Aztec Ruins National Monument
Historic Preservation Report

West Ruin
East and North Wing Documentation with
Integrated Resource Management System

FY98, FY99, FY00

Aztec Ruins National Monument
New Mexico

Kaisa M. Barthuli
Archaeology Technician
Architectural Conservation Projects Program
Intermountain Support Office - Santa Fe, New Mexico
National Park Service

U.S. Department of the Interior
Washington, DC
## Table of Contents

List of Figures.............................................................................................. i  

Appendices.................................................................................................. ii  

1.0 Introduction........................................................................................... 1  
   1.1 Purpose................................................................................................ 1  
   1.2 Brief Site Description....................................................................... 1  
   1.3 Stabilization History........................................................................ 2  
   1.4 Current Project Background......................................................... 5  

2.0 Project Description................................................................................ 6  
   2.1 Project Personnel............................................................................. 6  
   2.2 Work Accomplished.......................................................................... 7  

3.0 Summary of Observations.................................................................. 15  
   3.1 General Architectural Interpretations........................................... 15  
   3.2 Fabric Integrity and Stabilization Impacts.................................... 22  
   3.3 Performance Review of Stabilization Mortars Observed............. 23  

4.0 Conclusions and Recommendations.................................................. 26  

References Cited.......................................................................................... 29
List of Figures

Figure 1   Rooms Documented by Fiscal Year
Figure 2a-2c  Illustration of Documented Wall Integrity
Figure 3   Illustration of Wall Feature Labeling Conventions
Figure 4   Primary Construction Masonry Styles
Figure 5   Secondary Construction Masonry Styles
Figure 6   Secondary Construction Masonry Styles
Figure 7a-7c  Illustration of Wall Junctures
Figure 8a-8c  Illustration of Door and Vent Locations
Figure 9   Sample Rectangular Doorway Style
Figure 10  Sample T-Doorway Style
Figure 11  Sample Sealed Doorway and Irregularly Shaped Doorway
Figure 12  Sample Ceiling Construction
Figure 13  Sample Ceiling Features-Ledge
Figure 14  Sample Ceiling Features-Secondary Beam Sockets
Figure 15  Sample Plaster
Figure 16  Sample Plaster/Wash
Figure 17  Morris-era Cement Mortar
# Appendices

<table>
<thead>
<tr>
<th>Appendix</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Rooms Documented in FY98, FY99 and FY00</td>
</tr>
<tr>
<td>II</td>
<td>FY98 and FY99 Project Agreements</td>
</tr>
<tr>
<td>III</td>
<td>FY98 Draft Scope of Work</td>
</tr>
<tr>
<td>IV</td>
<td>FY00 Scope of Work</td>
</tr>
<tr>
<td>V</td>
<td>Evolution of Stabilization Forms 1930's-1990's</td>
</tr>
<tr>
<td>VI</td>
<td>1989/90 Architectural Recording Forms and Manual</td>
</tr>
<tr>
<td>VII</td>
<td>FY00 Architectural Recording Form and Manual</td>
</tr>
<tr>
<td>VIII</td>
<td>Sample Photo Log, FY00 Photologs</td>
</tr>
<tr>
<td>IX</td>
<td>Sample Condition Assessment and Repairs Required Forms</td>
</tr>
<tr>
<td>X</td>
<td>IRMS Database Inventory Reports</td>
</tr>
<tr>
<td>XI</td>
<td>IRMS Digital Archive Index</td>
</tr>
</tbody>
</table>
1.0 INTRODUCTION

1.1 Purpose

Architectural documentation and condition assessment of the North and East Wings of the West Ruin were accomplished during the 1998, 1999, and 2000 field seasons. The south half of the East Wing was documented in 1998, the north half of the East Wing in 1999, and the east half of the North Wing in 1999 and 2000 (See Figure 1, and Appendix I). These efforts were undertaken in response to the planned backfilling of these sections of the site for fiscal years 1999, 2000, and 2001. The intention of the documentation and assessment is to determine on room-by-room basis architectural attributes, stabilization histories, current conditions, and repairs required prior to backfilling. This documentation was collected and integrated into a computer database to facilitate access and increase the utility of the data. The computer database is known as the “Integrated Resource Management System” (IRMS), and was developed to meet the specific and unique long-term preservation management needs at Aztec Ruins National Monument (AZRU). The IRMS development addresses a long recognized need to develop a database capable of storing, querying and reporting on past stabilization data, photos, current conditions, architectural information, etc., for West Ruin rooms and other resources at AZRU. The west half of the North Wing, the West Wing, and the South Wing are scheduled for documentation in upcoming field seasons.

This document serves as a project completion report for work conducted in FY00, and provides a summary of project methodology and general observations for all work accomplished to date including FY98, FY99, and FY00.

1.2 Brief Site Description

It has been determined from tree ring studies that the West Ruin was initially constructed between AD 1109 and 1135 in the classic Chacoan style. Architectural renovations suggestive of Mesa Verdean influence are evident AD 1225 and 1252 (Schart, pgs 8-10, Metzger, 1989, Scope of Work, p. 2, Windes and McKenna, Table 1). The building measures approximately 360 ft (E-W) x 275 ft (N-S) (83 x 106 m) and is constructed primarily of core-and-veneer sandstone masonry and river cobbles. It is estimated that the building stood as tall as 3 stories high and contained as many as 500 rooms. Currently, approximately 267 rooms and 26 kivas have been excavated. The site is located on the relatively flat upper west bank of the Animas River. See Morris 1919, 1921, and 1928, Schart, Metzger, Lister and Lister 1987, 1990 for further site descriptions.
1.3 Stabilization History

Earl Morris conducted the site’s first formal excavations between 1916 and 1921. Efforts concentrated initially on rooms within the East Wing. Morris’ strategy tended to be excavation, with the intention of leaving the rooms exposed for interpretation rather than backfilling them. As a result, maintenance of the rooms has been an ongoing requirement since their excavation. In the East and North Wings (the foci of this project to date) numerous documented stabilization episodes occurred since excavation. They are described as follows:

1916-1926

Morris was the key player in stabilization efforts during this era. The stabilization efforts are minimally documented, however, though repair needs were sometimes noted amongst his excavation notes on a room-by-room basis (Morris, 1928).

In 1918 Morris reports, “For the most part the walls were in bad condition, hence a considerable proportion of the season’s activities consisted of patching those that threatened to collapse, and of rebuilding those that had fallen. As a final protection against the elements, the tops of the walls of the east wing, and those of north wing as far as they have been exposed, were capped with from one to three courses of stone laid in cement, the total area of wall surface so treated amounting approximately to 7500 square feet. By way of summary of the three years’ work [1916-1918], the walls of the east wing and one half of the north wing have undergone the ultimate stages of repair” (Lister and Lister, 1990, p. 197).

In 1924 Morris reports that repairs included, “the rebuilding of the front wall of Room 58, and the repair of the wall in front of this room; the repair of the cement drainage courses around Kiva G; the filling of sunken places at the northwest and southwest corners of Kiva J and recovering the same with cement; the repair of the drainage spout in the wall between Rooms 96 and 120; the construction of nine cement floors for the protection of intact ceilings beneath rooms 154\textsuperscript{2}, 152\textsuperscript{2}, 153\textsuperscript{2}, 191\textsuperscript{2}, 140\textsuperscript{2}, 127\textsuperscript{2}, 134\textsuperscript{2}, 179\textsuperscript{2}, and 133\textsuperscript{2}” (Lister and Lister, 1990, p. 199).

In 1925 the walls of Kiva L were “built up and capped”, and various unidentified room walls near Kiva L were stabilized (Lister and Lister, 1990, p. 200). Some of these “unidentified rooms” were identified as Rooms 110, 114, 122\textsuperscript{2}, 123\textsuperscript{2} during FY00 documentation.

In general, work undertaken in the East and North Wings during this era entailed capping of “seventy-one units” ((Lister and Lister, 1990, p. 202), drain installations, repointing, reconstruction of collapsed walls and features, and
construction of protective roofs over original roofs. All masonry work utilized untinted Portland cement for mortar, and site stone.

1927-1936

Stabilization work performed during this era was directed by the first full-time custodians of AZRU, George Boundey (1927-1929) and Johnwill Faris (1929-1936). Work conducted is summarized in letters and monthly reports to the Southwest Monuments Superintendent, “Boss” Pinkley. In the East and North Wings a terra-cotta colorant was applied over Morris’ untinted cement mortar (Lister and Lister, 1990, p. 202) in rooms including 110, 114, 122^2, 123^2. Boundey also “cleared” the interstitial spaces of some kivas and replaced the cultural fill with crushed rock to “absorb the moisture”. Tar was used to seal cracks in protective roofs. Wall repair was conducted including the capping of 42 exposed rooms. Graffiti was removed from wood members using a blow torch, or wet cloth dipped in sand (Lister and Lister, 1990, pg. 202). The remainder of work conducted during this era related to areas of the site not within the focus of the current project.

1938-1942

Under the direction of Gordon Vivian, the Civilian Conservation Corp Mobile Unit (precursor of the Chaco Mobile Unit) implemented a comprehensive stabilization effort. In 1939 the south end of the East Wing was treated, and in 1940 Kiva L was repaired. In 1942 Kiva H, Kiva J, and many rooms in the North Wing were stabilized, and drainage modifications were implemented. All masonry repairs were completed using site stone, new stone, and bitumen amended soil mortar.

1943-1946

Under the direction of AZRU Park Ranger James A. Lancaster, local workers implemented various stabilization efforts in the North and East Wings. Most efforts consisted of repointing and reconstruction using cement mortar in a 3:1 ratio, overpointed with mud. Protective roofs were repaired over Rooms 112 and 59, and decaying wooden lintels were replaced in some rooms. Soil against the north exterior wall of the ruin was graded to direct water runoff away from the site. In 1944 protective roofs over six North Wing rooms were repaired. The roof over mural Room 117 was replaced, and wells were constructed north of the West Ruin in order to collect and direct groundwater away from the West Ruin. The wells proved unsuccessful (Lister and Lister, 1990, p. 216). In 1946 an extensive drainage system was constructed to the north of the West Ruin, which greatly reduced the water table beneath the ruins (Lister and Lister, 1990, p. 219).
1950-1951
Under the general supervision of Gordon Vivian, and the field direction of Roland Richert, the Chaco Mobile Unit poured concrete at the bases or splash zones of the walls. Concrete mixed with a waterproofing admixture “Hydropel” was used for this work. Repointing was accomplished primarily using soil-bitumen (native soil and “bitumuls”) (Richert, The West Ruin, 1951). On wall midsections (not caps and bases), these mortars have proven exceedingly durable, and compatible with the soft surrounding sandstone masonry. It was during this time period that masonry stabilization practices and philosophies most dramatically and ubiquitously altered the original features and character of the East and North Wings. Other repairs during this time period included cleaning and rerouting existing tile room drains, replacement of deteriorated wood lintels, and protective roof repairs.

1953, 1956
Under the general supervision of Gordon Vivian, and the field direction of Roland Richert, the Chaco Mobile Unit conducted stabilization repairs such as repointing and recapping several walls in the North Wing. At this time repairs were made using tinted portland cement mortar, sometimes overpointed with mud. Leaks in protective roofs were repaired, including the roof over mural Room 117. The surface drainage at the north exterior of the West Ruin was improved and the drainage system constructed in 1946 was cleaned.

1959-1965
Under the general supervision of Roland Richert, and field direction of Joel L. Shiner hydropel concrete “footings” were poured at the bases or splash zones of walls, as in 1951. Sumps were also installed to improve drainage. Repointing of many walls was accomplished using tinted cement.

1973-1978
Under the direction of George Chambers, and field supervision of Peter Laudeman (1973), Marianne Trussell (1974) and Steve Adams (1975), local workers repointed and capped rooms in the East and North Wing using soil-cement. The standard mix consisted of Portland cement mixed with sediments in a 1:4 to 1:8 ratio. In 1974 the cement was tinted; in 1975 the mortar was not tinted, but was overpointed with unamended soil mortar. Fresh sandstone was quarried from a local, private source near one of the original prehistoric quarry’s (Trussell, Stab. Report, 1974). In 1975 all wood elements were treated with pentachlorophenalen (Adams, Stab. Report, 1975).
1982

Under the direction of Steve Adams, a French drain system was installed along the north side of the West ruin to intercept subsurface water (Adams, 1982). This drain system is in effect today.

1983 to Present

Recent stabilization practices have included reconstruction, repointing and recapping throughout the East and North Wings using various strengths of Rhoplex (acrylic polymer) amended soil mortar.

1.4 Current Project Background

Backfilling is the placement of soil in exposed structures to cover and protect structural fabric. Backfilling is currently considered one of the most beneficial techniques for preserving standing architecture. Backfilling increases the environmental stability of wall fabric wherein the fabric is less subject to the direct effects of weather and rapid freeze-thaw cycles. Backfilling is optimal in that it also minimizes or eliminates the need for cyclic replacement and repair of the buried original fabric. The rooms selected to be backfilled in the East and North Wings of the West Ruin at AZRU will benefit greatly from such treatment as large percentages of the wall fabric are original and insitu (see Figures 2a-2c). The interpretive trail will not be impacted, as the selected rooms are not incorporated in the current interpretive trail route. For these reasons backfilling rooms in the East and North Wings has been determined to be the most effective, long-term management approach to preserving the remaining form and integrity of these rooms. Backfilling will allow Park personnel to effectively concentrate funding and preservation efforts on the remaining exposed architecture of the site. The backfilling will also provide a case study for further research on the efficacy of this method as a preservation treatment.

This project involved the first stage of backfilling, which is to collect detailed documentation of the standing architectural remains. Collection of this data will provide information to researchers, managers, visitors, etc. in the absence of direct access to the rooms after backfilling. Data collection includes photography, architectural documentation, stabilization documentation, and condition assessment. Photography involves photogrammetric techniques using a 35mm SLR camera. Architectural documentation includes the collection of information on wall construction attributes, including stone types, mortar types, construction methods etc., and architectural features such as doorways, vents, and ceilings. Stabilization documentation includes the compilation of stabilization histories, determination of where repairs were made, what materials were used, how the stabilization materials have performed, and an evaluation of the remaining aboriginal fabric integrity. Additionally, current condition assessments are
made to assess deterioration and identify causes. Recommendations are also made for repairs prior to backfilling.

2.0 PROJECT DESCRIPTION

The primary tasks to be accomplished were defined in two Project Agreements dated February 1998, and December 1999 (see Appendix II). The tasks accomplished are summarized as follows:

1. Prepare Scopes of Work for backfilling the East and North Wings of the West Ruin.
2. Document select rooms in the East Wing and North Wing of the West Ruin. Documentation is to consist of photographs, architectural data, condition assessments, and stabilization history.
3. Develop a ruins preservation management database known as the Integrated Resource Management System (IRMS) to archive and manipulate the collected data, and to increase the accessibility of the data to researchers, managers, etc.
4. Input documentation data into the IRMS.
5. Produce completion reports of all documentation and backfilling activities.

2.1 Project Personnel

AZRU staff collaborated with staff from the Intermountain Support Office – Santa Fe, Cultural Resources Management Program, Architectural Conservation Projects and Anthropology Projects (IMSF). Chief Ranger Terry Nichols (AZRU) served as overall project manager. Supervisory Archeologist Jim Trott and Supervisory Exhibit Specialist Jeff Brown (IMSF) served as project managers for IMSF staff. Architectural Conservator Angelyn Bass Rivera (IMSF) and Exhibit Specialist Glenn Simpson developed Scopes of Work (Task 1). Archeology Technician Kaisa Barthuli (IMSF) served as Project Leader for the field documentation, IRMS database development, and data entry (Tasks 2, 3 and 4). Archeologist Art Ireland (IMSF) served as project photographer. Student Intern Bonnie Hildebrand was trained to assist with documentation in FY1998, and was hired in FY1999 as an Archeology Technician (AZRU) to continue documentation and to archive project photographic materials. Archeology Technician Beth Chambers (AZRU) was a full time participant in field documentation, digital archives development, and data entry in FY2000. Archeologist Gary Brown (AZRU) assisted with documentation on a part-time basis in FY2000 while also attending to duties related to backfilling activities and other Park responsibilities. Jim Trott also assisted with documentation in FY1998, FY1999, and on a limited basis in FY2000. Maintenance Work Leader James Brown (AZRU) who has nearly 25 years of Aztec Ruins stabilization experience served as an invaluable consultant during many moments of head-scratching in the field.

IRMS development included a team of computer specialists including Systems Engineer Erik Niemeyer (IMSF), Microsoft Access Database Consultant Michael
Young (independent contractor), Computer Technician Andrea Feucht (IMSF), Archeology Technician Emily Donald (IMSF), Exhibit Specialist Glenn Simpson (IMSF), and Computer Specialist Kerri Mich (IMD). Francis Thompson served as a volunteer to assist with miscellaneous project needs. Ranger Tracy Bodnar was instrumental in organizing and coordinating digitization of select park collections related to stabilization documentation with Western Archeological Conservation Center (WACC). She also supervised archiving of photographic materials in the absence of the project leader.

Barthuli (IMSF) produced a project completion report for all FY98 and FY99 documentation and backfilling activities. For FY00 activities, Barthuli (IMSF) produced the documentation completion report (this document, prepared in two weeks time), and Gary Brown (AZRU) produced the backfilling project completion report (currently in production). This document will only cover activities related to pre-backfilling documentation.

Project funding for the FY98 and FY99 projects is described in the FY99 Completion Report (Barthuli, 2000). Funding for documentation and IRMS related activities in FY00 were derived from the FY00 Backfilling Account No. 7380-0002-CCS, and the Stabilize Ruins Account No. 7380-0002-CMA. All expenditures were tracked by AZRU staff.

2.2 Work Accomplished

Task 1. Prepare Scopes of Work for Backfilling.

Scopes of Work were prepared to define specific backfilling methodology. Principle investigator in FY98 was Architectural Conservator Angelyn Bass Rivera (IMSF). Denver Service Center Structural Engineer Jim Ellis contributed as a consultant. Implementation guidelines were developed, and research needs were defined (see Appendix III). In FY00, Exhibit Specialist Glenn Simpson in consultation with AZRU staff prepared a second Scope of Work for the subsequent phase of backfilling (see Appendix IV). A third Scope of Work is currently being produced by Simpson for FY01 backfilling specifications.

Task 2. Document Select Rooms in the East and North Wings of the West Ruin.

Recording Methodology History

Since Morris’ excavations, subsequent documentation has been conducted largely within the context of stabilization activities. Prior to 1990, documentation methodology generally consisted of a simple stabilization form including brief room descriptions, repairs made, materials used, and photographs. The documentation format remained relatively consistent until it changed format three times between 1970 and the present (see Appendix V). In 1989, the NPS Southwest Cultural Resources Center, Division of Conservation (then PCC, now
IMSF) developed a new form to record room attributes in more detail than previous forms used at AZRU (Metzger, 1989, Scope of Work p.16, Metzger, 1989, Completion Report p. 6). The form was developed as a Bonito-Style architecture recording form with a stone typology developed specifically for AZRU (Appendix VI). This marked a change from viewing documentation as an adjunct to stabilization, to viewing it as a scientific requirement contributing to archeological research. The new form provided a new baseline of architectural information that is absent in past AZRU documentation. This data collected on the new form reduces the loss of archeological information as a result of stabilization activities, and provides an opportunity to increase the archeological knowledge base of the site. This type of data recording has subsequently become a formalized activity prior to stabilization work, and the need to document the entire site for monitoring and cyclic maintenance purposes is now recognized. Archeology Technician Kate Dowdy (PCC) first put the forms to use in 1990. In ensuing years, IMSF and AZRU staff have continued to test and refine the forms at AZRU.

Current Project Recording Methodology

Documentation of the East and North Wings of the West Ruin consisted of photographic documentation, records search, and collection of data related to architectural attributes including a stabilization profile, and condition assessment. Each room was documented on a wall-by-wall basis, and room files were created to contain all information collected for each room and kiva. (Current exceptions are the Kiva D interstitial Rooms 21, 32, 34, and 36, which were filled and capped with stone and concrete, and Rooms 11, 12, 13, 14, 15, and 22. Rooms 11-14 share a continuous east wall; Rooms 14, 15 and 22 share a continuous north wall. All interior cross walls are missing, making distinctions as to where each room begins or ends impossible to determine. As a result these rooms were recorded as a single unit, having one east wall, and one north wall.)

Architectural attribute documentation focused on dimensions, materials, construction methods, construction sequence, and the distinction between original and stabilization material. Typical recording strategy involved studying all previous records for a given room, from which a stabilization history was outlined. This exercise helped to ascertain the aboriginal integrity of the wall. Architectural attribute recording was then undertaken in tabular format for portions of the wall considered to have a high degree of insitu integrity. Stabilized or reconstructed wall sections were assessed in a separate part of the form. Each wall was also described in narrative format on the form. Wood elements were documented in a cursory fashion in order to avoid duplication of data collected in the current multi-year wood survey of the West Ruin conducted by NPS Archeologist Tom Windes.

In addition to tabular and narrative recording, photographs were digitized to CD, and printouts of the photos were used for making annotations. One to six photographs were selected for full coverage of each wall. When more than one photograph was required, a composite was created when possible. Annotations
were divided into three categories for each wall: architectural features, stabilization profile, and condition assessment.

Photographic Documentation

Photogrammetry is a long recognized method of generating reliable measurements by means of photography. Standard field methods for collecting photogrammetric data can be time consuming, however. Computer technology has evolved to reduce the efforts necessary to collect and build the photogrammetric database. Software programs such as “PhotoModeler” have reduced field time considerably, and yield images or models of the subject walls in scaled 3-Dimensional formats.

Prior to this project, AZRU had invested considerable time and funds collecting PhotoModeler data. Though PhotoModeler is currently a non-traditional approach to archeological documentation, monument and project staff agreed to continue with this methodology for the following reasons: 1) to maintain consistency with existing collected data, 2) to increase the potential for generating 3-D images/virtual tours suitable for visitor interpretation, and 3) to generate scaled images with increased accuracy over traditional perspective-controlled techniques.

33 rooms and 1 kiva were photographed during the FY98 field season. 42 rooms and 2 kivas were photographed in FY99, and 24 rooms and 3 kivas in FY00. For most rooms, all four interior walls and any exterior walls were photographed. All wall caps were photographed, and detailed photographs of doors, vents and niches were taken.

All walls were photographed to PhotoModeler standards. This consisted of photographing each wall and feature at several angles. In general, only three photographs per wall were required, though taller, more complex walls required up to 36 photos. Wall features such as doorways, wall tops, vents, etc. required additional photographs. Kodak Elitechrome) ASA 100, 200, and 400 color slide film was used for all images, which were then digitized to compact disk (CD). Black and white film was not used due to its inability to capture color tone data, and because of the improved archival life of color images processed to CD.

Extended tape measures or black-and-white scales were placed at the base of each wall for scale whenever possible. Initially numerous 10 cm diameter targets were placed across the wall surfaces. However, it was later determined that 3.5 or 5 cm targets worked equally well and were far less obtrusive. Wall sketches with features, target locations, and linear measurements between targets were drawn of each wall. Floor sketches were also drawn showing camera stations and additional room measurements. These sketches will serve as accuracy references for 3-Dimensional model construction. A photo board identifying each wall was also placed in each photo. A photo log was generated for all rolls of film taken (See Appendix VIII for FY00, and Barthuli, 2000, Appendix X for FY98 and
A cross-reference list was developed for the image subjects, film negative, film roll, CD image and CD.

Photography was conducted prior to architectural attribute, stabilization history and condition assessment documentation to enable annotations to be directly made on photographs during the form recording.

**Records Research**

Prior to field recordation, a records search was conducted, and historical data such as excavation notes, burial notes and stabilization records were compiled into the individual room files. Due to limited time and funds, records research was limited to records stored at AZRU, IMSF and the Western Archeological Conservation Center in Tuscon, Arizona. Primary sources were Earl Morris' excavation and burial notes, stabilization reports 1920's – present, the Administrative History (Lister and Lister, 1990) and documentation from 1989 stabilization observations (McKenna, 1989). This data provided a baseline for assessing integrity of fabric and features present, identifying feature loss, and assessing current conditions.

**Architectural Attribute Documentation**

The architectural recording form developed in 1989 was used to collect baseline architectural attribute data. Since the forms' initial development, it has undergone continuous design modifications. Most of the changes evolved over time as discrepancies in interpretation emerged between recorders. Reoccurring discrepancies were noted, and subjective elements within the tabular aspects of the form were minimized or eliminated if possible. Because the changes evolved over time, approximately three versions of the form exist in the 3-year current project file record (see Appendix VII for recent form). Explanations of pertinent form changes are as follows.

**Data Fields:**

**Stone Masonry Shaping (page 5):** “Pecked and Ground” was added as a new choice for describing shaping method. This was added to account for single stones that might be both pecked and ground.

**Stone Masonry Types (page 6):** During initial development of the recording form, a specific stone typology was developed for AZRU. Most of the stone types are distinctive, and easily identified. Stone Types 2 and 4 are very similar however, and distinguishing between the two is a highly subjective task. Both are described in the typology as medium to coarse grained sandstone. Differences between the two are primarily described in terms of color. Type 2 is a pale olive green, and Type 4 is yellow and olive green to gray. The color distinctions between the two are subtle and highly subjective. Variable lighting conditions can alter determination of color. As well, it has been observed at the Tucker Canyon quarry
associated with site construction (Stein and McKenna, 1988 p. 55) that a continuum of yellow, olive, and gray toned sandstone can be found within a single outcropping. For these reasons, the two stone types were lumped into a single category. Until research is conducted to further define the distinctions observed during the initial development of the stone typology, the two types are acknowledged, but recorded together.

Munsell Colors (pages 7,8): Munsell color designations were added to the form as an additional method of recording physical attributes of mortar and plaster.

Stabilization Materials (page 9): Initially the form requested “% Identified New Masonry Stone”, and “Cap: # of Courses”. These two fields were combined into one field entitled “% Identified New Masonry Stone or Reconstruction” (this includes capstone). This broadens the data collected to include the re-use of aboriginal stone in wall repair or reconstruction (which was often the case in Morris’ era). The % derived can be used to determine the aboriginal and insitu integrity of the overall wall/veneer fabric (see Figures 2a-2c).

Cap/Door/Vent Numbers (pages 10-12): During this project, labeling conventions for individual wall caps, doors and vents were introduced to the form. Commonly accepted documentation methodologies involve recording wall surfaces, or veneers on a room-by-room basis. This lends to recording wall caps, doors, and vents twice. For example, if Room 1 is adjacent to and north of Room 2, a single wall separates the two rooms. In typical documentation style, the walls’ vertical surfaces (veneers) are recorded twice – as the south wall of Room 1 and the north wall of Room 2. This is standard, accepted methodology, and was a desired methodology for this project to build upon a “room file” data concept. It is not desirable, however, to record the wall caps, doors, and vents twice, which often happens when recording walls on a wall-by-wall basis. To prevent this, caps, doors, and vents were assigned unique numbers, and recorded from one side of the wall only. This not only reduced documentation time, it was an essential step for generating normalized data in the IRMS database. The numbering convention for the features is based on the room numbers defined in the 1956 Archeological Base Map (revised in 1988). For example, a door that joins Room 1 and Room 2 was recorded as “Door 1 / 2” (See Figure 3). This doorway is recorded once from Room 1, the lowest numbered room. A wall cap residing on the wall that serves as the interior east wall of Room 3, and interior west wall of Room 4 was recorded as “Cap 3 / 4”, and was recorded once from the lowest numbered room, Room 3. The numbering convention used was chosen for its intuitive properties that essentially “pre-assign” the feature numbers.
Wood Core Sample #’s (pages 10-13): For the duration of the documentation project, Archeologist Tom Windes (IMSF) has been simultaneously conducting a wood survey. The field “Wood Core Sample #’s” was created to record the wood core sample numbers taken by the wood survey crew, and to serve as a cross reference to the wood survey documentation. Windes will produce a final report of the wood survey at a later date, as it is an on-going multi-year project.

Overall Form:

Quantifying Attribute Observations (pages 5, 6, 9): Initially, quantities of attributes observed (e.g. Stone Types, Stone Masonry Shaping) were recorded in percentages. Over time it was determined that this was a highly subjective task, and recorders would often disagree on the percentages perceived, and the information could rarely be duplicated. Determining percentages also proved to be a time-intensive task. An intermediate solution was developed to record the attributes merely by their presence or absence, using checkmarks. This methodology prevailed during FY99. In FY00 an improved methodology was developed to describe the presence AND quantity of an attribute in terms of the less-subjective terminology of “Dominant”, “Common”, “Rare”, and “None”. This methodology is the one currently in use.

Kiva Form: To date, the Kiva or Circular Room Form is under revision. The primary issue considered for revision is the method of dividing a kiva into four quadrants, NE, NW, SW, and SE. A kiva wall is typically constructed of a single, continuous wall, and recording a single wall as four separate entities can be redundant and time consuming. The arbitrarily defined quadrants also generate confusion, particularly when single features such as a southern recess reside in more than one quadrant. Recorders are currently debating these issues, and results will be reflected in the development of a new Kiva/Circular Room Form. It is recommended that the new kiva form be developed before documentation.
resumes in FY01, and that if possible, kivas recorded previously with the old form be re-recorded using the new form.

**Kiva Enclosures**: In order to account for and document each masonry wall surface within the West Ruin, the definition of the square enclosures around kivas required reconsideration. In the past they and the spaces they create have been referred to in a multiplicity of ways such as “interstitial spaces”, “kiva corners”, the exterior wall of an adjacent room, and/or “kiva enclosures”. To standardize the definition of these structures, the term “kiva enclosure” was selected for use in the recording methodology. Using this single conceptual term eliminates the arbitrary division of the enclosure space into separate entities (e.g. H-1, H-2, H-3, and Room 68 around Kiva H). The term “kiva enclosure” allows for the structure to be recorded as a single room with four walls containing features such as buttresses (e.g. in the Kiva G Enclosure), sealed doorways, or viga sockets. Recording this way also allows for a more complete perspective and synthesis of kiva construction sequence. In this view, the kiva itself is considered a room within the enclosure, and is recorded separately on a Kiva Form. All references, stabilization histories, etc. previously given the kiva enclosure are included in the documentation and room folder of each enclosure. For example, the Kiva H Enclosure room folder contains all previous records for H-1, H-2, H-3, and Room 68. This methodology was developed during FY00 due to difficulties in synthesizing kiva and kiva enclosure construction events, and as a result of other undesirable issues faced while recording the interstitial spaces as individual rooms on multiple forms. It is recommended that areas recorded prior to FY00 be re-recorded utilizing the concept of kiva enclosures.

**Condition Assessment**

Condition assessments were conducted for each room on a wall-by-wall basis. A standardized condition assessment form (Appendix IX) was modified to include wall cap and door information. Condition assessment information was also annotated on photographs. Based on the condition assessments, recommendations for repairs were made on a Repairs Required Form (Appendix IX). Quantifiable measurements for both condition assessment and repairs required were recorded in U.S. customary or standard units. These units were chosen with the understanding that stabilization materials and practices are typically calculated using standard units. Since the primary user of the data collected will be AZRU maintenance and stabilization staff, this unit of measure was chosen. If necessary, measurements can easily be converted to metric to meet the needs of the scientific community.

Condition assessment and repairs required consisted of tabular forms and annotated photographs in the FY98 field season. In the FY99 field season the use of tabular forms was discontinued in rooms to be backfilled. It was
concluded that in the case that the room was to be backfilled, annotated photographs, and recommendations made in completion reports were sufficient for defining wall condition and repairs required. In the case that the room was to remain exposed for interpretation and cyclically maintained, the tabular forms (with annotated photographs) continued to be used. Resulting entry of tabular data into the database would therefore reflect condition and cyclic maintenance needs of exposed (not backfilled) masonry only.

**Task 3. Develop Ruins Preservation Management Database**

A computer database was developed to meet the specific needs of the ruins preservation maintenance program at AZRU. The database was designed to track inventory (e.g. sites, walls, features), monitor changing conditions, determine preservation work required, track work accomplished, track budgets, utilize GIS data, and facilitate access to archival information such as photographs, maps, and documents. Three software programs were integrated into a single system to accomplish this. The software programs and their functions are Microsoft Access (relational database), ArcView (GIS database), and Adobe Acrobat (image/document viewer). The system was designed to support these programs and associated data, and is flexible enough to integrate other software programs that may be required or desired in the future.

As the database (hereinafter referred to as the Integrated Resource Management System, or IRMS) was developed, changes were made to the field recording forms to reflect database requirements. These changes evolved slowly and are reflected throughout the project documentation.

Documentation collected during the field seasons was entered into the IRMS (Appendix X). This entailed entering in quantifiable information such as inventory dimensions (e.g. square footage of wall), inventory condition, and work required in the relational database component. This allows for the data to be queried, and information such as inventory lists, inventory condition, stabilization requirements, and project work accomplished can be generated as reports. Project photographs and forms were digitized and organized by room in the archive component of the system. Maps and scaled data were input into the GIS component. Data entry of past and future data will be an ongoing requirement to achieve maximum database and accuracy potential.

Park staff was introduced to the system. Follow up training will be ongoing. System upgrades will also be on going. Funding is as yet unavailable to produce a Users Manual. The IMSF staff or any qualified ArcView or MS Access consultant in the surrounding community may provide technical support for the system.

**Task 4. Input documentation data into IRMS**

Documentation information was input into the three IRMS components: the database, digital document archive, and ArcView. Data entered into the
database by AZRU staff included resource names (such as Room 100, Int. South Wall 100, Doorway 100/101, etc.), and quantity of the resource in cubic or square feet. These figures allow managers to ascertain total square footage of exposed masonry prior to the commencement of backfilling. To date, this figure is approximately 58,817 sq. ft. (see Appendix X, rooms and kivas).

A digital document archive was also created. The archive is organized into two parts: the general library, and individual room folders. The general library contains numerous accessioned and un-accessioned documents related to stabilization activities at AZRU (see list of documents in Appendix XI). These documents were selected by AZRU and WACC staff, and scanned at WACC. IMSF assembled and organized the documents into the digital archive structure. Room folders containing room specific information collected during the current project were scanned by IMSF staff, and organized by room into the digital archive. Each digital room folder contains an index of its contents and some or all of the following: photologs, photographs, excavation notes, burial notes, the Architectural Recording Form, condition assessments, annotated photographs, sketch maps, wood documentation, and stabilization records.

The third component of the system, GIS, is currently under development with cooperative efforts being made by IMSF staff and GIS/Computer Specialist Kerri Mich of the Intermountain Support Office – Denver.

Task 5. Produce completion reports of all documentation and backfilling activities.

IMSF staff produced a project completion report for all FY98 and FY99 documentation and backfilling activities. For FY00 activities, IMSF staff produced the documentation completion report (this document), and Gary Brown (AZRU) produced the backfilling project completion report (currently in production).

3.0 SUMMARY OF OBSERVATIONS

3.1 General Architectural Interpretations

The Architectural Recording Form was designed to collect data on wall and building construction, including determination of materials used, and architectural features. To date, a research database has not been created to facilitate a thorough count, analysis and interpretation of the data collected. It is therefore difficult to provide an accurate synthesis of the data collected at this time. It is recommended that efforts in the future include a more comprehensive treatment of the data collected, in the form of a research database. Due to the de-normalized style of data collected to date, this may be a time-intensive task.

For the purposes of a preliminary review, only predominate architectural characteristics observed will be discussed. Anomalies will not be discussed, but
it must be understood that anomalies do occur, and are present in the data record.

Wall Foundations/Footings
Because fill covers the original floors to varying depths, wall foundations were rarely if ever observed, and wall footings in relation to the foundations were difficult to ascertain (It is known, however, that in 1933 AZRU Custodian Johnwill Faris “dug by wall bases in many portions of the pueblo to determine that their foundations did not go more than two and half feet below the ground surface” [Lister and Lister, 1990, p. 204]).

Wall Core Construction
Wall core construction was observable on several occasions. A breach made by pothunters in Wall 112/113 (Wall 112/113), and perforations made through Walls 64/84, 63/64, 63/72, 70/71, and 70-E by AZRU staff for drain pipe installation allowed observation into the wall interiors. Although the walls of West Ruin are generally thought to be rubble-core construction (Metzger, 1989, Scope of Work, p. 3), the core observed by AZRU and CAC personnel consisted of relatively careful construction utilizing moderately shaped stones laid in copious mortar in a semi to un-coursed style. In Wall 70/71 trash including 2 bones and obsidian debitage was observed in the mortar. A thorough description of the wall core observations during drain pipe installation will be provided by AZRU Archeologist Gary Brown in the FY00 backfilling completion report (currently in production). In October 1999 the installation of a drain through Wall 52/57 was monitored by CAC Supervisory Archeologist Jim Trott. Trott observed this wall to be trash-filled. Artifacts collected included pot sherds, bones, stone debitage, ground stone and charcoal, and have been curated at AZRU. These multiple observations suggest variations in wall core construction of the West Ruin.

Wall Veneers
Wall veneers in the primary (“Chaco”) construction phase generally consisted of quarried and shaped Type 2 and 4 sandstone laid “McElmo” style in fine-textured mortar. Stone facings were predominately pecked, then lightly ground to obtain a even veneer finish with slightly rounded edges. Occasionally, stone Types 1, 3 and 5 are found in the wall veneer, though rarely in large concentrations. Although the semi-coursed “McElmo” Style is the primary masonry style observed, banded masonry utilizing thin tabular Type 2 and 4 sandstone set in fine-textured mortar also occurs. The banded style and pattern often varies from wall to wall and room to room.
Figure 4. Room 54, west interior wall showing two examples of classic primary construction masonry styles. “McElmo” Style masonry is shown in lower half of photo, with banded masonry above it.

Secondary (“Mesa Verde”) construction and renovation is often easily distinguished by semi to un-coursed masonry styles set in fine-textured mortar. Stone types used include Type 2 and 4 stone, and the use of cobblestones and Type 3 brown sandstone is more common. This is particularly observable in the East Wing (e.g. Rooms 16-20, 22-31,33,35).

Figure 5. Room 54, south interior wall showing examples of secondary construction renovations (cobblestones) above “McElmo” Style masonry (modern capping).
Figure 6. Room 33, east interior wall showing secondary construction construction. Note liberal use of cobblestones and Type 3 dark brown sandstone.

Wall Thickness
Wall thickness in first story primary construction masonry ranges between .67 and 1.12 meters. It is interesting to note that the first story walls in the 3-story room blocks are no greater in thickness than other first story walls bearing much less weight. In walls constructed during the secondary construction phase, wall thickness ranges between .28 and .65 meters in first story walls. In general, second stories are thinner than first story walls.

Wall Junctures
Wall junctures provide valuable insights into building sequence of the rooms and pueblo. Observation of the wall juncture veneer was the only method available for ascertaining building sequence, as observation of the wall juncture core was not possible. Veneer observations provide less reliable information than core observations, since veneers do not necessarily represent the interior structure of the wall. As well, documented and undocumented stabilization interventions have modified the original appearance of the wall veneer juncture in some cases, particularly in top wall courses. Nonetheless, a map has been generated to illustrate veneer observations, and general trends in construction sequence may be inferred (See Figures 7a-7c).

Doorways, Vents, and Niches
Doorways, vents and niches were the most common wall features observed. Door and vent feature locations are shown in Figures 8a-8c. Rectangular
shaped doors were most common, with lesser occurrences of T-shaped and irregular-shaped doorways.

Figure 9. Doorway 48/54. Sample rectangular doorway with secondary wood lintels and secondary wood jambs present.

Figure 10. Doorway 53/58. Sample reconstructed T-shaped doorway.
Figure 11. Room 50, east interior wall. This wall shows a sealed rectangular doorway in the lower midsection of the wall (above signboard), and a doorway added in the upper left wall as a secondary renovation.

Ceilings/Roofs
Ceilings were consistently constructed of primary and secondary beam construction with bark and soil closing material. Four rooms were documented with complete, intact roofs. Vestiges of ceiling components such as ceiling/floor ledges, beam stubs, and beam sockets were commonly observed in the absence of intact roofs.

Figure 12. Room 59 ceiling construction detail. Note primary beams, secondary beams and juniper bark closing material.
Earthen Finishes
Plasters were usually found in protected environments such as covered rooms, doorways, and the southern recesses of kivas. Of the plasters observed, most were rough mud undercoats. A single plaster layer of widely variable thicknesses was commonly observed. Tool marks and fingerprints were readily visible where plaster surfaces were not eroded. In a few cases such as in Kiva G, a white wash is present, and multiple plaster and wash layers are visible. All plasters and washes were or will be documented in depth by Conservators with recommendations made for treatment prior to backfilling (Oliver, 1998, and Harzler, 1999).
3.2 Fabric Integrity and Stabilization Impacts

Fabric integrity was assessed to determine % of insitu stone and mortar in the wall core and wall veneer. A map illustrating relative wall integrity is shown in Figures 2a-2c for available data. The criteria for defining wall integrity are based on data from the Architectural Recording Form field “% Identified New Masonry Stone/Reconstruction”. A percentage of 0-25% reconstruction was considered “High Integrity”, 26-50% was considered “Average Integrity”, and 51-100% was considered “Low Integrity”. As can be observed from the map, the majority of walls were considered to have a high degree of integrity. Although the veneer
mortar is often 100% stabilization mortar, the amount of aboriginal stone in its
insitu position, and aboriginal mortar beneath the stabilization mortar is high. It is
hoped that this map, in conjunction with individual room folder data will be useful
when making management decisions for the backfill design including fill height
and placement of drain embrasures through walls, and also for determining
strategy and appropriate materials when masonry stabilization is required.

3.3 Performance Review Of Stabilization Mortars Observed.

A performance review of stabilization mortars used since the 1920’s is described
below. A type collection of stabilization mortars used at AZRU is currently being
developed for future staff/researcher use.

1920’s (Morris) – Untinted white portland cement mortar

The untinted white Portland cement used during Morris’ era is commonly seen in
drainage troughs (e.g. Room 58), wall caps (e.g. Room 93), and in wall veneers
(e.g. Room 114). The mix used for drains and for capping appears to have been
a standard high strength mix, and it remains resilient and stable. In drainage
troughs the effect of the cement on surrounding masonry appears to be minor; in
wall caps it has had a moderate effect in redirecting water to the softer
surrounding sandstone, accelerating the disintegration of the sandstone. A
beneficial aspect of the capping mortar is in its usefulness as an indicator of
where aboriginal wall height ends, and stabilization capping/wall reconstruction
begins.

The mix used for repointing wall veneers is a weaker mix than that found in the
troughs and caps. Today it appears friable, and with a little effort, can be
extracted from the mortar joints with fingers or a trowel. It is white to gray in
appearance, with an over coating of “terracotta colorant” (Lister and Lister, 1990,
p. 202). It closely resembles soil cement used in 1975. The permeability of this
mix seems to be compatible with the surrounding stone masonry, and the
“honeycomb” effect that more dense cement mortars often inflict on surrounding
softer masonry is not occurring. The mortar is stable in most areas, though is
disintegrating moderately in areas where the surface layer has been breached.
The disadvantage is its unnatural color and “sloppy” style of application.
27

Figure 17. Room 122, south interior wall. Example of Morris-era cement repointing, over-coated with “terra-cotta” colorant.

1939-1946 (Lancaster) – Bitumen mortar

Bitumen mortar is a soft mud mortar amended with the bitumals used in asphalt road construction. This mortar’s appearance is very natural, and yet it is easily distinguishable from aboriginal mortar by scraping it’s light colored surface to reveal a darker brown interior. It also has a much coarser texture and fewer organics than aboriginal mortar. Bitumen amended mortar is extremely durable in wall veneers, i.e. where water movement through the masonry is minimal. In wall caps and wall bases, bitumen is not durable.

The method of application in this era and in 1950/1951 was a good one; rather than cleaning the aboriginal mortar from the masonry joints prior to repointing, they left the mortar intact and applied the bitumen mortar over it. The bitumen mortar thus has served as a durable sacrificial layer (intact and stable for 60 years), protecting the underlying original mortar, which is present in abundance beneath the bitumen mortar.

1950,1951 (Vivian/Richert) – Bitumen mortar, pouring of concrete “foundations”

For a review of bitumen mortar, see previous remarks on 1939-1946 bitumen mortars, as attributes and performance are similar for bitumen mortar applied in this year. It is important to note, however, that during these years many aboriginal features were obliterated, or “stabilized out”. Fortunately, most features that were obliterated can be seen in pre-1950/1951 stabilization photos,
or they are mentioned in stabilization reports. Much greater effort was made to maintain original feature form in all years preceding and succeeding 1950/1951.

It was also in these years that Hydropel concrete “footings” were poured at the bases of select walls. The philosophy at the time was to replace eroded basal stones with cement, which would protect the wall from the capillary action of moisture in the floor fill. Although cement is notorious for its deleterious effects on soft sandstone, the footings have not accelerated basal erosion, and may have actually served their intended purpose. The observed visible masonry around and above the footings is often in fair to good condition. The effect of the footings on underlying masonry is unknown, however, as this masonry cannot be seen or evaluated.


These mortars are a standard high strength mix, and very easy to distinguish from other mortar types (little remains of any mud overpointing as it has eroded away). Today, these tinted mortars range in undesirable hues of purple, pink, and orange. It is possible that the different hues represent inconsistencies in mixing proportions or dye lots, or that the tints used are UV degradable.

It was originally thought that cement mortars would be a permanent preservation solution. Long term evaluation of their performance, however has shown that the low/non-permeable, water repelling nature of cement accelerates the disintegration of surrounding softer, aboriginal masonry stone. Water is directed away from the harder cement mortar beds, and into the stone. The result is disintegration of the stone, leaving the cement mortar beds intact yielding the so-called “honeycomb” effect. The use of cement mortar for repointing was abandoned in 1974 as a result. Today, research is ongoing in Parks such as Fort Union National Monument and Salinas Pueblo Missions National Monument to determine if the use of cement mortars may be appropriate under certain limited circumstances (NPS, personal communication). At AZRU, for example, it may be useful to study the positive versus negative effects of cement mortar use in new capping (see below, 1980’s performance evaluation of stabilization mortars – safety considerations).

1974 (Chambers/Adams) – Tinted portland cement mortar AND/OR tinted soil cement

Tinted cement mortar was used in early 1974 and is easily distinguishable by its pink hue, and a black, pebble aggregate. It was used for repointing, reconstruction and capping. Midway through the 1974 field season, the long-term deleterious effects of cement mortar in the West Ruin was realized, and a tinted soil cement mix was developed to replace it. The tinted soil cement mortar utilized the same dye tints and aggregate as the cement mortar, but had a much lower compression strength due to the addition of soil. The mix was a high content clay soil mixed with equal parts washed sand, then mixed at an 8:1 ratio.
of soil mix to tinted 94# cement. It’s performance is considered to be poor since very little of it remains in stabilized walls. It is also undesirable because of its pinkish color.

**1975 (Chambers/Adams) – Soil cement mortar (6:1) overpointed with mud**

The soil cement used in 1975 is distinguishable by its white color, and medium compression strength. It is friable when scraped with a fingernail or hard object. It can be difficult to distinguish from the soft untinted cement mortars used in wall veneers in the 1920’s. For this reason, it is important to refer to stabilization records for accurate determinations. The presence of unamended mud overpointing can assist in the determination of this mortar, though only trace amounts of mud remain on exposed walls. A good example of the soil cement mortar with intact mud overpointing is in the protected niche in the north wall of Room 96.

**1977 (Adams) – Soil mortar amended with Wilhold concrete adhesive (latex based)**

Soil mortar amended with Wilhold latex based concrete adhesive is a natural soil color, with greater durability than unamended soil mortar. Its durability has been fair to good in wall veneers, and poor in wall caps and bases. The primary disadvantage of Wilhold amended soil mortar used in 1977 is that in its varying stages of decomposition, it is difficult to distinguish from aboriginal mortar. It is recommended that if it is used in the future, that a distinguishable aggregate be included in the mortar mix to clearly distinguish it from aboriginal mortar.

**1980’s (Brown) – Soil mortar amended with Rhoplex (acrylic polymer)**

Soil mortar amended with Rhoplex is a natural soil color, with greater durability than unamended soil mortar. Variations in finishing techniques seen in the West Ruin include a stippled finish, brushed finish, extruded, or cracked finish. Its durability has been good in wall veneers, and fair to poor in wall caps and bases. Various soils ranging in color from brown to reddish brown have been used with Rhoplex since the 1980’s, with varying results. Visually, the reddish brown is the most desirable since it has a natural appearance, yet is easy to distinguish from all other mortars. A disadvantage of Rhoplex mortars however is its variability in performance depending on soil type used, temperature/weather at application, and curing environment.

**SAFETY CONSIDERATIONS:** Wall caps in the West Ruin tend to be set in either cement mortar or Rhoplex mortar; caps in cement tend to be stable though risky in terms of monolithic failure. Caps set in Rhoplex tend to be unstable and pose safety risks.
4.0 CONCLUSIONS AND RECOMMENDATIONS

Develop Research Database
It is recommended that a research database be developed for data collected on the existing Architectural Documentation Forms. It is recommended that the research database be developed prior to any further field documentation so that if new fields of information are required for database entry, they can be identified and reflected on the form prior to any further data collection. Data collected in FY98, FY99, and FY00 should be reviewed to ensure the data collected is consistent and conforms to database standards. The database architecture should reflect a normalized, relational design to enhance research capabilities. This could be easily accomplished within the context of the existing IRMS database structure. A benefit of the research database would be the ability to quickly answer such questions as “How many T-shaped doorways are present and in which rooms?”, “How many instances are there of banded masonry, and in which rooms?”, “How many E-W doorways are there?”, or “What rooms were stabilized in 1991?”. This database would facilitate a more thorough synthesis of the data collected, and would complement the existing IRMS Ruins Preservation Management Database. Defining database requirements would also provide a new framework for how data should be recorded, and thus establish a new level of quality control and accuracy in data collection.

Revise Kiva Form, and Re-Record Kiva’s and Kiva Enclosures

The process of recording kivas on the existing form has presented several challenges, which require further consideration and revisions to the Kiva Form (see discussion in Section 2.2, Kiva Forms). This needs to be accomplished prior to further field documentation. It is also recommended that all previously documented kivas (Kivas D, F, G, H, J, K, and L) be re-recorded using the new form to ensure consistency and accuracy of kiva data. Much of the data can be directly transferred from the old form to the new, but some field review may be necessary. As well, interstitial spaces that have not been recorded as “kiva enclosures” (see discussion in Section 2.2, Kiva Enclosures) should be re-recorded.

The above two recommendations include review and revision of all Architectural Documentation Recording Forms completed to date. If changes are made, these changes should also be updated in the IRMS Digital Archive.

Complete New Baseline Survey for Backfilled Rooms

Masonry that remains exposed after backfilling should be re-documented on a wall-by-wall basis, and entered into the IRMS system. Documentation should consist of photography, an abbreviated version of the Architectural Documentation Form, and a condition assessment. This data will serve as a new baseline to facilitate monitoring and identification of cyclic maintenance needs for the exposed masonry. As well, collection of baseline data needs to continue for
rooms in the West Ruin and East Ruin that are not targeted for backfilling. This should be accomplished utilizing the documentation methodology developed for AZRU. When entered into the IRMS, the data will provide an accurate view of inventory, condition, stabilization needs, and preservation work performed for all excavated rooms and walls at AZRU.

Use Stabilization Mortars That Are Easily Distinguishable From Aboriginal Mortars

An evaluation of stabilization mortars to date has concluded that Wilhold and Rhoplex amended soil mortars can be very difficult to distinguish from each other and from aboriginal mortar. Since these are currently the mortars being used for stabilization repairs, it is recommended that measures be taken to make the mortars more clearly distinctive. Recommendations are 1) Inclusion of a larger or distinctive aggregate is recommended, as aboriginal mortars tend to be very fine grained, and/or 2) use of a distinctively different soil color in the stabilization mortar mix. This practice will help ensure more accurate assessments of original vs. stabilized mortars.

Recommended Repairs

For rooms documented in FY98 and FY99 see the FY99 Completion Report (Barthuli, 2000). For rooms documented in FY2000, recommendations are as follows:

<table>
<thead>
<tr>
<th>ROOM/KIVA</th>
<th>WALL/FEATURE</th>
<th>TREATMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room 94</td>
<td>Int. South Wall, Above Vent 93/94-2 (West End)</td>
<td>Stabilize Large Void</td>
</tr>
<tr>
<td>Room 95</td>
<td>Doorway 95/J</td>
<td>Plaster Assessment</td>
</tr>
<tr>
<td>Room 96</td>
<td>Int. North and West Walls, Ext. South Wall</td>
<td>Stabilize Voids/Stone Erosion</td>
</tr>
<tr>
<td>Room 110</td>
<td>Doorway 110/122²</td>
<td>Stabilize Door Sill</td>
</tr>
<tr>
<td>Room 112</td>
<td>All Walls</td>
<td>Plaster Assessment</td>
</tr>
<tr>
<td>Room 113</td>
<td>All Walls</td>
<td>Plaster Assessment</td>
</tr>
<tr>
<td>Room 113</td>
<td>Int. North and West Walls</td>
<td>Mortar Loss - Repoint</td>
</tr>
<tr>
<td>Room 114</td>
<td>All Walls</td>
<td>Stabilize Wall Bases</td>
</tr>
<tr>
<td>All Rooms</td>
<td>Wall Caps</td>
<td>Stabilize Caps Before and After Backfilling</td>
</tr>
</tbody>
</table>

Conclusion

It is hoped that the data collected and stored in the hardcopy room folders, the IRMS database, and the IRMS Digital Archive will be regularly consulted when making management decisions for the backfill design including fill height and placement of drain embrasures through walls, and also for determining strategy and appropriate materials for all future ruins preservation activities.
REFERENCES CITED

Adams, Stephen E. and G.J. Chambers
  1975 Stabilization Report, West Ruin, Aztec Ruins National Monument, New Mexico, 1975, Volumes I and II.

Barthuli, Kaisa
  2000 Aztec Ruins National Monument, FY1999 Completion Report. On file at Aztec Ruins National Monument Headquarters, Aztec, New Mexico

Hartzler, Bob
  1999 September 23, 1999 Memorandum to Aztec NM Superintendent, Barry Cooper, on file at Aztec Ruins National Monument Headquarters, Aztec, New Mexico

Lister, Robert H., and Florence C. Lister

McKenna, Peter J.
  1989 Stabilization Observations at the Aztec Ruins: Prospective for the Superintendent. On file at Aztec Ruins National Monument Headquarters, Aztec, New Mexico.

Metzger, Todd

Morris, Earl H.
  1918 “Further Discoveries at the Aztec Ruin” American Museum Journal 18, no. 7, 602-10
<table>
<thead>
<tr>
<th>Year</th>
<th>Title</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>1919</td>
<td>The Aztec Ruin.</td>
<td>Anthropological Papers of the American Museum of Natural History 26(1).</td>
</tr>
<tr>
<td>1921</td>
<td>House of the Great Kiva at the Aztec Ruin.</td>
<td>Anthropological Papers of the American Museum of Natural History 26(2)</td>
</tr>
<tr>
<td>1928</td>
<td>Notes on Excavations in the Aztec Ruin.</td>
<td>Anthropological Papers of the American Museum of Natural History 26(5).</td>
</tr>
<tr>
<td>1999</td>
<td>Oliver, Ann April 8, 1999 Memorandum to Acting Superintendent, Intermountain Support Office-Santa Fe, on file at Aztec Ruins National Monument Headquarters, Aztec, New Mexico</td>
<td></td>
</tr>
<tr>
<td>1977</td>
<td>Schart, William An Assessment of the Archeological Resources of Aztec Ruins National Monument, New Mexico.</td>
<td></td>
</tr>
</tbody>
</table>