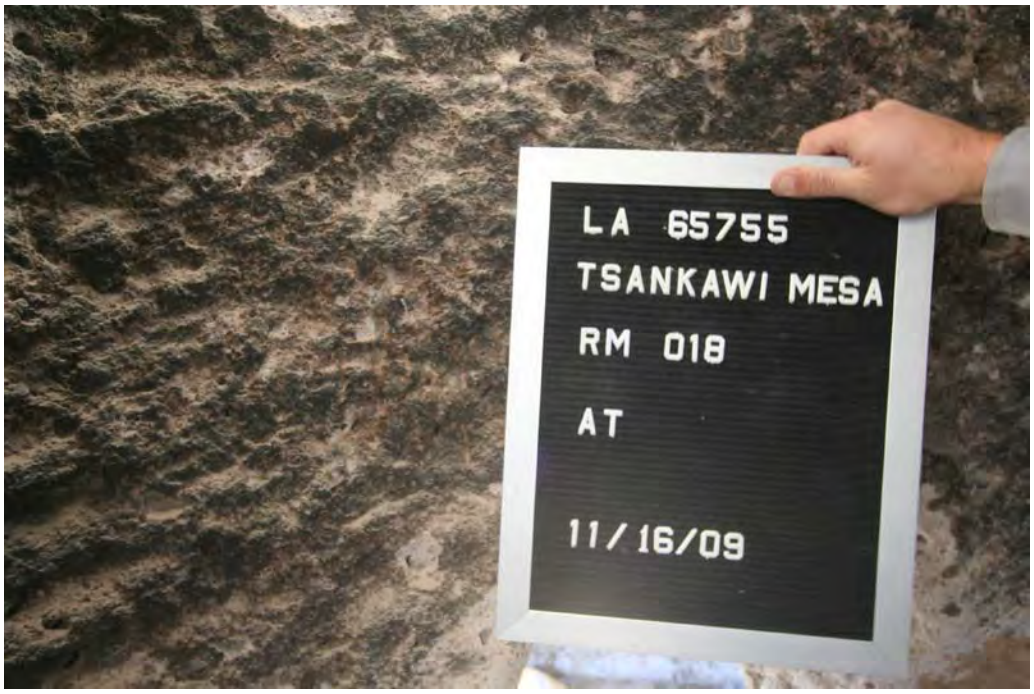
**"Middle Finger" (west wall)** *Before Treatment*




**"Middle Finger" (west wall)** *During Treatment, note cyclododecane*



**"Middle Finger" (west wall)** *After Treatment*




## LA 128410; Room 09

**"T + M" (south wall)** LA 128410; Room 09

*Conservators: Erin Tyson, Stephen Merkel, Molly Ray*

This instance of graffiti contains the initials "T + M" carved into the south wall of the cavate. It is deeply incised in the tuff and requires a mortar fill. We collected tuff having the same reddish color from nearby (*buff tuff) and used it in the test mixtures. As of September 17, 2009 three mixtures have been tested without having achieved an exact match yet.

An appropriate match was found and the treatment was completed on 9/28. One mixture was used to cover most of the incisions: (1 part red tuff, 1 part buff tuff, 1 part group A tuff, 1 part lime). Some voids and gaps were created in order to mimic the surrounding surface. Standard methods of application were used including wetting the surface, applying the mortar by firmly pressing down, and re-wetting the surface to help the material set evenly.

* It should be noted that what is now known as "buff tuff" was called "red tuff (nearby)" in previous notes. The "buff tuff" was collected directly outside of room 09 in LA 128410.

| Mixture | Comments |
|---|---|
| 1 buff tuff, 1 Group M tuff, 1 white tuff, 1 ½ lime | Too pale |
| 3 buff tuff, 1 lime | Fairly close but still too light and needs texture |
| 2 ½ buff tuff, ½ red tuff, ½ rock, 1 lime | Still a little too light |
| 1 red tuff, 1 buff tuff, 1 group A tuff, 1 lime | Good color and texture match |

**"R T" (south wall)** LA 128410; Room 09

*Conservators: Erin Tyson, Stephen Merkel, Molly Ray*

This instance of graffiti was carved very deep into the surface. Several layers of lime/tuff mortar were applied in order for the treatment to set flush with the surrounding surface. The following mixture was used: (1 part red tuff, 1 part buff tuff, 1 part group A, and 1 part lime). Gaps and voids were created but the entirety of the graffiti was mostly filled. Several small to medium sized rocks were pressed into the mortar. Standard methods of application were used for this treatment.

**"J + J" (north wall)** LA 128410; Room 09

*Conservators: Erin Tyson, Stephen Merkel, Molly Ray*

This instance of graffiti required a mortar and plaster fill to complete the treatment. The first "J" of the graffiti was filled with the following mortar mixture: (1 part buff tuff, 1 part group M tuff, 1 part white tuff, 1.5 parts lime). The first "J" was then completely covered with a plaster mixture: (2 parts red levigated clay, 1 part red yellow dirt, 1 part rock).

The "+" and 2nd "J" in the graffiti were filled with a mortar mixture: (2.5 parts buff tuff, .5 part red tuff, .5 part sanidine rock, 1 part lime). A plaster mixture was then used to cover the edges of the graffiti: (2 parts red levigated clay, 1 part red/yellow dirt, 1 part rock). Sections of the mortar fill were left exposed, creating unrecognizable organic shapes.

| Mixtures | Comments |
|---|---|
| 1 red/yellow dirt, 1.5 red levigated clay, 1 rock | Good mixture (could be a little warmer)<br>Good texture |
| 2 red levigated clay, 1 red/yellow dirt, 1 rock | Very good color and texture match<br>This mixture was used by Stephen Merkel to complete the treatment |
| 1 buff tuff, 1 group M tuff, 1 white tuff, 1.5 lime | This mixture was used to treat the first "J' in the graffiti |
| 2.5 buff tuff, .5 red tuff, .5 sanidine rock, 1 lime | This mixture was used to treat the "+" and 2nd "J" of the graffiti |

**"Backwards C" (north wall)** LA 128410; Room 09

*Conservators: Erin Tyson, Stephen Merkel, Molly Ray*

This piece of graffiti resembled the letter C if it were flipped backwards. It was not carved at a great depth and only required a plaster fill. The "backwards C" was almost completely filled with the following plaster mixture: (2 parts red levigated clay, 1 part red/yellow dirt, 1 part rock). The bottom left portion of the graffiti was left unfilled. The burnt umber pigment was also applied in small sections of the graffiti.

| Mixtures | Comments |
|---|---|
| 2 red yellow dirt, 1 red levigated, 1 white tuff | |
| 2 red yellow dirt, 1 red levigated, .5 rock | |
| 2 red levigated clay, 1 red/yellow dirt, 1 rock | Very good color and texture match |

**"J" (east wall)** LA 128410; Room 09

*Conservators: Erin Tyson, Stephen Merkel, Molly Ray*

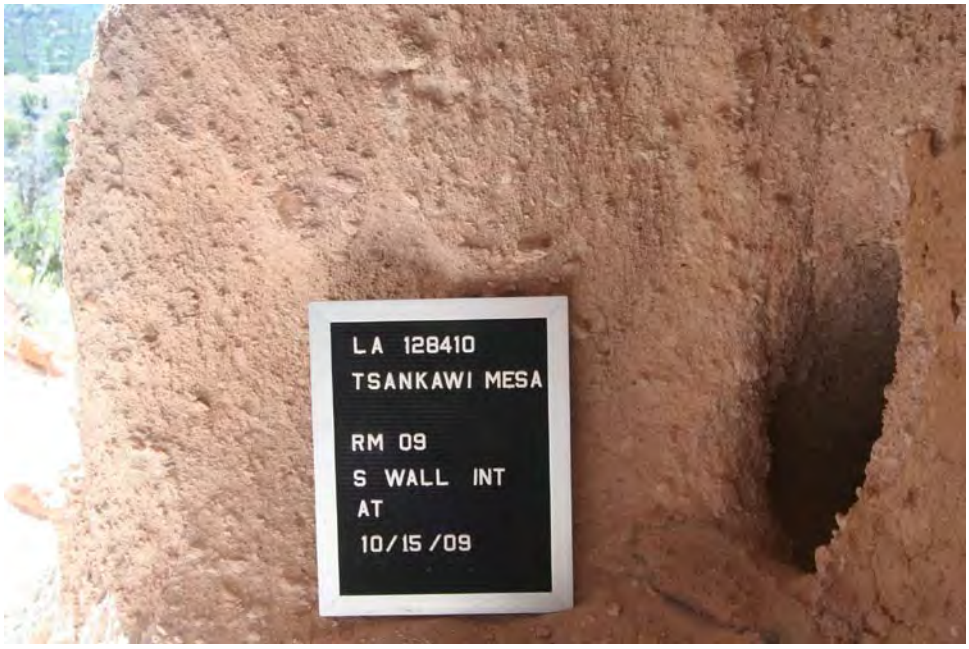
This piece of graffiti was completely filled with a mortar mixture: (2.5 parts buff tuff, .5 part red tuff, .5 part rocks, and 1 part lime). A plaster mixture was also used to treat sections of the graffiti: (2 parts red levigated, 1 part red/yellow dirt, and 1 part rock). The plaster was mostly applied in the edges of the "J", leaving the mortar fill in the center exposed. Standard methods of application were used when treating this graffiti.

| Mixtures | Comments |
|---|---|
| 2.5 buff tuff, .5 red tuff, .5 rocks, 1 lime | |
| 2 red levigated, 1 red/yellow dirt, 1 rock | |

**"T + M" (south wall)** *Before Treatment*



**"T + M" (south wall)** *After Treatment*



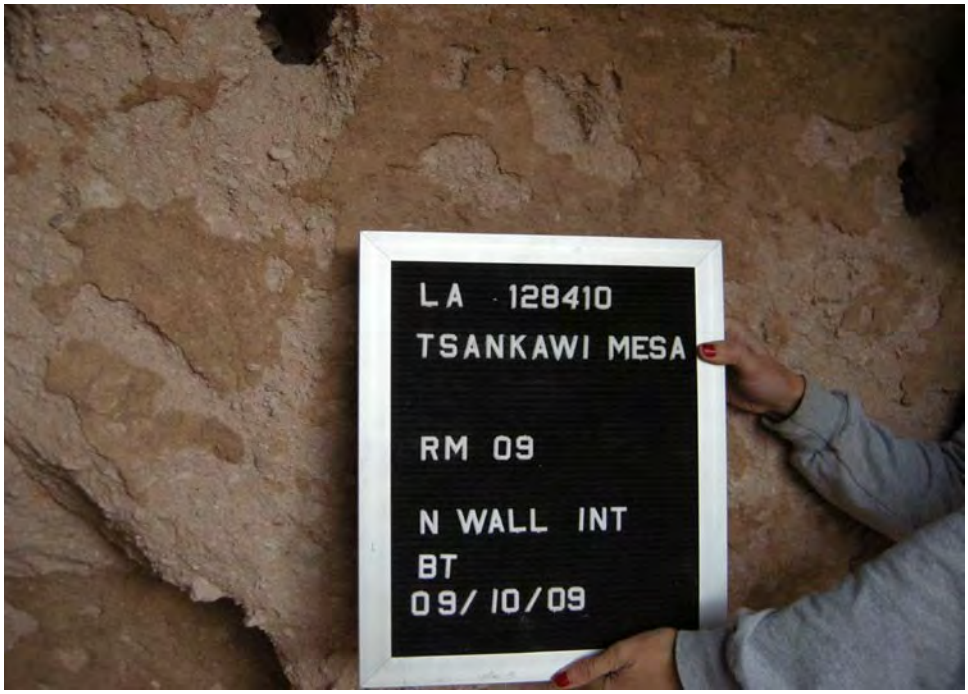

**R T (south wall)** *Before Treatment*



**R T (south wall)** *After Treatment*




**"J + J" (north wall)** *Before Treatment*



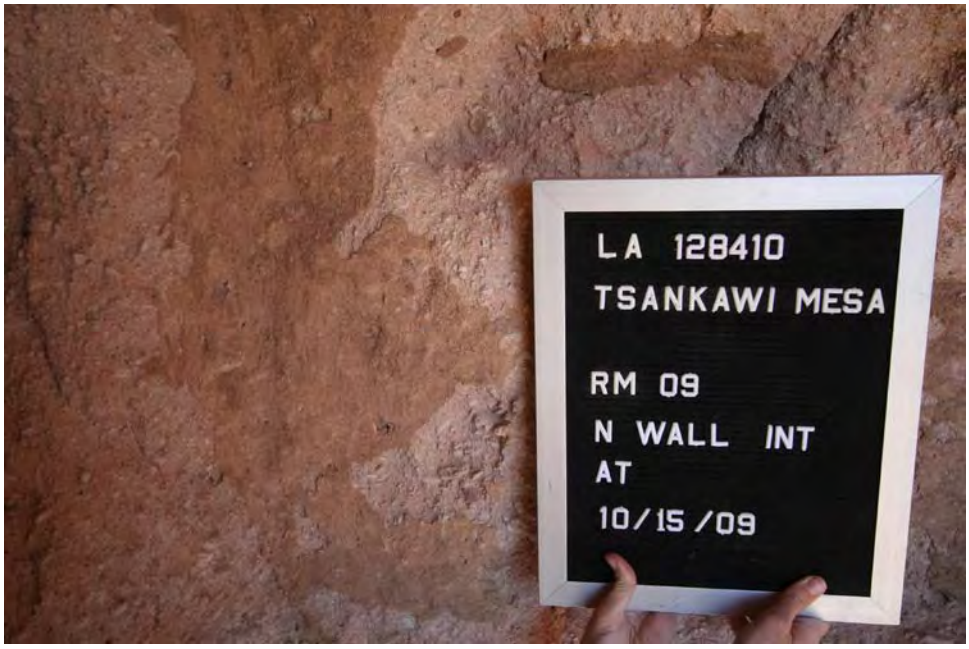
**"J + J" (north wall)** *After Treatment*




**"Backwards C" (north wall)** *Before Treatment*



**"Backwards C" (north wall)** *After Treatment*




**"J" (east wall)** *Before Treatment*




**"J" (east wall)** *After Treatment*



# Appendix H:

# Graffiti Mitigation Clay and Tuff Sources




**Figure 1: Map of clay and tuff sources 1–4**

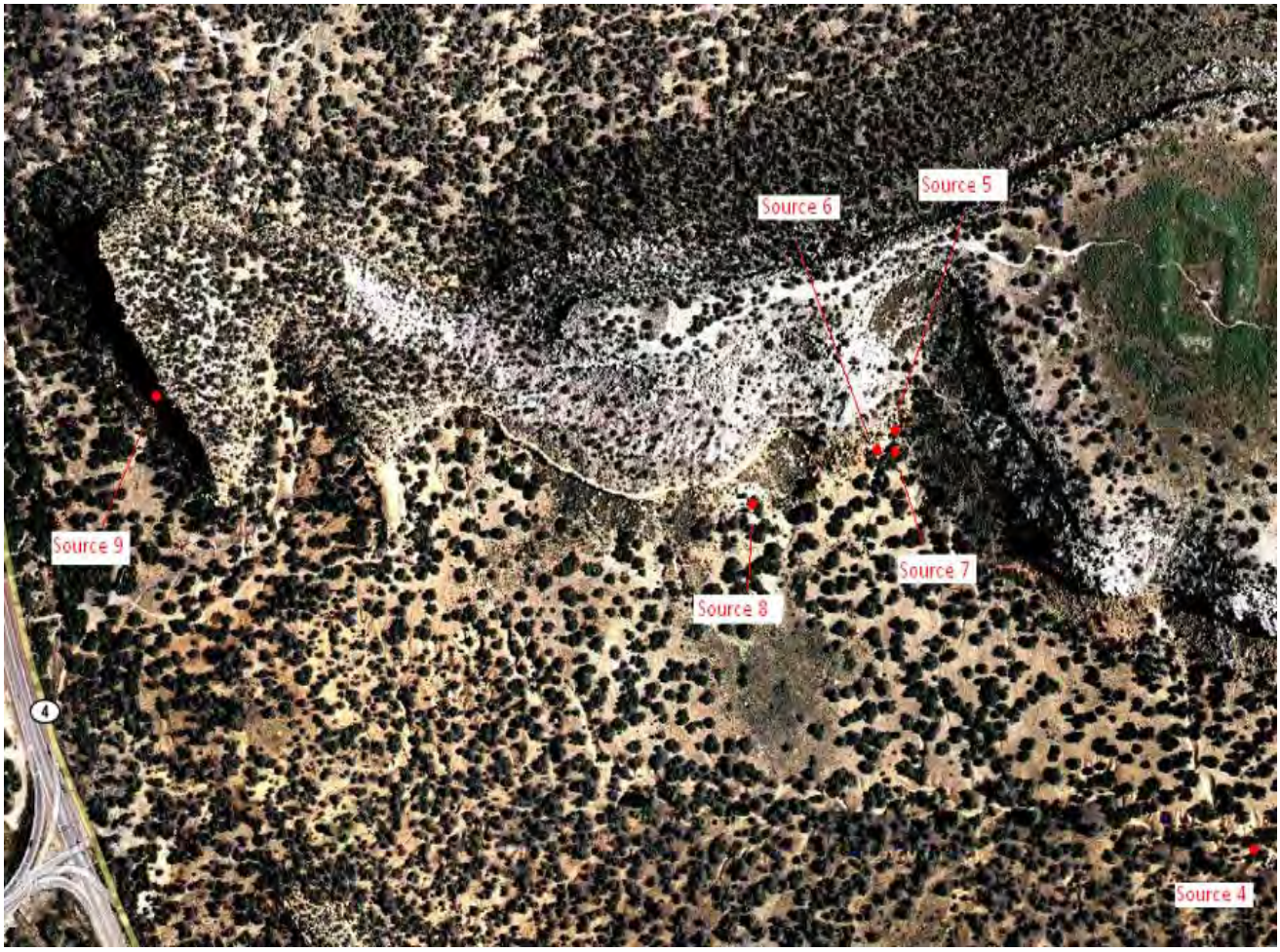


**Figure 2: Map of clay and tuff sources 5–9**



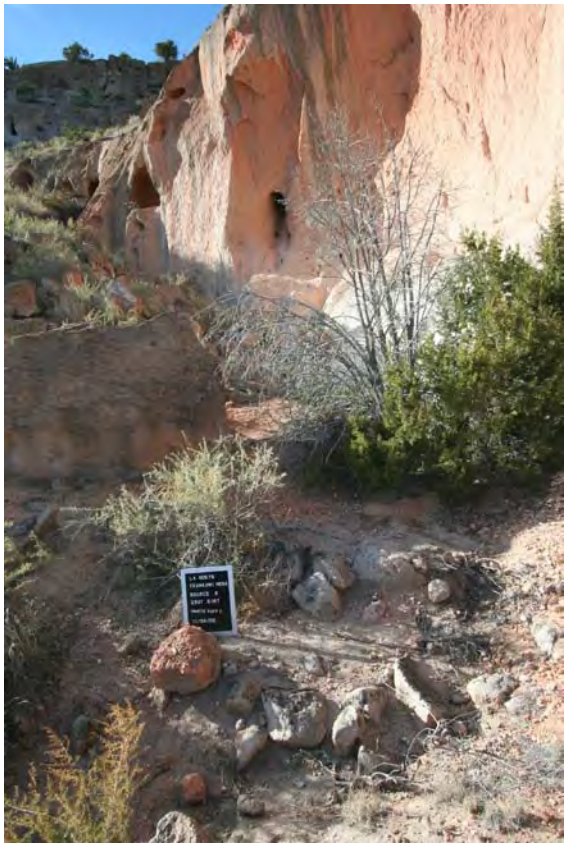



**Figure 3: Gray Pumice, Source 1, East of LA 70955 Facing East**

**Figure 4: Gray Dirt and White Tuff 2, Source 2, East of LA 50976 facing West**



**Figure 5: Gulch Clay, Source 3, Image 1, South of LA 65758 facing South**



**Figure 6: Gulch Clay, Source 3, Image 2, South of LA 65758 facing East**



**Figure 7: Red-Yellow Dirt, Source 4, Image 1, South of LA 65758 facing North**



**Figure 8: Red-Yellow Dirt, Source 4, Image 2, Due South of LA 65758**



**Figure 9: Red Levigated Clay and Red Tuff**



**Figure 10: Flesh Levigated Clay, Source 6, in LA 65751**



**Figure 11: Tan Levigated Clay, Source 7, in LA 65751 facing North**



**Figure 12: White Tuff and Tan Tuff, Source 8, in LA 65750 facing Northeast**



**Figure 13: Buff Tuff, Source 9, in LA 128410 facing Northeast**

| | *Chroma: 5* | 6 | 6 | 6 to 7 | 7 | 7 | 8 | 8 |
|---|---|---|---|---|---|---|---|---|
| *Hue:* | | | | | | | | |
| 2.5 Y | | | | | 7/1 gray *Gray Tuff* | | 8/1 white *White Tuff 2* | |
| 5 YR | | | | 6/8 red/ylw *Red Tuff* | | | | |
| 7.5 YR | | 6/1 gray *Gray Tuff* | 6/2 brn/gray *Gray Pumice* | 7/2 pink/gray *Group M Tuff* | 7/3 pink *Buff Tuff; Grp M Tuff 1* | 7/4 pink *Red Lev* | 8/2 brn *Tan Tuff* | 8/4 pink *Flesh Lev* |
| 10 YR | 5/4 yl/brn *Gulch Clay* | 6/2 brn/gray *Gray Dirt; Group A Tuff* | 6/3 brn *Tan Lev* | 6/4 ylw-brn *Red/ylw dirt* | | | | |

**Table 1: Chart of Munsell Colors for Infill Materials**



**Sample G:** Gulch Clay



**Sample M:** Red-Yellow Dirt



**Sample I:** 3 Gulch Clay,
1 Red Tuff, 1 White Tuff



**Sample 3:** 2 White Tuff, 1 Gulch Clay
1 Flesh Levigated, 1 Red/Yellow dirt,
1 Tan Levigated, 1 Red Levigated

**Figure 14: Plaster Test Samples**



**Sample K:**
*left*:(2 Tan Lev, 1 Flesh Lev)
*right:* (2 Tan Levigated, 1 White Tuff, 1 Red Levigated, 1 Flesh Levigated)



**Sample H:** *left:* Tan Levigated Clay
*middle:* Red Levigated Clay
*right:* Flesh Levigated Clay



**Sample V:** *center:* 2 Red-Yellow Dirt, 1 Flesh Levigated
*dots applied on right:* 1 Flesh Levigated, 1 White Tuff, 1 Red-Yellow Dirt
*top horizontal line:* 1 Flesh Levigated, 1 White Tuff, 1 Red-Yellow Dirt

**Figure 14: Plaster Test Samples (continued)**

# Appendix I:

# Graffiti Mitigation Strategy

## GRAFFITI MITIGATION STRATEGY

Stephen Merkel and Lauren Meyer

Within the cavates of Frijoles Canyon in Bandelier National Monument, graffiti is a special problem. It occurs in approximately 23% of these chambers, and appears as writing that has been applied onto or, more commonly, etched into prehistoric plaster or tuff surfaces. Names and dates are common, as are initials, offensive words and images. A large span of time is represented (from the earliest Spanish explorers to current-day school children), although most of the graffiti has occurred within the last 100 years.

Because of the archaeologically and culturally sensitive nature of the sites represented in Bandelier National Monument, specialized conservation techniques have been developed that help to obscure the modern graffiti from view. This type of mitigation is time consuming, as application of treatment materials must be modified for each instance of graffiti, and must be performed by a trained specialist. It is believed that graffiti begets more graffiti. If this is true, then removing or obscuring the graffiti that already exists will help to lessen further application.

Resource managers in Bandelier must come up with a plan of action that will address the problem of graffiti in the park. Decisions must be made regarding how to educate and inform the public on the negative effects of graffiti and how to monitor the sites as a preventative measure (Interpreter or LE presence). In addition, decisions must be made regarding the types of graffiti that are to be mitigated and how this mitigation is to occur.

Do we treat all of it, or are we selective in our approach to implementation?

For all other forms of deterioration, we are extremely selective in our actions. Should we consider graffiti differently? What is the graffiti mitigation program about? Is it about removing the modern hand and reintegrating surfaces (essentially restore) so that the materials can then degrade as they would have in their original application (some Pueblo participants in this program have identified this as their goal for

the graffiti mitigation work), or is it about addressing a threat to the resources and preventing further damage from occurring? Maybe somewhere in the middle?

These are difficult questions to answer. Most resource managers, most people in fact, have a strong aversion to graffiti, especially when it is placed on something of significance. In most cases, the decision to remove or obscure graffiti is an easy one. This is not so when the graffiti occurs in an archaeological site.

This gets to the question of ideal condition. What is the ideal condition of the cavates? What are we striving for here?

Are we hoping to eradicate all graffiti and bring the cavates back to a period of significance, that being the Pueblo period of occupation or something close to it? Is that something that we should strive for in all cases, or should we adopt that idea for special cases only? And if so, what are those special cases?

OR

Are we attempting to maintain the cavates in their current condition, and treating that which will prevent further losses from occurring? Do we only treat those cases of graffiti where there is a threat of further decay? This includes those cases which occur in cavates that are, or have the potential to be, experienced by the public. In these cases, the very existence of graffiti could encourage further application, even if the graffiti itself is not negatively impacting remaining original material. In these public areas, can we justify obscuring everything so as not to encourage more graffiti? If not, then what do we tolerate and why? What are the special cases that we leave visible?

*Selective approach:*
If our approach is to be selective in our application, with a goal of preventing further damage, the following should apply:

The overarching consideration should be whether or not graffiti mitigation would be beneficial to the *cavate*.

These benefits could come in many forms:

a. **Visual reintegration of surfaces**: Graffiti mitigation would obscure graffiti, which would potentially result in less graffiti being applied. Many people ascribe a value to a site based on the way it appears. If there is graffiti impacting a site, people will assume that it has little value. Obscuring this graffiti will enhance the value of these sites in the eyes of the public. *This fact should weigh heavily in cavates that are on, accessible from or visible from the main loop trail.*
b. **Physical reintegration of surfaces**: Plaster and tuff surfaces that are actively deteriorating because of the surface disruption caused by the graffiti would be filled and inpainted. This would prevent future losses that would result from edge wear, as would it prevent damage from water flowing over and behind surfaces, etc. *This should be a consideration in all cavates that retain significant embellishments, features or structural elements that would be impacted by losses caused by graffiti.*

Factors that should hold weight in decision making (refers to your decision making tree):

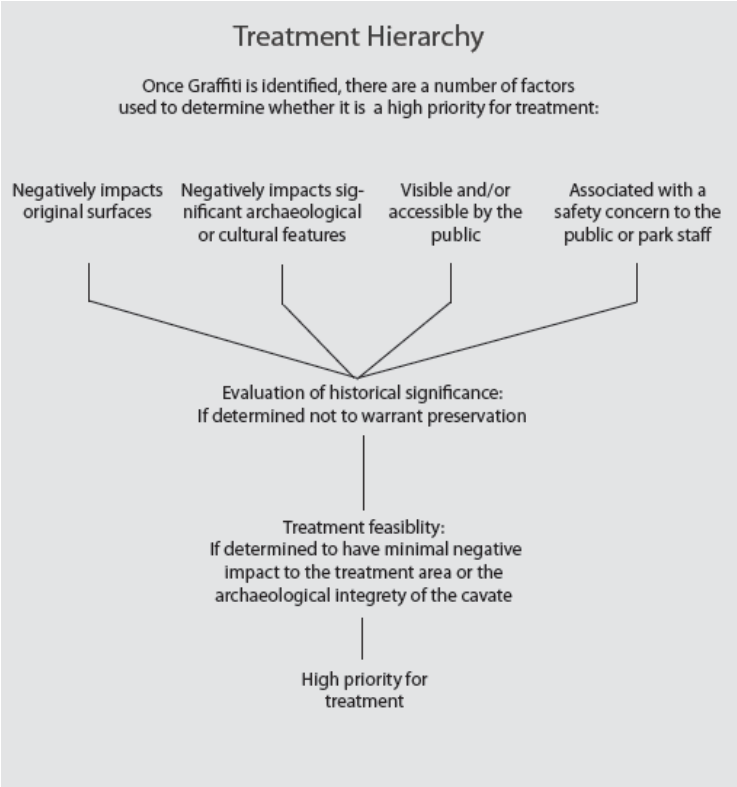
1. Is the graffiti negatively impacting the original materials into which it is carved or etched, or onto which it was applied?
2. Is there potential for archaeologically or culturally significant cavate elements (embellishments, features, petroglyphs, or associated cavates) to be negatively impacted as a result of the deterioration caused by the graffiti?
3. Is the cavate or the graffiti visible to the general public? Is the graffiti in a cavate that is on or accessible from the main loop, or is it visible from the actively used trails (Group A)? Is there potential for an individual to access the cavate and view the graffiti?
4. Is there a safety issue that can be addressed through treatment?

If the answer to any of the above is yes, then treatment is viable. The only exceptions are those cases in which the graffiti is considered to be historically significant. This gets at the idea of 'what should we tolerate and why?'. Respond to the following:

5. Is the graffiti composed of recognizable symbols or images (i.e. letters or numbers, names or dates)? If so, are the symbols or images considered to be archaeologically or historically significant?

   If the graffiti is composed of recognizable symbols or images, but they are not considered to be historically significant, move forward with treatment.

Significance should be determined through response to the following:




Is the graffiti representative of a significant period in the history of the cavates, park or region (i.e. Spanish script)? If the graffiti is a name, is it recognizable as an important figure in the history of the landscape or the park (i.e. Wetherill)? If it is a name that is unfamiliar, yet it is paired with a date, consider the following: Does the date relate to a significant period of use in the cavates (not likely)? Does the date relate to a significant period of use in the park or region (these periods are will be identified by the Historic Resource Study currently being produced for the park), and if so, is it significant enough to warrant retention? Cases such as this should be directed to the program manager for final decision on treatment.

If the graffiti is determined to be historically significant, then treatment is not recommended.

If it is not considered significant, then the final question should be as follows:

6. Is treatment feasible? Are there extant conditions that may cause the treatment to fail or otherwise negatively impact the cavate? For example, is there a threat of staining that could alter the appearance of the original material surrounding the area to be treated? If treatment is feasible, then move forward. If treating the graffiti with current methods has the potential to fail or negatively impact the remaining original material, then new treatment methods should be developed and tested, and implementation should only occur if the threat to intact original material is minimal to non-existent.

# Appendix J:

# Graffiti Mitigation Report - 1998
# (Excerpt from Tsankawi Project Completion Report, Dec. 1998)

accommodate the weight to be placed on top, and due to the depth of the mechanical abrasion, all of the resulting void was filled with masonry. Further, the surrounding cavate walls provided excellent support against shear and buckling by holding the masonry in a solid framework. However, upon completion, the wall was inspected and found to be too thin (only one width thick on the upper portion) and of unstable, wavy construction. The top ¼ of the wall was dismantled, and the rear upper half of the wall was built back up with stones and mortar in order to complete the wall at two widths thick to nearly the top, and one width thick for the last four courses. In addition, the mortar mix at the lower levels of cavate #20 was slightly altered with more cement to add strength to the base.

Cavate Graffiti Mitigation

Many of the cavates at Tsankawi display heavy amounts of modern graffiti in the plasters, walls, and ceilings. These consist mostly of names or initials carved into the surface, though occasionally these are drawn with pieces of Tsirege Tuff due to its chalk-like texture. Some of the carved surfaces stand out particularly well due to the sgraffito-like appearance of white tuff showing through the tan plaster or smoke blackened surfaces.

Three primary reasons were behind the decision to include graffiti mitigation in the scope of work for the Tsankawi Project. First, there is the belief that graffiti begets graffiti. In other words, a blank surface is less likely to be vandalized than a surface that already displays an intrusion. This idea initially came from urban areas where spraypaint is a major concern, and has been incorporated into management frameworks for cultural sites. Secondly, the aesthetic unsightliness of names, initials, and other carvings in cavate plasters and tuff that also display numerous petroglyphs and other architectural features warrants graffiti mitigation. Lastly, there is the cultural issue of permanent non-native imposition on a place considered ancestral and sacred. Oftentimes the most prevalent graffiti is carved into the plasters and tuff of cavates that display many of the characteristics of kivas and are commonly believed to be so. These intrusions are of a particularly insulting nature due to the added importance of a kiva room, though the prehistoric authenticity of some carvings is questionable. For this reason, there is a strong necessity to be discriminating in identifying and treating contemporary intrusions. Only clearly modern graffiti was filled. The filling of these areas not only removes the damage from the untrained eye, but may lessen the chance of it occurring in the future.

The Scope of Work identified cavate #19 (Lister and Toll's classification system) as the probable location for graffiti mitigation. However, further onsite discussion during the training program of June, 1998 determined that two more appropriate cavates for graffiti mitigation would be #59 and #66. These two cavates, commonly believed to have been kivas due to their size, numerous plaster layers, and significant petroglyphs, displayed deeply incised initials, names, and symbols of historic and non-native origin.

Cavate #59 retains most of its plaster finish in the lower dado area, and contained two major instances of graffiti on the lower portion of the west wall directly across from the doorway. These intrusions were an "A" with a circle around it and slash through it commonly attributed to mean "anarchy" in pop culture. Secondly was the name "Pearl" (see Figures 8 & 9). Both of these were filled on July 28 and 29, 1998

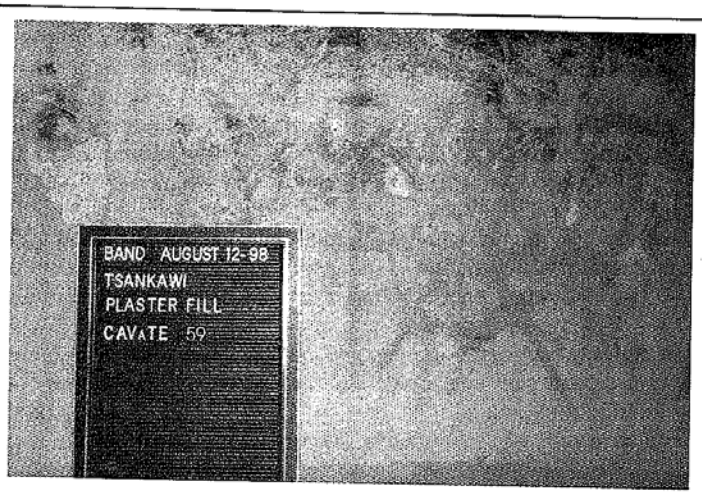



**Figure 8: Graffiti mitigation #1, Cavate # 59**

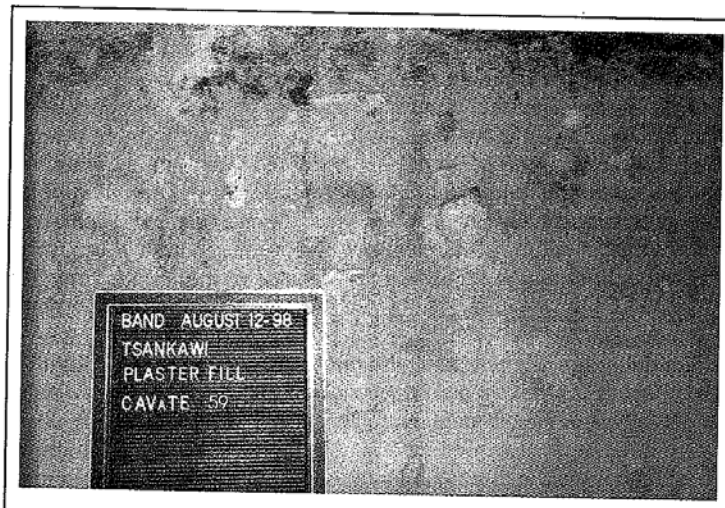



**Figure 9: Graffiti mitigation #2, Cavate 59**

Cavate #66 retains a fair amount of plaster, mostly near the upper edge of the lower dado area. What is left of this band contained a fair number initials and lines carved in its two major portions in the southwest and northeast corners.

Due to the delicate nature of material and color matching while infilling plasters, a number of test patties were created using local materials found on or around Tsankawi Mesa in order to determine the most texturally and aesthetically matched infill material. These included the gray dust from the floor of the cavates, dirt from the mesa slopes, and sand from the arroyos below. Mixed with water, the dirt from the mesa slopes provided an almost exact texture and color match. This material was mixed with water until it achieved a consistency that was workable but wouldn't flow or distort with gravity. Further, an amendment to the sieved soil fill (5-10% acrylic emulsion [Rhoplex E330]), totaling about 5% of the total fill volume, was added to the mix for better adhesion.

Plaster fill methodology was basically simple. The water and dirt mix was pressed with the fingers, no tools needed, directly into the groove until significant adhesion was achieved. However, three issues of critical importance had to be addressed:

- Moisture content in the mix could not be too high. Excessive saturation would quickly spread to the plaster surrounding the fill, discoloring the area and causing the mitigation to be highlighted.
- Fill surface had to be smooth and parallel to the surface of the surrounding plaster. No fingertip impressions should be visible.
- Absolutely no "feathering" of the fill should be done. Fill should be even with the edge of the groove as a feathered surface would extend over this edge with thin fill material. This method is both unsightly and structurally unsound as the feathered material would eventually separate from the plaster below it and flake off.

Smoke-blackened graffiti areas, only mitigated in cavate #66, utilized totally different materials and methods. Here, the material lost was not replaced with a like material as with the plaster fill, but with a mix of black acrylic paint and water. This was applied by simply dabbing the acrylic and water mix, with a small artist's brush onto the white tuff areas. An attempt was made to mix some of the gray dust from the floor of the cavate into the acrylic paint to achieve a more granular texture to match the carbon surface, but this served only to lighten the color of the paint. Further, smoke blackening was suggested as possible method of covering graffiti in the ceilings, but was rejected due to the negative effects it would have on future Carbon 14 dating methods. As with the plaster infill, critical issues had to be incorporated.

- The acrylic paint and water mixture must be relatively thick and globular. Paint that is too thin will be withdrawn by capillary action into the tuff and appear on the surface to be light gray. Further, this thicker application more closely resembles the texture of the surrounding carbon surface.
- Two or more applications may be necessary in order to achieve a sufficiently dark color.

# Appendix K:

# Tsankawi Graffiti Mitigation Report - 2001

**TSANKAWI GRAFFITI MITIGATION REPORT - 2001**

The objective of the graffiti mitigation project is to obscure modern graffiti by inpainting and filling incised graffiti with a physically and visually compatible material. This will prevent further loss of fabric and reduce the chance of re-occurrence of vandalism

Prior to treating the graffiti, the treatment areas were photographed. Incised graffiti was brushed free of dirt and debris, then pre-wet with water to clean the surface. If needed, exposed friable tuff was consolidated with a 10% acrylic emulsion in water.

Infilling was performed on plaster or sooted tuff where the incised graffiti exposed the tuff substrate. The soil infill was formulated to match the surrounding plaster. Dry sieved soil was mixed with water to form a relatively moist paste. The infill material was applied to the lacunae with a microspatula or by hand, then firmly pressed into the void. The material was left flush or slightly recessed from the plane of the surrounding plaster. Dry soil or pigments were added to the surface to match the surrounding color and appearance.

Inpainting was performed on shallow incisions in plaster layers or on sooted tuff. Shallow voids in plaster were inpainted with a slip consisting of a muddy mixture of soil and water. The slip was applied with a thin artist's brush, then compressed with a damp sponge. Graffiti incised into sooted tuff was inpainted with a dry mineral pigment and acrylic matte medium or water. Pigments included ivory black, red umber, yellow umber and assissi gray. The pigment and medium were mixed on the brush to create a dry, gritty texture to better match the surrounding soot deposits, then applied to the lacunae.

A new technique of applying pigments was also developed this season. Rather than mixing the pigments with acrylic matte medium, the area was slightly dampened with a 5% solution of El Rey, and, using a microspatula, dry pigment or dirt was gently blown on to the area. This method achieved the desired coarse texture, as well as imitating the appearance of the original grainy material. The blowing technique allowed for controlled application of pigments and blended smoothly into the existing scheme. This technique was used both for inpainted and infilled areas.

All treatment areas were photographed and graphically recorded on acetate overlaying pre-treatment digital images.

Approximately 100 man-hours were spent treating roughly 2 square meters of graffiti mitigation areas.

Three cavates at Tsankawi Mesa were treated during the summer 2001 season. Two cavates in LA 50976 (59 and 64), and one unnumbered cavate (Cavate 3) were treated on June 27, July 11, 18, 25 and 30. The conservation team included Patrick Cruz, Larry Humetewa, Glenda Fred, Erin Martin, Naomi Naranjo and Kathleen Forrest.

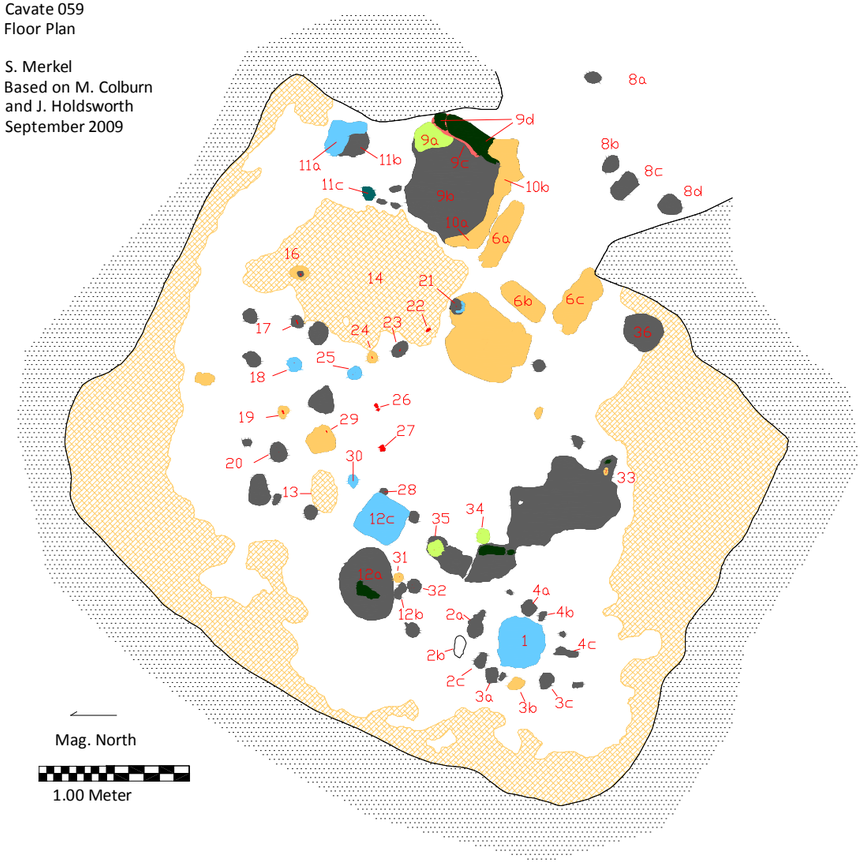
# Appendix L:

# Floor Maps of Cavates 59 & 64
# LA 50976

# Floor Feature Identification

LA 50976
Cavate 059
Floor Plan

S. Merkel
Based on M. Colburn
and J. Holdsworth
September 2009




Plaster
Plaster/Mortar Filled Depression
Unexcavated Depression
Stone
Inserted Tuff Plug
Reddish Mortar
Ashy Plaster/Mortar
Organic Material W/Sand

Loom Anchor Loop/Fragment (Floor)

8a Description Number *

* Description Numbers relate to the features visible in the photograph of the same number. Features sharing a number are related only by proximity and happened to be photographed together.

1. Circular, heavily cracked tuff slab imbedded in an earthen mortar; tuff slab closely fits the dimensions of the depression or pit it is covering

2a. Amorphous depression filled with sediment

2b. Ovular incision in the tuff bedrock (maybe the outline of an uncarved depression)

2c. Circular depression filled with sediment

3a. Circular depression filled with sediment

3b. Circular tan plaster/mortar fill

3c. Circular depression filled with sediment

4a. Square depression filled with sediment

4b. Amorphous depression with charcoal and dirt fill

4c. Linear depression (3cm wide) filled with sediment

5. Large amorphous depression filled with sediment

6a-c. Rectangular depressions with plaster/mortar fill

7. Large, double ovular depression with plaster/mortar fill

8a-d. Exterior depressions filled with sediment

9a. Triangular patch of whitish ashy consolidated material partially covered with short striations

9b. Large circular depression filled with sediment, possibly a fire pit

9c. Chunky fire-hardened red mortar surrounding tuff masonry stones

9d. Two shaped tuff stones in mortar

10a. Brown plaster dust that appears charred (10a fades into 10b)

10b. Red plaster dust that appears to be oxidized or burnt plaster

11a. L-shaped piece of crumbly tuff set into a depression (floor plaster appears to have been applied on top of the tuff insert next to east wall)

11b. Circular depression filled with sediment

11c. Circular dirt deposit rich in organic material on the surface of the floor plaster

12a. Large circular sediment-filled depression with a chunk of tuff in center

12b. Small depression filled with sediment

12c. Large, cracked, closely-fitted tuff plug imbedded in an earthen mortar

13. Cracked insert made of a coarse plaster that rises above the tuff floor surface; it appears that this plaster is covering a hole or depression

14. Large area of tan floor plaster. There are three layers of plaster with two embedded loom anchors (16 and 22). The second layer has black areas. Map cracking is present.

15. No location 15

16. Intact loom anchor loop appears to be made of twisted twigs and is 1.5cm thick and extends .5cm above the ground; the anchor and depression in which it is set is surrounded by earthen mortar overlaps the plaster floor surface

17. Intact loom anchor loop composed of one branch (not twisted) is 2cm thick and extends 1cm above the fill; the anchor is set in a depression that is surrounded by earthen mortar overlaps the plaster floor surface.

18. Two extant loom anchor stumps are embedded in a round tuff plug (could possibly be plaster) that is cracked down the center The anchor loop appears to be made of one thick (1cm) branch that is not twisted. The plug protrudes above the tuff floor surface.

19. Intact loom anchor loop 1cm thick and extending 1.5cm above the ground . The anchor loop, made of two thin parallel branches, is in a depression surrounded by earthen mortar that protrudes above the tuff floor surface.

20. Five wooden stubs are embedded in circular depression. The highest stub is about 1cm above the ground. It is unlikely that all the stubs represent the ends of broken anchor loops. There may have been one or two separate anchor loops and the rest of the stubs belong to twigs in the packing material wrapped around the anchor.

21. This depression has a number of wooden pieces protruding out of the fill. There is one crushed loop that may have been the anchor loop and it is .5 cm thick and extends 2cm above the ground. The twigs and loop may only be a part of the packing material around an anchor that is now destroyed. Half of the circular depression has a piece of tuff in it that goes above the level of the floor plaster. It appears to have been part of a tuff plug.

22. This is an intact loom anchor embedded below the plaster surface. The top, which is just visible, is 1cm thick. Anchor appears to be made of several twisted branches or roots.

23. Intact loom anchor 1.3cm thick and 1.5cm above ground; anchor loop appears to be a twisted branch

24. Intact loom anchor .75cm thick composed of one branch embedded in an earthen mortar

25. Two loom anchor stumps (once composed of a single branch that is 0.75cm thick) embedded in a round raised tuff plug

26. Two loom anchor stumps and one complete, but charred, loom anchor loop that is 1.5cm wide and .5cm above ground; the anchors appear to be set directly into the tuff, but it may have a compacted dirt fill around it

27. Two loom anchor stumps and one complete loom anchor that is .5cm thick and .5cm above ground; the anchors appear to be set directly into the tuff, but it may have a compacted dirt fill around it.

28. Circular depression with dirt infill that could have held a loom anchor loop

29. Intact loom anchor .7cm thick and extends .5cm above ground composed of one split twig; anchor is surrounded by a round plaster fill

30. Ovular tuff plug that may be in the location of a former loom anchor

31. Two loom anchor stumps surrounded by a round plaster fill; the wood is not twisted and is about 1cm thick

32. Seven stumps (some charred) surrounded by a round bed of dirt and small twigs (mostly the packing material around the broken anchor loop); the broken anchor loop is charred, straight and is about 1cm thick

33. Intact loom anchor .5cm thick and extending 1cm above ground; appears to be made of twisted twigs

34. Two loom anchor stumps surrounded by a circular ashy grayish-yellow mortar; stubs are frayed around the edges and are 1cm thick

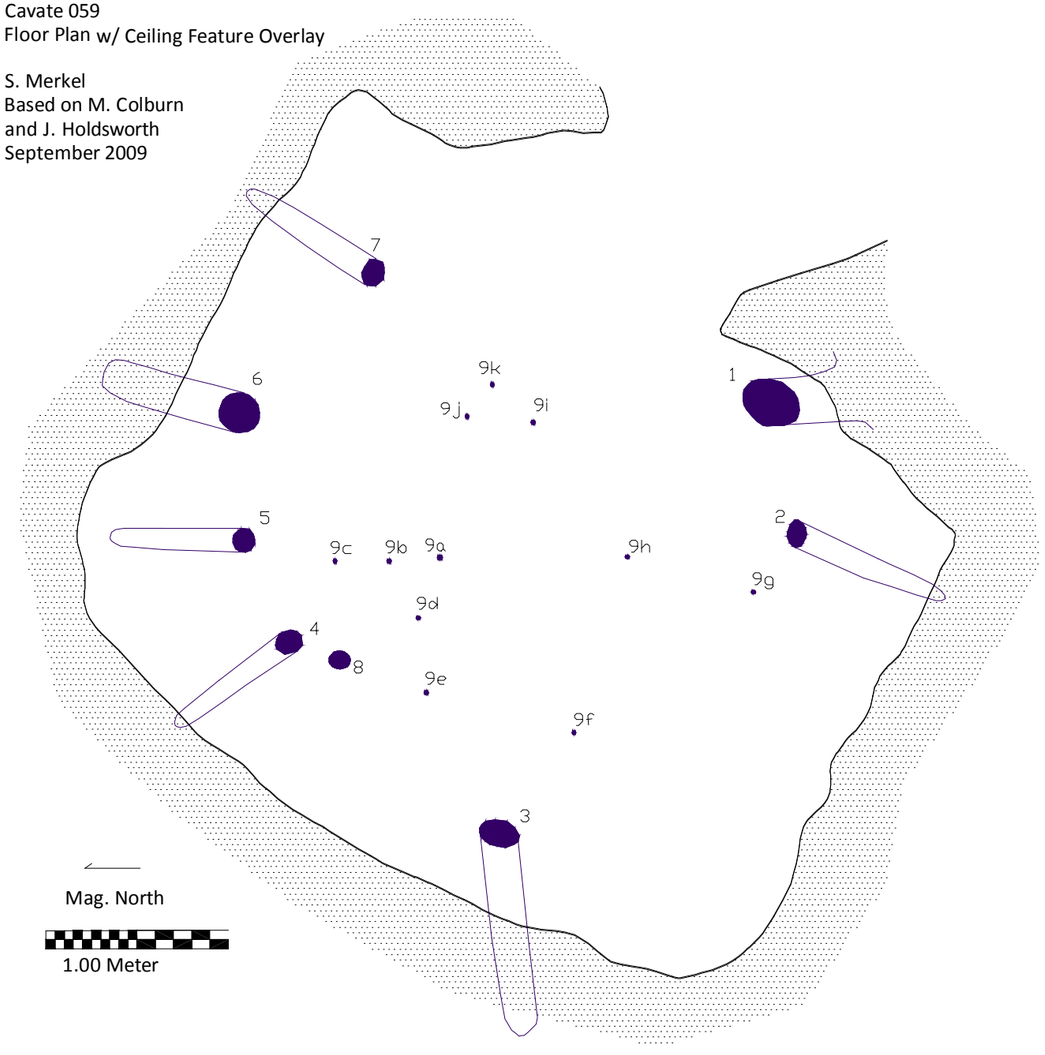
35. Two loom anchor stumps (charred) surrounded by a grayish yellow mortar; the stubs are about 1cm thick.

36. Large depression with charcoal mixed into the dirt fill located directly below the smoke hole; possibly a fire pit

# Ceiling Feature Identification

LA 50976
Cavate 059
Floor Plan w/ Ceiling Feature Overlay

S. Merkel
Based on M. Colburn
and J. Holdsworth
September 2009




Upper Loom Support Sockets/Holes (Ceiling)

Loom Sockets

1. This is a smoke hole. Sooting is present on the upper portion but on the lower portion soot has eroded away due to dripping water. The smokehole is oriented at about a 60 degree angle upward. The dimentions are 46cm deep, 35cm wide, and 33cm tall.

2. Loom socket: Sooting is present on the top of the socket but is absent from the bottom section. The socket has broken through to an adjacent cavate. The surrounding ceiling surface has a white powdery deposit. The very back is concave. The hole is angled at about 10 degrees. The dimentions are 46cm deep, 15cm wide, and 17cm tall.

3. Loom socket: Heavy black soot is present on the top but is absent near the back and the bottom of the hole. The hole is uniform in dimensions throughout. The surrounding wall surface has heavy dark sooting. The very back is concave. It is angled at about 5-10 degrees above the horizon. The dimentions are 57cm deep, 6cm wide, and 14cm tall.

4. Loom socket: Heavy black sooting is present at the top but absent at the bottom of the socket. On the north side of the hole a carved line runs halfway into the hole. The hole is of uniform diameter throughout. Heavy black sooting (much of which has flaked away) surrounds the area outside the socket. A modeled surface remains. They very back is concave. It is angled at about 10 degrees above the horizon. The dimentions are 39cm deep, 12cm wide, and 16cm tall.

5. Loom socket: Heavy black sooting is present at the top but absent at the back and bottom. Deep striations align with the direction of the socket. The exterior is covered in heavy dark soot. The very back is concave. The hole is nearly horizontal at about 0-5 degrees above the horizon. It is 37cm deep, 10cm wide, and 11cm tall.

6. Loom socket: Heavy dark soot is present on top but is absent from the back and bottom. Numerous pock marks are present on the top and back. These voids appear to be spots where stones have fallen out of the tuff. The surrounding ceiling has been sooted but has lost some of its finish. The surface is modeled. The back of the hole is concave. The socket is angled at about 5-10 degrees. The dimentions are 38cm deep, 10cm wide, and 14cm tall.

7. Loom socket: Modeled sooting is present at the top of the socket but absent from the bottom. On the facing side of the socket there is a baseball-size concave indentation. Examination of back and bottom was not possible because the socket was inhabited by nesting birds. The exterior surface was once sooted but is now heavily modeled. The socket is about 5-10 degrees above the horizon. The dimentions are 41cm deep, 16cm wide, and 14cm tall.

8. Conical vertical hole in the ceiling: The hole is sooted and deeply ribbed (perhaps unfinished). It is 13cm deep, 6cm wide, and 5cm tall.

9. Small Drilled Holes:

These cylindrical holes are fairly standardized to be 1.5 cm diameter, but their depth varies from 3 to 9cm. (The location of many of these holes were estimated after the floor had been covered, and may have errors up to 20cm, with exception of 9a, 9e, 9h and 9k which were measured on the grid using a plumb-bob during floor mapping)

9a. Broken loop made of wood set vertically into the ceiling; mortared in with white material that was then sooted (see photo 37)

9b. 6cm deep, vertical

9c. 6cm deep, vertical

9d. 6cm deep, vertical

9e. 3cm deep (1cm diameter), vertical

9f. 7cm deep, vertical

9g. 3cm deep, horizontal

9h. 3 cm deep, vertical

9i. 6cm deep, vertical

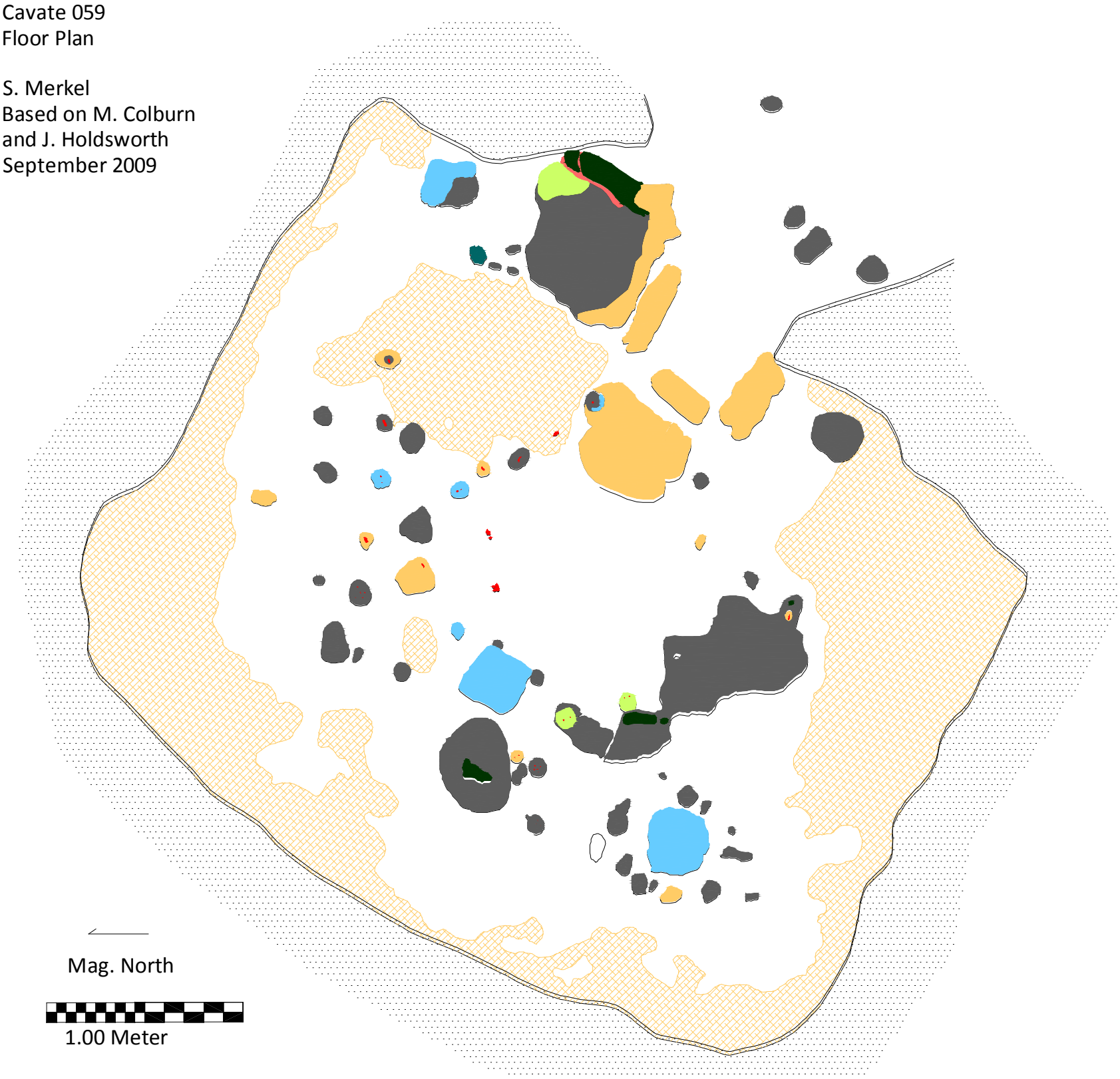
9j. 9cm deep, vertical

9k. 9cm deep, vertical

# Floor Features

LA 50976
Cavate 059
Floor Plan

S. Merkel
Based on M. Colburn
and J. Holdsworth
September 2009



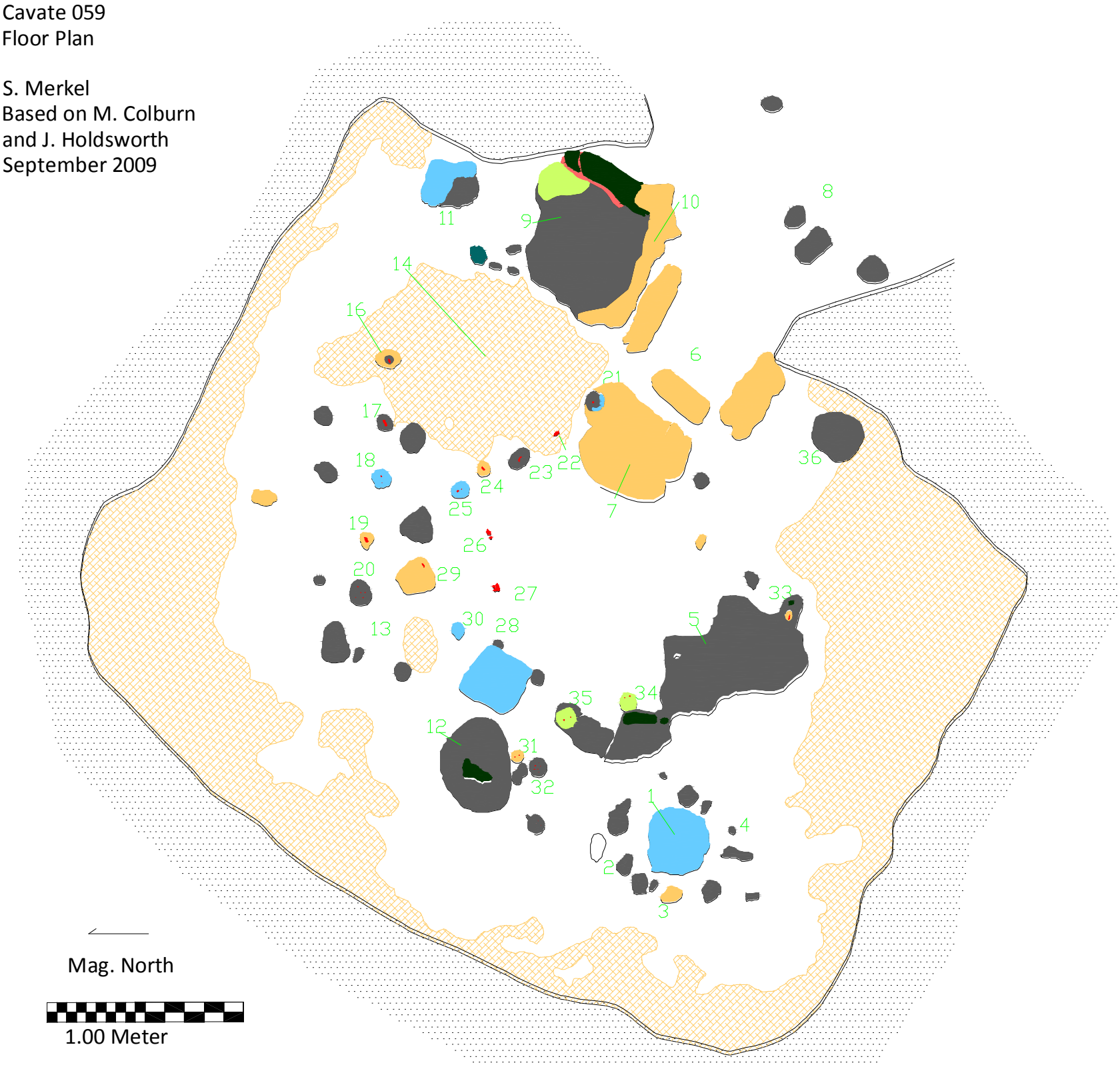

Plaster
Plaster/Mortar Filled Depression
Unexcavated Depression
Stone
Inserted Tuff Plug
Reddish Mortar
Ashy Plaster/Mortar
Organic Material W/Sand

Loom Anchor Loop/Fragment (Floor)

# Photograph Numbers

LA 50976
Cavate 059
Floor Plan

S. Merkel
Based on M. Colburn
and J. Holdsworth
September 2009




Plaster

Plaster/Mortar Filled Depression

Unexcavated Depression

Stone

Inserted Tuff Plug

Reddish Mortar

Ashy Plaster/Mortar

Organic Material W/Sand

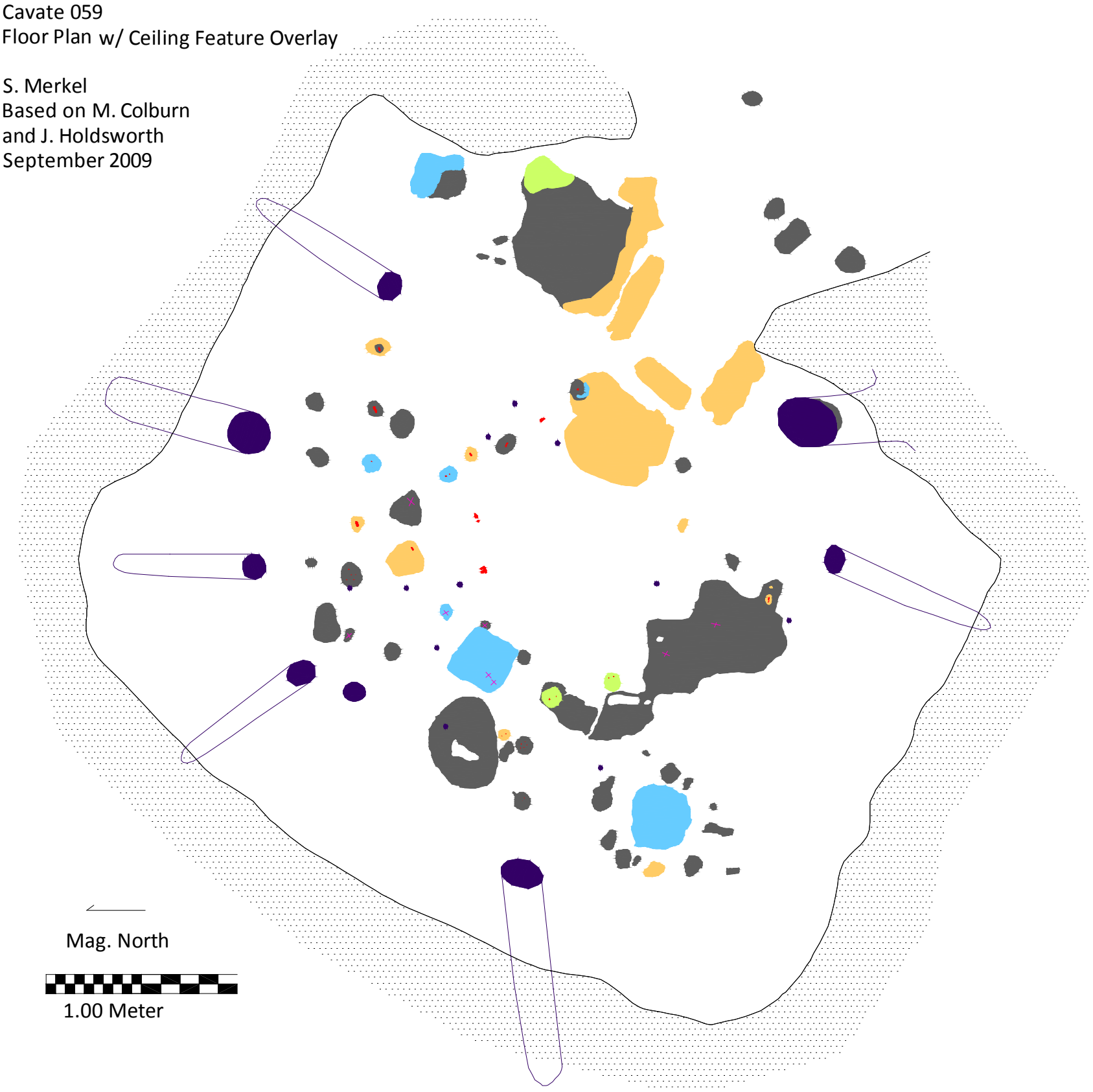
Loom Anchor Loop/Fragment (Floor)

8 Photo Number (7-13-09)

# Floor Features Overlayed with Ceiling Features

LA 50976
Cavate 059
Floor Plan w/ Ceiling Feature Overlay

S. Merkel
Based on M. Colburn
and J. Holdsworth
September 2009

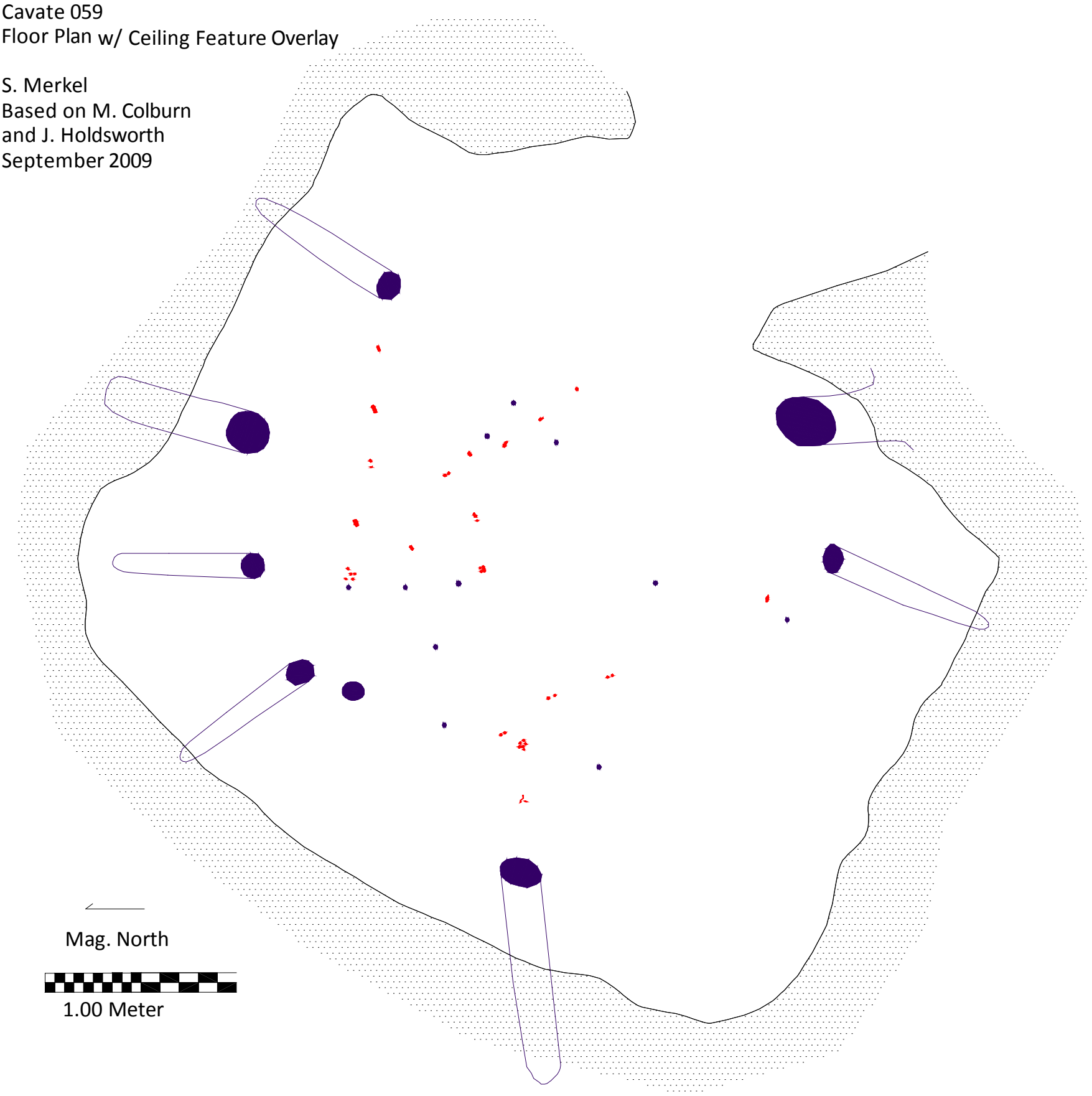



Plaster/Mortar Filled Depression
Unexcavated Depression
Inserted Tuff Plug
Ashy Plaster/Mortar
Loom Anchor Loop/Fragment (Floor)
Upper Loom Support Sockets/Holes (Ceiling)
Possible Anchor Position

# Loom Anchors and Support Sockets

LA 50976
Cavate 059
Floor Plan w/ Ceiling Feature Overlay

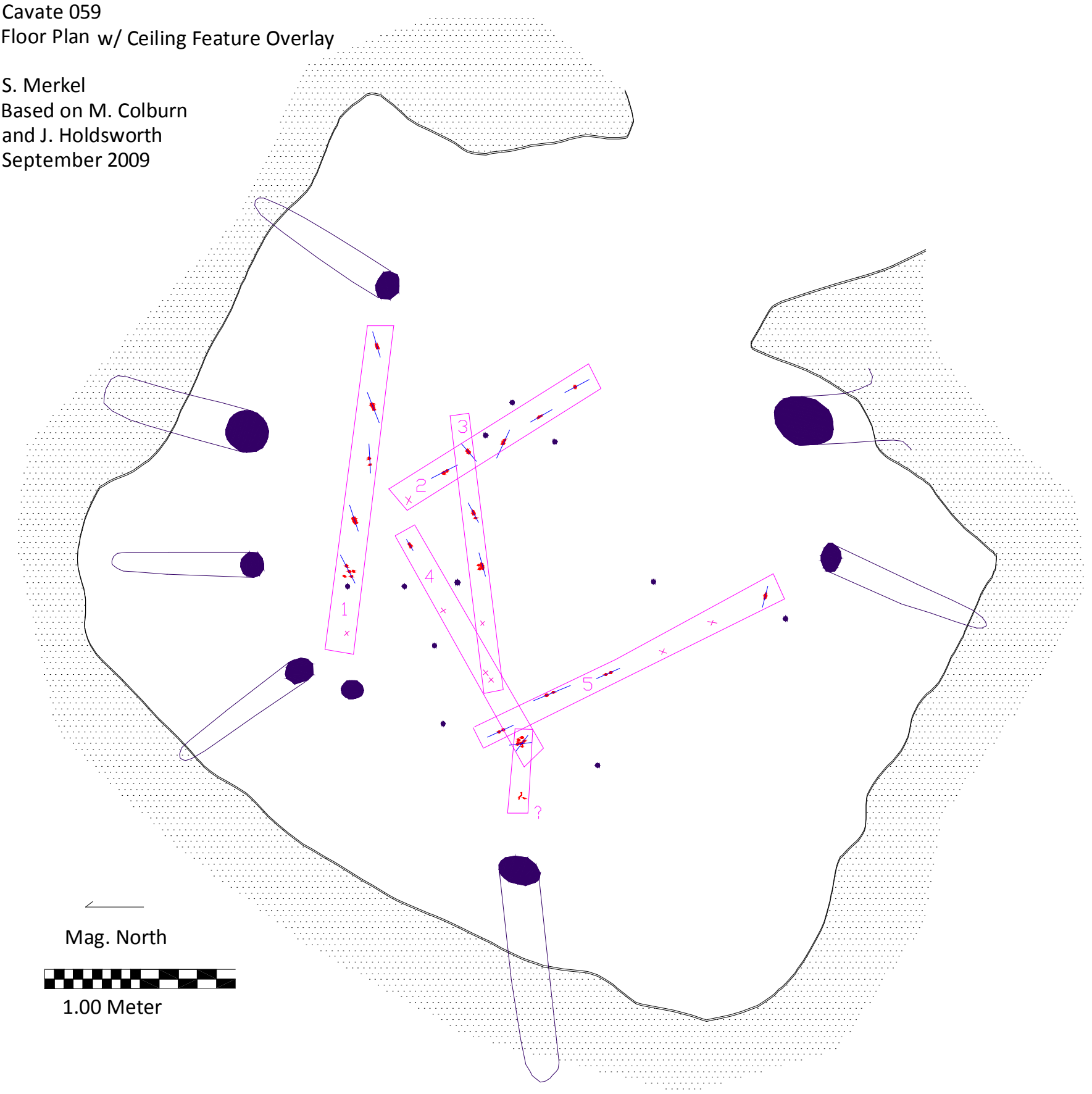
S. Merkel
Based on M. Colburn
and J. Holdsworth
September 2009



# Loom Configurations and Anchor Alignments

LA 50976
Cavate 059
Floor Plan w/ Ceiling Feature Overlay

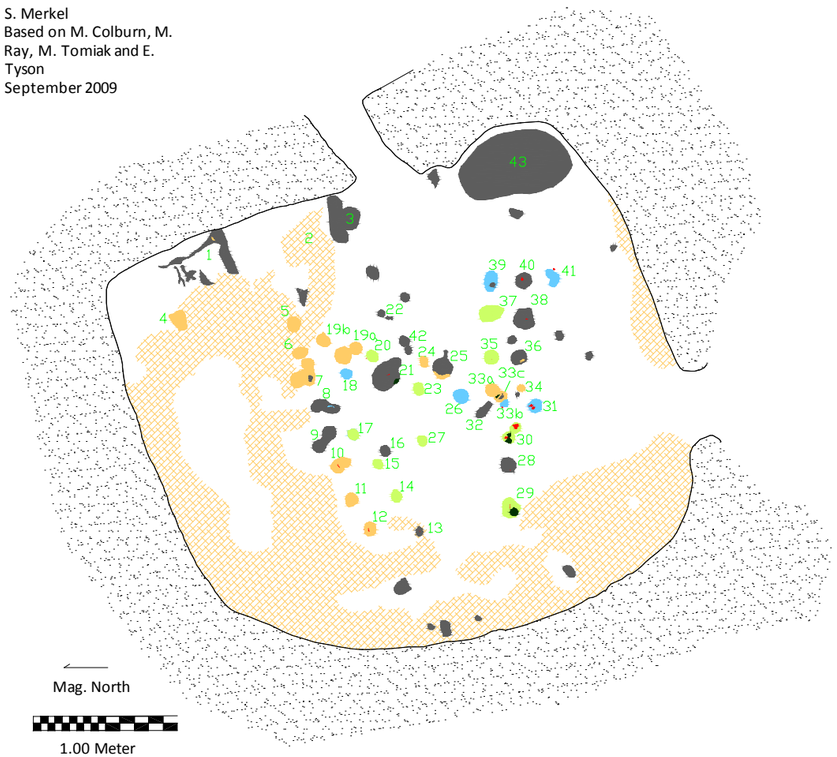
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September 2009



# Floor Feature Identification

LA 50976
Cavate 064
Floor Plan

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September 2009




1. In this area there are several grooves and cracks in the tuff bedrock of unknown function.

2. Area of darker floor plaster that may be discolored from fire or a large plaster plug.

3. Deep amorphous depression just north of the entrance containing loose dirt fill

4. Rectangular-shaped depression 1cm deep filled with a mortar material

5. Shallow depression in the floor plaster 1cm deep; similar in size to a typical loom anchor (loom anchor may have been in this location and was intentionally covered over)

6. Shallow depression in the floor plaster 1cm deep; similar in size to a typical loom anchor (loom anchor may have been in this location and was intentionally covered over)

7. Complex feature composed of three overlapping plaster plugs, which are loom anchor size, one of which has a sediment-filled depression that may have once held an anchor loop

8. Four loom anchor stubs all about 1cm thick protruding out of a sediment-filled depression in the shape of two intersecting circles

9. Loom anchor stub 1cm thick protruding out of a sediment filled depression in the shape of three intersecting circles

10. Plaster filled depression in the shape of two intersecting circles with one containing a mostly intact anchor made of a split twig that is about 1cm thick and four wood stubs, 0.5cm thick, protruding from the same depression indicating another one or two anchors.

11. Plaster plug that is probably covering a loom anchor

12. Two loom anchors are in this location, one broken and one complete. The complete anchor is made of a split twig that is 1cm thick and is mostly covered over with plaster. The broken anchor loop is very thin, 0.3cm.

13. Complete loom anchor, made of a split twig, that is set into a depression filled with loose sediment

14. One wood stub 1cm thick protruding out of a depression that has an ashy earthen mortar fill

15. Two wood stubs (remains of a loom anchor) set in an ashy mortar

16. Two wooden stubs 1cm thick protrude out of a depression filled with loose sediment

17. Four wooden stubs protruding out of a depression filled with an ashy mortar; the broken anchor loops are 3cm wide and made of branches 0.7cm thick

18. Tuff plug, tightly inserted into the ground, with five stubs (remains of anchor loops) protruding out of it

19a. Plaster-filled depression in the shape of two intersecting circles; one of these circles has broken loom anchor fragments

19b. Plaster-filled depression with two wooden stubs between 0.5 and 1cm thick that are 3cm apart

20. Circular depression filled with a coarse ashy-gray mortar; five stubs protrude out of the plaster and have been worn smooth; one of the stubs is about 1cm in diameter and the others are smaller; one stub appears to be burnt

21. Mostly intact loom anchor loop (made from a split twig) in this large sediment-filled depression; loop is 0.5cm thick and 2cm wide

22. Set of sediment filled depressions

23. Ashy mortar-filled depression with two large stubs, each about 1cm thick and 3cm apart

24. Circular depression filled with mortar; a dark area within the depression appears organic

25. Depression with sediment and mortar fill (There is charcoal in the fill and there appears to be some heat alteration to the mortar)

26. Broken loom anchor in a tuff plug which is slightly raised above the floor level; the stubs are about 1cm thick and 2.5cm apart

27. Ashy mortar-filled depression which may have burnt loom anchor fragments in it

28. Circular depression with fragments of two loom anchor loops (two stubs are 0.5cm thick and 1.5cm apart and one that is 1cm thick); anchor depression overlaps an unfinished shallow depression of the same size

29. Intact loom anchor loop, 1cm thick and 5cm wide, made of a split branch set in an ashy mortar

30. Set of two adjacent ashy mortar-filled depressions each with a loom anchor; intact anchor loop is made from a split branch that is 0.75cm thick and 3cm wide; broken loop has two stubs that are 0.5cm thick and 2cm apart

31. Tuff plug with a broken loom anchor in it; stubs are 0.5cm thick and 3cm apart (No Photo)

32. Somewhat rectangular depression filled with sediment

33a. Anchor loop fragment set into an earthen mortar

33b. Tuff plug with one piece of wood protruding out of the crack between the tuff insert and the bedrock

33c. Broken anchor loop set in a mortar-filled depression; stubs are about 1cm thick

34. Area with coarse plaster and a small depression

35. Three anchor fragments set in an ashy mortar in a circular depression

36. Circular depression with some remains of mortar

37. Large depression with an ashy mortar fill that appears to have anchor loop fragments

38. Sediment filled depression with the broken remains of an anchor loop; one anchor loop fragment is bent

39. Large piece of tuff that is inserted into a hole in the floor; tuff plug rises above the floor surface and has four holes that may have held anchor loops

40. Circular sediment filled depression

41. Large fractured tuff plug with one fragment of wood protruding out of the crack between the tuff insert and the bedrock (Wood may have been part of a anchor loop, but it is quite thin being only 0.3cm thick)

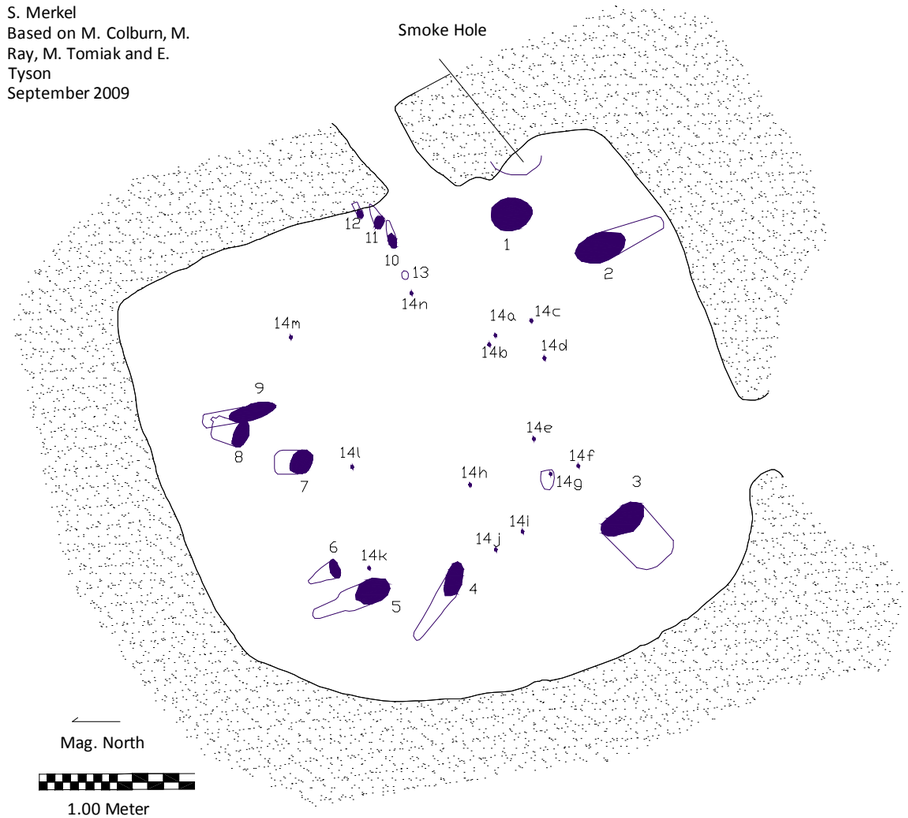
42. Two small depressions filled with sediment

43. Large depression situated under a smoke hole; the fill contains specks of charcoal indicating that it may have been used as a fireplace

# Ceiling Feature Identification

LA 50976
Cavate 064
Floor Plan w/ Ceiling Features Overlayed

S. Merkel
Based on M. Colburn, M.
Ray, M. Tomiak and E.
Tyson
September 2009




Large Holes and Loom Support Sockets

1. This is a deeply ribbed, conical, nearly vertical hole in the ceiling. The gouges made by the digging tool are up to 3 cm deep. The hole is sooted on the interior. The dimentions are 26cm deep, 25cm wide, and 18cm tall.

2. Probable loom support socket: The opening is oval-shaped and the hole narrows toward the back. It is sooted on the top, worn on the bottom and has shallow grooves. It is slightly angled at 5-10 degrees above the horizon. The dimentions are 36cm deep, 12cm wide, and 11 cm tall.

3. Probable loom support socket: The hole is sooted the extent of its length the top, the bottom is worn and abraded, and shallow grooves from the digging tool can be seen, and the hole is rounded at the back. It is angled about 5-10 degrees above the horizon. The dimentions are 36cm deep, 13cm wide, and 14cm tall.

4. Deep loom support socket: It is worn on the bottom, sooted on the top and lacks any sign of grooves. It is angled about 10 degrees above the horizon. The hole is 41cm deep, 10cm wide, and 8cm tall.

5. Loom support socket: There are deep grooves on the ceiling above the hole. The hole diameter constricts after 17cm, about at the midpoint of the depth of the hole. It is sooted on the top and worn on the bottom, and has a steep angle of about 15-30 degrees above the horizon. It is 36cm deep, 11 wide, and 12 tall.

6. Conical hole: This hole has deep grooves along the length. It is mostly sooted and may not be finished. It has an angle of about 5-10 degrees above the horizon. The dimentions are 17 deep, 7cm wide, and 7cm tall.

7. This hole is oval in section, does not narrow, and is rounded at the back. It is completely sooted except some pecking marks at the back of the hole. It is nearly horizontal. It is 13cm deep, 8cm wide, and 5cm tall.

8. This is a hole that is mostly sooted, has deep grooves from a digging tool, and has an irregular finish in the back. It is nearly horizontal. Its dimentions are 16cm deep, 8cm wide, and 8cm tall.

9. Loom support socket: The hole is mostly sooted, but there is some wear at the base of the openning. It maintains a circular section and has a concave end. It is slightly angled at 5-10 degrees above the horizon. It is 24cm deep, 9cm wide, and 10cm tall.

10. This is a tappered hole that is mostly sooted. Some of the soot is worn of at the base of the openning. It is angled at 5-10 degrees above horizon. The dimentions are 12cm deep, 4cm wide, and 7cm tall.

11. This is a tappered hole that is mostly sooted. Some of the soot is worn of at the base of the openning. It is angled about 5-10 degrees above horizon. It is 11cm deep, 6cm wide, and 5cm tall.

12. This is a cylindrical hole that is mostly sooted except for some wear at the base of the openning. It is angled about 5-10 degrees below the horizon. It is 7cm deep, 5cm wide, and 5cm tall.

13. This is a shallow depression in the ceiling. It is sooted and is about 2cm deep.

14. Small Drilled Holes - These cylindrical holes are fairly standarized to be 1.5 diameter, but their depth varies from 2 to 7cm. (The locations for most of these holes were estimated after the floor had been covered, and may have errors of up to 20cm, with exception of g, h, and l which were all measured using a plumb-bob on the grid during floor mapping)

14a. 4cm deep, angled

14b. 4cm deep, vertical

14c. 7cm deep, vertical

14d. 6cm deep, vertical

14e. 2cm deep, vertical

14f. 3cm deep, vertical

14g. 6cm deep, vertical

14h. 2.5cm deep, vertical

14i. 3cm deep, angled

14j. 3.5cm deep, vertical

14k. 4cm deep, vertical

14l. 2.5cm deep, vertical

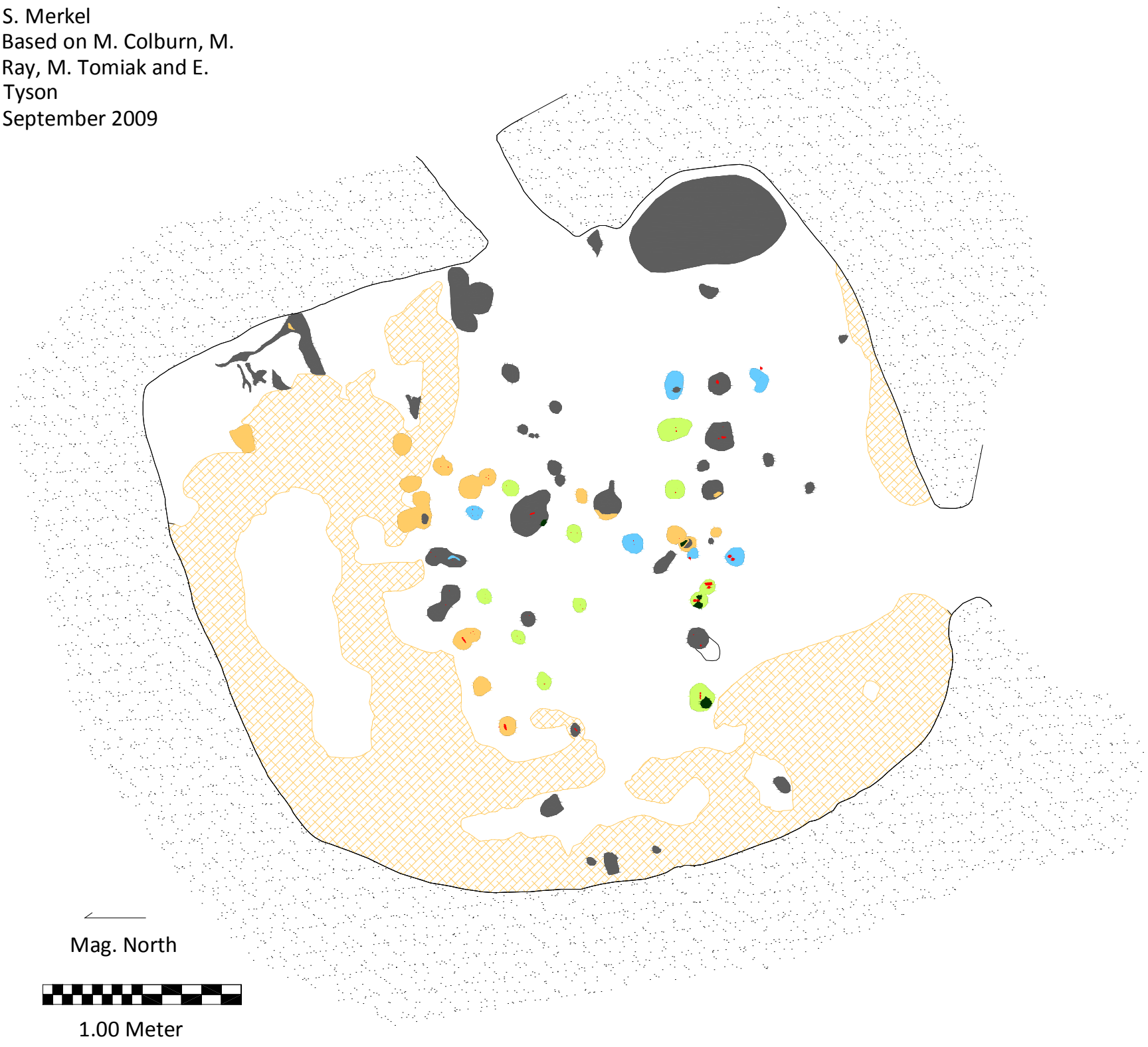
14m. 7cm deep, vertical

14n. 2cm deep, vertical

# Floor Features

LA 50976
Cavate 064
Floor Plan

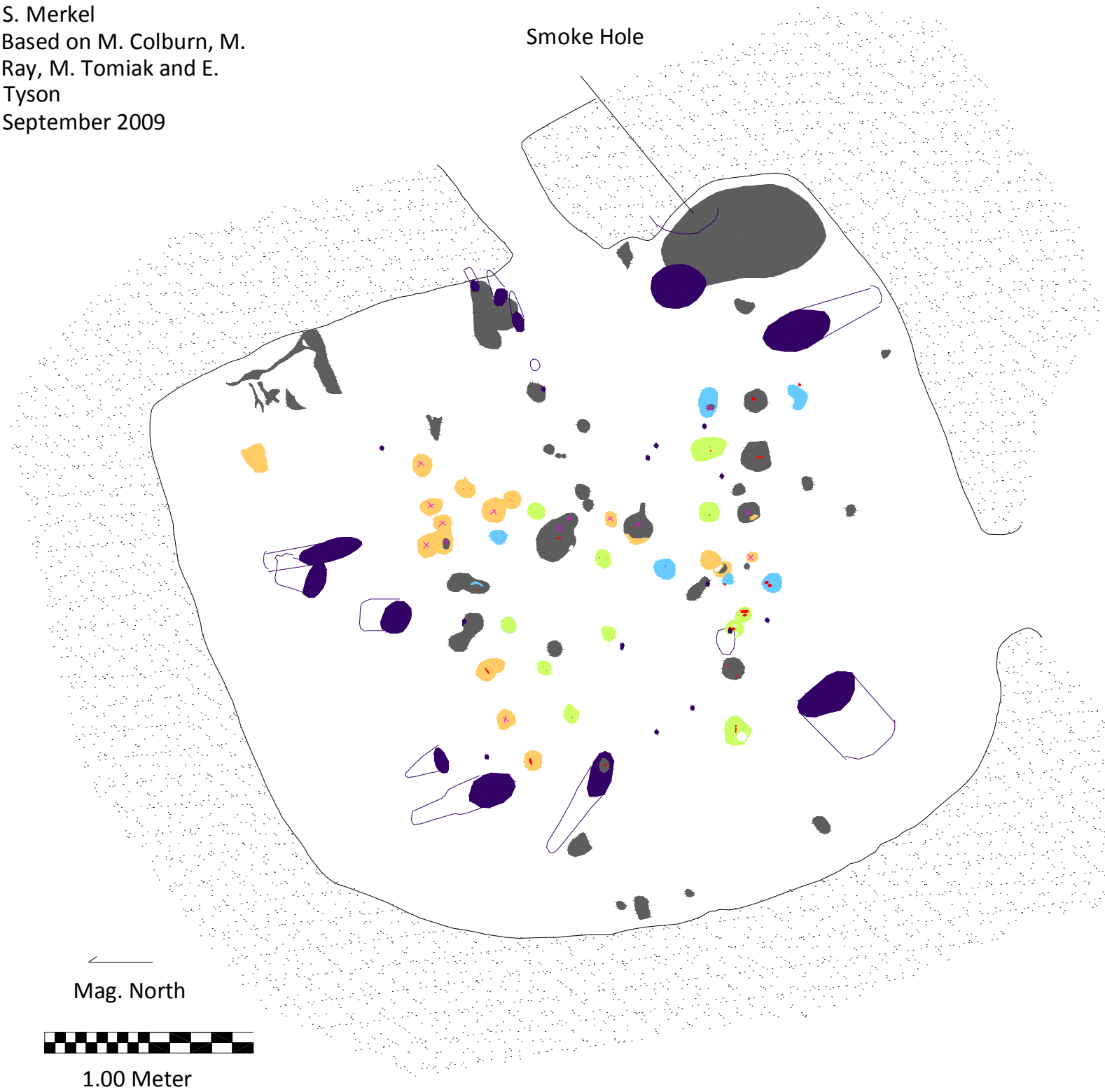
S. Merkel
Based on M. Colburn, M. Ray, M. Tomiak and E. Tyson
September 2009



# Floor Features Overlayed with Ceiling Features

LA 50976
Cavate 064
Floor Plan w/ Ceiling Features Overlayed

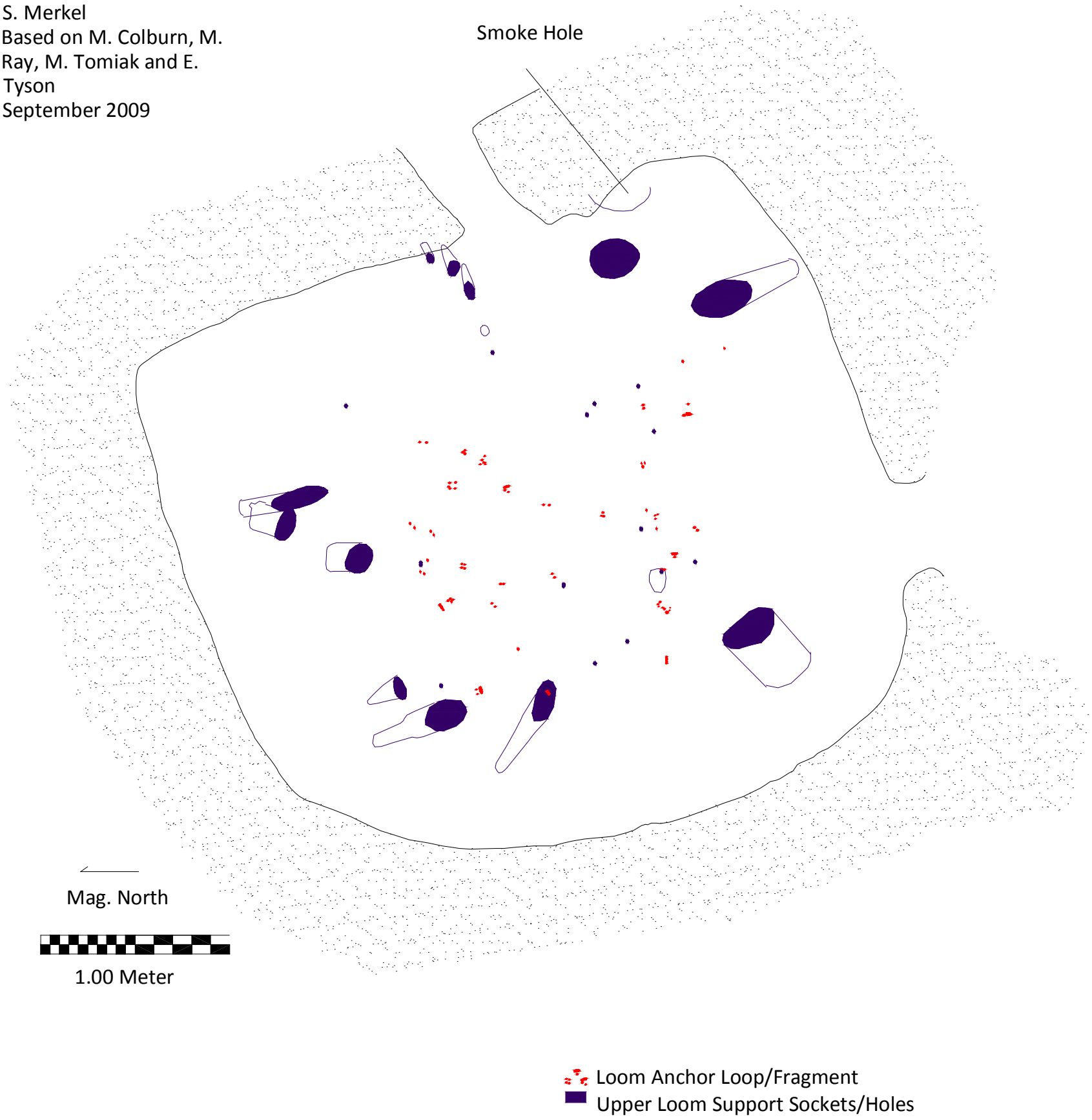
S. Merkel
Based on M. Colburn, M. Ray, M. Tomiak and E. Tyson
September 2009



# Loom Anchors and Support Sockets (Floor and Ceiling)

LA 50976
Cavate 064
Floor Plan w/ Ceiling Features Overlayed

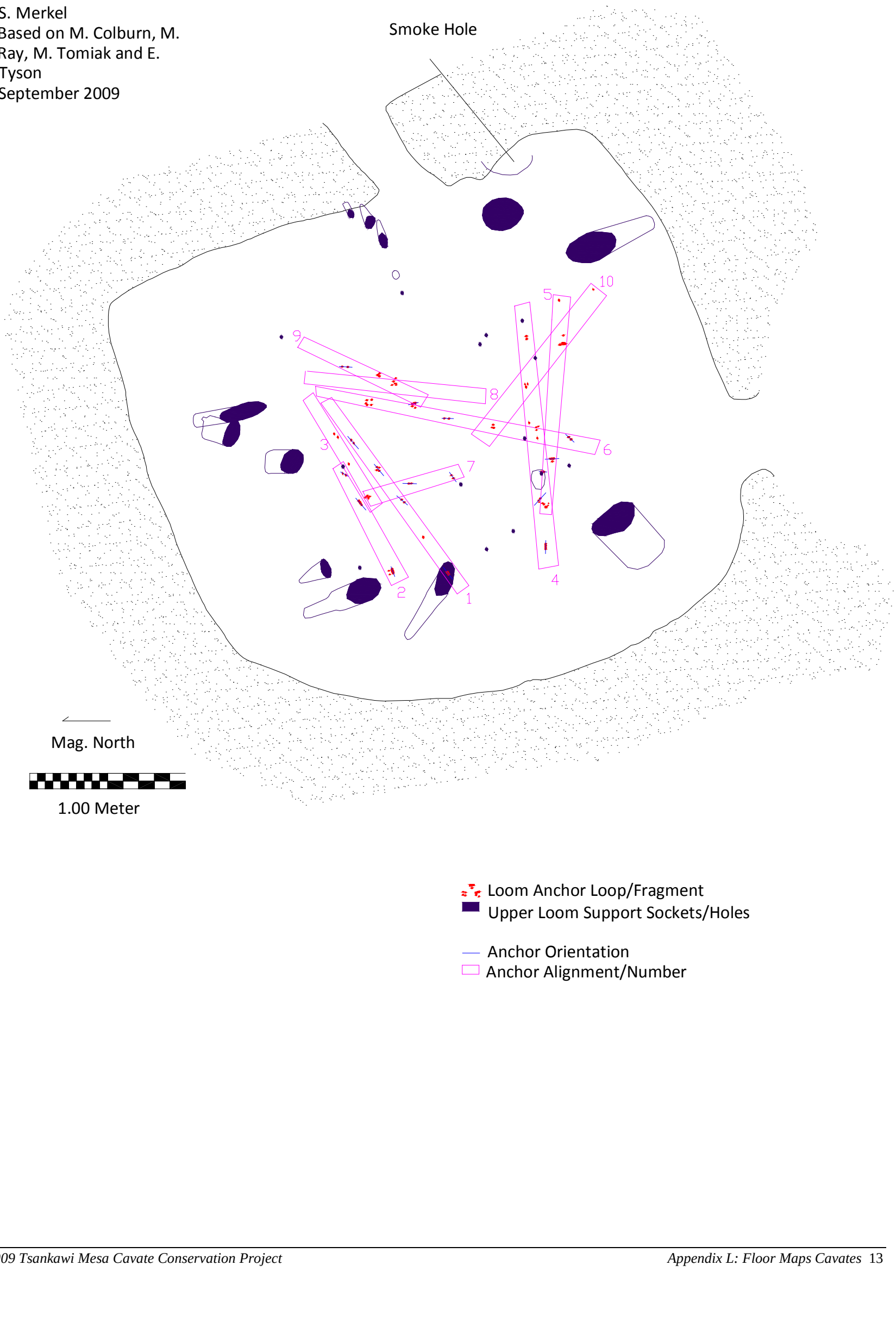
S. Merkel
Based on M. Colburn, M. Ray, M. Tomiak and E. Tyson
September 2009



# Loom Configurations and Anchor Alignments (Floor and Ceiling)

LA 50976
Cavate 064
Floor Plan w/ Ceiling Features Overlayed

S. Merkel
Based on M. Colburn, M. Ray, M. Tomiak and E. Tyson
September 2009



# Appendix M:

# Analysis of Floor and Ceiling Features

## ANALYSIS OF FLOOR AND CEILING FEATURES

*Descriptions of Floor and Ceiling Feature Terminology*

- Plaster – This describes areas that had intact earthen plaster covering the tuff substrate. Areas may have evidence of multiple layers (seven layers were not uncommon) or only a single layer. Some surfaces, particularly around the bases of walls which see little foot traffic, are highly polished, whereas areas in the center of the room tend to be more coarse and abraded. Floor plasters tend to be tan in color, but may have superficial dark discolorations on the surface or between plaster layers. Floor plasters often contain inclusions of pumice and sanidine crystals. Much of the floor plaster exhibits map cracking and in some cases deep cracks and worn, rounded, edges. Detailed documentation of the condition of the floor plaster was beyond the scope of this project.



**Figure 1: Plaster-filled depression. The size, shape and location indicate that it was probably a loom anchor. Photo point 11, RM 64, LA 50976**

- Plaster-filled depression – This term was applied broadly to describe a sub-floor depression that was subsequently plastered or mortared over with an earthen material. This usually included pits or holes in the floor that were filled with mortar so that only a planview of the depression could be seen, but the depth remains unknown. Some of these depressions may have once held loom anchors, as suggested by the similarities in dimensions to anchors with wooden remains.

- Unexcavated depression – This term describes depressions of unknown depth that are filled with windblown sediment, and were not cleared of debris during the floor-clearing process. These areas were not cleared primarily to prevent the disruption of potentially intact archaeological deposits below the fill. In some areas charcoal flecks could be seen in the fill and in other places, the fill was packed hard and only the loose sediment was

brushed off. Similarities to known loom anchors and their proximity to loom anchor alignments suggest some of these depressions may have once held loom anchors.

- Stone – Stones of various sizes were encountered during floor clearing. Stones partially buried in compact fill or set into mortar or plaster were left in situ and mapped.

- Inserted tuff plug – This term is used to describe a piece of tuff that was shaped and inserted into the floor. In some cases a tuff plug was set into a bed of mortar while others appear to fit tightly into place. Most tuff plugs protrude a little above the floor surface. Some are made of a single piece or several pieces of tuff carefully fitted to fill a hole, while other tuff plugs were cracked and some may have been made of multiple pieces pounded and compacted into place. Some loom anchors were secured with tuff plugs. These were either constructed as a solid piece of tuff with drilled holes into which the ends of the wooden anchor loop were inserted or a wooden anchor loop wedged between two or more tuff stones fitted together set into the floor.



**Figure 2: Tuff plug with wooden anchor fragments. Photo point 18, RM 64, LA 50976**

- Reddish mortar – This occurs rarely, but it is used to describe areas where an earthen material (plaster or mortar) has been subjected to heat, causing it to turn orange or red. The presence of this discoloration likely indicates the location of a hearth.

- Ashy plaster / mortar – This is a little understood material that is frequently found in cavates. It appears that this is an earthen material mixed with wood ash as evidenced by flecks of charcoal. The color can vary from whitish gray to yellowish tan, but always appears to be lighter in hue than more common earthen plasters. It is friable and has a powdery or chalky consistency. There may be some technical advantages for using ashy

mortar by utilizing the lime present in the ash, or the various salts, to produce a more durable mortar. Ashy mortar was most often used for loom anchors.

- Organic material – This refers to a deposit of feces of unknown species or antiquity, but it may also be a cultural deposition of unknown material.

- Loom anchor loop or anchor loop fragment – A loom anchor loop is a wooden loop bent in a U-shape that is partially sunken below the floor level and secured with an earthen or ashy mortar packing material or with a tuff plug. In some cases the anchor loop is intact, but usually it is broken and can only be identified by vertical 0.5 to 1.0cm diameter stumps raising out of a fill or packing material. Anchor loops appear to be made with one to three willow branches and can be twisted, not twisted, or split.

### *Cotton Cultivation and Weaving in the Southwest*

Very little remains of prehistoric looms in the Southwest. Much of what is known about prehistoric looms has been inferred from several of indirect sources. The presence of woven material in the archaeological record indicates that looms were used somewhere, but fabric can travel great distances and there is little way of knowing where it was produced. Woven fabrics have been found in New Mexico dating from around 700 AD and by 1100 AD increased in frequency, spanning much of the Southwest. [1] Evidence of the cultivation of cotton reflects its demand and importance in the community. In Northern New Mexico, stalks of cotton plants and cotton seeds have been found in the Chaco and Aztec areas from the Pueblo III period[2]. Analysis of cotton pollen from excavations in the White Rock area suggests that cotton was grown nearby during the Late Coalition Period and later. [3] Early Spanish accounts mentioned the existence of cotton fields near many of the Northern Rio Grande pueblos, such as Santo Domingo, Santa Clara, Jemez Pueblo, Tiguex Pueblo near Bernalillo, and the Chama region, and in addition the

[1] K. P. Kent, *The Cultivation and Weaving of Cotton in the Prehistoric Southwestern United States*, New Series – Vol. 47, Part 3 (Philadelphia: The American Philosophical Society, Independence Square, 1957), 467.

[2] Ibid, 467-468.

[3] S. J. Smith, "Chapter 63, Pollen's Eye View of Archaeology on the Pajarito Plateau," *The Land Conveyance and Transfer Project, Vol. 3, Analysis* (Los Alamos: LANL, 2008), 523 – 596.

widespread use of cotton clothing was also noted.[4] One such garment was found near a jar of cleaned cotton bolls in White Rock Canyon, a few miles from Bandelier National Monument. [5]

There is evidence of cotton cultivation and loom technology from the Early Classic Period, such as the loom anchors present in Room 10 at Burnt Mesa Pueblo,[6] and by the 1400s loom features are present in a number of cavates in Frijoles Canyon and the Tsankawi Unit. Despite the poor preservation of wall and floor features in a large number of cavates, the percentage of the 175 cavates surveyed by Toll in Frijoles Canyon and Tsankawi with loom features is 6%, indicating that weaving was a major activity on the Pajarito Plateau.[7]

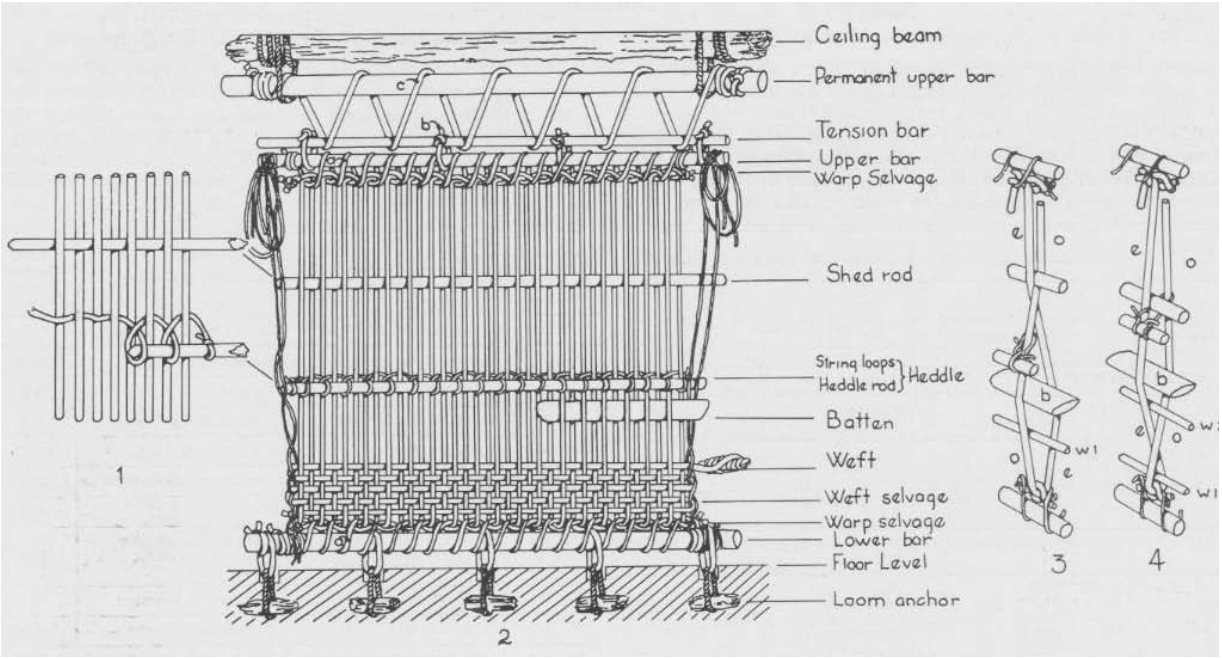



**Figure 3: Typical Puebloan vertical loom showing the row of loom anchors (Kent 1957: 282). In a cavate, the permanent upper loom bar would be attached to two perpendicular upper loom support beams extending from the cavate walls rather than a ceiling beam.**

[4]Ibid, 559.

[5] "They Found Awanyu's Gifts: Local Boys' Discovery of Centuries Old Pottery," *The Atom*, No. 11 (Nov. 1964): 19 -21.

[6] Kohler, T. A. and M. J. Root "Chapter Five: The Late Coalition and Earliest Classic on the Pajarito Plateau (A.D. 1250-1375)." *Archaeology of Bandelier National Monument: Village Formation on the Pajarito Plateau, New Mexico*. T. A. Kohler, ed. (Albuquerque, University of New Mexico, 2004), 185.

[7] Toll, 1995: 216-217.

Weaving traditions have been carried down through generations in the modern pueblo and Diné communities. The use of the vertical loom is well documented in the historic period[8], and archaeological evidence for this type of loom can also be found.




**Figure 4: Loom anchor from Spruce Tree House, Mesa Verde National Park, Photo courtesy of Kay Barnett**

Mesa Verde National Park and a number other sites over a wide geographic area have loom anchors of a remarkable similarity to those found on the Pajarito Plateau. An alignment of four loom anchors has been found in RM 24 of Spruce Tree House.[9] The anchors appear to consist of a twisted branch, bent in a U-shape and set into a hole in the floor with earthen mortar. The row of anchor loops carved entirely out of bedrock found in Kiva E in Long House at Mesa Verde National Park exhibits a different anchor technology than that found at Bandelier National Monument.[10]

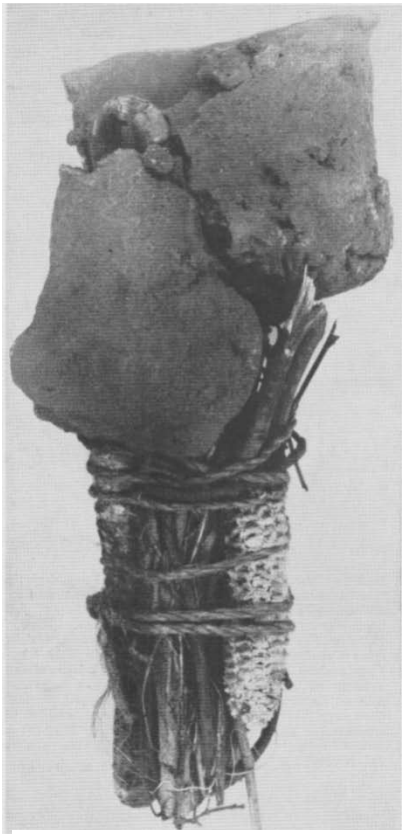


**Figure 5: Loom Anchor from Painted Cave, Arizona (Kent 1957: 484)**

Excavations at Antelope House at Canyon de Chelly, in northeastern Arizona, uncovered a number of loom anchors dating from the late PIII period. Loom alignments there appear in sets of four anchors, and the anchor loops are slightly depressed below the floor surface. At Antelope House loom anchor alignments are found in Kivas A, 18, 23, and 42. Kiva

[8] Kent, 1957: 483-484.

[9] Kay Barnett, personal communication, 2009

[10] G. S. Cattanach, Jr., *Long House, Mesa Verde National Park, Colorado*, Publications in Archaeology 7H Wetherill Mesa Studies (Washington, D.C., National Park Service, 1980), 68.

18 has two loom alignments whereas the others have one.[11] The anchors consist of a bent U-shaped willow or oak branch, lashed together with corn cobs, twigs and plant fibers.[12]

*Loom Anchor Variation*

Sub-floor loom anchors can be found in northeastern Arizona, southwestern Colorado and in Northern New Mexico, particularly in the Rio Grande Valley; in the Hopi country of northern Arizona, a different method of securing the warp was developed using carved sandstone warping blocks.[13] In the Rio Grande Valley, little work has been done to assess the standardization of loom anchor technology within archaeological sites or on a larger regional scale.




**Figure 6: This is a loom anchor cross-section found in Jb019 in Frijoles Canyon. Note the yellow-gray ashy mortar with charcoal**

| Materials Used in Loom Anchors | | |
|---|---|---|
| | RM 59 | RM 64 |
| Earthen Mortar | 6 | 18 |
| Ashy Mortar | 2 | 11 |
| Tuff Plug | 4 | 7 |
| Unknown | 7 | 12 |
| Total | 19 | 48 |

The loom anchor technology observed in the two cavates mapped at Tsankawi has enormous variation, even within the same cavate. Three different materials have been used to secure wooden anchor loops prepared in at least four different styles.

Earthen mortar, indistinguishable from the material used to plaster floors is commonly used to secure the anchor bundles and loops to the floor at Bandelier and Mesa Verde. There are most likely other sites that exhibit a similar technology.

[11] D. P. Morris, *Archaeological Investigations at Antelope House* (Washington, D.C., National Park Service, 1986), 28-9.

[12] Ibid, 251.

[13] Kent, 1957: 486-487.

As previously mentioned, ashy mortar is identified by its yellow to gray color, powdery texture and often contains charcoal inclusions. The use of ash in mortars securing loom anchors has been documented outside of Bandelier. A. V. Kidder describes the use of a compacted ashy material at Pecos Pueblo,[14] and Peckham suggests that clay or ash was used to secure loom anchors in the Rio Grande area.[15] At Bandelier, Toll describes the loom anchor fill material to be some form of clay.[16] It has become apparent that two distinctly different mortar materials have been used in the two cavates studied at Tsankawi: an earthen mortar and an ashy mortar. Both of these mortars can be seen within a single cavate.

A third method of securing loom anchors was discovered during this study that has not been documented before at Bandelier or elsewhere: the use of shaped tuff. We define a tuff plug as a carved tuff block set into the floor. For securing anchor loops, two types of tuff plugs were identified. Tuff anchor plugs documenting at Tsankawi come in a variety of sizes ranging from 5 to 14 centimeters, the average loom anchor socket being around 7cm in diameter, and are generally round in shape. The first tuff plug style is a tuff block with drilled holes to secure the wooden anchor loop. The second type is a wooden anchor loop wedged between two or more stones that are closely fitted and set into a hole in the floor. It may be that several of the tuff plugs were a single piece and which was damaged during insertion, giving the appearance of the second type. Whereas anchors with an earthen or ashy mortar are usually set so that the anchor loop is slightly below or level with the floor surface, tuff plugs usually protrude above the floor level. Tuff plugs are the rarest form of loom anchor in the two cavates documented, but only slightly less common than the use of ashy mortar.

| Intact Anchor Loops | | |
|---|---|---|
| | RM 59 | RM 64 |
| Straight | 4 | - |
| Twisted | 4 | - |
| Split | 1 | 4 |
| Multiple | 1 | 1 |

[14] W. Smith, *Prehistoric Kivas of Antelope Mesa*, Papers of the Peabody Museum of Archaeology and Ethnology, Vol. 39, No. 1(Boston: Peabody Museum of Archaeology, Harvard University, 1972), 123.

[15] S. L. Peckham, "When is a Rio Grande Kiva?," *Collected Papers in Honor of Bertha Pauline Dutton*, Papers of the Archaeological Society of New Mexico, No. 4, ed. A. H. Schroeder (Albuquerque: Archaeological Society of New Mexico, 1979), 68.

[16] Toll, 1995:145.

In addition to the variation in anchoring materials, the anchor loops themselves exhibit a diverse range of size, shape and style. Anchor loops in the two cavates studied appeared to be made of willow branches, but this may vary from site to site. The anchors in Cavate Jb019 in Frijoles Canyon appear to be made from gamble oak. The anchors from RM 59 and RM 64 range from 0.5 to1.5 cm in diameter. There are 15 intact anchor loops in the two cavates; ten in RM 59 and five in RM 64. Anchor loops fall into four varieties: straight, twisted, split, and multiple straight. Straight is defined as a single willow branch bent in a U-shape without any twisting. Twisted refers to a single branch where the bend shows twisting. Split refers to a thicker branch that, when bent, split, creating an arch half the thickness of the branch. The splintered halves were then cut at the base of the arch. Two to three straight branches bent together in a U-shape can also be found in a single anchor. This is called a multiple straight anchor. No effort has been made to assign meaning to the differences in anchor loops or to find a correlation between loop type and anchor material.

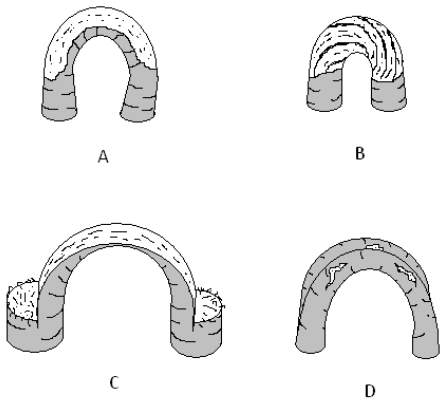



**Figure 8: Anchor loop types found in RM 59 and RM 64. A: Straight, B: Twisted, C: Split, D: Multiple. Not to scale. Stephen Merkel**



**Figure 7: Split type anchor loop. Photo Point 10, RM 64, LA 50976.**

Both cavates studied contained multiple anchor alignments (at most five in RM 59 and ten in RM 64) corresponding to different loom configurations. Many of these alignments conflict and overlap, limiting the number of looms active at any one time to one or two. At Pecos Pueblo,

Kidder found that multiple sets of anchors frequently occur in the same general locations, and he postulates that the anchors occasionally had to be replaced.[17]

When describing loom anchor alignments in Classic Rio Grande "Kivas" Peckham says that often only a single alignment is found, but when there are multiple alignments, they tend to be parallel to the walls on either side of the hearth and ventilator opening.[18] Weaving requires light, and alignments reflect that fact. Interestingly, the looms in RM 59 where oriented to the fire pit, so that a person working in the middle of the room could work by firelight no matter what loom configuration was used. This is not true of the alignments in RM 64 where the looms appear to be oriented to the east facing doorway. This may reflect an absence of exterior architecture in front of the RM 64 that would have blocked sunlight.

| Number of Anchors per Loom Alignment | | |
|---|---|---|
| | RM 59 | RM 64 |
| 2 Anchors | 1 | - |
| 3 Anchors | - | 1 |
| 4 Anchors | 1 | 4 |
| 5 Anchors | 2 | - |
| 6 Anchors | 2 | 4 |
| 7 Anchors | - | 1 |
| Total | 6 | 10 |

Why so many loom configurations were found is not fully understood. The abundance of loom configurations likely reflects duration of occupation, but seasonal changes in lighting or ritual use may also impact the number of loom configurations. With this said, there must be a temporal component because some loom anchors have been plastered over, retiring certain loom configurations. In addition, the diversity in methods used to construct the loom anchors within a single alignment may indicate temporal change because it is unlikely that different technologies would be used to construct a single anchor alignment. Most anchor alignments have multiple types of loom anchors, the only exceptions being alignments using only earthen mortars. Since there are no alignments only containing tuff anchor plugs or ashy mortar, it may be that these technologies appeared later and were used to replace damaged anchors or to adapt a new anchor

[17] A. V. Kidder, *Pecos, New Mexico: Archaeological Notes,* Papers of the Robert S. Peabody Foundation for Archaeology, No. 5 (Andover, Mass., Phillips Academy, 1958), 179, fig. 50.

[18] Peckham, 1979: 68.

alignment to some existing anchors. More work should be done to further analyze the anchor alignments and to perhaps determine a relative chronology.



**Figure 9: Upper Loom Support D170/3A, Frijoles Canyon**

*Ceiling Features*

There are no known intact upper loom support beams at Tsankawi, but there appear to be two instances in cavates in Long House, Frijoles Canyon. Both cavates D170/3A and D190/3A have wooden elements in the ceiling that have been interpreted as upper loom supports, though only one of the two cavates has an anchor alignment that is still visible on the floor (D170/3A). In addition to these two cavates, two more cavates at Long House with ceiling sockets were investigated and no evidence of loom anchors could be found on the plaster floor. This either shows that the sockets, usually interpreted as upper loom support sockets, may not be associated with looms at all, or that floors have been refinished since the use of the loom to adapt the room for other use.

| Depth of Upper Loom Support Sockets | | |
|---|---|---|
| | RM 59 | RM 64 |
| 1 | 46 cm | 36 cm |
| 2 | 57 cm | 36 cm |
| 3 | 39 cm | 41 cm |
| 4 | 37 cm | 36 cm |
| 5 | 38 cm | 17 cm |
| 6 | 41 cm | 13 cm |
| 7 | - | 16 cm |
| 8 | - | 24 cm |
| Average | 43 cm | 27 cm |

There are a number of holes in the ceilings of Cavates 59 and 64, LA 50976, which fit into two groups: sockets, usually around 7 cm in diameter, and small indeterminate holes or peg holes 1 to 2 cm in diameter. Many of the sockets are likely to be for upper loom supports because of their correlation to loom anchor alignments below. They are fairly standardized in diameter and depth, though there are several shallow sockets in RM 64. In all cases the sockets are parallel to the floor surface or slightly angled up into the

ceiling. As a pair, the sockets mark the ends of a loom alignment and are usually perpendicular to or angled towards the end anchors in an anchor alignment.

There are a number of indeterminate or peg holes in the ceilings. These drilled holes are between 2 and 9 cm in depth, with an average depth of around 5 cm, and all are approximately 1.5 cm wide. It is difficult to make sense of such holes because they do not correlate to other features in the cavate or show a discernable pattern. One hole in the ceiling of RM 59 has wood remains and appears to be a small, broken, loop, perhaps made from a split twig, bent so that the two ends are inserted into the hole.

### *Conclusions*

A tremendous amount of information was obtained during the documentation and study of floor and ceiling features in RM 59 and RM 64, LA 50976. As floors are continually being impacted by visitor use, studies such as this one will become more difficult in the future. The damage caused by visitation to cavates at Tsankawi is clear in comparison to the protected cavates of Long House, for example. Floor plasters in high traffic areas have been abraded away to the substrate by visitors, often wearing away fragile wooden anchor loops and other features. Had the floor been better protected, however, the complexity of floor features would still be under layers of fill and floor plaster, and would not yet have been uncovered.

# Appendix N:

# Instructions for Cavate Photography

## INSTRUCTIONS FOR CAVATE PHOTOGRAPHY - 2009

The Vanishing Treasures (VT) group at Bandelier National Monument has undertaken the task of documenting more than 300 cavate structures at Tsankawi Mesa with photographs and measurements. Previous teams have completed written documentation of the cavates, but photodocumentation remains ongoing.

There are several challenges in photographing the cavates at Tsankawi.

1. The cavates are irregularly shaped and often very small;
2. They are often dark, with walls and/or ceilings blackened with soot or pigmented plasters; and
3. They are often difficult to access, and have fragile floors and wall plasters.
4. The environment is dusty and detrimental to camera equipment.

These challenges can be largely met by using equipment and techniques designed for such circumstances, including wide-angle lenses, reflectors, and long exposures.

In addition to standard 35mm black and white photography, high resolution digital photography is also used to provide easily accessible images of the cavates for VT staff. The procedures and methods listed below are designed to facilitate successful photography, and were updated in 2007 by Joshua (Moe) Nadel and Breelyn Van Fleet, based on methodology developed by preceding Vanishing Treasures staff.

Cameras, both conventional film and digital, are increasingly complex, and every manufacturer adds unique features which compounds the complexity. But the basic principles of light and exposure are constant. The instructions for camera use below attempt to provide only basic guidance for the operation of Bandelier's cameras. But these instructions cannot replace the manufacturers' manuals that accompany each camera and flash unit, or hands-on instruction by someone with field experience.

*Signboard*

Wherever possible, a signboard and scale should be included in each overall shot of the exterior, walls, ceilings, and floors. A photo scale should be included in all close-ups and detail shots. A scale is not required in the context shots of the cavate groups, but should be used, if possible, in the individual exterior cavate photographs. The most convenient means of including a scale in each photograph is to

attach the scale bar to the sign board by slipping it under the edge of the signboard frame. For detail images, the scale can be held next to the subject. Be sure that the sign board and scale do not obscure significant elements of the room, such as niches or embellishments. In the event that the sign board has to cover a feature, two photographs should be taken, moving the signboard between the two images. Double check the signboard frequently for the correct information. The sign board should include the following information:

1. LA #
2. Group, Panel (if applicable), 3-digit room number, and name (if applicable)
3. Direction and subject
4. Date

The sign board should appear as follows:

LA12345
Group X
Room 012
Long House
N Wall

10/11/2007

*35 mm Photography*

Conventional silver-chemistry black and white film provides the greatest archival stability, and so the VT program uses 400 ASA black and white film for the archival documentation photography. Label each roll of film with a sequential number with a sharpie (record this on the photolog) and take a picture of the roll number identification sign with the first shot on the roll (or later if you forget). The roll identification sign can be a small dry erase board, a blank printout with a space for the roll number and date, or a blank piece of paper with the information written on it if nothing else is available. This information provides identifying information for archival purposes, and taking a photo of the sign ensures that the information will always stay with the negatives. Keep all exposed, unprocessed film in a central location prior to processing.

Bandelier owns a Pentax ZX-5n and a Nikon FM 10. Both are automatic 35mm single lens reflex cameras, with interchangeable lenses. Most photographs of walls, ceilings, and floors should be taken with the 24 mm lens. Photographs of smaller special features should be made with the 28-200 mm zoom lens. In the 2009 season, the Pentax ZX-5n, Nikon FM 10, and Nikon FG 20 (L. Meyer's personal camera) were used. Based on current protocols, a flash should not be used unless long exposures fail to produce satisfactory results. Longer exposures offer a higher quality photo than using a flash.

An f-stop of f/5.6 or higher should provide adequate depth of field. Each photograph should include an overlap area on both sides and top and bottom, to ensure that all interior surfaces of the cavates are photographed. Whenever there is a doubt about whether a 35 mm photograph was taken correctly - or covered an adequate area, or was in focus or not - take it again. Film is relatively cheap. Bracket exposures if you are unsure of a light meter reading, or of the electronic flash output.

*Digital Photography*

The park owns six digital cameras, two Canon PowerShot A630s, a Nikon Coolpix P5100, a Pentax Optio E60, and a Canon Rebel XT. The Rebel XT is used for interior cavate photography because it provides higher quality images, the viewfinder looks directly through the lens (rather than above it), and it has a wide angle lens. The digital cameras are more complex than the 35 mm film cameras, however once it they are set up, use is relatively straight forward. Digital versions of the camera manuals are saved in the VT folder at U:\VT\Camera Manuals.

Canon Rebel XT: Use for high quality documentation along with 35mm black and white camera. Make sure the camera is set to ISO 400. The tripod should be used at all times. For general available light, use camera on Program (P) setting. This setting is completely automatic and will give the best working combination of shutter speeds and aperture. For tricky lighting situations, such as cavates that read below "30" on the internal light meter and walls with openings to outside daylight, the photos must be approached with the camera set on manual (M). Be sure to set the camera on self timer as to avoid shaking the camera while depressing the shutter button. The self timer is located on the back of the camera with a "timer" symbol next to it. When the camera is set to manual, *the hand-held light meter must be used*. After reading the hand-held light meter, adjust the aperture and shutter speed appropriately. Longer exposures offer a higher quality photo than a strobe! A flash should never be used.

Because the camera is an SLR, the LCD screen cannot be used as a viewfinder. When camera is on auto focus, each image should be checked on the LCD screen to make sure the image is actually in focus. A

useful tool is the zoom setting on the camera. The zoom in and zoom out buttons are located in the upper right corner on the back of the camera with a magnifying glass symbol next to it. the "+" is zoom in and the "-" is zoom out.

For general battery maintenance, daily charging is not necessary. At the end of the field week, charge battery to completion. For general memory card care, download images from card daily. Be sure that card is empty before another day of shooting. The last shot for the day is the digital photo log. The photo log is always photographed in case the hard copy is damaged or lost.

*Hand-Held Light Meter*

Sekonic Twinmate L-208: Read the light meter's manual. Make sure ISO is set to the correct film speed. While holding the light meter in your hand, face the dome toward the camera. Be sure to have the camera already in place to take a photo so that the light meter reading is most accurate.

For a tricky lighting situation, such as a wall that has extreme highlights and shadows, the light meter must be placed in the average shadow. Under most circumstances highlights will be caused by vent holes, passages, or openings. It is important to prioritize shadow detail over highlights.

It is important to have the dome slid over the light-sensitive eye. This will provide an incident (middle-gray) reading vs. a reflective reading.

*Photo Logs*

It is important to keep the photologs accurately to ensure proper identification. Photologs should always be recorded in the field as photos are taken (not at the end of the day). Periodically reconcile the photo log and the cameras to make sure that they are in synch.

**Film Log:**

Make sure the following info is filled in:

1. Names of photographers
2. Date
3. Roll #
4. Type of film (brand and speed)
5. Type/make of camera

When filling out the information in the description use the following format:
**group A – panel a – room 001 ext nw**

When a photo is taken and the exposure/focus or sign board is incorrect, retake the photo and note in log that image was reshot and what frame # it is.

**Digital Log:**

Make sure the following info is filled in:

1. Names of photographers
2. Date

When filling out the information in the description use the following format:
**group A – panel a – room 001 ext nw**

Leave the shot # column blank until you are back in the office and able to fill in the photo image #'s.

**Back in the Office**

When downloading the images, go through the photo log and assign correct image number to the matching description in the photo log. At the beginning of each new entry for a cavate, go over the group/panel/room # with a black fine-tipped sharpie so that data entry is easier. Allow approximately one hour at the end of the day for going over the photo logs, downloading the digital images, and entering information into the database.

**Photolog Abbreviations**

| | |
|---|---|
| N | north |
| S | south |
| E | east |
| W | west |
| NW | northwest |
| NE | northeast |
| SW | southwest |
| SE | southeast |
| fea | feature |
| nich | niche |
| ext | exterior |
| BT | before treatment |
| AY | after treatment |

**REMINDER…**ALWAYS** carry extra charged **batteries**, **film** and **memory cards** for the cameras, as well as additional **roll identification forms** and **photo logs** when going out into the field and **NEVER** place cameras or parts on the ground. It is very dusty in and around the cavates, and the cameras will break if you are not careful!*

# Appendix O:

# Cavate Photography - 2009

**CAVATE PHOTOGRAPHY CHECKLIST - 2009**

## No LA

| LA_Num | UnitNum | Priority | Digital | Print | Comments |
|---|---|---|---|---|---|
| N/A | C012 | Low | [ ] | [ ] | |
| N/A | C013 | Low | [ ] | [ ] | |
| N/A | C014 | Low | [ ] | [ ] | |
| N/A | C181 | Low | [ ] | [ ] | |
| N/A | W1 | N/A | [ ] | [ ] | |

## LA 128408

| LA_Num | UnitNum | Priority | Digital | Print | Comments |
|---|---|---|---|---|---|
| 128408 | 002 | Medium | [ ] | [ ] | |
| 128408 | 003 | Low | [ ] | [ ] | |
| 128408 | 004 | Low | [ ] | [ ] | |
| 128408 | 005 | ? | [ ] | [ ] | |

## LA 128410

| LA_Num | UnitNum | Priority | Digital | Print | Comments |
|---|---|---|---|---|---|
| 128410 | 006 | Low | [ ] | [ ] | |
| 128410 | 007 | Low | [ x ] | [ x ] | 9-1-09 |
| 128410 | 008 | Low | [ x ] | [ x ] | 9-1-09 |
| 128410 | 009 | Medium | [ x ] | [ x ] | 9-1-09 |
| 128410 | 010 | Low | [ x ] | [ x ] | 9-1-09 |
| 128410 | 011 | Medium | [ x ] | [ x ] | 9-1-09 |
| 128410 | 012 | Low | [ x ] | [ x ] | 9-1-09 |
| 128410 | 013 | Low | [ x ] | [ x ] | 9-1-09 |
| 128410 | 015 | Low | [ x ] | [ x ] | 9-1-09 |
| 128410 | 016 | Low | [ x ] | [ x ] | 9-1-09 |
| 128410 | 017 | Low | [ x ] | [ x ] | 9-1-09 |
| 128410 | 018 | Low | [ x ] | [ x ] | 9-1-09 |
| 128410 | 019 | Low | [ x ] | [ x ] | 9-1-09 |
| 128410 | 020 | ? | [ ] | [ ] | |
| 128410 | 021 | Low | [ x ] | [ x ] | 9-1-09 |
| 128410 | 022 | Low | [ x ] | [ x ] | 9-1-09 |

## LA 50976

| LA_Num | UnitNum | Priority | Digital | Print | Comments |
|---|---|---|---|---|---|
| 50976 | 015 | Medium | [ x ] | [ x ] | 7-6-09 |
| 50976 | 016 | Medium | [ x ] | [ x ] | 7-6-09 |
| 50976 | 017 | Low | [ x ] | [ x ] | 7-6-09 |
| 50976 | 018 | Low | [ x ] | [ x ] | 7-6-09 |
| 50976 | 019 | Low | [ x ] | [ x ] | 7-6-09 |
| 50976 | 020 | ? | [ x ] | [ x ] | 7-6-09 |
| 50976 | 021 | Low | [ x ] | [ x ] | 7-6-09 |
| 50976 | 022 | Low | [ x ] | [ x ] | 7-6-09 |
| 50976 | 023 | Medium | [ x ] | [ x ] | 6-29-09 |
| 50976 | 024 | Medium | [ x ] | [ x ] | 6-29-09 |
| 50976 | 025 | Low | [ x ] | [ x ] | 6-29-09 |
| 50976 | 026 | Medium | [ x ] | [ x ] | 7-6-09 |
| 50976 | 027 | Medium | [ x ] | [ x ] | 6-22-09 |
| 50976 | 028 | Low | [ x ] | [ x ] | 7-23-09 |
| 50976 | 029 | Low | [ ] | [ ] | Ladder Needed |
| 50976 | 030 | Medium | [ x ] | [ x ] | 7-22-09 |
| 50976 | 031 | Low | [ x ] | [ x ] | 7-22-09 |
| 50976 | 032 | Low | [ x ] | [ x ] | 7-22-09 |
| 50976 | 033 | Medium | [ x ] | [ x ] | 7-22-09 |
| 50976 | 034 | Low | [ x ] | [ x ] | 7-22-09 |
| 50976 | 035 | Low | [ x ] | [ x ] | 7-22-09 |
| 50976 | 036 | Low | [ x ] | [ x ] | 7-22-09 |
| 50976 | 037 | Low | [ x ] | [ x ] | 7-15-09 |
| 50976 | 038 | Low | [ x ] | [ x ] | 7-15-09 |
| 50976 | 039 | Medium | [ x ] | [ x ] | 7-14-09, 7-22-09 |
| 50976 | 040 | Low | [ x ] | [ x ] | 7-14-09, 7-22-09 |
| 50976 | 041 | Medium | [ x ] | [ x ] | 7-14-09, 7-22-09 |
| 50976 | 042 | Low | [ x ] | [ x ] | 7-14-09, 7-22-09 |
| 50976 | 043 | Low | [ x ] | [ x ] | 7-14-09, 7-22-09 |
| 50976 | 044 | Low | [ x ] | [ x ] | 7-14-09, 7-22-09 |
| 50976 | 045 | Low | [ ] | [ ] | Need ladder |
| 50976 | 050 | Medium | [ x ] | [ x ] | 6-24-09 |
| 50976 | 051 | Low | [ ] | [ ] | |
| 50976 | 052 | Low | [ ] | [ ] | |
| 50976 | 053 | High | [ x ] | [ x ] | 6-29-09 |
| 50976 | 054 | Low | [ x ] | [ x ] | 7-20-09 |
| 50976 | 055 | Low | [ x ] | [ x ] | 7-20-09 |
| 50976 | 056 | Low | [ x ] | [ x ] | 7-20-09 |
| 50976 | 057 | Low | [ x ] | [ x ] | 7-20-09 |

| LA_Num | UnitNum | Priority | Digital | Print | Comments |
|---|---|---|---|---|---|
| 50976 | 058 | Low | [ x ] | [ x ] | 7-20-09 |
| 50976 | 059 | High | [ x ] | [ x ] | 6-15-09, 6-16-09 |
| 50976 | 060 | Low | [ x ] | [ x ] | 6-29-09 |
| 50976 | 061 | Low | [ x ] | [ x ] | 6-29-09 |
| 50976 | 062 | Low | [ ] | [ ] | |
| 50976 | 063 | Low | [ x ] | [ x ] | 7-23-09 |
| 50976 | 065 | Medium | [ x ] | [ x ] | 7-23-09 |
| 50976 | 064 | High | [ x ] | [ x ] | 5-27, 5-28, 6-1-09 |
| 50976 | 065 | Medium | [ x ] | [ x ] | 7-23-09 |
| 50976 | 066 | High | [ x ] | [ x ] | 6-17-09, |
| 50976 | 067 | N/A | [ x ] | [ x ] | 7-23-09 |
| 50976 | 501 | ? | [ ] | [ ] | |
| 50976 | 502 | Low | [ x ] | [ x ] | 7-6-09 |
| 50976 | 503 | Low | [ x ] | [ x ] | 7-6-09 |
| 50976 | 504 | N/A | [ ] | [ ] | |
| 50976 | 505 | Low | [ x ] | [ x ] | 7-6-09 |
| 50976 | 506 | N/A | [ x ] | [ x ] | 7-6-09 |
| 50976 | 507 | Low | [ x ] | [ x ] | 7-6-09 |
| 50976 | 508 | Low | [ x ] | [ x ] | 7-6-09 |
| 50976 | 509 | Low | [ x ] | [ x ] | 6-29-09 |
| 50976 | 510 | Low | [ ] | [ ] | |
| 50976 | 511 | N/A | [ x ] | [ x ] | 6-29-09 |
| 50976 | 512 | ? | [ ] | [ ] | |
| 50976 | 513 | N/A | [ x ] | [ x ] | 6-29-09 |
| 50976 | 514 | N/A | [ x ] | [ x ] | 7-23-09 |
| 50976 | 515 | Low | [ x ] | [ x ] | 7-23-09 |
| 50976 | 516 | Low | [ x ] | [ x ] | 7-23-09 |
| 50976 | 517 | Low | [ x ] | [ x ] | 7-23-09 |
| 50976 | 518 | ? | [ x ] | [ x ] | 7-23-09 |
| 50976 | 519 | Low | [ x ] | [ x ] | 7-23-09 |
| 50976 | 520 | ? | [ ] | [ ] | |
| 50976 | 521 | Low | [ x ] | [ x ] | 7-23-09 |
| 50976 | 522 | Low | [ x ] | [ x ] | 7-23-09 |
| 50976 | 523 | Low | [ ] | [ ] | |
| 50976 | 524 | Low | [ x ] | [ x ] | 7-23-09 |
| 50976 | 525 | Low | [ x ] | [ x ] | 7-23-09 |
| 50976 | 526 | Low | [ x ] | [ x ] | 7-23-09 |
| 50976 | 527 | Low | [ x ] | [ x ] | 7-23-09 |
| 50976 | 528 | ? | [ ] | [ ] | |
| 50976 | 529 | N/A | [ ] | [ ] | |

| LA_Num | UnitNum | Priority | Digital | Print | Comments |
|---|---|---|---|---|---|
| 50976 | 530 | Low | [ x ] | [ x ] | 7-20-09 see niche in RM 55 |
| 50976 | 531 | Low | [ x ] | [ x ] | 7-20-09 see niche in RM 54 |
| 50976 | 532 | N/A | [ x ] | [ x ] | 7-20-09 |
| 50976 | 533 | Low | [ x ] | [ x ] | 7-20-09 |
| 50976 | 534 | Low | [ ] | [ ] | |
| 50976 | 535 | Low | [ ] | [ ] | |
| 50976 | 536 | Low | [ ] | [ ] | |
| 50976 | 537 | Low | [ ] | [ ] | |
| 50976 | 539 | N/A | [ ] | [ ] | |
| 50976 | 540 | N/A | [ ] | [ ] | |
| 50976 | 541 | N/A | [ ] | [ ] | |
| 50976 | 542 | N/A | [ ] | [ ] | |
| 50976 | 543 | N/A | [ ] | [ ] | |
| 50976 | 544 | Low | [ ] | [ ] | |
| 50976 | 545 | N/A | [ ] | [ ] | |
| 50976 | 546 | Low | [ ] | [ ] | |
| 50976 | 547 | Low | [ ] | [ ] | |
| 50976 | 548 | Low | [ x ] | [ x ] | 7-22-09 |
| 50976 | 549 | Low | [ ] | [ ] | |
| 50976 | 550 | ? | [ ] | [ ] | |
| 50976 | 551 | Low | [ ] | [ ] | |
| 50976 | 552 | ? | [ ] | [ ] | |
| 50976 | 553 | Low | [ ] | [ ] | |
| 50976 | 554 | Low | [ x ] | [ x ] | 7-22-09 |
| 50976 | 555 | ? | [ x ] | [ x ] | 7-22-09 |
| 50976 | 556 | Low | [ ] | [ ] | |
| 50976 | 557 | Low | [ x ] | [ x ] | 7-22-09 |
| 50976 | 558 | Low | [ x ] | [ x ] | 7-14-09, 7-22-09 |
| 50976 | 559 | Low | [ x ] | [ x ] | 7-14-09 |
| 50976 | 560 | Low | [ ] | [ ] | |
| 50976 | 561 | Low | [ x ] | [ x ] | 7-22-09 |
| 50976 | 562 | ? | [ ] | [ ] | |
| 50976 | 563 | N/A | [ x ] | [ x ] | 7-14-09 |
| 50976 | 564 | Low | [ x ] | [ x ] | 7-14-09, 7-22-09 |
| 50976 | 565 | N/A | [ x ] | [ x ] | 7-14-09 |
| 50976 | 566 | Low | [ ] | [ ] | Need ladder |
| 50976 | 567 | Low | [ x ] | [ x ] | 7-22-09 |
| 50976 | 568 | Low | [ ] | [ ] | Need Ladder |
| 50976 | 569 | N/A | [ x ] | [ x ] | 7-23-09 |
| 50976 | 570 | N/A | [ ] | [ ] | |

| LA_Num | UnitNum | Priority | Digital | Print | Comments |
|---|---|---|---|---|---|
| 50976 | 571 | Low | [ ] | [ ] | |
| 50976 | 572 | Low | [ ] | [ ] | |
| 50976 | 573 | ? | [ ] | [ ] | |
| 50976 | 574 | ? | [ ] | [ ] | |
| 50976 | 575 | ? | [ ] | [ ] | |

## LA 65661

| LA_Num | UnitNum | Priority | Digital | Print | Comments |
|---|---|---|---|---|---|
| 65661 | 001 | Low | [ x ] | [ x ] | 9-1-09 |
| 65661 | 002 | Low | [ x ] | [ x ] | 9-1-09 |
| 65661 | 003 | N/A | [ x ] | [ x ] | 9-1-09 |
| 65661 | 004 | Medium | [ x ] | [ x ] | 9-1-09 |
| 65661 | 005 | Low | [ x ] | [ x ] | 9-1-09 |
| 65661 | 006 | Low | [ x ] | [ x ] | 9-1-09 |
| 65661 | 007 | Low | [ x ] | [ x ] | 9-1-09 |

## LA 65662

| | | | | | |
|---|---|---|---|---|---|
| 65662 | 001 | Medium | [ x ] | [ x ] | 7-7-09 |
| 65662 | 002 | Medium | [ x ] | [ x ] | 7-7-09 |
| 65662 | 003 | Low | [ x ] | [ x ] | 7-7-09 |
| 65662 | 004 | Low | [ ] | [ ] | Need Ladder |
| 65662 | 005 | Low | [ x ] | [ x ] | 7-7-09 |
| 65662 | 006 | Low | [ x ] | [ x ] | 7-7-09 |
| 65662 | 007 | Low | [ ] | [ ] | Need Ladder |

## LA 65748

| LA_Num | UnitNum | Priority | Digital | Print | Comments |
|---|---|---|---|---|---|
| 65748 | 001 | Low | [ x ] | [ x ] | 7-7-09 |
| 65748 | 002 | Low | [ ] | [ ] | Need Ladder |
| 65748 | 003 | Low | [ x ] | [ x ] | 7-7-09 |
| 65748 | 004 | Low | [ x ] | [ x ] | 7-7-09 |
| 65748 | 005 | Low | [ ] | [ ] | Need Ladder |
| 65748 | 006 | Low | [ x ] | [ x ] | 7-29-09 |
| 65748 | 007 | Low | [ x ] | [ x ] | 7-29-09 |
| 65748 | 008 | Low | [ x ] | [ x ] | 7-29-09 |
| 65748 | 009 | Low | [ x ] | [ x ] | 7-30-09 |
| 65748 | 010 | Medium | [ x ] | [ x ] | 7-30-09 |
| 65748 | 011 | Low | [ x ] | [ x ] | 7-7-09 |
| 65748 | 012 | Low | [ x ] | [ x ] | 7-7-09 |

## LA 65749

| LA_Num | UnitNum | Priority | Digital | Print | Comments |
|---|---|---|---|---|---|
| 65749 | 001 | Low | [ x ] | [ x ] | 7-30-09 |
| 65749 | 002 | Medium | [ x ] | [ x ] | 7-30-09 |
| 65749 | 003 | Medium | [ x ] | [ x ] | 7-30-09 |
| 65749 | 004 | Medium | [ x ] | [ x ] | 8-3-09 |
| 65749 | 005 | Low | [ x ] | [ x ] | 8-3-09 |
| 65749 | 006 | High | [ x ] | [ x ] | 8-3-09 |
| 65749 | 007 | Low | [ x ] | [ x ] | 8-3-09 |
| 65749 | 008 | Low | [ x ] | [ x ] | 8-3-09 |
| 65749 | 009 | Low | [ x ] | [ x ] | 8-3-09 |
| 65749 | 010 | Low | [ x ] | [ x ] | 8-3-09 |
| 65749 | 011 | Low | [ x ] | [ x ] | 8-3-09 |
| 65749 | 012 | Low | [ x ] | [ x ] | 8-3-09 |
| 65749 | 013 | Low | [ x ] | [ x ] | 8-3-09 |
| 65749 | 014 | Low | [ ] | [ ] | |
| 65749 | 015 | Low | [ ] | [ ] | |
| 65749 | 016 | Low | [ ] | [ ] | |
| 65749 | 017 | Low | [ ] | [ ] | |

## LA 65750

| LA_Num | UnitNum | Priority | Digital | Print | Comments |
|---|---|---|---|---|---|
| 65750 | 001 | Low | [ x ] | [ x ] | 8-18-09 |
| 65750 | 002 | Low | [ x ] | [ x ] | 8-18-09 |
| 65750 | 003 | Low | [ x ] | [ x ] | 8-18-09 |
| 65750 | 004 | Low | [ x ] | [ x ] | 8-18-09 |
| 65750 | 005 | Low | [ x ] | [ x ] | 8-18-09 |
| 65750 | 006 | Low | [ x ] | [ x ] | 8-18-09 |
| 65750 | 007 | Low | [ x ] | [ x ] | 8-18-09 |
| 65750 | 008 | Low | [ x ] | [ x ] | 8-18-09 |
| 65750 | 009 | Low | [ x ] | [ x ] | 8-18-09 |
| 65750 | 010 | Low | [ x ] | [ x ] | 8-18-09 |
| 65750 | 011 | Low | [ x ] | [ x ] | 8-18-09 |
| 65750 | 012 | Low | [ x ] | [ x ] | 8-18-09 |
| 65750 | 013 | Low | [ x ] | [ x ] | 8-18-09 |
| 65750 | 014 | Low | [ x ] | [ x ] | 8-18-09 |

## LA 65751

| LA_Num | UnitNum | Priority | Digital | Print | Comments |
|---|---|---|---|---|---|
| 65751 | 001 | N/A | [ x ] | [ x ] | 8-17-09 |
| 65751 | 002 | N/A | [ x ] | [ x ] | 8-17-09 |
| 65751 | 003 | N/A | [ x ] | [ x ] | 8-17-09 |
| 65751 | 004 | N/A | [ x ] | [ x ] | 8-17-09 |
| 65751 | 005 | Low | [ x ] | [ x ] | 8-17-09 |
| 65751 | 006 | Low | [ x ] | [ x ] | 8-17-09 |
| 65751 | 007 | N/A | [ x ] | [ x ] | 8-17-09 |
| 65751 | 008 | Low | [ ] | [ ] | |
| 65751 | 009 | High | [ x ] | [ x ] | 5-21, 5-28, 6-1-09 |
| 65751 | 010 | Medium | [ x ] | [ x ] | 5-21, 5-28, 6-1-09 |
| 65751 | 011 | Low | [ x ] | [ x ] | 8-17-09 |
| 65751 | 012 | Low | [ x ] | [ x ] | 8-17-09 |
| 65751 | 013 | Low | [ ] | [ ] | Where? |
| 65751 | 014 | Low | [ x ] | [ x ] | 8-17-09 |
| 65751 | 015 | Low | [ x ] | [ x ] | 8-17-09 |
| 65751 | 016 | ? | [ x ] | [ x ] | 8-17-09 |
| 65751 | 017 | ? | [ x ] | [ x ] | 8-17-09 |
| 65751 | 018 | ? | [ ] | [ ] | |

## LA 65753

| LA_Num | UnitNum | Priority | Digital | Print | Comments |
|---|---|---|---|---|---|
| 65753 | 001 | Low | [ x ] | [ x ] | 9-1-09 |
| 65753 | 002 | Low | [ x ] | [ x ] | 9-1-09 |
| 65753 | 003 | N/A | [ x ] | [ x ] | 9-1-09 |
| 65753 | 004 | N/A | [ x ] | [ x ] | 9-1-09 |
| 65753 | 005 | Low | [ x ] | [ x ] | 9-1-09 |
| 65753 | 006 | N/A | [ x ] | [ x ] | 9-1-09 |
| 65753 | 007 | N/A | [ x ] | [ x ] | 9-1-09 |
| 65753 | 008 | N/A | [ x ] | [ x ] | 9-1-09 |
| 65753 | 009 | N/A | [ x ] | [ x ] | 9-1-09 |
| 65753 | 010 | N/A | [ x ] | [ x ] | 9-1-09 |
| 65753 | 011 | Low | [ x ] | [ x ] | 9-1-09 |
| 65753 | 012 | Low | [ x ] | [ x ] | 9-1-09 |
| 65753 | 013 | N/A | [ x ] | [ x ] | 9-1-09 |
| 65753 | 014 | Low | [ x ] | [ x ] | 9-1-09 |
| 65753 | 015 | Low | [ x ] | [ x ] | 8-25-09, 8-26-09 |
| 65753 | 016 | N/A | [ x ] | [ x ] | 8-25-09 |
| 65753 | 017 | Low | [ x ] | [ x ] | 8-25-09 |

| LA_Num | UnitNum | Priority | Digital | Print | Comments |
|---|---|---|---|---|---|
| 65753 | 018 | Low | [ x ] | [ x ] | 8-25-09 |
| 65753 | 019 | Low | [ x ] | [ x ] | 8-25-09 |
| 65753 | 020 | Low | [ x ] | [ x ] | 8-25-09 |
| 65753 | 021 | Low | [ x ] | [ x ] | 9-1-09 |
| 65753 | 022 | Low | [ x ] | [ x ] | 9-1-09 |
| 65753 | 023 | Low | [ x ] | [ x ] | 8-25-09 |
| 65753 | 024 | ? | [ x ] | [ x ] | 8-25-09 |
| 65753 | 025 | Low | [ x ] | [ x ] | 8-25-09 |
| 65753 | 026 | Low | [ x ] | [ x ] | 8-25-09 |
| 65753 | 027 | Low | [ x ] | [ x ] | 8-25-09 |
| 65753 | 028 | Low | [ x ] | [ x ] | 9-1-09 |
| 65753 | 029 | Low | [ x ] | [ x ] | 8-25-09 |
| 65753 | 030 | N/A | [ x ] | [ x ] | 9-1-09 |
| 65753 | 031 | Low | [ x ] | [ x ] | 9-1-09 |
| 65753 | 032 | ? | [ x ] | [ x ] | 9-1-09 |
| 65753 | 033 | ? | [ x ] | [ x ] | 8-25-09 |
| 65753 | 034 | ? | [ x ] | [ x ] | 8-25-09 |

## LA 65755

| LA_Num | UnitNum | Priority | Digital | Print | Comments |
|---|---|---|---|---|---|
| 65755 | 001 | Low | [ x ] | [ x ] | 8-17-09 |
| 65755 | 002 | Low | [ x ] | [ x ] | 8-17-09 |
| 65755 | 003 | Low | [ x ] | [ x ] | 8-17-09 |
| 65755 | 004 | Low | [ x ] | [ x ] | 9-1-09 |
| 65755 | 005 | Low | [ x ] | [ x ] | 8-17-09 |
| 65755 | 006 | Low | [ x ] | [ x ] | 8-17-09 |
| 65755 | 007 | Low | [ x ] | [ x ] | 8-17-09 |
| 65755 | 008 | Low | [ x ] | [ x ] | 9-1-09 |
| 65755 | 009 | Low | [ x ] | [ x ] | 8-19-09 |
| 65755 | 010 | Low | [ x ] | [ x ] | 8-19-09 |
| 65755 | 011 | Low | [ x ] | [ x ] | 8-19-09 |
| 65755 | 012 | Low | [ x ] | [ x ] | 8-19-09 |
| 65755 | 013 | Medium | [ x ] | [ x ] | 6-22-09 |
| 65755 | 014 | Medium | [ x ] | [ x ] | 6-22-09 |
| 65755 | 015 | High | [ x ] | [ x ] | 6-23-09 |
| 65755 | 016 | High | [ x ] | [ x ] | 6-23-09 |
| 65755 | 017 | Low | [ x ] | [ x ] | 9-1-09 |
| 65755 | 018 | High | [ x ] | [ x ] | 8-19-09 |
| 65755 | 019 | Medium | [ x ] | [ x ] | 8-19-09 |
| 65755 | 020 | Low | [ x ] | [ x ] | 8-19-09 |

| LA_Num | UnitNum | Priority | Digital | Print | Comments |
|---|---|---|---|---|---|
| 65755 | 021 | High | [ x ] | [ x ] | 8-19-09 |
| 65755 | 022 | Low | [ x ] | [ x ] | 6-22-09 |
| 65755 | 023 | Low | [ x ] | [ x ] | 8-25-09 |
| 65755 | 024 | Low | [ x ] | [ x ] | 8-25-09 |
| 65755 | 025 | Medium | [ x ] | [ x ] | 8-19-09, 8-25-09 |
| 65755 | 026 | Low | [ x ] | [ x ] | 8-19-09 |
| 65755 | 027 | Low | [ ] | [ ] | |
| 65755 | 028 | Low | [ x ] | [ x ] | 8-19-09 |
| 65755 | 029 | Low | [ x ] | [ x ] | 8-19-09 |
| 65755 | 030 | Low | [ x ] | [ x ] | 8-19-09 |
| 65755 | 031 | Low | [ x ] | [ x ] | 8-17-09 |
| 65755 | 032 | Low | [ x ] | [ x ] | 8-17-09 |
| 65755 | 033 | Low | [ x ] | [ x ] | 8-17-09 |
| 65755 | 034 | Low | [ x ] | [ x ] | 8-17-09 |
| 65755 | 035 | Low | [ x ] | [ x ] | 8-18-09 |
| 65755 | 036 | Low | [ x ] | [ x ] | 8-18-09 Interior Impossible |
| 65755 | 037 | Low | [ x ] | [ x ] | 8-18-09 |
| 65755 | 038 | Low | [ x ] | [ x ] | 8-18-09 |
| 65755 | 039 | Low | [ x ] | [ x ] | 8-18-09 |
| 65755 | 040 | Low | [ x ] | [ x ] | 8-18-09 |
| 65755 | 041 | Low | [ x ] | [ x ] | 8-17-09 |
| 65755 | 042 | Low | [ x ] | [ x ] | 8-17-09 |
| 65755 | 043 | Low | [ x ] | [ x ] | 8-17-09 |
| 65755 | 044 | Low | [ x ] | [ x ] | 8-25-09 |
| 65755 | 045 | ? | [ x ] | [ x ] | 8-25-09 |
| 65755 | 046 | ? | [ x ] | [ x ] | 8-25-09 |
| 65755 | 047 | ? | [ x ] | [ x ] | 8-25-09 |
| 65755 | 048 | ? | [ ] | [ ] | |

## LA 65756

| LA_Num | UnitNum | Priority | Digital | Print | Comments |
|---|---|---|---|---|---|
| 65756 | 001 | Low | [ x ] | [ x ] | 9-1-09 |
| 65756 | 002 | N/A | [ x ] | [ x ] | 9-1-09 |
| 65756 | 003 | Low | [ x ] | [ x ] | 9-1-09 |
| 65756 | 004 | Low | [ x ] | [ x ] | 8-26-09 |
| 65756 | 005 | Low | [ x ] | [ x ] | 8-26-09 |
| 65756 | 006 | Low | [ x ] | [ x ] | 8-26-09 |
| 65756 | 007 | Medium | [ x ] | [ x ] | 8-26-09 |
| 65756 | 008 | Low | [ x ] | [ x ] | 8-26-09 |
| 65756 | 009 | Low | [ x ] | [ x ] | 8-26-09 |

| LA_Num | UnitNum | Priority | Digital | Print | Comments |
|---|---|---|---|---|---|
| 65756 | 010 | High | [ x ] | [ x ] | 8-26-09 |
| 65756 | 011 | Low | [ x ] | [ x ] | 8-26-09 |
| 65756 | 012 | Medium | [ x ] | [ x ] | 8-26-09 |
| 65756 | 013 | Low | [ x ] | [ x ] | 8-26-09 |
| 65756 | 014 | Low | [ x ] | [ x ] | 8-26-09 |
| 65756 | 015 | Low | [ x ] | [ x ] | 9-1-09 |
| 65756 | 016 | Low | [ x ] | [ x ] | 9-1-09 |
| 65756 | 017 | Low | [ x ] | [ x ] | 9-1-09 |
| 65756 | 018 | Low | [ x ] | [ x ] | 9-1-09 |
| 65756 | 019 | N/A | [ x ] | [ x ] | 9-1-09 |
| 65756 | 020 | Low | [ x ] | [ x ] | 8-26-09 |
| 65756 | 021 | Low | [ x ] | [ x ] | 8-26-09 |
| 65756 | 022 | Low | [ x ] | [ x ] | 8-26-09 |
| 65756 | 023 | Low | [ x ] | [ x ] | 9-1-09 |
| 65756 | 024 | Low | [ x ] | [ x ] | 9-1-09 |
| 65756 | 025 | Low | [ x ] | [ x ] | 9-1-09 |
| 65756 | 026 | ? | [ x ] | [ x ] | 9-1-09 |
| 65756 | 027 | ? | [ ] | [ ] | |

## LA 65757

| LA_Num | UnitNum | Priority | Digital | Print | Comments |
|---|---|---|---|---|---|
| 65757 | C068 | N/A | [ ] | [ ] | |

## LA 65758

| LA_Num | UnitNum | Priority | Digital | Print | Comments |
|---|---|---|---|---|---|
| 65758 | 001 | Medium | [ ] | [ ] | |
| 65758 | 002 | Medium | [ ] | [ ] | |
| 65758 | 003 | Low | [ ] | [ ] | |
| 65758 | 004 | Low | [ ] | [ ] | |
| 65758 | 005 | Low | [ ] | [ ] | |
| 65758 | 006 | Low | [ ] | [ ] | |

## LA 70955

| LA_Num | UnitNum | Priority | Digital | Print | Comments |
|---|---|---|---|---|---|
| 70955 | 001 | Low | [ x ] | [ x ] | 9-2-09 |
| 70955 | 002 | Low | [ x ] | [ x ] | 9-2-09 |
| 70955 | 003 | Medium | [ x ] | [ x ] | 9-2-09 |
| 70955 | 004 | Low | [ x ] | [ x ] | 9-2-09 |
| 70955 | 005 | Low | [ x ] | [ x ] | 9-2-09 |

| LA_Num | UnitNum | Priority | Digital | Print | Comments |
|---|---|---|---|---|---|
| 70955 | 006 | Medium | [ x ] | [ x ] | 9-2-09 |
| 70955 | 007 | Low | [ x ] | [ x ] | 9-2-09 |
| 70955 | 008 | Low | [ x ] | [ x ] | 9-2-09 |
| 70955 | 009 | Low | [ x ] | [ x ] | 9-2-09 |
| 70955 | 010 | Low | [ x ] | [ x ] | 9-2-09 |
| 70955 | 011 | Low | [ x ] | [ x ] | 9-2-09 |
| 70955 | 012 | Low | [ x ] | [ x ] | 9-2-09 |
| 70955 | 013 | Low | [ x ] | [ x ] | 9-2-09 |
| 70955 | 014 | Low | [ x ] | [ x ] | 9-2-09 |
| 70955 | 015 | Low | [ x ] | [ x ] | 9-2-09 |
| 70955 | 016 | ? | [ ] | [ ] | |
| 70955 | 017 | ? | [ x ] | [ x ] | 9-2-09 |
| 70955 | 018 | ? | [ x ] | [ x ] | 9-2-09 |

## LA 70957

| LA_Num | UnitNum | Priority | Digital | Print | Comments |
|---|---|---|---|---|---|
| 70957 | C002 | Low | [ ] | [ x ] | 9-2-09 |

# Appendix P:

# Photography Forms

**BANDELIER NATIONAL MONUMENT**
**2009 Cavate Documentation — Digital Photography Log**

Photographer(s): _____ Date: _____, 2009

Page _____ of _____

| Digital File | Shot No. | Description |
|---|---|---|
| | 1 | |
| | 2 | |
| | 3 | |
| | 4 | |
| | 5 | |
| | 6 | |
| | 7 | |
| | 8 | |
| | 9 | |
| | 10 | |
| | 11 | |
| | 12 | |
| | 13 | |
| | 14 | |
| | 15 | |
| | 16 | |
| | 17 | |
| | 18 | |
| | 19 | |
| | 20 | |
| | 21 | |
| | 22 | |
| | 23 | |
| | 24 | |
| | 25 | |
| | 26 | |
| | 27 | |
| | 28 | |
| | 29 | |
| | 30 | |
| | 31 | |
| | 32 | |
| | 33 | |
| | 34 | |
| | 35 | |
| | 36 | |
| | 37 | |
| | | |

**BANDELIER NATIONAL MONUMENT**
**2009 Cavate Documentation — Film Photography Log**

Photographer(s): Date: _____, 2009

Camera: **Pentax ZX-7** **Vivitar**
Film: _____ Roll No.: **BANDCAVATE – 09 – ____**

| Neg. No. | Shot No. | LA#:_____ Group:_____ Description: |
|---|---|---|
| | 1 | roll identification sign |
| | 2 | |
| | 3 | |
| | 4 | |
| | 5 | |
| | 6 | |
| | 7 | |
| | 8 | |
| | 9 | |
| | 10 | |
| | 11 | |
| | 12 | |
| | 13 | |
| | 14 | |
| | 15 | |
| | 16 | |
| | 17 | |
| | 18 | |
| | 19 | |
| | 20 | |
| | 21 | |
| | 22 | |
| | 23 | |
| | 24 | |
| | 25 | |
| | 26 | |
| | 27 | |
| | 28 | |
| | 29 | |
| | 30 | |
| | 31 | |
| | 32 | |
| | 33 | |
| | 34 | |
| | 35 | |
| | 36 | |
| | 37 | |

BANDELIER NM

ROLL: BANDCAVATE-09-_____

DATE: _____, 2009

NOTES:

# Appendix Q:

# Condition Assessment and Archaeological Documentation Forms for Tsankawi Mesa And Glossary

**Area**: Tsankawi Unit / Tsankawi Mesa **LA #**: **Room #**: **Alternative #s**:

**Date**: **Examined by**:

**UNIT SUMMARY DATA**

**Structure type:** cavate / noncavate / masonry room / rear wall of constructed room / N/A

**Orientation (*facing*): _____**

**Wholeness (applies to cavate structures):** Complete / Partial / Indeterminate

**Context**: isolated / cluster / contiguous **Exposure**: open / protected

**Number of entrances**: **_____** **Number of associated geologic fractures: _____**

**Rock Type:** Tshirege tuff / Otowi tuff / Tshirege and Otowi tuff / Other:

**Surface Texture:** undressed / pointed (gouged) / pecked / obscured / indeterminate / other:

**Dimensions** (*all measurements in metric; include in plan and section sketch*):

1. **Shape in plan view**: Curvilinear / D-Shaped / Rectilinear
2. **Diameter / Length (*max*): _____**cm. **Direction: _____**
3. **Diameter perpendicular to maximum / Width: _____**cm. **Direction: _____**
4. **Height from ground level to ceiling at center: _____**cm.
5. **Opening dimensions:** Height: _____cm. Width: _____cm.

**GENERAL COMMENTS**

**SKETCHES** (*complete on back*):

| Floor Plan (*include floor features, openings, compass directions and dimensions*) | Elevations (*for each wall, include orientation, geologic joints, features and dimensions*) |
|---|---|
| | |

**CONSTRUCTION DETAILS:**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Unit ID** | **Unit Segments:** (indicate direction) | **_____I/E** | **_____I/E** | **_____I/E** | **_____I/E** | **Cavate exterior** | **Floor** | **Ceiling** |
| | **Segment Type:** (Rock/Masonry) | **R M** | **R M** | **R M** | **R M** | **R M** | **R M** | **R M** |
| **Dimensions** | **Length:** | | | | | | | |
| | **Thickness (upper):** | | | | | | | |
| | **Thickness (basal):** | | | | | | | |
| | **Height:** | | | | | | | |
| **Masonry** | **Masonry Origin:** (original, stabilization) | | | | | | | |
| | **Stab. Reference** (Date/Name): | | | | | | | |
| | **Masonry Type:** (wet-laid, dry-laid) | | | | | | | |
| | **Stone Type:** (Tshirege, Otowi, basalt, other) | | | | | | | |
| | **Mortar Type:** | | | | | | | |

**SURFACE FINISHES**

**General scheme for interior walls and ceiling** (*circle one*):

earthen finished walls and sooted rock ceiling
earthen finished walls and ceiling
earthen finished walls and unsooted rock ceiling
sooted rock walls and ceiling
sooted rock walls and earthen finished ceiling
unfinished
indeterminate
other (*describe*): _____

**Schemes:**

| | **Interior Walls** | **Ceiling** |
|---|---|---|
| **Predominate Finish type:** (Circle all that apply) | extruded-smooth plaster / applied plaster / wash / soot / unfinished | applied plaster / wash / soot / unfinished |
| **General colors** (applies to plasters and washes)**:** (Circle all that apply) | red / brown / tan / white / gray / blue / black / other: | red / brown / tan / white / gray / blue / black / other: |
| **Maximum # of layers** (applies to plasters and washes) | | |
| **Presence of sooted layers between finishes?** | Yes / No | Yes / No |
| A. **Coverage** (applies to plasters and washes)**:** (Circle one) | partial / full / indistinguishable | partial / full / indistinguishable |
| B. **Grouping** (applies to plasters and washes)**:** (Circle one) | simple / complex / indeterminate | simple / complex / indeterminate |
| **C. Elements** (applies to plasters and washes)**:** (Circle all that apply) | full wall / dado / field / aura / floor band / embellishment / indeterminate / other: | aura / embellishment / other: |
| **Finish Texture** (applies to plasters and washes)**:** (Circle all that apply) | striated / finger or handprints / smooth / indeterminate / other: | striated / finger or handprints / smooth / indeterminate / other: |
| **Earlier finish schemes?** | Yes / No (if yes, describe below) | Yes / No (if yes, describe below) |

**Comments:**

_____

_____

**EMBELLISHMENTS**

| **ID** | **Motif** (anthro, zoo, geo, indeterminate, other) | **Specific type** (describe) | **Location / Substrate** (segment/ rock, masonry, plaster) | **App. Method** (incised, applied, impressed, other) | **Color(s)** | **Comments** |
|---|---|---|---|---|---|---|
| **1** | | | | | | |
| **2** | | | | | | |
| **3** | | | | | | |
| **4** | | | | | | |

**FEATURES**

**Feature types include:** fire pit / floor ridge / floor box / floor pit complex / loom anchors / metate rest / floor level niche / wall niche / slot / smoke hole / vent / upper loom support / socket / viga hole / indeterminate hole / bench / doorway (entrance) / interior doorway / other (*describe*)

| **Feature #** | **Location** (Seg.) | **Type** | **Shape** | **L** (cm) | **W** (cm) | **D / H** (cm) | **Description** |
|---|---|---|---|---|---|---|---|
| **01** | | | | | | | |
| **02** | | | | | | | |
| **03** | | | | | | | |
| **04** | | | | | | | |
| **05** | | | | | | | |
| **06** | | | | | | | |
| **07** | | | | | | | |
| **08** | | | | | | | |
| **09** | | | | | | | |
| **10** | | | | | | | |
| **11** | | | | | | | |
| **12** | | | | | | | |

**FLOOR DESCRIPTION**

**Materials**: (Circle all that apply) earthen plaster / bedrock / obscured / other (*describe*): _____
**Maximum # of layers**: _____ **Black finish?** Yes / no

**Indicate whether floor should be cleared in the future in order to record possible features:** Yes / No

**Description** (*surface treatments, stratigraphy, features, etc.*)**:**

_____
_____
_____
_____
_____

## CONTEXT

**Is there evidence of an associated masonry structure (if so, then describe below)?** Yes / No

_____
_____
_____
_____

**Is there evidence of associated architectural features on the exterior of the cavate? This refers to features that have an obvious functional relationship to the cavate being documented. (if so, then describe below)** Yes / No

_____
_____
_____
_____

**Are there petroglyphs associated with this unit (if so, then describe below)?** Yes / No

_____
_____
_____
_____

**Are there prehistoric trail segments (providing direct access) associated with the unit (if so, then describe below)?** Yes / No

_____
_____
_____
_____

**Is unit associated with a significant cluster or panel (if so, then describe below)?** Yes / No

_____
_____
_____
_____

## ARCHAEOLOGICAL SIGNIFICANCE

(Room/cavate gets **1** point for each criterion met. If room/cavate has outstanding examples of any one or multiple criteria, additional points can be awarded. Total score indicates overall significance of room.)

_____ *Wholeness* (Room retains 3 intact walls, a floor and a ceiling, and the closure wall, is >50% intact)

_____ *Unique feature(s)*

_____ *Intact example of common feature(s)*

_____ *Integrity* (no NPS stabilization / vandalism / modern alterations)

_____ *Surface embellishments*

_____ *Contextual significance*

**_____ Total significance score**

**Comments:**

_____
_____
_____

**Area**: Tsankawi Unit / Tsankawi Mesa **LA #**: **Room #**:

**Date**: **Examined by**:

## CONDITION ASSESSMENT

| | For each condition record the severity: I=Insignificant (<10%), L=Low (10-25%), M=Moderate (26-50%), H=High (>50%), N/A = not applicable (condition does not exist on segment) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Unit Segments:** (indicate direction – N, S, E, W, NE, NW, SE, SW)) | **_____I/E** | | **_____I/E** | | **_____I/E** | | **_____I/E** | | **Cavate exterior** | | **Floor** | | **Ceiling** | |
| **Existing Conditions** | **Substrate** (R/M/F)**:** | **R M** | **F** | **R M** | **F** | **R M** | **F** | **R M** | **F** | **R M** | **F** | **R** | **F** | **R** | **F** |
| | *Loss of total original* | | | | | | | | | | | | | | |
| | *Partial loss* | | | | | | | | | | | | | | |
| | **Friability** | | | | | | | | | | | | | | |
| | **Detachment** | | | | | | | | | | | | | | |
| | *Rock undercutting* | | | | | | | | | | | | | | |
| | **Structural cracking** | | | | | | | | | | | | | | |
| | **Non-structural cracking** (*map-cracking*) | | | | | | | | | | | | | | |
| | **Efflorescence** | | | | | | | | | | | | | | |
| | **Accretions** | | | | | | | | | | | | | | |
| | **Mud flow** | | | | | | | | | | | | | | |
| | **Graffiti / vandalism** | | | | | | | | | | | | | | |
| | **Biological growth** | | | | | | | | | | | | | | |
| | **Vegetation** | | | | | | | | | | | | | | |
| | **Surface weathering** (*of the tuff*) | | | | | | | | | | | | | | |
| | **Mechanical damage** | | | | | | | | | | | | | | |
| | **Other** (*describe*) | | | | | | | | | | | | | | |

**Comments:** _____

_____

_____

_____

_____

_____

_____

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_____

_____

## TREATMENT RECOMMENDATIONS

**Treatment priority** (*circle one)*: high medium low n/a

**Safety hazard**: Yes / No
If yes, describe:

_____

_____

**Prioritize treatment actions:** none / backfill (partial / full) / cover with slash / restrict access / finishes conservation (grouting / cleaning / reattachment / edging / other) / animal or insect control / drainage control / masonry stabilization / masonry infill / tuff consolidation and infill (for undercut areas) / monitor / documentation, other (*describe*)

| **Priority** | **Treatment** (*include specific location*) |
|---|---|
| **1** | |
| **2** | |
| **3** | |
| **4** | |
| **5** | |
| **6** | |
| **7** | |
| **8** | |

## GENERAL CAVATE DESCRIPTION

(include archaeological and/or architectural information, conditions, and reasons for assigning treatment priorities and treatment actions):

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

**Area:** Tsankawi Unit

**LA #:** Laboratory of Anthropology site classification number (see plans)

**Room #:** as per plans and elevations (Lister numbers are primary identifiers)

**Alternative #s:** alternative numbers associated with cavate

**Date:** date(s) of examination

**Examined by:** surveyor(s) full name

**UNIT SUMMARY DATA**

**Structure type:** *Cavate* – a cavity in the canyon wall that would have been enclosed on at least three sides and is primarily the result of excavation of the rock

*Non-cavate* – a depression in the cliff face that was, at one time, partially excavated into the tuff and partially enclosed by masonry

*Rear wall of a constructed room* – a flat plane / surface that was, at one time, the rear wall of a stone masonry room (indicated by the presence of viga holes above and below the surface, plaster or other architectural finishes, architectural features, or evidence of or extant masonry construction); ≥75% of the structure associated with a *rear wall of a constructed room* would have been masonry

*Masonry room* – room constructed wholly of masonry walls

*N/A* – area shows no evidence of human modification (refers to areas in the cliff face that were given room numbers during the BAS survey, but are not man-made)

**Wholeness** *(applies ONLY to cavate structures)***:**

*Complete* – cavate retains three intact walls, a complete floor and ceiling, and a closure wall that is > 50% intact

*Partial* – cavate is less than complete

*Indeterminate* – unknown

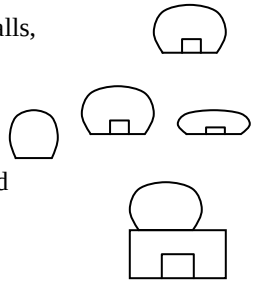
**Orientation** (*facing*)**:**

Compass directions according to **true N** (N, E, S, W, NE, NW, SE, and SW)

**Context:** I*solated* – a singular unit with no immediate adjacent neighbors or shared walls, ceilings, floors

*Cluster* – a group of two or more of the same units in close proximity

*Contiguous* – a subcategory of clustered units where adjacent units are joined through a common interior opening/entrance, this includes units which once opened upon masonry rooms



**Exposure:** *Open* – opening is > 50% of entrance wall

*Protected* – opening is < 50% of entrance wall

**Number of entrances:**

Provide total number of extant entrances (an entrance is an original opening large enough for a person to pass through, not smoke holes or vents). If entrance wall is missing or damaged, and entrances cannot be observed, enter 0.

**Number of associated geological fractures:**

Provide number of geological fractures defining or intersecting the feature (interior and exterior).

**Rock type:** *Tshirege* tuff (gray in color; most cavates in Frijoles Canyon are in the lower unit of the Tshirege)

*Otowi* tuff (tends to be red in color and less consolidated / welded than the Tshirege member)

*Tshirege and Otowi* tuff

**Interior rock surface texture:**

*undressed* – no tooling discernable on exposed rock surface

*pointed* **–** gouged, groove tooling

*pecked* – pounded, dimple tooling

*obscured* **–** concealed or damaged

*indeterminate* – unknown

*other* – surface texture does not fall into defined categories

**Dimensions:**

1. **Shape in plan view:**

*Curvilinear* – cavate has curved walls

*D – shaped* – cavate is shaped like a half-moon (one wall is straight and all others are curved)

*Rectilinear* – cavate walls are all at right angles to each other (walls are straight rather than curved)

*Indeterminate* – cavate is too eroded to determine plan

2. **Diameter / Length (*max*):**

Longest dimension of cavate and direction in which measurement is taken (**N – S, E – W, NE – SW, NW – SE**)

3. **Diameter perpendicular to maximum / Width:**

Dimension of cavate taken perpendicular to maximum and direction in which measurement is taken

4. **Height from ground level to ceiling at center:**

Height of room from ground / floor level to ceiling taken from center

*GENERAL COMMENTS*

Summary of findings including general description of cavate, conditions, context, and anything else that has not been addressed in the survey form.

**SKETCHES**

Sketch floor and ceiling (if ceiling features exist) plan and wall elevations (complete on back if necessary). Include segment direction (**N, E, S, W, NW, NE, SE, SW**), architectural and geological features and embellishments. Architectural features should be numbered on the drawing and should correlate with the list of features.

**CONSTRUCTION (SEGMENT) DETAILS**

**Unit ID:**

**Unit segment:**

Indicate wall segment (**N**, **S**, **E**, **W**, **NW**, **NE**, **SW**, **SE**, *Exterior*, *Floor*, *Ceiling*) and whether it is an interior (**I**) or exterior (**E**) surface (designate **I** or **E** according to the wall's original context). Note the following definitions:

*Wall* – a vertical surface that serves to enclose, divide or define an area. In a curvilinear or domed room, a wall ends at the midpoint of the arc between the wall and ceiling.

*Ceiling* – the upper surface of a room that is opposite to the floor

**Segment type:**

*Rock* (**R**) **–** modification of the living rock, usually through subtractive processes; provide general location

*Masonry* (**M**) - rubble or worked / finished rock units laid dry or wet with mortar

*Dimensions:* **(all measurements in metric)**

**Length:** length of wall

**Thickness (upper):** thickness of upper portion of wall (refers to masonry walls only)

**Thickness (basal):** thickness of basal portion of wall (refers to masonry walls only)

**Height:** height of wall

**Masonry:**

**Masonry origin:** *Original* – masonry remains unmodified by modern hands

*Stabilization* **–** masonry has been stabilized since its period of use, often include the use of cement mortar

**Stabilization reference:** Indicate location of information regarding stabilization (bibliographic reference)

**Masonry type:**

*Wet-laid* – masonry is laid in mortar

*Dry-laid* **–** masonry is laid with dry joints (no mortar)

**Stone type:**

*Tshirege tuff, Otowi tuff, basalt,* or *other*

**Mortar type:**

*Earth*

*Modified earth* – earth with additive such Portland cement (gray), calcium aluminate (pink), or acrylic

*Portland cement*

*Indeterminate*

*Other*

**SURFACE FINISHES**

**General scheme for interior walls and ceiling:**

Choose overall scheme for the room, refers to surface treatments which appear on the interior walls and ceiling. If the ceiling or walls are obscured or missing, choose indeterminate.

**Interior walls and ceiling:** (described in separate columns)

**Predominant finish type:**

*Extruded smooth plaster* – mortar that extends beyond masonry courses and onto the surface of the wall, covering at least 3/4 of each masonry unit; *does not apply to plaster on tuff*; is often used as a surface leveling and filling technique; thickness can vary

*Applied plaster* **–** a discrete layer or layers of plaster greater than 1mm thick applied over masonry or tuff, and which has been worked to create a continuous, relatively uniform surface

*Wash* – a discrete layer or layers of thinly applied earthen finish, usually less than 1mm thick, which is applied directly over plaster, masonry, or tuff

*Soot* – soot deposited on the tuff (without earthen finishes)

*Unfinished* – the intentional absence of a finish

*Indeterminate* **–** scheme is not able to be determined due to heavy erosion or loss of material

**General color(s):**

Circle all visible colors

**Maximum # of layers:**

Maximum number of plaster and wash layers visible with the naked eye or with low magnification (soot not counted)

**Presence of sooted layers between earthen finishes:** Indicate yes or no

**Finish scheme:**

This combination of fields describes the spatial coverage of the finishes and the grouping of elements that compose the surface scheme (the uppermost visible layer); this set of attributes relates to the original intent and execution of the finish application, as opposed to the existing remnants.

**A. Coverage:**

*Partial* – the presence of one or more finish elements (see below) in combination with unfinished rock; the wall is *not* fully finished (including sooting)

*Full* – the presence of one or more finish elements covering the entire wall; the wall is fully finished

*Indeterminate* - grouping is not able to be determined due to heavy erosion or loss of material

**B. Grouping:**

*Simple* – the presence of only one element defining the surface scheme

*Complex* – the presence of two or more elements defining the surface scheme

*Indeterminate* - grouping is not able to be determined due to heavy erosion or loss of material

**C. Elements (circle all that apply):**

*Full wall* – a layer or layers of earthen finish or soot that entirely cover the surface

*Dado* – as band of earthen finish or soot on the lower third or half of a wall that is finished differently than the rest of the wall

*Field* – a band of earthen finish or soot on the upper third or half of a wall that is finished differently than the rest of the wall

*Aura* – a finish of earth or soot around a doorway or other opening in the cavate; it is usually a different color than the rest of the wall

*Floor band* – a band of earthen finish or soot applied to the lower 10-20cm of the wall; it can also be an extension of the material used to finish the floor

*Embellishment* – a discrete detail or pattern of designs applied, incised, or impressed in earthen finish, soot, or rock

**Finish texture:**

*Striated* - stippled, parallel grooves in finish as if brushed on during application

*Finger and handprints* - finger and hand impressions left by application process

*Smoothed* - finish has a smooth texture and appearance

*Indeterminate* - texture is not able to be determined due to heavy erosion or loss of material

**Earlier finish schemes:**

Indicate yes or no and then briefly describe

**EMBELLISHMENT(S)**

**ID:** Embellishments are numbered consecutively, beginning with 1

**Motif (the type of representation that the embellishment most closely represents):**

*Zoomorphic* – having the form of an animal or bird

*Anthropomorphic* – having the form of a human

*Geometric* – having rectilinear or curvilinear lines

*Indeterminate* – motif is unclear

*Other* – motif does not fall into defined categories (describe in following field)

**Specific type:** Actual shape or character represented by embellishment

**Location / substrate:**

Indicate wall segment upon which embellishment appears as well as the substrate material (rock or plaster).

**Application method (application method used to create the embellishments):**

*Incised* – the small-scale incision of a motif or pattern into the finish or sooted tuff, created with a sharp tool, usually after the finish has dried

*Applied* – the small-scale surface application of a wash, applied as a motif or pattern with the aid of a tool such as a yucca paint brush, stick, or fingertips to the wet or dry finish

*Impressed* – the small-scale impression of a motif or pattern into the finish while it is still plastic and before it has dried; observed impressions include**:** maize cobs, potsherds, stick ends, fingertip and handprints

**Color(s):** Indicate all colors that appear in embellishment

**Comments:** General comments regarding embellishment

**FEATURES**

Features exist as any remaining constructed or excavated element in the walls, ceiling or floor of a cavate. These elements serve to enhance the archaeological significance of the individual rooms if they are unique or uncommon, or if they are outstanding examples of common elements. Many features help to associate a function to the cavates, with *fire pits*, *smoke holes* and *vents* often indicating habitation or some practice necessitating fire or burning, *loom anchors* and *upper loom supports* demonstrating the practice of weaving, and *metate rests* signifying food production (the grinding of grains and / or corn), while others remain as an enigma to the modern student of this type of architecture. Features most commonly found in the cavates include *indeterminate holes*, or holes for which no specific function can be associated, *wall niches* and *floor level niches*. The rarest features, or those that are unique to specific cavates, are the *floor pit complex*, the *metate rest*, and *loom anchors*. The careful documentation of features within the cliff rooms will aid in the development of a list of significant cavates, and will provide data for a comprehensive conservation and management plan for the archaeological resources of the park.

**Feature #:** Features are numbered consecutively, beginning with 01 and should correlate with the numbers indicated on the sketch; features must be numbered singly, not as pairs or groups (*use supplemental form for additional features*)

**Location:** Indicate the direction of the wall segment in / on which feature is located

**Type:** Feature types include fire pit / floor ridge / floor box / floor pit complex / loom anchors / metate rest / floor level niche / wall niche / slot / smoke hole / vent / upper loom support / socket / viga hole / indeterminate hole / bench / doorway (entrance) / interior doorway / other

**Shape:** Indicate shape of feature – *round*, *curvilinear* or *rectilinear*

**Length:** Length (longest dimension) or diameter of feature

**Width:** Width (shortest dimension) of feature

**Depth/Height:** Depth of wall or ceiling feature or height of floor feature

**Description:** Detailed description of feature
**Feature definitions:**

*Fire pit* – excavated floor feature showing evidence of burning; can be formally constructed and plaster lined or informally constructed by breaking through layers of floor material; usually rectilinear or round in shape

*Floor ridge* – constructed feature resembling a raised partition in the floor; composed of multiple layers of plaster; usually runs across the width (or short dimension) of a room

*Floor box* – excavated floor feature which is rectilinear or curvilinear in shape and lined with plaster; differs from fire pit in that there exists no evidence of burning within; some are located against an interior cavate wall, while others appear along the cavate opening and are independent of any external construction; features of floor boxes include, but are not limited to, constructed shelves (mortar and plaster) which serve as backing, plaster collars, and multiple layers of applied plaster

*Floor pit complex* – appears as a cluster of rounded excavated cupules, or depressions, in the floor; depressions can be plaster lined or without surface treatment; very rare feature
*Loom anchors* – usually occurring in groups of 6 (in cases where the floor is intact), loom anchors appear as holes in the floor organized in a straight line, sometimes containing wooden loops / wood fragments still mounted in a cementing material

*Metate rest* – constructed floor feature resembling a plaster ramp which would have served to cement a metate in place; can be worn smooth as a result of grinding activity; often remains as a plaster shadow-line on a wall angled towards the floor; uncommon feature

*Floor level niche* – large niche at floor level which can vary in size from a slight wall depression to a substantial chamber; tends to be curvilinear in plan and plastered in a similar manner to the cavate with which it is associated; openings can be rectilinear or curvilinear, and may have plaster collars

*Wall niche* – excavated wall feature which tends to be much smaller than the larger floor level niche; appears in cavate walls, some distance from the floor; can be plastered, sooted or unfinished; appears as a rectilinear, curvilinear or round opening, and may have a plaster collar

*Slot* – vertical or horizontal groove in cavate wall or floor which is longer than it is wide

*Smoke hole* – appears above cavate entrance as a large, rounded opening; often angled upward as it passes to the outside

*Vent* – rounded opening which goes through a wall; differs from a smoke hole in that it appears anywhere *but* directly above an entrance and is horizontal rather than angled upward; occurs predominantly in exterior walls

*Upper loom support* – deep rounded sockets near the cavate ceiling; often appear in conjunction with loom anchors

*Socket* – round or square beam support that appears on the interior wall of a cavate; sockets often have a matching hole on the parallel wall and they tend to be large and deep

*Viga hole* – large, curvilinear or rectilinear depression or hole in the cliff face which is located in such a way as to indicate its use as a roof support; usually occurs on the periphery of cavates which are designated as rear walls to constructed masonry rooms

*Indeterminate hole* –hole which cannot be definitely identified as relating to a specific function

*Bench* –appears as an unexcavated rectilinear platform that rises from the floor and has sharp edges and a smooth, flat top

*Doorway (entrance)* – a carved opening in the rock large enough for a person to enter through, sometimes associated with lintel holes, slots, and sill. Erosion should be noted in the *Comments*

*Interior doorway* – doorway leading from one chamber into another

*Other* – anything which is not identified in feature list

**FLOOR DESCRIPTION**

**Materials:** Indicate floor material(s): earthen plaster / bedrock / obscured / other (describe)

**Maximum # of layers:** Maximum number of plaster layers visible with the naked eye or with low magnification on site

**Black finish?** Indicate whether there is a black finish on the floor surface

**Indicate whether floor should be cleared in the future in order to record possible features.**

Circle yes or no to indicate whether the floor has the potential to yield further information. Yes should be selected if there is clear evidence within the cavate that could lead one to believe that there are obscured significant features (i.e. there are loom support holes in the ceiling that could indicate that there are loom supports in the floor).

**General description:** Describe surface treatments, layering sequence, etc.

**CONTEXT**

**Is there evidence of an associated masonry structure (if so, describe below)?**

Circle yes or no to indicate whether there is evidence of an associated masonry structure. Evidence includes viga sockets or extant masonry at the base of the cliff. In comments, include location of evidence.

**Is there evidence of associated architectural features on the exterior of the cavate? This refers to features that have an obvious functional relationship to the cavate being documented. (if so, then describe below)**

Circle yes or no to indicate whether there is evidence of associated architectural features on the exterior of the cavate. Evidence includes viga sockets, niches, hand and toe hold trails, etc. Features should an obvious functional relationship to the cavate being documented (i.e. hand and toe hold trails that lead into cavate opening from above or below). In comments, describe features and any obvious construction details, as well as relationship to cavate.

**Are there petroglyphs associated with this unit (if so, then describe below)?**

Circle yes or no to indicate whether there is evidence of associated petroglyphs or petroglyph panels. Petroglyphs should be within sight of cavate opening and can relate to more than one unit. In comments, describe imagery and any other relevant information (i.e. pecking still apparent from development of petroglyph, or petroglyph is barely visible to the naked eye).

**Are there prehistoric trail segments (providing direct access) associated with the unit (if so, then describe below)?**

Circle yes or no to indicate whether there is evidence of associated prehistoric trail segments. Associated trail segments should provide direct access to the cavate being assessed. In comments, describe trail (include average depth, etc).

**Is unit associated with a significant cluster or panel (if so, describe below)?**

Circle yes or no to indicate whether unit is associated with a significant cluster of cavates or panel within a particular group. In comments, explain why cluster or panel is significant.

**ARCHAEOLOGICAL SIGNIFICANCE**

*Room/cavate gets 1 point for each criterion met. If room/cavate has outstanding examples of any one or multiple criteria, additional points can be awarded.*

**Wholeness:** Cavate retains 3 complete walls, a floor, a ceiling, and a closure wall which is >50% intact

**Unique feature(s):**

Room/cavate retains intact or partial example of unique feature (unique features include floor ridges, floor pit complexes, loom anchors or metate rests)

**Intact example of common feature:**

Room/cavate retains intact example of common feature

**Integrity:** Individual room/cavate remains free of modern alteration, National Park Service stabilization, or vandalism

**Surface embellishments:**

Room/cavate retains surface embellishments on the walls, ceiling or floor

**Contextual significance:**

Relates to the relationship of an individual room/cavate to its surroundings (i.e. geological features, hand/toe holds, and other cavates/noncavates)

**Total significance score:**

**Total number of criterion met (a high number indicates a high degree of archaeological significance)**

**Comments:** Comments regarding archaeological significance

# Appendix R:

# List of Treated Cavates

**TREATED CAVATES - 2009**

*Cavates Treated for Graffiti*

| | LA # | RM # | Cond. Ass. Priority | Severity of Graffiti | Dates Treated |
|---|---|---|---|---|---|
| 1 | LA 50976 | Room 27 | Medium | Medium | 07/13–09/08/2009 |
| 2 | LA 50976 | Room 54 | Low | Low | 08/04–09/10/2009 |
| 3 | LA 50976 | Room 55 | Low | Low | 08/04–09/08/2009 |
| 4 | LA 50976 | Room 56 | Low | Low | 08/26–09/08/2009 |
| 5 | LA 50976 | Room 59 | High | High | 07/20–08/26/2009 |
| 6 | LA 50976 | Room 64 | High | High | 06/23–07/08/2009 |
| 7 | LA 50976 | Room 66 | High | High | 06/22–07/14/2009 |
| 8 | LA 65751 | Room 09 | High | High | 06/11–06/22/2009 |
| 9 | LA 65751 | Room 10 | Medium | Low | 06/11–06/22/2009 |
| 10 | LA 65755 | Room 18 | High | Low | 09/14–11/16/2009 |
| 11 | LA 128410 | Room 09 | Medium | Low | 09/14–09/18/2009 |

*Floor Mapping and Backfilling*

| | LA # | RM # | Cond. Ass. Priority | Dates Mapped | Dates Backfilled |
|---|---|---|---|---|---|
| 1 | LA 50976 | Room 59 | Medium | 06/23–07/13/2009 | (07/15/2009) |
| 2 | LA 50976 | Room 64 | Low | 07/21–08/05/2009 | (08/06/2009) |

*Cavates Treated to Control Drainage and Erosion*

| | LA # | RM # | Cond. Ass. Priority | Dates Treated |
|---|---|---|---|---|
| 1 | LA 50976 | Room 50 | Medium | 6/24-11/15/2009 |
| 2 | LA 65755 | Room 13 | Medium | 09/23/2009 |

*Cavate Closure*

| | LA # | RM # | Cond. Ass. Priority | Dates Treated |
|---|---|---|---|---|
| 1 | LA 65755 | Room 16 | High | 11/15/2009 |

# Appendix S:

# List of Participants

## PARTICIPANTS – 2008

| | |
|---|---|
| Lauren Meyer | Program Manager/Architectural Conservator |
| Shannon Dennison | Project Manager/Architectural Conservator |
| Leslie Friedmann | Exhibit Specialist |
| Daniel Madryga | Exhibit Specialist |
| Stephen Merkel | Archaeological Technician |
| Becky Chan | Archaeological Technician |
| Katy Gallagher | Archaeological Technician |
| | |
| Cynthia Herhan | OCA Senior Archaeologist |
| Brian Cribbin | OCA Field Director |
| Leslie Cohen | OCA Crew Chief |
| Matt Devitt | OCA Archaeologist |
| Jamie Hilyard | OCA Archaeologist |
| David Holtkamp | OCA Archaeologist |

## PARTICIPANTS – 2009

| | |
|---|---|
| Lauren Meyer | Program Manager/Architectural Conservator |
| Shannon Dennison | Project Manager/Architectural Conservator |
| Stephen Merkel | Field Supervisor |
| Erin Tyson | Exhibit Specialist |
| Jonathan Holdsworth | Archaeological Technician |
| Mae Colburn | Archaeological Technician |
| Molly Ray | Archaeological Technician |
| Karim Hassanein | Intern |
| Moses Nadel | Photographer |
| Jessica Bitely | Archivist/Record Management |
| Ashley Crossen | Archivist/Record Management |
| Marty Davenport | Exhibit Specialist |
| Cliff Hickey | Mason |
| Rachel Prezel | Archaeological Technician |
| William Goumas | Archaeological Technician |

# Appendix T:

# Materials and Suppliers

**MATERIALS AND SUPPLIERS – 2008 & 2009**

*Materials for Graffiti Mitigation and Tuff Treatment*

- #35 Sieve
- Crushed tuff (collected near site)
- Clays (collected near site)
- Hydrated Hydraulic Lime (St. Austier)
- Trowel (for collecting soils)
- Microspatulas (a variety of shapes and sizes)
- Dental Picks
- Pallet knife
- 50ml and 250ml plastic measuring beakers
- Assortment of painting brushes (fine to coarse, small to large)
- Dusting brush or canned air
- Plastic pallet for mixing pigments and clays
- Mineral pigments (Ochres, umbers, carbon pigments)
- Rags
- Eye dropper w/ water
- Water bottle
- Small spray bottle
- Spray bottle filled with 5% v/v El Rey acrylic emulsion in water
- El Rey acrylic additive
- Head lamp
- Nitrile gloves
- Palm coated masonry gloves
- Safety goggles or glasses

*Materials for Floor Mapping*

- 22” x 22” metric graph paper
- 22” x 28” masonite board 3/16” thick
- Graphite pencils and colored pencils
- Drafting dots
- Two measuring tapes (ribbon)
- Two self-retracting pocket tape measures
- Plumb-bob
- Scotch tape
- Artists tape (for tracing curves)
- Compass w/ vertical needle or wire for easy alignment
- Soft paint brush (for investigating features)
- Canned air

*Materials for Floor Clearing and Backfilling*

- Two 1’ wide brushes
- Two dust pans
- Full-face or half-face respirator w/ safety goggles
- Nitrile gloves
- Geotextile Typar 3401 non-woven polypro
- Four five-gallon buckets
- External frame packs or internal frame packs
- Rubber bungee cords, 22” and 30”
- Shovels for processing dirt
- 1/4” screen for processing dirt
- Two 8’x8’ tarps

*Materials for Drainage Control Treatment*

- Shovel
- Loppers and hand trimmers for vegetation removal
- 5-gallon buckets
- 2.5-gallon water jugs w/ water
- Portland cement
- Masonry trowels
- Dash brush
- Palm coated masonry gloves
- Leather work gloves

*Materials for Field Photography*

- Digital SLR camera with memory card and battery
- B&W film SLR camera
- 2 rolls of extra B&W film
- Tripod
- Light meter
- Long lens
- Sign board and letter case
- Scale bar and arrow
- Pencil and sharpie
- Camera cleaning supplies
- Clipboard
- Film and digital photo logs
- Roll identification sheets
- Compass
- Maps
- Cavate database list

*Suppliers*

**El Rey Superior Additive 200**
El Rey Stucco Company, Inc.
Corporate Office Parex Lahabra, Inc.
4125 E. La Palma, Suite 250
Anaheim, CA 92807
Phone: (714) 778-2266
Fax: (714) 774-2079

**Geotextile Typar 3401 non-woven polypro**
Du-Pont
Buckley-Powder & Co.
DuPont™ Typar® Geosynthetics
L-2984 Luxembourg
Tel. (+352) 3666 5779
Fax. (+352) 3666 5021

**Pigments, graffiti mitigation and mapping supplies**
Artisan Santa Fe Inc
2601 Cerrillos Rd
Santa Fe, NM 87505-3257
(505) 954-4179
www.artisan-santafe.com

**Field supplies**
Home Depot
952 Richards Ave
Santa Fe, NM 87507
(505) 424-9463

**Photography supplies and film processing**
Camera and Darkroom
Penn Road Shopping Center
Santa Fe, NM 87505
505-988-2043

**Microspatula**
Talas
213 W 35th St
New York, NY 10001-1996
212-736-7744

**St. Austier Hydrated Hydraulic lime**
Transmineral USA
201 Purrington Rd.
Petaluma, CA 94952
Ph. (707) 769-0661
info@transmineralusa.com

# Appendix U:

# References & Further Reading

**REFFERENCES AND FURTHER READING**


ND *Mission 66 in Bandelier National Monument*. National Park Service. MS is on file at Bandelier National Monument.

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