DOLORES ARCHAEOLOGICAL PROGRAM TECHNICAL REPORTS

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1978 Additive Analysis Report

by

William A. Lucius

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Under the supervision of
David A. Breternitz, Senior Principal Investigator

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ABSTRACT

Analysis of Dolores Cultural Resources Mitigation Program ceramic collections from excavations of prehistoric sites was undertaken beginning in October 1978. An inventory analysis was designed to: (1) approach specific questions of the Research Design; (2) provide an inventory of those materials in relation to taxonomic and provenience systems; and (3) establish a data base for the selection of materials for intensive analyses. A coding system was developed to place the data into a machine readable format for ease of handling and manipulation of large collections.

A tripartite hierarchy of analysis was instituted with the initial focus being the inventory analysis as outlined above. Intermediate or supportive activities include the construction of a type collection and of a reference file, and the selection of specific materials for thin-section verification of temper types. A program of reconstructing ceramic items from floor proveniences was also instituted. Advanced analyses have been formulated but await the completion of other inventory analyses prior to their initiation. These analyses are concerned with the characteristics of ceramic assemblages by the use of decorative and technological attributes.

INTRODUCTION

The Dolores Archaeological Program (D.A.P.) is a federally funded archaeological investigation of the prehistoric and historic cultural resources of the Dolores River Valley and adjacent areas that are slated to be impacted by the construction and utilization of the McPhee Dam and Reservoir. The primary project impact areas lie north and west of the town of Dolores in southwestern Colorado and cover approximately 16 km of the river valley. Canals, laterals, and other outlying features are located to the northwest, west, and south. Mitigation and survey of the cultural complement of the project area has and will result in a substantial volume of artifactual materials which requires inventory and analysis prior to the employment of those data in the interpretation of the archaeological resources of the project.

Several task specialists have been given the responsibility to reduce the artifactual material--remains which are composed of the actual objects and the provenience information which describes the relationships of the objects to each other and to their respective sites--into data which serve as input into development of descriptive and interpretive statements regarding the cultural characteristics of the prehistoric populations.

The basic requirements of the ceramic analysis program have been outlined in the University of Colorado contract proposal (University of Colorado [1:30]):

2. Ceramics analysis. A program of ceramics analysis will be carried out by the Research Center; objectives of the program will be the definition of the role of ceramic vessels in storage and domestic activities, the definition of activity areas by the presence of certain vessel types, the identification of social divisions by stylistic analysis, the use of pottery types as a relative dating

technique and the role of ceramics in trade and exchange networks. The Research Center will employ a full-time specialist in ceramic analysis.

The duties of the Additive Task Specialist are several, but primarily he is required to: (1) inventory those prehistoric items manufactured employing additive technologies which are recovered from excavation and survey operations; (2) develop a data structure which will provide classificatory systems for the definition of time- and space-sensitive groupings; and (3) develop analytical programs for the resolution of appropriate problems related to the Research Design. Additionally, the task specialist is required to provide formal training for the project personnel at large and for task technicians specifically; the training involves interpretation and potential applications of analytical results as well as basic analytical techniques.

W. Lucius was appointed on 2 October 1978 to serve as the additive specialist as called for in the contract proposal; Lucius replaced K. Masterson, who served as the additive specialist during the previous summer. A ceramics task crew composed of University of Colorado and Young Adult Conservation Corps employees was assigned to Lucius for training and data reduction. Presently the crew consists of six technicians with L. Matthews acting as the assistant task specialist under the direct supervision of W. Lucius. Training is a continuous process with on-the-job experience being the primary mode of instruction. A basic introductory seminar concerning ceramics and ceramic typology was offered to all D.A.P. personnel on 20 November 1978 and was structured to provide basic training in ceramics. Impromptu small scale seminars concerning ceramics or archaeological subjects are a continuing activity.

Currently, preliminary analysis of prehistoric ceramic items collected during the 1978 D.A.P. field season is in progress. Because of the scarcity of other artifacts produced by the application of additive technologies (basketry, cordage, etc.) in the 1978 collection, the development of analytical techniques to deal with these remains was assigned a low priority and deferred until the completion of the preliminary analysis for ceramics. Hence, most of this report is concerned with the ceramic analysis; the additional analytical technique will be developed in the summer and fall of 1979.

THE CERAMICS ANALYSIS RESEARCH DESIGN

Introduction

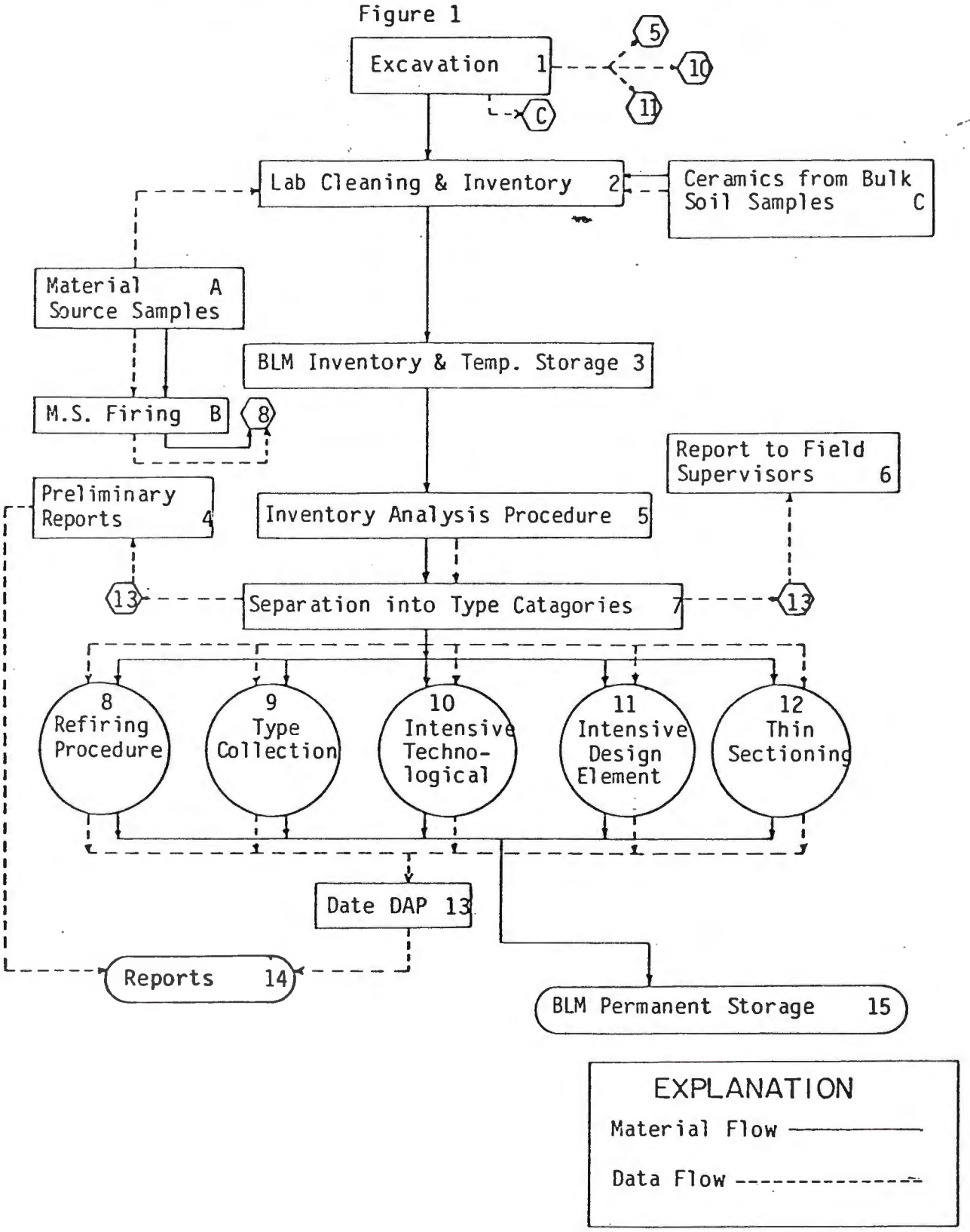
The intent of the ceramics analysis program is to structure ceramic material remains and their accompanying provenience data into a form which can ultimately be used to approach the component questions of the five problem domains of the D.A.P. General Research Design (Kane et al. [2]). Three levels of analysis have been developed in order to meet the requirements of the research design. The preliminary analysis serves to inventory and classify the ceramic remains to provide a data base for selection of specific portions of the total population for further analysis; it also results in a compilation of the data which can be used to directly approach the problem domains. The intermediate analyses are supportive of the preliminary analysis and, as such, do not directly address the problems of the research design but rather aid in the performance and verification of the inventory analysis. The intensive analysis is at present being designed to utilize selected portions of the data base for input into several problem domains of the general research design. The present structure for flow of materials and data and the articulation between the inventory analysis and more intensive studies is illustrated in Figure 4.1. A more complete description of the relationship between ceramic analysis and the program general research design can be obtained by consulting the formal D.A.P. Additive Analysis Research Design (Appendix A, this report).

Figure 4.1 Material and data flow for ceramics analysis, D.A.P. Additive Analysis Program.

D.A.P. ADDITIVE ANALYSIS PROGRAM

MATERIAL AND DATA FLOW FOR CERAMIC ANALYSIS

Figure 1



Ceramics Analysis and Problem Domains

The following format will be used to indicate the direction and amount--if any--of input into the five general problem domains of the program research design as they apply to ceramic data. Those posed questions that are expected to be only addressed in an indirect way by the inventory level data are not listed. Descriptions of each analysis procedure may be found in succeding sections of this report. The advanced stylistic analysis is being developed and has not been tied into the Research Design.

Problem Domain 1: Economy and Adaptation

Question 1: What resources were available in the area; in each temporal unit? A material source sampling procedure has been instituted which is formulated to locate and define each raw material needed for ceramic manufacture within and adjacent to the project area. The program is ongoing, dependent on time and funding restrictions.

Question 2: Within each temporal unit, which resources were used by prehistoric people? Following location and identification of potential local resources by means of material source sampling, comparison of source materials with ceramic collections by employment of a refiring analysis will allow description of selection and use behaviors.

Question 3: How were each of these resources used, again within each temporal unit? Another aspect of the material source and refiring analysis will address the manufacture and use cycle from procurement through discard and the regularities of association of those ceramics with archaeological features.

Question 4: Within each temporal unit, how are the tasks and

strategies of resource exploitation organized to form a subsistence system to meet basic social and cultural needs? A reconstruction of the cycle of ceramics resource use within the constraints of seasonality and scheduling of the social setting will be attempted following the material source and refiring analyses.

Question 5: What were the basic social organizational attributes of the subsistence systems identified for each temporal unit? Given that the preceding questions can be successfully approached, spatial and organizational aspects of ceramics procurement systems will be addressed following the material source and refiring analyses.

Problem Domain 2: Paleodemography

No specific studies dealing with the application of ceramics analyses to estimate characteristics of prehistoric populations have been designed.

Problem Domain 3: Social Organization

Subdomain I: Social Organization: No specific studies concerning the applications of ceramics analysis to problems of Anasazi social organization have been developed.

Subdomain II: Economic Social Organization.

Question 4. How was production of each major class of material goods organized? The material source and refiring analysis, in addition to addressing the various questions of resource use (Problem Domain 1), will additionally provide data that can be applied to problems associated with social aspects of ceramic production, especially concerning stages of production and activity loci involving ceramic production and use.

Question 5. What were the patterns of consumption for each

major class of material goods? Definition of the consumption cycle, including differential group use and reutilization will be possible given that the basic descriptions of ceramics can be determined by the material source and refiring analyses.

Question 6. How was each major class of material goods distributed? Again, given the success of documentation of ceramics to a point where such distinctions are feasible, the distribution mechanisms of ceramics will be investigated by the material source and refiring analyses.

Question 7. Given the patterns of production, consumption, and distribution derived from questions 4a-4c, what was the system of economic social organization?

Question 7 will be addressed when possible, given the development of methods to address the previous three questions of the problem domain by the material source and refiring analyses.

Subdomain III: Political Organization: Ceramics analysis programs involving the reconstruction of Anasazi political organization have not been developed.

Subdomain IV: Ideology and Ceremony: No ceramics analysis programs resulting in input into this subdomain have been developed at this time.

Problem Domain 4: Foreign Interactions

In general, this problem domain is being approached by all levels of ceramics analysis. Exotics are defined in the inventory analysis by use of type collection references which are being developed as intermediate analysis. The material source and refiring analysis additionally will allow for definition of local versus foreign ceramics when developed. Therefore input into the specific questions posed in the research design

will be considerable, but as of yet no intensive analyses dealing specifically with the foreign interactions problem domain have been developed.

Problem Domain 5: Cultural Process

Question 1: How do the project area data, in the bivariate framework of both calendar dates and assigned periods, vary over time? Ceramic artifacts, by their inherent characteristic of plasticity of form and design, allow a viable avenue of approach to the questions of culture process. Given that combinations of defined ceramic attributes vary temporally in relation to other aspects of Anasazi culture, it is possible to document those changes by ceramics analysis. Application of those space and time markers to questions of process will be possible when frameworks of inquiry are devised which will permit use of those data in combination with other data sets. Once the hypotheses for testing are developed, the ceramic data from the three levels of analysis will be available in a useful format.

THE INVENTORY ANALYSIS

Specifications

The initial requirement of the ceramics analysis procedure is one of inventory. However, the inventory process does not consist solely of a list of provenience units and a count of the total numbers of items recovered. Rather, a classificatory system was instituted that is used to divide the general complement of ceramics into meaningful analytical units which can be correlated with provenience and raw counts and/or weights.

The basic inventory unit adapted by project personnel is the FS (Field Specimen) lot number, which also serves as the basic provenience unit. The FS number and its attendant information supplies the basic provenience data required for analysis.

A taxonomic classification based on recognition of the variability of ceramic remains (attributes) has been formulated for analysis of project ceramic collections; the classificatory scheme is oriented toward the derivation of time- and space-sensitive types and provides descriptive variables which complement the provenience data.

Raw number counts and weights per analysis unit (provenience and classificatory divisions) are also tabulated to provide further data that can be manipulated in combination with the above two sources of information in order to construct interpretive statements concerning cultural activity within and between sites. Due to the volume of the ceramic remains which must be processed through the preliminary analysis procedure (every ceramic item except those too small or fragmentary for consistent observations) and the data handling needs of the project, the inventory procedure data is coded into a machine

...able format. Such computerized data allow for data storage and manipulation which would be prohibitive otherwise. Attributes identified during analysis are recorded on standardized forms (Figure 4.2); the attributes are defined by a variable/value list (Table 4.1) which gives the range of values that are possible for each variable. Figure 4.3 is a flowchart representation of the structure of the inventory analysis and should be referred to for clarification in the following discussion.

Structure

The four basic requirements of the inventory analysis (provenience data, taxonomic ordering, numerical inventory, and computer-coded variables) are incorporated into the analytical procedure. Provenience data include the site number and FS number with their attendant information (Material ID, Catalog Item Number, Special Specimen Number and Type, and Point Location [the variables in major columns 2-5 in Figure 4.2, the Preliminary Analysis Form]) provide the basic provenience data and account for approximately one-third of the computer form. Documentation of these data allows for cross referencing with field records and other informational sources.

Variable 08 (Artifact Form) is used to record the condition of the ceramics under scrutiny at the time of analysis (fragmentary versus whole vessels or nonvessels) and together with the Catalog Item Number (VAR 04) provides information on the nature of the artifact.

A regional ceramic typology, designed so as to be broad in its attribute expression in order to include region wide variation, was selected to permit placement of project ceramic collections within the established Mesa Verde ceramic system. The traditional type category

Table 4.1 Preliminary Ceramic Analysis, Additive Analysis Program (Page 1 of 10)

DOLORES ARCHAEOLOGICAL PROGRAM
VARIABLE/VALUE LIST

COLUMN NUMBER		VARIABLE DESCRIPTION
1-8	VAR 01, 02, 03	Site Number: use Smithsonian designation with state, county, and sequential designation: Right justified.
9-14	VAR 04	Field Specimen Number: Right jusified.
15-16	VAR 05	Material Identification 01: Ceramics
17-19	VAR 06	Catalogue Number 001: Undifferentiated lot of vessel sherds 002: Undifferentited lot of ceramic items, not sherds of vessels 003-999: Single items, including all whole vessels
20-21	VAR 07	Special Specimen Type: Numeric designator for specimens other than artifact samples, a subcategory of materials within the Field Specimen Catalogue. 00: Not applicable 01: Archaeomagnetic samples 02: Radiocarbon sample 03: Dendrochronological sample 04: Material source sample (lithics-ceramics) 05: pollen core 06: Pollen sample 07: Stratigraphic column 08: Sediment sample 09: Bulk soil sample 10-11: No longer used 12: Botanical specimens 13: Latex peels 14: Plaster positive 15: Monolith 16: Soil peel 17: Ethnobotanical sample 18-98: Unassigned 99: Isolated finds
22-25	VAR 08	Special Specimen Number: Right justified.
26-29	VAR 09	Point Location; Number assigned to each floor artifact, designating triangulation coordinates.

Table 4.1 Preliminary Ceramic Analysis, Additive Analysis Program (Page 2 of 10)

COLUMN NUMBER		
30	VAR 10	Ceramic Artifact Form: Condition of the analysis lot 1: Whole or partial vessel 2: Vessel sherd(s) 3: Ceramic form(s) other than vessel or sherds (figurines, pipes, etc.)
31	VAR 11	Firing Atmosphere: The heat treatment of ceramic material which induces chemical and physical changes. 0: Not applicable 1: Indeterminate 2: Unfired (none) 3: Reduced 4: Oxidized 5: Refired 6: Vitrified 7: Other
32-33	VAR 12	Temper: Aplastics in a clay body which reduce shrinkage and heat shock during drying and firing. 00: Not applicable 01: Indeterminate 02: None 03: Andesite/diorite 04: Sherd (andesite/diorite) 05: Trachy basalt with hematite 06: Quartz sand 07: Multilithic sand 08: Mica 09: Sherd and quartz sand 10: Quartz sand with hematite 11: Trachy basalt 12: San Juan 13: Sandstone 14: Sherd and San Juan 15: crushed sherd and sandstone 16: Conglomerate 17: Mixed 18: Dakota sandstone 19: Quartz and conglomerate 20: Crushed sandstone with dark gray matrix 21: Sherd 22: Fine Sand Juan crushed 23: Dark andesite/diorite 24: Salmon matrix sandstone crushed 25: Sherd with trachy basalt 26-29: Unassigned 30: Crushed igneous (Kayenta) 31: Stained quartz sand (Kanenta) 32: Quartz sand (Kayenta) 33: Sherd and quartz sand (Kayenta) 34: Fine quartz sand (Kayenta)

Table 4.1 Preliminary Ceramic Analysis, Additive Analysis Program (Page 3 of 10)

COLUMN NUMBER		
34	VAR 13	Surface Manipulation: Surface indications of elements of decoration, or utility. 0: Not applicable 1: Indeterminate 2: Plain (none) 3: Filleted 4: Coiled 5: Corrugated 6: Pinched 7: Incised 8: Perforated 9: Other
35	VAR 14	Surface Compaction: Surface indications of mechanical compression. 0: Not applicable 1: Indeterminate 2: Unpolished (none) 3: Polished 4: Other
36	VAR 15	Surface Cover: Surface indications of added slips or washes. 0: Not applicable 1: Indeterminate 2: None 3: Slipped/Washed 4: Fugitive Red 5: Other
37	VAR 16	Paint Type: The physical composition of the paint. 0: Not applicable 1: Indeterminate 2: None 3: Mineral paint with organic binder 4: Organic paint only 5: Mineral paint only 6: More than one type of paint, each clearly defined in separate zones 7: Clay paint only 8: Paint other than those specified above
38	VAR 17	Paint Color: 0: Not applicable 1: Indeterminate 2: None 3: Brown to black (including lead-based colors) 4: Orange to red 5: White 6: Combination of any of the above 7: Others not specified above

Table 4.1 Preliminary Ceramic Analysis, Additive Analysis Program (Page 4 of 10)

COLUMN NUMBER		
39-40	VAR 18	Cultural Category: The cultural branches recognizable by ceramic traditions. (See attached Type Sheets.) 00: Not applicable 01: Indeterminate 02: Mesa Verde (Dolores River) 03: Chaco/Cibola 04: Chuska 05: Kayenta 06: Little Colorado 07: Navajo 08: Pueblo (historic) 09: Shoshone 10: Nevada/Virgin 11: Kayenta/Virgin 12: Mesa Verde (San Juan)
41	VAR 19	Ware: A group of pottery types which consistently show the same means of manufacture. (See attached Type Sheets.) 0: Not applicable 1: Indeterminate 2: Gray 3: White 4: Red/orange 5: Brown 6-8: Unassigned
42-43	VAR 20	Type: a cluster of selected attributes which defines any group and distinguishes it from any other grouped attributes. 00: Not applicable 01: Indeterminate 02-99: See attached Type Sheets for type values.
44-45	VAR 21	Item Form: The recognizable body form from sherd remains. 00: Not applicable 01: Indeterminate 02: Bowl 03: Jar 04: Seed jar 05: Indeterminate, but not a vessel or vessel part 06: Figurine 07: Effigy 08: Miniature vessel 09: Pipe 10: Ball 11: Cone 12: Bead 13: Pendant/pendant blank 14: Gaming piece 15: Spindle whorl 16: Jar handle 17: Bowl dipper handle 18: Other Handle 19: Bowl dipper 20: Open gourd

Table 4.1 Preliminary Ceramic Analysis, Additive Analysis Program (Page 5 of 10)

COLUMN NUMBER		
46-50	VAR 22	Item/Lot Weight: The total gram weight of the analysis unit.
51-54	VAR 23	Item/Lot Count: Total number of items of the analysis unit.
55-58	VAR 24	Lot Rim Count: The total number of rim sherds of the analysis unit. 0000: Not applicable
59-62	VAR 25	Lot Modification Count: The total number of items culturally modified after firing 0000: Not applicable.
	VAR 26	Special Handling Status
	VAR 27	Special Handling Status

****

TYPE SHEETS
Cultural Categories, Wares, and Types

VAR 18 MESA VERDE CULTURAL CATEGORY (02)

VAR 19 MESA VERDE GRAY WARE (2)

VAR 20 Types:
02: Chapin Gray
03: Moccasin Gray
04: Mancos Gray
05: Mummy Lake Gray
06: Mancos Corrugated
07: Dolores Corrugated
08: Mesa Verde Corrugated
09: Early Pueblo Gray
10: Late Pueblo Gray
11: Corrugated Body Sherds
12: Unclassifiable Plain Gray
13: Unclassifiable Corrugated
(2-8 are classified solely on the basis of rim or distinctive neck sherds)

VAR 19 MESA VERDE WHITE WARE (3)

VAR 20 Types:
02: Chapin B/W

VAR 20 (cont.) Types:
03: Piedra B/W
04: Cortez B/W
05: Mancos B/W
06: McElmo B/W
07: Mesa Verde B/W
08: Early Pueblo White
09: Late Pueblo White
10: Unclassifiable White

VAR 19 MESA VERDE RED/ORANGE (SAN JUAN RED WARE) (4)

VAR 20 Types:
02: Abajo R/O
03: Bluff B/R
04: Deadmans B/R
05: Early Pueblo Red
06: Unclassifiable Red
07: Late Pueblo Red

VAR 18 CHACO/CIBOLA CULTURE CATEGORY (3)

VAR 19 CIBOLA GRAY WARE, CHACO SERIES (2)

VAR 20 Types:
02: Lino Gray
03: Wide Neckbanded
04: Narrow Neckbanded
05: PII Corrugated
06: Corrugated Body Sherds
07: PIII Corrugated
08: Early PII Neck Corrugated
09: Early Pueblo Gray
10: Late Pueblo Gray
11: No longer used
12: Unclassifiable Gray
(2-8 are classified solely on the basis of rim or distinctive neck sherds)

VAR 19 CIBOLA WHITE WARE, CHACO SERIES (3)

VAR 20 Types:
02: La Plata B/W
03: Whitemound B/W
04: Red Mesa B/W
05: Escavada B/W
06: Puerco B/W
07: Gallup B/W
08: Chaco B/W
09: Chaco/McElmo B/W
10: Early Pueblo White
11: Late Pueblo White
12: Unclassifiable White

Table 4.1 Preliminary Ceramic Analysis, Additive Analysis Program (Page 7 of 10)

VAR 17-4, WHITE MOUNTAIN RED WARE (4)

Types:
02: Puerco B/R
03: Wingate B/R
04: Wingate Polychrome
05: St. Johns B/R
06: St. Johns Polychrome
07: Unclassifiable Red

VAR 18 CHUSKA CULTURAL CATEGORY (4)

VAR 19 CHUSKA GRAY WARE (2)

VAR 20 Types:
02: Bennet Gray
03: Sheep Springs Gray
04: Tocito Gray
05: Gray Hills Banded
06: Newcomb Corrugated
07: Captain Tom Corrugated
08: Blue Shale Corrugated
09: Hunter Corrugated
10: Early Pueblo Gray
11: Late Pueblo Gray
12: Corrugated Body Sherds
13: Unclassifiable Gray

(2-9 are classified solely on the basis of rim or distinctive neck sherds)

VAR 19 CHUSKA WHITE WARE (3)

VAR 20 Types:
02: Drolet B/W
03: Naschitti B/W
04: Taylor B/W
05: Brimhall B/W
06: Early Pueblo Mineral Paint B/W
07: Late Pueblo Mineral Paint B/W
08: Tunicha B/W
09: Newcomb B/W
10: Burnham B/W
11: Chuska B/W
12: Toadlena B/W
13: Nava B/W
14: Crumbled House B/W
15: Early Pueblo Carbon Paint B/W
16: Late Pueblo Carbon Paint B/W
17: Unclassifiable White

(2-7 are Chuska White Ware, Mineral Paint Series: 8-16 are Chuska White Ware, Carbon Paint Series)

Table 4.1 Preliminary Ceramic Analysis, Additive Analysis Program (Page 8 of 10)

VAR 19	CHUSKA RED WARE (4)	
VAR 20	Types:	
	02:	Sanostee R/O
VAR 18	KAYENTA (TUSAYAN) CULTURAL CATEGORY (5)	
VAR 19	TUSAYAN GRAY WARE (2)	
VAR 20	Types:	
	02:	Lino Gray
	03:	Kana-a Gray
	04:	Coconino Gray
	05:	Tusayan Corrugated
	06:	Moenkopi Corrugated
	07:	Kiet Siel Gray
	08:	Early Pueblo Gray
	09:	Late Pueblo Gray
	10:	Corrugated Body Sherds
	11:	Unclassifiable Gray
	12:	Tusayan Applique
VAR 19	TUSAYAN WHITE WARE (3)	
Var 20	Types:	
	02:	Lino B/G
	03:	Kana-a B/W
	04:	Black Mesa B/W
	05:	Sosi B/W
	06:	Dogoszhi B/W
	07:	Flagstaff B/W
	08:	Tusayan B/W
	09:	Kayenta B/W
	10:	Early Pueblo White
	11:	Late Pueblo White
	12:	Unclassifiable White
	13:	Obelisk Gray
VAR 19	TSEGI ORANGE WARE AND TUSAYAN RED WARE (4)	
VAR 20	Types:	
	02:	Tsegi Orange
	03:	Tsegi R/O
	04:	Tsegi B/O
	05:	Deadmans B/R
	06:	Medicine B/R
	07:	Tusayan B/R
	08:	Tusayan Polychrome
	09:	Dogoshzhi Polychrome
	10:	Kayenta Polychrome
	11:	Kiet Siel Polychrome

Table 4.1 Preliminary Ceramic Analysis, Additive Analysis Program (Page 9 of 10)

VAR 20 (cont.) 12: Early Pueblo Red
13: Late Pueblo Red
14: Polychrome Body Sherds
15: Unclassifiable Red
16: Citadel
17: Tallahogan Red

VAR 18 NEVADA/VIRGIN (10)

VAR 19 MOAPA GRAY WARE (2)

VAR 20 Types:
02: Boulder Gray
03: Moapa Brown
04: Moapa Corrugated
05: Virgin Plain Gray

VAR 19 MOAPA WHITE WARE (3)

VAR 20 Types:
02: Boulder B/G
03: Trumbull B/G
04: Moapa B/G
05: Toroweap B/G
06: Virgin Plain White

VAR 18 KAYENTA/VIRGIN (11)

VAR 19 SHINARUMP GRAY (2)

VAR 20 Types:
02: Shinarump Brown
03: Shinarump Corrugated

VAR 19 SHINARUMP WHITE WARE (3)

VAR 20 Types:
02: Virgin B/W
03: Toquerville B/W
04: Shinarump White

VAR 18 MESA VERDE (SAN JUAN) (12)

VAR 19 GRAYWARE (2)

VAR 20 Types:
02: Chapin Gray
03: Moccasin Gray
04: Mancos Gray
05: Mummy Lake
06: Mancos Corrugated

Table 4.1 Preliminary Ceramic Analysis, Additive Analysis Program (Page 10 of 10)

VAR 20 (cont.)	07:	Dolores Corrugated
	08:	Mesa Verde Corrugated
	09:	Early Pueblo gray
	10:	Late Pueblo Gray
	11:	Corrugated Body Sherds
	12:	Unclassifiable Gray
	13:	Unclassifiable Corrugated
VAR 19	WHITE WARE (2)	
VAR 20	Types:	
	02:	Chapin B/W
	03:	Piedra BoW
	04:	Cortez B/W
	05:	Mancos B/W
	06:	McElmo B/W
	07:	Mesa Verde B/W
	08:	Early Pueblo White
	09:	Late Pueblo White
	10:	Unclassifiable B/W
VAR 19	RED WARE (4)	
VAR 20	Types:	
	02:	Abajo R/O
	03:	Bluff B/R
	04:	Deadmans B/R
	05:	Early Pueblo Red
	06:	Unclassifiable red
	07:	Late Pueblo Red

Figure 4.2 Standard Form For Preliminary Ceramic Analysis, D.A.P. Additive Analysis Program.

DOLORES ARCHAEOLOGICAL PROGRAM
U.S. Bureau of Reclamation

PRELIMINARY CERAMIC ANALYSIS FORM

F.S. Numbers _____ through _____

F.S. Page _____

Prepared by _____

Catalog Item Number	Special Specimens		Point Locations	Artifact Form	Technological Attributes							Traditional Type			Item Inventory					F.S. Matches ?
	Type	Number			Atmosphere	Temper	Surface			Paint		Cultural Category	Ware	Type	General Form	Item or Lot Weight	Lot Count	Rim Sherd Count	Modified Item Count	
							Manipulation	Compaction	Cover	Type	Color									

Figure 4.3 Ceramics Inventory Analysis Procedure Flow Chart, D.A.P. Additive Analysis Program.

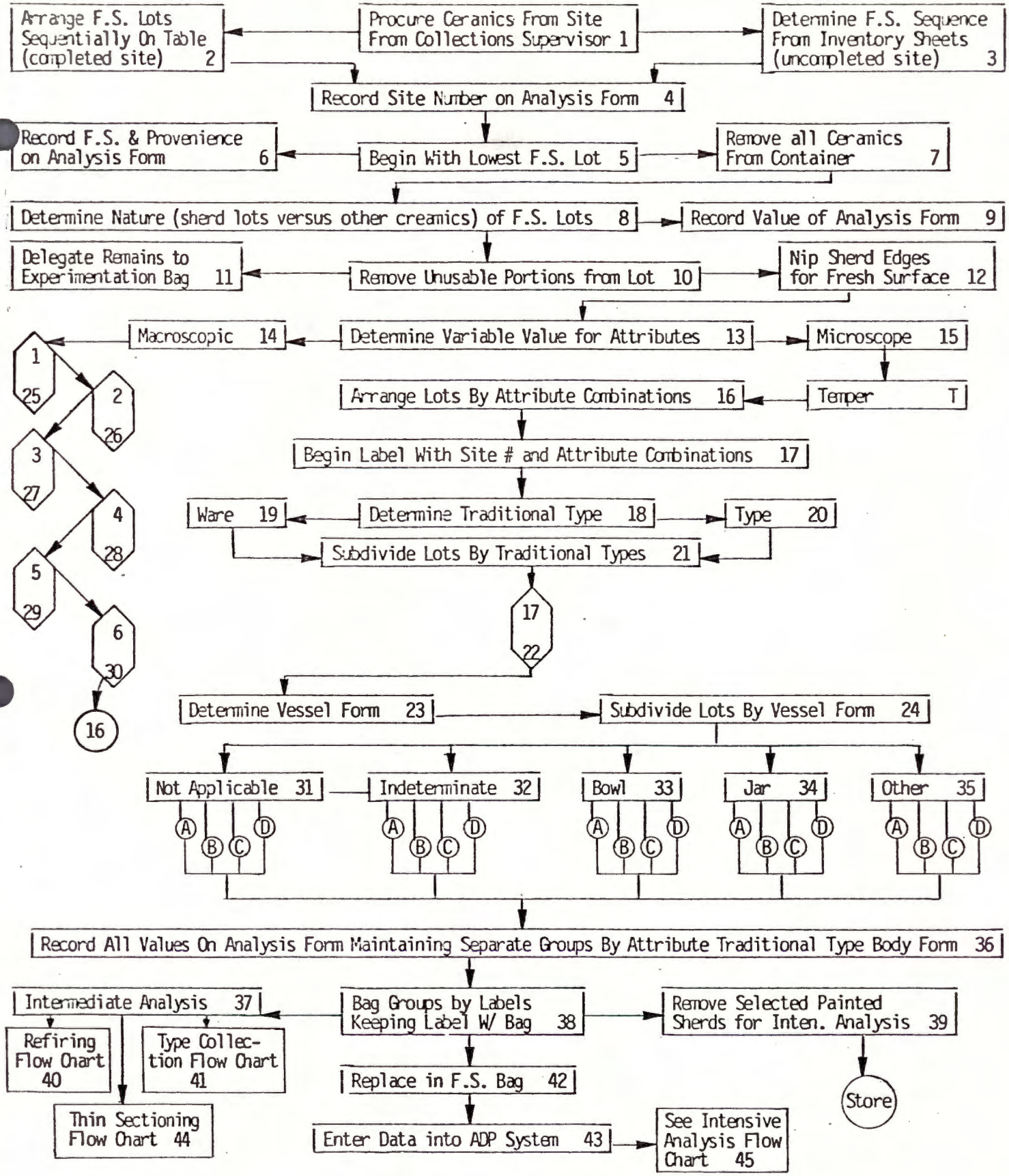

Arrange F.S. Lots Sequentially On Table (completed site) 2
Procure Ceramics From Site From Collections Supervisor 1
Determine F.S. Sequence From Inventory Sheets (uncompleted site) 3
Record Site Number on Analysis Form 4
Record F.S. & Provenience on Analysis Form 6
Begin With Lowest F.S. Lot 5
Remove all Ceramics From Container 7
Determine Nature (sherd lots versus other ceramics) of F.S. Lots 8
Record Value of Analysis Form 9
Delegate Remains to Experimentation Bag 11
Remove Unusable Portions from Lot 10
Nip Sherd Edges for Fresh Surface 12
Macroscopic 14
Determine Variable Value for Attributes 13
Microscope 15
Temper T
Arrange Lots By Attribute Combinations 16
Begin Label With Site # and Attribute Combinations 17
Ware 19
Determine Traditional Type 18
Type 20
Subdivide Lots By Traditional Types 21
Determine Vessel Form 23
Subdivide Lots By Vessel Form 24
Not Applicable 31
Indeterminate 32
Bowl 33
Jar 34
Other 35
A B C D
Record All Values On Analysis Form Maintaining Separate Groups By Attribute Traditional Type Body Form 36
Intermediate Analysis 37
Bag Groups by Labels Keeping Label W/ Bag 38
Remove Selected Painted Sherds for Inten. Analysis 39
Refiring Flow Chart 40
Type Collection Flow Chart 41
Thin Sectioning Flow Chart 44
Replace in F.S. Bag 42
Enter Data into ADP System 43
See Intensive Analysis Flow Chart 45
Store

Figure 4.3

consists of three variables: cultural category, ware and type (Variables 16-18, Table 4.1). The cultural category variable relates the cultural affiliation represented by the ceramics (Kayenta Anasazi versus Shoshonean). The ware variable defines the color/functional subdivisions within each cultural category (e.g., Mesa Verde White Ware). The type variable is a coded numeric for the specific name which has been traditionally applied to ceramics with specific variable expressions.

Although the type placement of project ceramics items is recorded, it was felt that further documentation of the nature of the ceramic remains recovered as a result of program operations was required. Therefore, seven additional variables that are technological in their expression were selected as being discriminating for the description of ceramics (see Table 4.1 for the variables selected and their values). These technological variables (VAR 09-15) will be manipulated through data sorting programs to define the actual parameters of program ceramic collections.

In general, the utilization of a program-specific typology in the preliminary analysis will allow for finer discrimination of the ceramics recovered, and by cross referencing with chronological data, will result in stricter time controls for dating within and between sites. Use of the Mesa Verde Regional typology will allow for interdistrict and interregional comparisons.

The technological variables chosen for inclusion in the inventory analysis were selected from traditional type descriptions as being those attributes which could be used to make technological distinctions and which are applicable to nearly all ceramic remains regardless of their ware category or fragmentary nature (the type diagnostic traits for the

placement of sherds into regional typologies often use attribute models which are restricted to subsets within ceramic collections such as rim form and design formats). As the bulk of the ceramic complement of any one site excavated in the D.A.P. study areas will normally consist of gray ware body sherds (often approaching 90 percent), the need for variables that are applicable across all program collections is evident.

Variable 19 (General Form) was included to record the vessel body shape (bowl, jar, etc.). As it is normally impossible for the analyst to determine body form beyond the jar/bowl dichotomy when dealing with ceramic fragments, no attempt was made to list as variable values all the recognized vessel forms in Anasazi ceramics. Not only is body form indicative of type placement, but additionally functional interpretations of vessel use (storage jars and serving bowls) allow for determination of use areas by ceramic assemblages and type combinations.

The actual procedure used in the inventory level analysis incorporates the 11 variables discussed above as sorting strata. That is, any one FS lot from a site is laid out and divided into subsets according to the different variable values. After sorting, the original FS lot is so divided that each resulting sublot contains sherds that have identical values for all sorting variables. For example, the temper variable (VAR 10, Table 4.1) is employed for the initial separation. If two distinct temper types are represented in the sherds, two separate lots are formed. This procedure is repeated until all 11 sorting variables have been utilized. The provenience and taxonomic data from each sublot is then recorded on a single line of the ceramic data form (Figure 4.2).

The Item Inventory variables (VAR 19-23, Table 4.1) are for inventory data recording. The structure of the general form attribute (VAR 19,

Table 4.1) has previously been discussed. Variables 20 and 21 are two different approaches for quantifying the mass of ceramics within each sublot. An item count and an item weight have both been instituted as a means of gauging which methods provide the most useful interpretation of the amount of ceramics being recovered. As no minimum number of individuals (MNI) quotient has yet been developed for ceramic sherds, one or both of the two amount variables will be used for statements of frequency.

The Rim Sherd Count and Modified Item Count attributes (VAR 22-23 Table 4.1) are designed to record the number of each of those types of sherds in each sublot. The variables were included primarily as a bookkeeping system of markers; if future analysis is required for either rim sherds or modified sherds, the information on their location and affiliation can be easily retrieved.

An additional procedure, which occurs prior to the implementation of the inventory analysis, is the FS Match program. Its intent is the recognition and recording of matching vessel sherds in separate FS lots within a site. Distinctive sherds can be matched with their counterparts in separate FS lots, resulting in an information source to the field archaeologist for the interpretation of the processes of ceramic deposition and reuse. The FS Match system also results in the reconstruction of partial or whole vessels, a useful tool for vessel shape and decoration recognition.

FS Match procedures have been applied to Sites 5MT2191, 5MT2098, 5MT2235 and are presently being conducted on the ceramics of Site 5MT4475. Site 5MT2202 did not contain any FS matches as only 18 sherds were analyzed from the site. A recording form has been drafted for the data resulting

from the procedure (Figure 4.4). Sherds that match with others in other FS lots are removed for their inclusion into a reconstructed ceramic item (RC). The weight of those items and their original FS location (plus any special locational data) are recorded on the FS Match form. Vessel numbers are assigned sequentially within a site and become the permanent recording designation for those items. The column "FS Matches?" on the analysis form (Figure 4.2) is not at present being used.

The column "Special Handling?" is an indicator that an FS sublot or some portion of that lot has undergone special handling. Figure 4.5 reproduces the form that has been devised to document the various types of special handling that are possible. A check mark in the column is used to indicate that certain items have been removed for special handling purposes (i.e., photography).

Current Status

Since the implementation of the inventory analysis procedure in December 1978, the ceramic complements of four excavated sites within the Sagehen Locality and 116 surface collected survey sites of the project area (Bureau of Reclamation Surface Survey) have been processed. Following analysis of each site, as well as the completion of survey materials, a summary report of the basic typological data recorded and a first interpretation of analysis was prepared and delivered to each field archaeologist for inclusion in preliminary site reports (the summary reports did not contain firm descriptive statistics as the required computer program had not been developed). Those sites that have been processed through inventory analysis are Sites 5MT2191, 5MT2198, 5MT2235, and 5MT2205.

Figure 4.4 Ceramic FS Matches Form, D.A.P. Additive Analysis Program.

Figure 4.5 Ceramics Special Handling Form, D.A.P. Additive Analysis Program.

DOLORES ARCHAEOLOGICAL PROGRAM
U.S. Bureau of Reclamation

CERAMIC ANALYSIS: F.S. MATCHES

Site Number | | | | | | | | | |

Prepared by | | | | |

Vessel No. _____ Form _____								Vessel No. _____ Form _____							
Item No.	F.S. No.	Point Location	Weight	Item No.	F.S. No.	Point Location	Weight	Item No.	F.S. No.	Point Location	Weight	Item No.	F.S. No.	Point Location	Weight
0 0 3				0 0 3				0 0 3				0 0 3			
0 0 3				0 0 3				0 0 3				0 0 3			
0 0 3				0 0 3				0 0 3				0 0 3			
0 0 3				0 0 3				0 0 3				0 0 3			
0 0 3				0 0 3				0 0 3				0 0 3			
0 0 3				0 0 3				0 0 3				0 0 3			
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0 0 3				0 0 3				0 0 3				0 0 3			
0 0 3				0 0 3				0 0 3				0 0 3			
0 0 3				0 0 3				0 0 3				0 0 3			
0 0 3				0 0 3				0 0 3				0 0 3			
0 0 3				0 0 3				0 0 3				0 0 3			

Figure 4.4

DOLORES ARCHAEOLOGICAL PROGRAM
U.S. Bureau of Reclamation
CERAMICS
SPECIAL HANDLING FORM

Site Number

Prepared by

Field Specimen Number	Catalog Item Number	Photographic Data				Thin Sectioned	Refired	Type Collection	Design Analysis	Technical Analysis	Illustration	Other	COMMENTS
		Film Type	Roll Number	Exposure	Negative								

Figure 4.5

One site (Site 5MT4475) remains to be inventoried. Analysis is ongoing with completion of the ceramic complement expected by late March 1979. The ceramic complements of the remaining sites excavated in the previous field season are being processed through an identical procedure by C. Breternitz at Washington State University. Cooperation with W. Lucius for data congruity is an ongoing process.

The inventory analysis as outlined above has proven to be an efficient method of preliminary sorting and data reduction. However, the lack of a data manipulation program has prevented full implementation of the analysis and the evaluation of its potential. At the present time the desired program is being put on-line with full operation expected by 15 March 1979.

THE INTERMEDIATE ANALYSES

Due to the lack of appropriate computer programs and needed equipment, the intermediate analyses and their recording procedures have not been instituted. However, the following summary will serve to describe the justification and procedures of the analyses.

Two separate intermediate analyses will be undertaken on selected portions of the ceramic collections. Briefly, computerized random sampling will be used to construct reference collections for the project area, and to select sherds for petrographic thin-section analysis.

Each analysis was designed to fulfill a specific need. Representative collections will be constructed in order to maintain mini-collections from each site and to provide a reference collection for ceramic types. Additionally they will be used for training of project personnel. Petrographic thin-sectioning is being developed in order to systematically verify the visual observations of the tempering agents of the ceramics and identify inconsistencies in temper identification; another goal of this analysis is to identify exotic items in the collections through recognition of foreign tempering agents. A more thorough description of the proposed petrographic analysis is presented in Appendix B, this report.

ADVANCED ANALYSIS

Two separate and complementary approaches for advanced analyses have been proposed but finalization of the procedural frameworks and justifications for these analyses have not been completed.

K. Masterson has proposed an intensive analysis utilizing design element and formats for the definition of finite ceramic groups (Appendix D). With definition of recognizable "styles" it will be possible to study the spatial movement of those ceramics for attributes within program study areas, therefore adding to our knowledge of intersite and intercommunity relationships. In addition, the analysis will be structured to redefine the regional types of painted wares by standardization of the criteria used to determine design format divisions. It is expected that definition of the nature of the change of ceramic design styles through time will also occur. As the analysis is still in the early stages of planning, no articulation of the procedure with the research design was presented in the discussion of the Ceramic Research Design Section.

A refiring/material source sample analysis that directly addresses Problem Domains 1 (Resource Utilization) and 3, Subdomain 2 (Economic Social Organization) is currently being developed (Appendix C). It is designed to document the availability, selective utilization, and technologies of ceramic resource utilization. Interpretations of subsistence and social organization patterns affiliated with that resource are expected to occur as a result of the analysis.

Material source sampling was begun in the fall of 1978 but inclement weather prevented full evaluation of the clay and temper resources and sampling of those deposits. Initiation of the refiring analysis will be

delayed until the material source location program can be resumed.

Finalization of the proposed analyses will occur once the details of the analysis procedures have been completed and the proposals have been securely tied to specific questions of the Problem Domains.

SUPPORTIVE ACTIVITIES

Type Collections

In an attempt to provide a reference library of ceramic types commonly recovered from archaeological contexts, an intensive program of soliciting for typeable ceramics has been ongoing. D. Breternitz, the program Principal Investigator, has supplied materials and expertise for the library as have ceramists from areas adjacent to the project. The development of the reference library is a continuing and expanding part of the ceramics laboratory and is considered an integral requirement for the definition of ceramic types, especially those that occur as trade items.

Bibliographic File

Additionally, a library reference file concerning the various facets of ceramic analysis is slowly being developed. Primarily the references are being located and copied for use by laboratory personnel in the interpretation and reporting of ceramic data. The use of the literature also extends to training of new ceramic personnel. When sufficient sources have been accumulated, the bibliography will be included in an annual ceramics report.

Glossary

As a part of the analysis, development of a glossary of ceramic terms as used in the laboratory or in reports issued from the program has been initiated. The necessity of defining those terms basic to the analytical methodology is considered as a primary obligation. The finalized glossary

will be incuded in any major discussions of the techniques or results of the ceramic analysis program.

Reanalysis of Survey Ceramics

Completion of the 1978 D.A.P. Survey materials pointed out the need for comparative data from the previous surveys of the project area. Therefore, the ceramic materials from the 1974-1976 Dolores River Project surveys were requested from the Bureau of Land Management and those materials were passed through the present analysis routine for inventory analysis. The results of the analysis will be used for comparison with 1978 survey data to provide a broad data base concerning known sites in the project area. At present the materials from surveys prior to 1974 have not been obtained for reanalysis.

CONCLUSION

It should be apparent that one main theme present in the discussions of the ceramic program and its constituent levels of analysis is the intent to clearly define the criteria of the taxonomic classification being used to reduce the data from the ceramic complements into a form which is useful for addressing questions of the problem domains of the research design. This definition will allow for not only a well documented basis for the derivation of testable hypotheses but also for recognition of cultural activities based on the discriminating abilities of the ceramic types.

The use of mass data storage and manipulation by statistical programs available in computer form is an integral part of the analysis design. High speed correlations of the relationships between provenience data and typological classifications will allow form recognition of trends, and so aid in the development of specific hypotheses concerning the placement and constituency of ceramic remains.

One of the main obstacles in the way of smooth operation of the ceramic program has been the lack of a suitable computer data storage and manipulation program. With finalization of that program, expected to occur by 15 March 1979, a more complete exposition of the nature of the ceramics program and its results should be available.

APPENDIX A

DOLORES ARCHAEOLOGICAL PROGRAM
CERAMICS RESEARCH DESIGN

by

William A. Lucius

INTRODUCTION

The following manuscript was drafted to define the role of ceramics analysis in relation to the general research design of the D.A.P. It should serve as a guide for evaluation of the ceramics laboratory operations and specific research being proposed by the laboratory for advanced analysis of portions of the data being recovered. The intent of this draft is not to explore all possible applications of the ceramic data being recorded, but rather to define the types of data being recovered, the priorities of the analysis, and the articulation of each analysis with the general project research design.

This manuscript will not summarize the D.A.P. General Research Design (Kane et al. [2]) but rather will refer to specific portions by Problem Domain and/or Question being addressed. D. Breternitz, Senior Principal Investigator, has specified the format for research proposals which was followed for the presentation of the advanced analysis proposals (Appendices B, C, and D).

THE INVENTORY ANALYSIS

The inventory or "rough-sort" analysis has been in effect since December, 1978. Its primary objective is to inventory all ceramic materials within a framework of provenience, typology, and numerical summaries in a computer coded format. The analysis was structured to allow for sorting of the resultant data utilizing one or any combination of sorting variables. The coding sheet for those variables selected for the analysis constitutes Table 4.1 in the body of this report. Figure 4.2 of this report is the computer coding sheet being used for documentation of the data. The analysis provides a data base which represents the ceramics universe of the D.A.P. and allows for any subdivision of that population (e.g., the weight of all bowl sherds with quartz sand temper from the Sagehen Flats Locality).

Definition of the structure of the inventory analysis can be best demonstrated by a detailed description of the steps followed to pass a sherd lot through the analysis routine. FS lots of ceramics are received for analysis from Bureau of Land Management (BLM) temporary material storage ordered by site of collection. As a sherd lot passes through the analysis, it is subdivided into smaller lots until each final lot expresses the same values for the attributes being utilized for the analysis. Labels containing the pertinent data of each lot are made for each division and placed with the ceramics in a small plastic bag which i returned to its parent FS bag at the end of analysis for that FS lot. Th data from each slip of paper is placed on one line of the computer data form. The subdivisions of the FS by lots are maintained through BLM permanent storage stage for ease of retrieval of desired lots.

The provenience variables are those which have been standardized for all analyses of project materials. FS lots 1 through n are possible for any one site. Sublots 1 through n are also possible for the divisions within an FS lot and cotnrol of those lots is accomplished by the use of Catalog Item Numbers. These are assigned sequentially to lots within the parent FS lot beginning with 004 (see Figure 4.2, body of this report).

Major separation of the FS lot begins with the typological variables. The analysis is structured to require the analysts to record values for seven technologically relevant attributes prior to the assignment of a traditional type to the sherds. The use of the artifact form variable allows for retrieval of nonsherd (whole or partial vessels) items from the data. The seven technological variables were selected as those most deterministic for the delineation of type categories. K. Masterson is at present developing a recording procedure for documentation of the stylistic elements which lead to type definiton. At present design elements and their layouts are being used to determine a type placement of painted ceramics but those attribute values are not being recorded. The addition of stylistic attributes to the recording procedure will ensure comparability of data.

Once the ceramics have been subdivided into categories by their expression of the seven technological variables, further division occurs as each sherd is evaluted for traditional type status. A modified Mesa Verde regional typology (Breternitz et al. [3]) was instituted to document the typological placement of the ceramics.

Final division occurs when the sherds are separated into bowl or jar forms. Definition of the parent shape for sherds was included to allow for sorting of the ceramic complement of any FS lot or combinations for

distributional studies.

After final divisions have been made, the numerical data, including weights, counts, and number of rim sherds, and modified items within the sublots, are recorded. The column labeled FS matches is not being used.

Sherds smaller than a thumbnail (1 1/2 cm or less) are automatically discarded prior to the analysis. However, if only one such sherd is present in an FS lot, analysis is completed despite the size of the item. Additionally, sherds with only one remaining surface are generally discarded as it is normally impossible to document the vessel form being represented.

The inventory analysis procedure represents the initial structuring of ceramic data into a format which provides for inventory data as well as a data base for input into reports, evaluation of hypotheses, and a universe from which to obtain selected samples for further analysis.

Inventory analysis is of critical importance as it provides the data base for all further utilization of ceramic information. The analysis is properly considered as having three stepwise aspects. Analysis of the sherd lots is followed by recording of the resultant data onto the computer forms. Computer input and editing then occurs. At present ceramics lab personnel are charged with the responsibility of computer input. Thus the problems and minor errors which have crept into the analysis can be recognized and often corrected.

Selected level priority is the use of selected inventory level data in the development of descriptive reports. As the status of the ADP system has precluded such reports through the fiscal year, brief preliminary reports were drafted to describe the basic nature of the ceramic materials from those sites excavated during the 1978 field season.

Recent refinement of the ADP capabilities will allow for statistically based reports concerning the nature and amount of the ceramics from all excavated and surveyed sites of the project area. The following reporting format will be used to structure the data from all excavated sites. A similar outline also will be used for the surveyed sites--including the Dolores River Project surveys, Bureau of Reclamation 1978 and D.A.P. 1979 surveys--with deletion of those items not applicable to unexcavated sites.

I. Populations (primarily tables)
   A. Total ceramic inventory
      1. Sherd counts
      2. Sherd weights
      3. FS lots containing ceramics
   B. Ceramics by type (percent of total by weight and count)
      1. Mesa Verde (Dolores) Cultural Category
         a. White Ware
         b. Gray Ware
         c. Red Ware
      2. Other Cultural Categories
         a. White Ware
         b. Gray Ware
         c. Red Ware
      3. Unidentified ceramics
   C. Distributional Studies (percent of total count and weight)
      1. NP (no provenience)
      2. Fill provenience
      3. Structural provenience
      4. Study Unit provenience
      5. Special provenience (burial features, etc.)
   D. Special Categories
      1. Worked sherds
         a. By type
         b. By provenience
      2. Bowl/Jar Forms
         a. By type
         b. By provenience
      3. Other forms
         a. By type
         b. By provenience

II. Interpretational Narrative
   A. Temporal assignments
      1. Begin/end dates for study units
      2. Begin/end dates for the site

B. Trade (exotics)
   1. Density
   2. Direction
   3. Supportive dating by exotics
C. Differentials
   1. Site typology as indicated by ceramics
   2. Use area assignments as indicated by ceramics
      a. By ceramic forms (functional interpretations)
      b. By ceramic density (SYMAP mapping)
D. Ceramics summary

Third level priority will be assigned to a project ceramics report. In order to reduce repetition of the basic procedures, rationales, and typologies in individual site reports, and to summarize the results of the individual site reports, a summary report will be written to state the basic nature and bias of the analysis procedure and its results. The following outline will be followed.

I. Introduction
II. Rationale
   A. The Research Design
   B. The structure of analysis
III. The populations
   A. Excavated sites
   B. Surveyed sites
IV. The typological framework
   A. Review of Mesa Verde ceramics
   B. Type definitons of D.A.P. ceramics
V. Dating
   A. Chronological controls
   B. Trade ceramics
VI. Foreign interactions
   A. Density
   B. Directions
   C. Change over time
VII. Other uses of ceramic data
   A. Site typology
   B. Use area analysis
      1. Functional studies
      2. Mapping studies
VIII. Problems
IX. Summary
X. Appendices
   A. Glossary
   B. Summary data tables
   C. Bibiography

The preceding discussion has dealt with the definition of the types of data being generated by the inventory analysis and the priorities of ordering portions of that data into usable information. In general, the inventory analysis has been developed to order ceramics into a system which provides data in a form amenable to approaching questions of the general research design. The analysis itself does not articulate with the research design. Table 4.A.1 graphically displays how data from the analysis is expected to provide input into the various reports which will in turn address the various problem domains of the research design.

Table 4.A.1 Articulation of Ceramic Analyses with the General Research Design

Domains and Questions		Inventory	Petrographic	M/S refiring	Stylistic
PD 1	1		S	S	(The articulation of the analysis with the research design is at present unknown.)
	2	I	S	S	
	3		S	S	
	4				
	5				
PD 2	1				
	2				
	3				
	4				
	5				
PD 3					
SUBD 1	1	I			
	2				
	3	I		S	
SUBD 2	4	I		S	
	5			S	
	6			S	
	7			S	
SUBD 3	8				
	9				
	10				
SUBD 4	11				
	12				
	13				
	14				
	15				
PD 4	1	I	I	S	
	2	I	S	S	
	3	I	S	S	
	4	I	S	S	
	5	I	S	S	
	6	I	S	S	
PD 5	1	I	I	S	
	2	I	I	I	
	3			I	
	4			I	
	5			I	

S = Specific Input
I = Incremental Input

INTENSIVE ANALYSES

In order to develop data concerning specific problem domains of the research design, advanced analysis procedures have been formulated. Problem Domains 2 and 5 (Paleodemography and Culture Process, respectively) will not be initially addressed by any of the advanced analyses. However, incremental input into Problem Domain 5 will accrue from the intensive analyses.

Due to the desire to limit the scope of the ceramics research to manageable proportions, the advanced analyses will initially concern themselves with the Sagehen Flats Locality of the project. Sagehen was selected as a topical area due to its concentration of excavated sites complemented with survey information. In addition to providing a cross-section of excavated sites from approximately A.D. 625 (Site 5MT4545) to A.D. 1100 (Site 5MT2235)--thereby providing a platform for temporal variability studies--the locality contains several defined communities with contemporaneous sites for studies requiring synchrony.

After initial evaluation of the data and the methodology of the advanced analyses in relation to the Sagehen Flats Locality, it will be feasible to apply the successful techniques to other localities. Additionally, the results of the Sagehen Flats topical research will provide a model of ceramic interpretation against which other localities can be compared. In general the advanced analyses are concerned with extrasite relationships ranging from the interaction of communities all the way to regional interpretations. The reporting format of the inventory analysis will in turn discuss intersite variability, including dating and use area analysis.

The advanced analyses represent an attempt to integrate the separate but complimentary orientations of the Ceramics Staff Specialist and the Ceramics Consultant into a holistic approach for addressing specific problem domains of the research design. Thus the stylistic expertise of K. Masterson will lead to interpretations of social organization (Problem Domain 3) while the technological orientation of W. Lucius will approach the problem domains of resource use and applied technology (Problem Domain 1, Problem Domain 3, Subdomain 2), and foreign relationships (Problem Domain 4). The resulting program is expected to lead to data and interpretations of the research design which would be less complete if only one specialist were contributing.

The following discussions of the advanced analyses are summations of the research proposals which have been submitted to the project. The research proposals are attached as Appendices B, C, D, and E and should be referenced for specific questions which may arise. The articulations of each proposal with the general research design are listed in Table 4.A.1.

Petrographic Analysis

Petrographic analysis of selected samples which are assumed to be representative of each class of tempering agents appearing in the project sherd collections will be undertaken. The intent of the analysis is two-fold: petrographic analysis will initially define the mineralogical constituents which characterize each temper type and relate them to the geological classification of origin; this initial stage then is verification of the classifying variable (temper) as having validity by geological scrutiny. The petrographic analysis additionally will characterize the temper sufficiently to allow for determination of source

location. Four sites in the Sagehen Flats Locality will be used to evaluate the range of temper types represented. A random sampling program will be applied to the inventory data to extract one sample of each temper type extant in each site to be thin-sectioned.

It is apparent from the inventory analysis that the overwhelming cultural choice is for the use of locally available river cobbles as aplastic agents. It is therefore assumed that any other tempering agent represents nonlocal manufacture. Characterization of those minerals will allow for evaluation of their location and thus allow for statements as to their foreign or local availability.

Selection of the samples to be thin-sectioned will be undertaken as soon as the sites being sampled (Sites 5MT2193, 5MT2235, 5MT4475, and 5MT4545) have undergone inventory analysis. The sample sherds will then be submitted to a petrographer for analysis. Following receipt of the data and interpretations of the analysis, source location and evaluation will occur.

The petrographic procedure will result in direct information input for evaluation of Problem Domains 1 and 4, resource use and intercultural interaction respectively. The determination of resource availability and use will result from the evaluation of aplastic use while the definition of exotics will allow for input into the direction and nature of the foreign relationships as indicated by ceramic trade.

Material Source/Sherd Refiring Analysis

A program of clay resource documentation will be undertaken in conjunction with refiring of selected sherds in order to determine the prehistoric utilization of ceramic resources in the Sagehen Flats

Locality. Potential clay sources will be located within a 5 km radius of Site 5MT2193 by archaeological survey techniques and sampled employing standard project material source sampling procedures. Selected sherd samples will be derived from Site 5MT2193 by random sampling (25 percent level on locally made ceramics) and will undergo refiring at standardized time/temperature rates to allow for comparisons with the fired clay samples. A stepwise comparison will begin by comparisons of color between fired clay and refired sherds. Matches will be examined further for comparable natural inclusions (shell fragments for example) to further correlate the samples and sherds. Matches will then be sent to a specialist for x-ray diffraction analysis for final verification of the matches.

It is assumed that clay resource utilization is directly related to distance and that local clays will be used differentially between ceramic manufacturing sites. Characterization by refired color and by inclusions will lead to verification of resource use by x-ray diffraction and allow for comparison of clay uses among ceramic manufacturing locales. It is postulated that it will be possible to define the manufacturing location of each ceramic complement and trace its movement. The analysis is the test case to define the methodology and affirm the assumptions that have been drawn from observation of the preliminary analysis.

Priority of the analysis is the selection of sherd samples from the inventory data base. Refiring of those sherds will follow. After documenting the variability in the refired sherds, the survey for location of clay sources will begin. One km radii will be inspected with refiring of all clay samples within the first radius being accomplished and compared to the sherd samples prior to initiation of the second radius.

Matches based on color and inclusions will then be sent to a specialist for x-ray diffraction tests. If the analysis proves feasible and informative, a proposal will be submitted to increase the scope of the analysis to other sites in the Sagehen Flats Locality.

The analysis articulates with Problem Domain 1 of the general Research Design as it is concerned with the documentation of the availability and utilization of resources. It is also predicted that input into Problem Domain 3, Subdomain 2 will occur concerning the production distribution, and consumption of ceramic items.

Stylistic Analysis

Refer to Appendix D for a discussion of the preliminary outline of the stylistic analysis as submitted by K. Masterson.

APPENDIX B

A RESEARCH PROPOSAL FOR PETROGRAPHIC ANALYSIS

by

William A. Lucius

Scope

Selected sherds from four sites located in the Sagehen Flats Locality will be thin-sectioned for petrographic evaluation of their tempering agents and identification of local versus imported ceramics.

Preliminary Research

Inventory analysis automatically aggregates the sherds in each site into temper categories, and temper has been shown as indicative of the locus of manufacture.

Conceptual Framework

The criterion for the definition of exotics is the utilization of materials, designs, and technologies other than those defined as being statistically predominant or available in the study area (Problem Domain 4, Question 2). Preliminary analysis has defined the predominant and available tempering material as crushed rock. It is proposed that those tempering agents other than crushed rock (termed andesite/diorite) represent nonlocal imports.

Sampling Strategy

The population universe for each of the four sites being sampled will have been determined by preliminary analysis. The sampling strategy will use the temper types defined by inventory analysis to draw one sherd from each temper category by use of a computerized random sampling program. All sherds with unknown temper will be sampled at a 100 percent level. Due to the strict definitions of temper classes developed by the

ceramic lab and the placement of nonidentifiable tempers into an indeterminate category, any one sample should be representative of its class.

Analytical Assumptions

By definition, exotic ceramics will at minimum exhibit nonlocal temper. Petrographic analysis, in addition to defining the mineralogical constituents of each major temper type and all unknown temper types, will allow for correlation of the various tempering agents with their parent source. Taxonomic classification of the tempering agents has allowed for the variability within each major class of minerals. The uncertainty of the location of the parent source will be approached by field checks of expected sources and consultation with geological specialists.

Analytical Techniques

The analytical techniques involved in accomplishing thin-section petrographic analysis are documented in Kamilli [4], Kamilli and Lamberg-Karlovsky [5] and in Warren [6]. The results will take the form of descriptive summations of the variety of tempering agents and their mineralogical constituents. Also statements as to source locations and therefore distance from the project area will result.

No alternative procedures or techniques for satisfying the needs of the analysis are known.

Work Time Expenditures

Time estimates cannot be made as the duration of the analysis and reporting procedure is dependent on the petrographer as well as on the number of sherds to be analyzed. Approximately 30 sherds are indicated as

requiring analysis. The time required for deriving the samples is not expected to exceed five person hours.

Required coordination would be with the ADP specialist and the petrographer. Computer time and personnel will be required for the derivation of the random sampling procedure. It is not planned to enter the resultant data into the computer.

Articulation with Research Design

Questions 1-3 of Problem Domain 1 concerning the availability and utilization of resources will be directly addressed. Problem Domain 4, the identification and intepretation of exotics and their movements will be investigated. Incremental input into Problem Domain 5, Question 1 will accrue from the analysis as the four sites selected for testing (Sites 5MT2193, 5MT2235, 5MT4475, and 5MT4545) represent a continuum from approximately A.D. 650-1100 and therefore will allow for a diachronic viewpoint.

APPENDIX C

A RESEARCH PROPOSAL FOR MATERIAL SOURCE/SHERD REFIRING ANALYSIS

by

William A. Lucius

Scope

Material source samples collected by survey techniques will be compared with selected sherds from Site 5MT2193 to determine clay source utilization by a ceramic manufacturing site.

Preliminary Research

The sherds to be used have been classed into traditional types by the inventory analysis. Clay resources will be treated as entities.

Conceptual Framework

The criteria for correlation of clays with ceramics are as follows:

1. Under standard conditions of firing, the raw clay and the sherds made from that source will exhibit the same color due to the presence of naturally occurring iron particles in the clay.

2. Raw clays and sherd samples can be matched by the presence of similar natural inclusions in those samples previously correlated by color.

3. X-ray diffraction analysis can verify the correspondence of clays and fired ceramics.

Sampling Strategy

All trade (exotic) and grouped types (Basketmaker III-Pueblo I Gray) will be deleted from the sampling universe. The remaining population will be random sampled by use of a computer program which will extract samples at a 25 percent level based on type designation as defined by the inventory analysis. Approximately 400 sherds will be analyzed to ensure representative data.

Clay sources will be recovered by a stepwise survey technique of 100 percent sampling of an area around Site 5MT2193. As sherd samples will have been processed through the refiring prior to the initiation of survey, it will be possible to determine the number of clay sources represented. Initially a 1 km radius around the site will be surveyed and the resultant clay sources will undergo firing and comparison prior to the second 1 km survey. A savings in the survey effort will be effected if the clay sources are located close to the site.

Analytical Assumptions

It is postulated that the clay sources further than 5 km from the site were not normally used for body pastes due to the distance of transport and the availability of suitable clays within a shorter distance (Arnold [7]).

Also, it is believed that individual clay sources, with exception of multiple outcrops of a single clay type, are dissimilar enough to be characerized by the three correlation criteria outlined above.

Given that clays are local and defineable, it is assumed that specific clays can be correlated with specific manufacturing sites and therefore it should be possible to trace the movement of ceramics from site to site within a synchronic viewpoint.

Uncertainty is being controlled by the multiple testing of matching sources and sherds as well as by the limitation of the study to a site without diachronic problems. Site 5MT2193 appears to meet the criteria for a manufacturing site as raw clay, possible tools, and kilnlike features have been documented.

Analytical Technique

Sherds selected from the site will be broken in half with one portion being retained as a control sample. The remaining portions will be fired to a temperature of 950° centigrade in the lab muffler kiln under controlled time and temperature parameters. Colors and natural inclusions will be recorded.

Each clay source will be sampled for one liter of clay, one half of which will be levigated with water and screened through 40 mesh screen to retrieve the natural inclusions. The other half will be reserved as a control sample. The used portion will be formed into test tiles and fired under the same regime as the sherd samples and compared as to color and inclusions.

Streak plate colors will be assigned Munsell values to document the color of sherds and clay. If matches occur in color and/or inclusions, samples will be subjected to x-ray diffraction to verify the correspondence.

No alternate procedures are known.

Work Time Expenditures

Time costs cannot be predicted as the number of clay sources present and the matches between clay sources and sherds are unknown. The time required for x-ray diffraction and results cannot be determined until the sample size is known.

No special equipment needs are anticipated. Cost of the x-ray diffraction analysis will depend on the sample number and the specialist contracted to do the analysis. F. Leonhardy should be contacted for determination of the contractor.

Coordination would be with the ADP specialist and the analysis contractor. No data processing needs other than the derivation of samples from the inventory analysis is expected. The resulting data is not expected to be computerized.

Articulation with Research Design

The proposal articulates directly with Problem Domain 1 as it concerns the availablility and utilization of resources. Also it is expected that Problem Domain 3, Subdomain 2 will be addressed concerning the production, distribution, and consumption of ceramic items.

APPENDIX D

A PROPOSAL FOR A MULTILEVEL DESIGN ANALYSIS OF THE DOLORES ARCHAEOLOGICAL PROGRAM CERAMICS

by

Kellie Masterson

The purpose of this proposal is to outline a multilevel ceramic design analysis program to fit within the requirements of the Dolores Archaeological Program Research Design. It is necessary at this time to develop a stylistically oriented analysis program. This must be done to determine chronologically and spatially sensitive design variations on both a micro- and macrolevel for the pottery recovered from the project surveys and excavations. These observed variations may then be incorporated into the typological studies and the intensive, problem-oriented analyses.

It must be stated at the outset that this proposal is primarily limited to the development of a methodology for design analysis rather than topically restricted research problems. It deals strictly with the graphic designs found on Anasazi painted pottery although the methodology outlined here is applicable to other types of decorated items. One of the problems with a proposal of this type is that it must necessarily be general. The validity and usefulness of design studies for the questions posed within the problem domains is established. What remains is to develop a method through which ceramic design data on a variety of artifacts may systematically be observed and collected.

The collected data will be applied to a number of different studies from typological analyses to the intensive analyses. Internal comparison between sets of attributes can isolate relevant attributes for studies of ceramic change. Comparisons with other data sets, e.g., metric and surficial characteristics of the ceramics will help to define variation within the established types. In addition, the design analysis may be used to identify interaction groups (Redman [8]), both social and functional, in order to answer some of the research questions. At this

time there are no plans to attempt to identify individual potters as Hill [9] and others have done. Consequently, those criteria used to identify individual craftsmen will not be included in this proposal. Should it be decided later that such a problem is worthy of study, an analysis program may easily be developed.

The program outlined in this proposal will deal with three levels of design composition: elements, motifs or configurations, and structure or design layout. This program is roughly based on Redman's studies of Mimbres pottery for the Cibola Archeological Research Project (Redman [8, 10]). Redman has designed a hierarchical, nested typology using four levels of analysis: (1) technological and functional characteristics; (2) design configuration; (3) design elements; and (4) metric characteristics including the size, shape, and paint attributes of the ceramics. The design configuration refers to the total design symmetry, type of field partition, and design panel type. Design elements refers to the identification and characterization of the individual components of design (elements and motifs are considered together in this scheme). Metric characteristics reflect the tool and motor habits of the potter. These attributes include the width of painted lines and individual elements and the frequency of hatching in a design. This program will be restricted to the identification and description of design configuration, elements, and motifs. The other attributes considered in Redman's study are included in the initial analysis of the Dolores ceramics; e.g., paint type, tempering material, and vessel form.

Three levels of design analysis have been used on Southwestern ceramics. These levels are conceived of in terms of increasing complexity of design organization: (1) elements; (2) motifs; and (3) composition and

structure (Shepard [11]). Symmetry analysis is subsumed under composition and structure.

Design elements are the simplest regular parts of a design. They have been referred to as the basic, irreducible elements of design; they are the smallest, self-contained units. Motifs or configurations, the second level of design analysis, are arrangements of one or more elements. These arrangements are often complex and difficult to recognize. However, the repeated occurrence of specific configurations of elements on the same vessel and on others may be significant and aid in the identification of both elements and motifs. Ethnographic evidence suggests that modern potters deal with design in terms of motifs rather than elements (Bunzel [12]; Friedrich [13]); thus it is expected that the classification of elements will be difficult.

The third level of design analysis is the study of the composition and structure of design. The purpose of this type of analysis is to identify the original outlines and major divisions of the design field, that blank area on the surface of the pot that is to be decorated. Motifs and elements are then fitted into the overall pattern provided by the layout of the design structure. The composition and structure are generally described using geometric terms (Amsden [14]; Shepard [15]). Symmetry analysis is merely one method by which the composition and structure of a design may be described.

Each level of analysis is appropriate to a specific kind of archaeological data. A study of design elements and motifs may be done on a wide range of ceramic remains from sherds to whole pots. However, this type of study is commonly used with sherds since only a relatively small portion of the total design is necessary for analysis. An analysis of

otifs can be done on those sherds with a sufficient amount of the design intact, and on whole and partial pots. The study of composition and structure is generally limited to those whole and partial pots with most of the design still observable. Symmetry analysis may be applied to both elements and motifs although it is usually used for the total design.

Attempts have been made to apply these levels of design analysis to various problems with varying degrees of success. The most common use of design elements and motifs has been in the description of pottery types. (There is no methodological distinction between elements and motifs in the majority of reports cited here; these terms are used more or less interchangeably.) The role of design elements and motifs in these reports is to categorize a style or type of pottery by a group of elements and motifs in order to facilitate comparisons with other pottery styles or types. Much effort has been expended to standardize the nomenclature used to describe elements and motifs. The most notable attempt to this end has been the work of Douglas and Raynolds [15]). Discussions of the use of elements and motifs in this context are to be found in a number of other publications as well (e.g., Colton [16]; various Museum of Northern Arizona Ceramic Series Bulletins).

Other studies have used design elements and motifs for purposes other than the usual type descriptions. Hill [17] and Longacre [18] used a combination of both elements and motifs to distinguish postmarital residence patterns and lineages. Plog [19] has borrowed the techniques of Hill and Longacre and used them to examine the degree of interaction between communities. Friedrich [13] has dealt with the interactions between groups of potters and the formation of styles of design on this level. All of the above mentioned studies (with the exception of

Friedrich) have the same weaknesses. As Plog [19] has pointed out, the methods of design classification must be improved. The design classification on which these previous studies are based was created as a result of intuitive ideas, usually based on the work of earlier typologists, as to what constitutes a discrete design motif or element (Hill [17]; Plog [20]). There are no explicit techniques by which elements are defined or their relative importance determined. No distinction is made between what may be a discrete class of design elements or personal idiosyncrasies. The entire basis of these studies is subjective and, in most cases, cannot be duplicated (Plog [20]). In addition, there are some indications that the incidence of clusters of design elements and motifs is restricted to specific localities or regions. These clusters of elements and motifs cannot easily be used to describe or classify ceramic collections from other areas (Friedrich [13]).

A number of studies have been done using composition and structure to categorize design classes and describe spatial and temporal variation within and between groups. The majority of these have used design layout, that is, the regular, geometrically patterned division of the design field. Papers by Amsden [14], Beals et al. [21] and others illustrate the uses to which this method can be put. This method has proved to be more successful in the study of design perhaps because the recognition of design composition and structure is more direct and easily quantified for descriptive purposes.

The use of symmetry analysis to describe pottery designs was first suggested by Brainerd [22]. Shepard [11] formalized the procedure and applied the technique to ceramic collections from the Southwest. Recently

there have been a number of studies using this technique (Washburn [23]; Zaslow and Dittert [24]).

There has been little overt criticism of the methods using composition and structure. Recent summaries of design analyses have been favorable and lack critical comments on these studies (Plog [20]; Watson [25]). Shepard has pointed out, however, that there is no general, all-inclusive system for the classification of design structure. This is particularly relevant with respect to the studies of design layout.

One of the major drawbacks of the previous studies has been the subjective method by which elements and motifs are identified. In order to avoid biasing our perception of the elements and motifs used by the Dolores potters, much of the earlier work on defining design elements (e.g., Douglas and Raynolds [15]) will be disregarded. In order to obtain a systematic view of designs used in the Dolores area a new system of classification must be developed. Unfortunately, the element of subjectivity cannot be entirely eliminated in the identification of elements and motifs. The extreme fluidity with which these components were used by potters makes them difficult to isolate. This program will use Shepard's [11] and Friedrich's [13] criteria to identify elements and motifs. Briefly, elements are the basic irreducible units of design. The repetition of these elements to form motifs should aid in identifying these components. The reoccurrence of simple geometric figures in a variety of arrangements will help to isolate the elements.

The proposed system would classify elements on the basis of geometric shapes; e.g., triangles, quadrilaterals, and circles. These are then broken down further into subclasses of the primary shapes; e.g., right triangles, scalene triangles and equilaterial triangles, much as Redman

[8] has done. These are further reduced by distinguishing the types of filler within the various shapes. See Figures 4.D.1 and 4.D.2 for an example of the tentative classification of elements. This will undoubtedly be revised; it is only an example, drawn up without reference to the designs on the ceramics. The greatest effort will be in the initial classification and isolation of the elements. Once a master chart is formed, analysis should go fairly smoothly. Hopefully, by reducing elements to their basic geometric shape, this classificatory scheme will prove to be general enough so that it may be applied to other collections for comparative purposes.

Motifs are composed of one or more design elements. They may be classified in a variety of ways depending upon the elements forming them. These design elements may be classified into two groups according to their function in the design. Primary elements are painted first. Secondary elements are optional and their location in the configuration depends on depends on the type of primary element used (Friedrich [13]). Secondary elements may be grouped by their shapes or by their position with respect to the primary elements. Motifs may be classified according to this or according to the manner in which the primary elements are recombined or repeated. See Figure 4.D.3 for an example of the various ways motifs may be grouped (adapted from Friedrich [13]). While this is a very untraditional method, Friedrich has used it with great success to study the transmission of designs throughout the community. It will, in addition, provide us with an insight into the methods of construction of motifs.

There will be a number of procedural questions with this classificatory scheme for elements and motifs. The main problem will be establishing consistent definitons for elements and motifs and distinguishing

Figure 4.D.1 Example of Tentative Classification of Design Elements.

Figures 4.D.2 Example of Classification of Design Elements on Rim Sherd.

Figure 4.D.3 Example of classification of motifs by various methods.

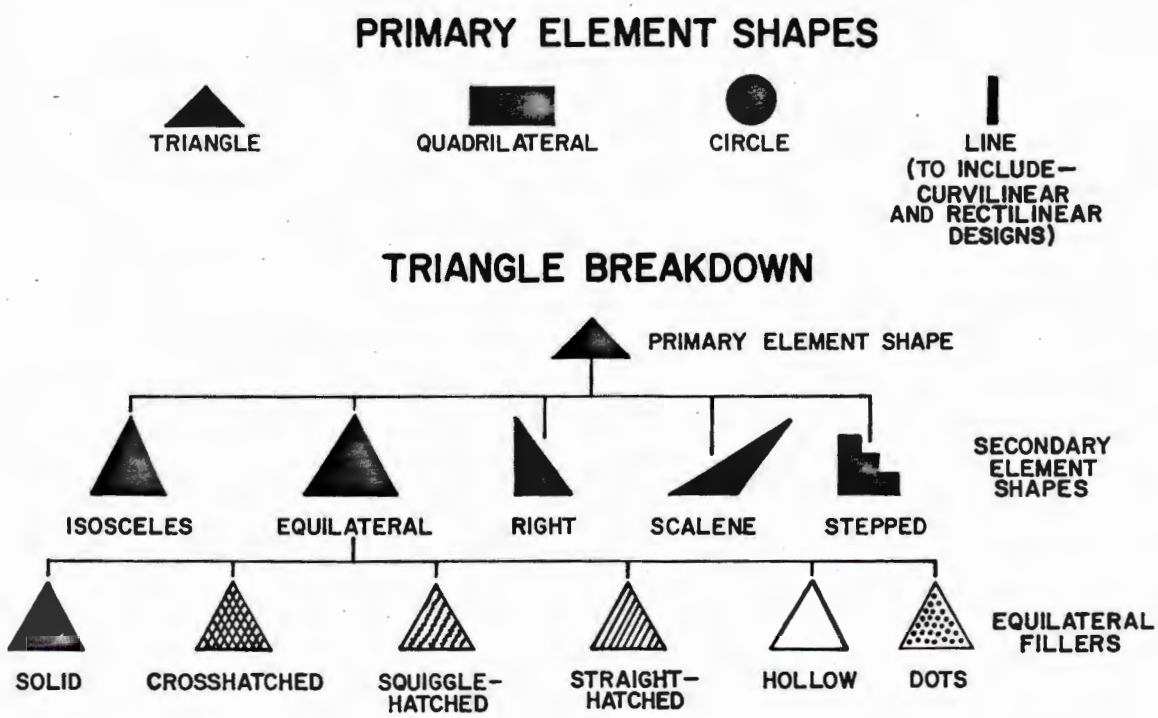

Figure 4.D.1 Example of tentative classification of design elements.

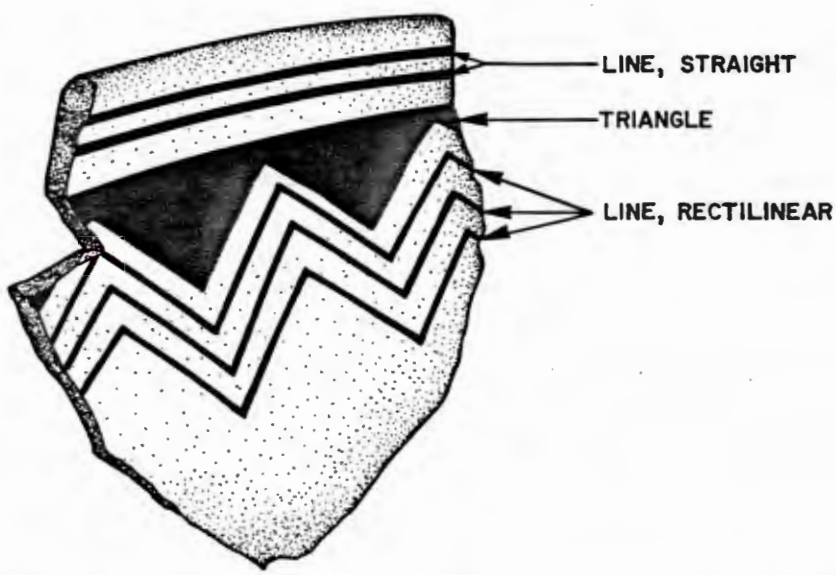

Figure 4.D.2 Example of classification of design elements on rim sherd.

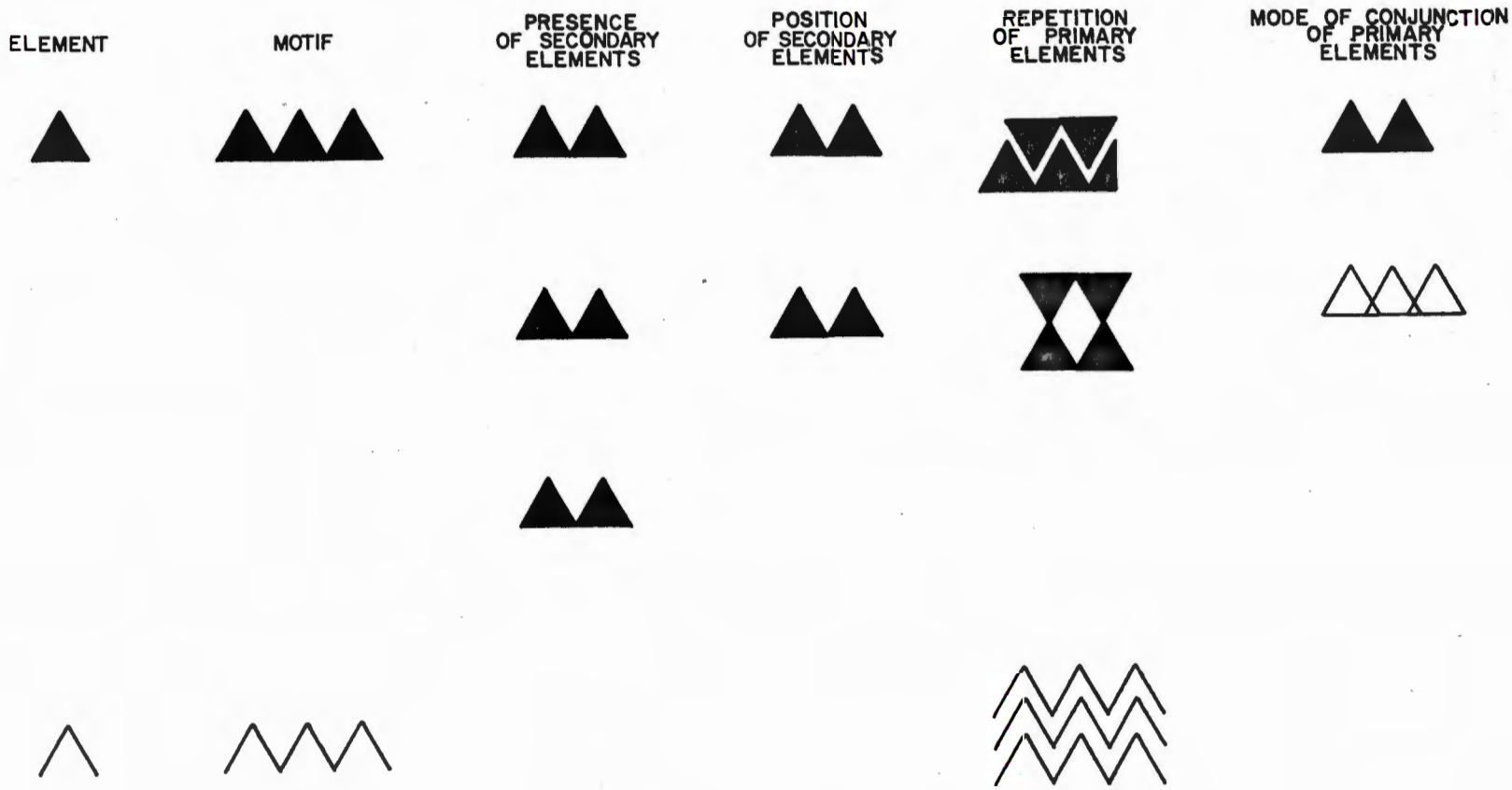

Figure 4.D.3 Example of classification of motifs by various methods.

between the two. For example, a diagonally hatched, equilateral triangle is classed as an element but it could also be considered as a motif with the triangle as the primary element and the hatching as a secondary element. Both are possible with the classification scheme as outlined. Such questions can be resolved only through examination of the data.

Classification of design structure and composition is the most straightforward process. Perhaps because it is not commonly included in the majority of design studies, there are fewer alternatives as to how the structure and composition of a design may be described. This proposal will use the methods outlined by Shepard [11]. Designs are classified according to their overall structure, field partitions, and panel type. The occurrence of particular motifs with specific field partitions and vessel forms will be noted. The total design symmetry, both the symmetry of the structure and the design will be analyzed according to the procedures established by Washburn [23].

This is perhaps the most interesting design analysis that will be done on the Dolores ceramics. It is the least equivocal in terms of the methods used and the phenomena being observed. It has great potential for regional studies of trade and culture change.

The sample size is, in part, dependent upon the individual studies that will make use of the data. In general, however, the numbers to be dealt with will be limited by the size of the sherd. A sherd must show a sufficient portion of the design in order to be analyzed for elements and motifs; for this a virtually complete element or motif must be present. Whole and partial pots show no such size restrictions: all specimens can be analyzed. Whole and partial pots will probably not occur in numbers great enough to overwhelm the analyst. Presumably the requirements of a

particular study will determine the initial selection of proveniences to be sampled. The limitations of the design requirements for sherd size will reduce the sample size further. Good chronological associations, besides those associations implicit in the type name itself, are required for chronological studies. Independent means of dating are necessary to maintain the integrity of the study. Intensive analyses, designed to define the interaction of social and functional groups, will require meaningful contextual association such as house floors, activity areas, or burials. Once the relationship between certain ceramics and specific contexts is firmly established then ceramics may be used to predict certain situations. Again, the selection of certain proveniences will limit sample sizes, which will be reduced still further by the size requirements of the sherds. Should a sample still remain of unmanageable size, a statistical sampling strategy may be implemented.

This is a brief outline of the proposed methodology for the design analysis of the Dolores Archaeological Program ceramics. It has been derived from a variety of other such studies; notably, Friedrich [13]; Redman [8, 10]; Shepard [11]; and Washburn [23]. The methods proposed here have been used previously and will be modified to fit the needs of the project.

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