

Examining Variability and Provenance through Ceramic Petrography at Chavín de Huántar, Perú

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Submitted in Partial Fulfillment of Master of Arts in Anthropology

Stanford University

May 20, 2015

Acknowledgments

I wish to thank my advisor, John W. Rick, for his guidance throughout this project and for his role in introducing me to the archaeology of the Andes and the amazing site of Chavín de Huántar. I would also like to thank my second reader, Justin Leidwanger, for his support and advice on ceramic petrography.

Additionally, I would like to thank:

- Isabelle C. Druc for her guidance and tutelage
- César Sara Repetto for his help in choosing the sample and setting up the macroscopic analysis
- Rosa Rick and Maria Mendoza (and Proyecto Arqueológico Chavín de Huántar) for their generosity with logistical support and resources
- Stefanie Bautista for her help in setting up the database and analysis guide for the macroscopic analysis
- Kenneth Beefus for his instruction in geological petrography
- Alan Greene for his advice on ceramic analysis and theory
- Edilberto Mena for preparing the thin sections
- the Stanford Archaeology Center and its staff and faculty for supporting me in my academics over the years
- Undergraduate Advising and Research at Stanford University for providing the funding for this research.

Finally, I wish to thank my parents, Neil and Michele Marsh, and my brothers, Kevin and Brian Marsh, for their constant and invaluable support of my education.

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Abstract

This paper relates the methodology and results of recent research using the analysis technique of ceramic petrography on pottery from the site of Chavín de Huántar, a Middle and Late Formative Period site in the Peruvian Andes that was constructed and utilized as a ceremonial center during the first two millennia BCE. The goal of the project was to analyze composition and determine provenance, in terms of raw materials sourcing, of ceramic materials from various contexts within the site to examine intra-site variability of pottery between contexts as well as possible evidence of interactions with other areas. This research encompassed the process of selecting fragments for thin-sectioning from a larger sample of sherds analyzed at the macroscopic level as well as the subsequent petrographic analysis of these samples. Different fabrics were defined primarily based on type, size, frequency, maturity, alteration, and other characteristics of the inclusions present to reflect significant differences in materials and processing used in the production of this pottery.

Study of the composition of these fabrics allowed for claims to be made about their general provenance and differences in processing of materials. Furthermore, it elucidated patterning in variability in fabrics when compared with contextual, morphological, and decorative data from the sherds. One of the major trends observed is that there is a greater variety in pastes found at the monumental core of the site as opposed to the residential area across the river, and that most of the La Banda fabrics could have been produced in the immediate vicinity of the site, in the river valley. Meanwhile, much of the pottery from the ceremonial center would have required at least some transport of raw materials or finished products, likely from the surrounding higher elevations. Also, the fragments from later stratigraphic layers at the

ceremonial center generally have a very distinctive crushed-rock-temper fabric, possibly corresponding to deposits from post-Chavín occupations.

Overall, the data seem to support current theories about Chavín as a ceremonial center, with artifacts being brought in from different places and by different people, although there is no definitive evidence for very long-distance travel or trade found in this dataset. There does seem to be a distinct compositional and stylistic divide between pottery from the residential and monumental areas, which could correspond to the use of the monumental core as a center for ritual which attracted diverse contributions while the residential area probably produced its own ceramics for more domestic use from materials local to the valley. This could suggest that control over and participation in ceremonial activities at the site was not the domain of the general local population, but was rather under the authority of a different entity, or multiple entities, with the ability to appeal to a wider audience.

Introduction

Chavín de Huántar is an archaeological site from the Early Horizon, around 1000 to 200 BCE, in the Central Andes of Peru. The site is located in the Callejón de Conchucos, a steep and narrow valley near the Cordillera Blanca at 3,200 meters above sea level in the Department of Ancash, Peru (see Figure 1). It is situated on the land at the juncture of the Mosna and Wacheqsa Rivers which flow down the Cordillera. Chavín has long inspired speculation about the character of the society that originally built and utilized the ceremonial center, which consists of various monumental structures, labyrinthine passageways, subterranean canals, and large-scale lithic art. The site has been interpreted as anything from the “birthplace of Andean civilization” to an imitator of earlier sites to a pilgrimage center of cult worship (Tello 1960, Burger 1992, Rick 2004). Various projects have undertaken excavations at the site, researchers have examined a myriad of its materials, and it is now a notable tourist attraction as a UNESCO World Heritage Site. Based on the research done up until now at Chavín, the prevalent theory among current scholars is that the site was actually the ritual center of a cult, or possibly multiple ones with distinct customs and ideologies, competing for support from the region’s populace, as well as competing against other contemporaneous sites for prestige and power (Rick 2014a and 2014b).



Figure 1. Map of Peru showing Lima and Chavín de Huántar. Shapefile of Peru and its departments, courtesy of geocommons.com.

Comparisons can be made between Chavín and other sites within the region of the Central Andes during the same time period. Sites roughly contemporaneous to Chavín, from the Early Horizon, include Garagay, Ancón, and Pacopampa. These sites tend to exhibit stylistic similarity with Chavín in their material culture, incorporating elements such as anthropomorphic figures and stylized felines, birds, and reptiles into their work, as well as featuring similar architectural characteristics such as plazas sitting within U-shaped raised architectural features (Lumbreras 1981, Donnan 1982). However, each site seems to have its own distinct version of this shared style, and the manners and materials in which it is expressed vary from site to site. Therefore, it is generally thought that there was some sort of cultural cohesion across the region

during this time period, but that the different sites were more or less functioning independently (Rick 2004). It remains open for debate whether Chavín or some other site exerted particular influence or acted as the first innovator of the tradition, or whether the sites developed more or less contemporaneously and adopted or modified the iconography and perhaps the ideology expressed by the others in a reciprocating manner.

In this examination of thin sections of ceramics from Chavín, the goal was to gain a better understanding of Chavín's role in the region by looking at the production and origin of some of its material culture. By observing patterns of variation within the fabrics from Chavín, it was possible to make interpretations about intra-site variability and differentiation among the people and activities involved in the site. This research has contributed to understandings of production and use of material culture at the site, and it has also allowed for the determination of strategies for future research that would be able to add onto these advances. With further analyses in the future and more extensive sampling, as well as comparison with geological samples from throughout the area and ceramic samples from other sites from the same time period, it would be possible to more precisely determine the origin of the ceramics to aid in more accurately defining Chavín's role within Andean civilization by evaluating the amount of trade or interchange, possibly as a result of pilgrimage, implied by the ceramics present at Chavín de Huántar.

Background on Chavín and Its Material Culture

Excavations at Chavín de Huántar have revealed extensive architecture and large quantities of high-investment artifacts, structures, carvings, and other worked forms of various materials (discussed in various publications including Burger 2008, Lumbreras 1989 and 1993,

Mesia 2007, Rick 2004 and 2008, Rick and Lubman 2002, and Tello 1960). For example, the monumental core of the site consists of five massive platform structures, at least three plazas (there are likely others remaining unexcavated), extensive systems of galleries and canals running within and underneath the structures and plazas, and various other features. Many of the stones used in the architecture weigh more than several tons, and in many cases gallery roof beams would have had to have been raised to significant heights to be put in their places. Massive investment in labor and resources must have been needed to build the monumental core of Chavín. While there are recurring construction patterns throughout the site, such as sunken plazas bordered on three sides by structures, different sectors of the site display different styles of architecture, and access to different areas of the site is often physically restricted. Analyses of construction have revealed a very complex series of phases adding on to the buildings and features built in the first phases (Kembel 2001). It appears that construction was ongoing throughout Chavín's use as a ceremonial center.

Numerous items of material culture have been found at the site that seem to have served purposes beyond utilitarian functions. Lithic art is very prominent at Chavín, and often it is worked in extreme detail and would have required many hours of labor and great skill to create. Perhaps the most notable examples are the tenon heads from the walls of the principle buildings and the anthropomorphic carvings of the Lanzón, Tello Obelisk, and Raimondi Stela (see the previously listed references for more on the material of Chavín, including the worked stone) Numerous conch-shell trumpets, often intricately carved, have been found at the site, the most notable occurrence being in the Caracolas Gallery where a large number of the trumpets were found as if they had been stored there, probably for ceremonial use (Rick and Lubman 2002). Beads fashioned from seashells as well as the shells themselves have been found, and therefore

either the raw material or the finished product had to travel a significant distance to arrive at Chavín from the coast. Vessels fashioned from stone and extremely long projectile points that are unlikely to have been wielded in combat or hunting, of both flaked and ground stone, are among the other items that appear at the site. The preceding examples are only a much abbreviated summary of the vast diversity of material culture found at Chavín that seems to have served ceremonial or ritual purposes.

The ceramic material at Chavín, which is the subject of this paper, is extremely varied, ranging from undecorated cooking vessels to highly elaborate vessels with plastic decoration. The more high-investment vessels tend to be fine blackwares with very high polish, and take a variety of forms. Some are bowls of varying wall form with incised and stamped decoration, usually using a similar set of motifs in different arrangements, but never identical. Many of the fragments from the residential area of La Banda exhibit this stamped decoration, although many are also coarse, undecorated, and seemingly utilitarian. Another form of vessel found at the monumental center is the stirrup-spout bottle. Examples of this style exhibit modelling in the form of draconian figures and swirling lines or incision with avian or floral figures, among many other designs. These bottles follow various stylistic affinities, such as those from the Ofrendas Gallery (Lumbreras 1993), and many are found broken in the canals that run beneath the monument. There are myriad other styles of ceramic vessels, and some have cinnabar, graphite, or other substances caked in and coloring their incisions. There are also small figurines and beads, though some of these are from occupation of the site by later peoples.

Some previous analyses focusing on composition have been carried out on ceramic materials from Chavín with similar research questions to the ones of this project. Petrographic, X-ray fluorescence, and INAA work conducted by Druc (1998 and 2004) demonstrated that raw

material resources shifted from volcanic to intrusive-rich compositions over time. Furthermore, there was internal paste variability that suggested the work of different producers, and the adjacent highland Callejón de Huaylas and coastal valleys were identified as the locations of provenance of some of the materials. The studies done by Salazar and colleagues (1986) on samples from surface finds and a gallery by Mössbauer spectroscopy, INAA, and XRD pointed to mostly local production and firing in a reducing atmosphere with a final oxidation stage. In contrast, their analysis of pottery from the Ofrendas Gallery suggested mostly non-local provenances for this context, with compositional groups generally corresponding to the different styles present (Lumbreras et al. 2003).

The great variety of material culture at Chavín, and especially that which would have required high investment of time and resources, is suggestive of the use of the site as a ceremonial center drawing in people and materials from different areas. The ceramic studies discussed in the previous paragraph showed evidence of non-local materials being deposited at the site, further supporting this. The petrographic analysis presented in this paper has expanded upon this evidence and allowed for further interpretations about the nature of pottery deposits at both the monumental core of Chavín as well as the residential area of La Banda.

Theory of Ceramic Studies and Petrography

This paper relies on ceramic analysis as its main technique for understanding some of the material culture and its social implications at the site of Chavín; however, ceramic analysis is a broad category that covers a range of techniques, each with its own merits and drawbacks. The wide variety of technologies that can be used in analysis of archaeological pottery can sometimes make it difficult to decide which to use. A project carrying out indiscriminate ceramic analysis can wind up in a sea of data that seems to answer no specific question or lead to any coherent

conclusions. Furthermore, the abundance of ceramic fragments in the archaeological record only adds to the data swamp. Therefore, it is important for any investigation of ceramic material to be focused and to have specific questions to answer before beginning analysis (Rice 2006). This can also lead to problems, though, as a determined agenda can lead an analyst to find just what he or she wants to find, ignoring alternative observations or possible explanations.

It is also important to remember that pots cannot be equated with people. There are myriad ways in which pottery can reflect or actively reinforce social status, portray individuality or ethnicity, or be consciously or subconsciously styled. Without ethnographic or historical evidence, it is hard to know whether two distinct styles of pottery represent two different ethnic groups, two different families within the same ethnic group, two rival bands trying to show their distinct identities, or other countless possibilities (Dietler 1998, Gell 1998, Van der Leeuw 1993). Often, the answer is a combination of factors, some of which the potters themselves may not even recognize as being at play. The archaeologists using pottery in interpretations must be sure to not jump to simple assumptions when the situation may be, and often is, quite complex.

Due to this complexity, pottery studies can seldom, if ever, yield unquestionably conclusive results, and it is important to acknowledge this when presenting interpretations. However, the fact that an analyst will never know exactly what a specific pot meant the person who owned or used it, why a certain style arose in an area when it did, or why a specific clay source was chosen to make a particular vessel, does not mean that pottery studies can't reveal useful insights about the past. Narrowing down the realm of possibilities through careful study of pottery to determine a set of plausible answers to a research question can result in a clearer idea of past society while not reducing its complexity with overly simple conclusions. Furthermore,

certain questions, such as ones about trade or exchange, differentiation of production, or unequal access to resources can lend themselves to more solid answers within limits.

Petrographic analysis of thin sections, the main analysis technique used for this paper, involves examining 30-micron-thick slices of pottery samples under a polarized light microscope and using the optical properties of minerals and other components of the material to determine their nature and origin. This analysis can provide valuable information about particle structure and inclusions, surface treatments, and alterations due to firing, as well as many other characteristics of the ceramics (Rice 1987: 379). In addition to determining what materials went into making the ceramics, it is possible to obtain information about the techniques used, such as coiling, wheel-throwing, or slab building (Druc 2001: 71).

In this project, it has been especially important to keep in mind certain limitations of the techniques used. Developing a typology or any sort of categorization of ceramics can be problematic in that it may use certain criteria for distinction that may not have been recognized by the actual potters (Hardin 1979, Kempton 1981). This study was an attempt to understand variability in the pottery analyzed in terms of physical attributes that allow for differentiation and comparison, which may or may not have been recognized by the potters themselves. In some cases, clear differences in choice of materials for ceramic fabric likely reflect a conscious act by the potters that they knew distinguished their particular pottery from that of others. In other cases, the choice may simply have been based on convenience or access to resources; however, this still results in differentiation that can lead to significant interpretations for the purposes of this research.

The fabric analysis also brings up the problem of attributing materials to sources. There is nothing to say that potters in the past used clay found in the exact spot where a comparative

sample was taken for the project, and the use of tempers from other locations adds further complications. However, while it is hard to pinpoint an exact clay source used for a vessel, it is much more feasible to determine the general area from which it came (Arnold and Bishop 1991). For the purposes of this project, this more general sourcing is actually quite useful in itself for making interpretations about variability within the site and the distances and possibly effort involved in making the pottery. One of the most important things to be aware of in performing analysis on archaeological pottery is the limitations of each particular technique and the complexity of the area of study as a whole. Although it may sometimes be tempting to oversimplify an interpretation, the less certain and more complicated interpretation is not necessarily worse.

Previous Macroscopic Analysis and Selection of Sample

Since the focus of the current study was on exploring the variability found within Chavín de Huántar and its pottery, contexts from which to analyze fragments were chosen, with the aid of John W. Rick and César Sara, in order to encompass as much of this variability as possible within a limited sample (see Table 1 for brief descriptions of the contexts, recorded by Proyecto Arqueológico Chavín de Huántar, for the fragments used for the petrographic analysis). Therefore, several contexts were selected from the ceremonial core of the site, also referred to as the monument, and several were selected from the residential sector of La Banda, drawing primarily on material from recent excavations. Two different canals, Canal 2 and Canal 6, as well as the unit above the access point to Canal 6, were sampled because of the large quantity of highly-decorated ceramics found there and because of the proposed ritual nature of the canal deposits. The contexts from La Banda were chosen from recent excavations containing a variety

of ceramic types, from coarse wares probably used for cooking or storage to finely decorated bowls. It was possible to determine the general contemporaneity of most of the layers sampled by contextual relationships and pottery styles: the contexts were from Chavín occupations (roughly 1000 to 550 BCE) except for those from the unit above Canal 2, which are fill layers possibly from post-Chavín occupations from the centuries after Chavín, with quite a bit of Chavín material still mixed in.

Unit	Levels	Description
CdH-EC-CE2 O	1	Deposit in Canal 2 of the Esplanade of Building C at the Monument
CdH-EC-GG15 NE/CE6 E02	3 Rasgo 1	Deposit in Canal 6 of the Esplanade of Building C at the Monument
CdH-EC-GG15 NE/CE6 E09	3	Deposit in Canal 6 of the Esplanade of Building C at the Monument
CdH-EC-GG15 NE/CE6 O	2	Deposit in Canal 6 of the Esplanade of Building C at the Monument
CdH-EC-HH15 NE	2, 3	Unit over the access point to Canal 6 of the Esplanade of Building C at the Monument; fill layers
CdH-LB N604 E676	6	Fill at La Banda
CdH-LB N606 E674 Cuadrante NE	6	Fill at La Banda
CdH-LB19-CSW	9	Between walls with lenses of carbon near a funerary context at La Banda
LB-S3-U9	6, 7 Estructura 1A	Associated with a hearth at the intersection of two walls at La Banda
LB-S3-U9-C1	5	Near the intersection of two walls of uncertain function at La Banda
LB-S3-U9-C2	5	Near the intersection of two walls of uncertain function at La Banda
LB-S3-U9-C3	5	Near the intersection of two walls of uncertain function at La Banda
LB-S3-U9-C4	5	Near the intersection of two walls of uncertain function at La Banda
LB-S3-U9-C5	6	Near the intersection of two walls of uncertain function at La Banda

Table 1. Table of units and levels from which ceramic fragments were taken for the petrographic analysis, and brief descriptions of these contexts.

Before carrying out a systematic petrographic analysis, it is of great utility to carry out a macroscopic (in this case a low-powered digital microscope was used as a tool, but the term “macroscopic” is used to make the distinction between this and the petrographic analysis clear) ceramic analysis of fragments from the contexts of interest. The macroscopic analysis done for this project is detailed in Marsh and Druc (2015) but is summarized here. In the summer of 2013, a database and analysis guide was created and filled in with information about contextual, morphological, stylistic, and decorative attributes of the 303 fragments composing the sample from the site of Chavín de Huántar (drawing upon methodologies discussed in Orton et al 2013, Rice 2006, and Sinopoli 1991). Then, a digital USB microscope (a Dino-Lite AM413ZT Polarized Portable Digital Microscope) was used to view and photograph the paste of each fragment with approximately 55-85x magnification.

Using these photographs, the sherds were separated into fabric groups based on characteristics such as inclusion type and size, inclusion frequency and distribution, firing, and porosity. These groups were established across all contexts, and from the fabric groupings and the macroscopic data recorded, variability in fabric was compared across space, time, vessel type, and other dimensions to observe patterning within the site. This yielded interesting results by itself; however, the petrographic analysis of the ceramic thin sections chosen from among the fragments of the macroscopic sample has greatly added to this research.

A total of 75 sherdes, with a few from each macroscopic fabric group, were selected for petrographic analysis (see Appendix 1 for a condensed data table containing information about

each sample). The selections were made, with the aid of Isabelle C. Druc, John W. Rick, and César Sara, based on various attributes including presence of unique decorative features or ones representative of a typical style found at the site, diagnostic features allowing for determination of vessel form, and distinctive finish or firing. Samples were chosen that seemed very representative of the paste of each group as well as those that seemed to be slight outliers to cover the variety present within each group. For the petrographic analysis, previously described, it was necessary to obtain 30-micron-thick slices of the chosen ceramic fragments to analyze their mineral content and structure in order to determine provenience. The preparation of the samples for this project was done in Lima by Edilberto Mena.

The research goal of this petrographic analysis was to help confirm the paste groupings established from the macroscopic analysis and to allow for a more in-depth examination of the variability found in Chavín ceramics. It also was aimed at the sourcing, at least in terms of local versus non-local, of the materials used in the pottery to shed light on possible trade and exchange or pilgrimage interactions among Chavín and other sites or localities within the region. By adding to the body of knowledge on production and transport of material culture found at Chavín, information on ceramic production and trade could aid in the process of establishing a more accurate understanding of Chavín's function as a ceremonial center within the broader context of the Formative Andes.

Petrographic Analysis

Once the thin sections had been made, a polarized light microscope (a Zeiss Axio Scope.A1) was used to analyze the petrographic samples (this was following an initial rapid assessment performed with Isabelle Druc with a portable digital microscope to get an idea of the

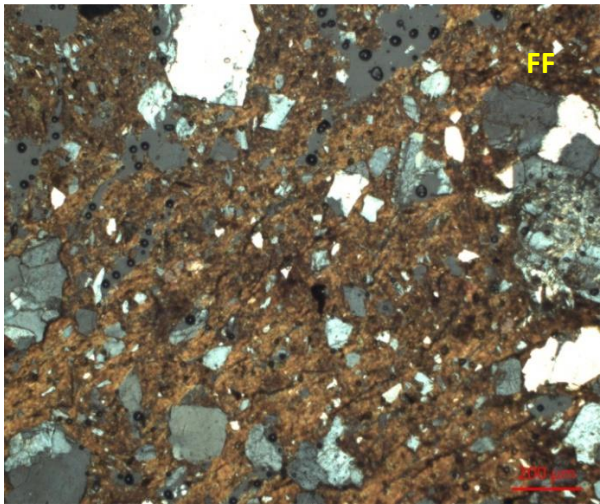
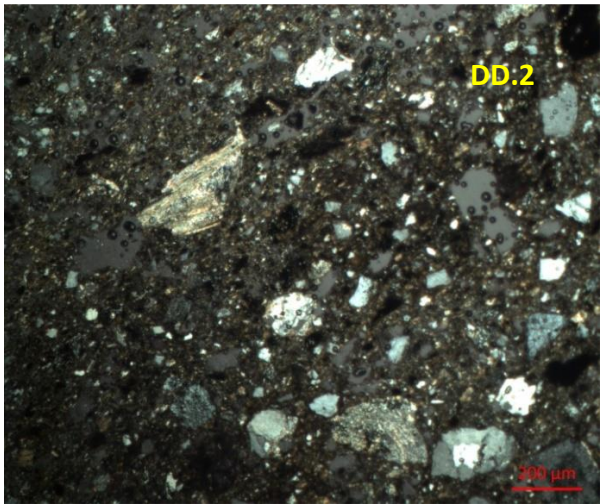
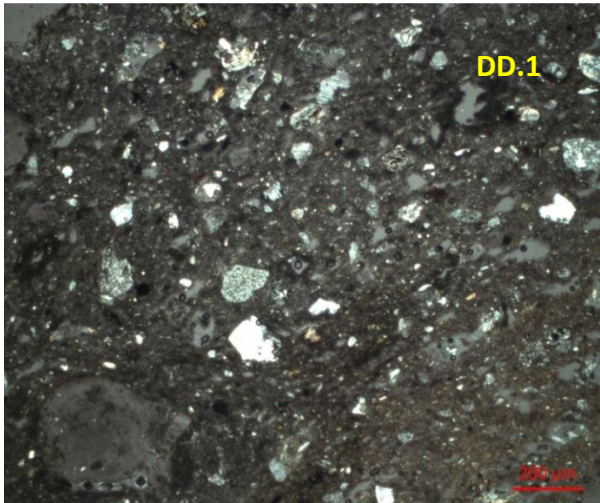
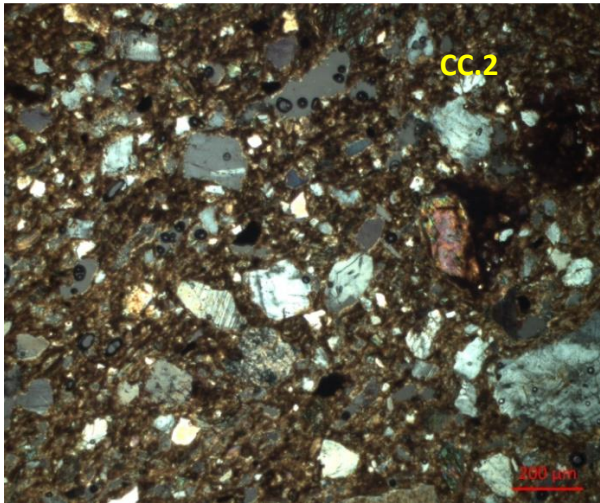
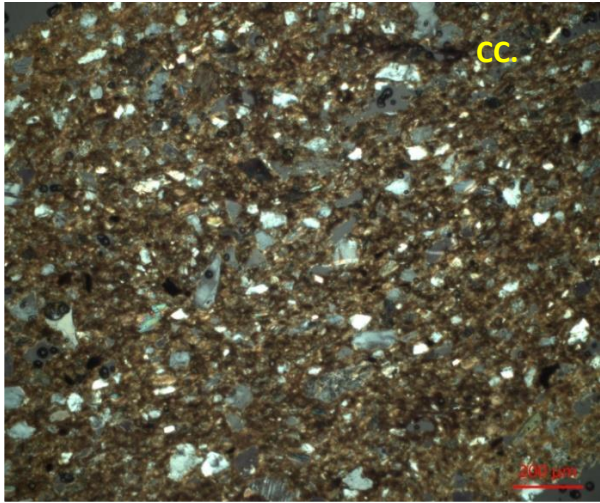
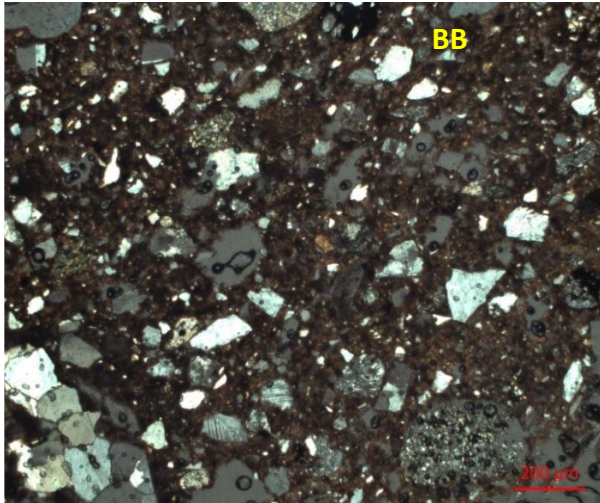
variability present in the samples). This analysis was done without reference to the macroscopic paste groupings in order to avoid biases from the previous categorization. First, each sample was observed under the microscope and brief notes were taken on the characteristics of the fabric, focusing on type, frequency, sorting, angularity, alteration, and other characteristics of the inclusions present. During this process, if certain fragments seemed to have similar fabrics it was noted in the description, but at this point the samples weren't formally assigned to groups.

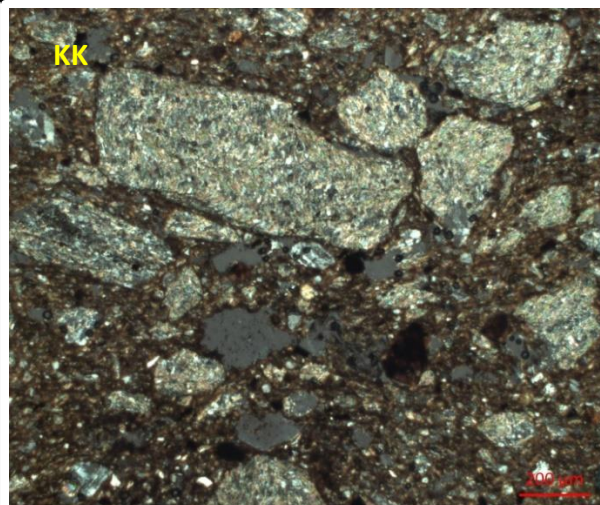
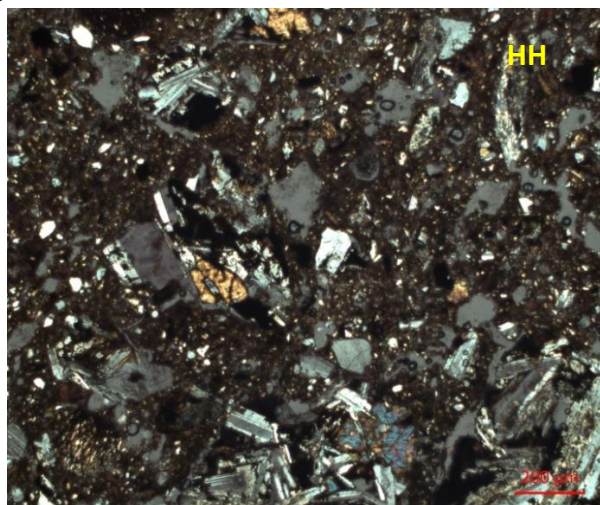
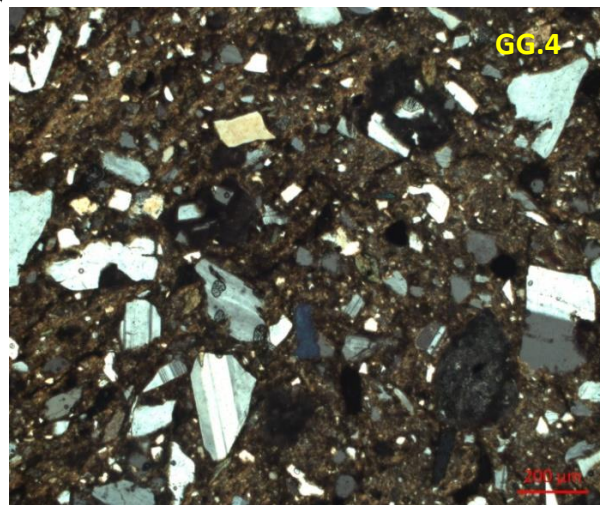
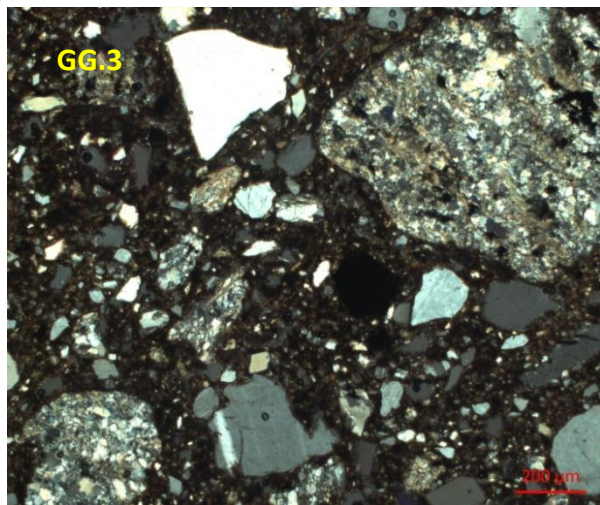
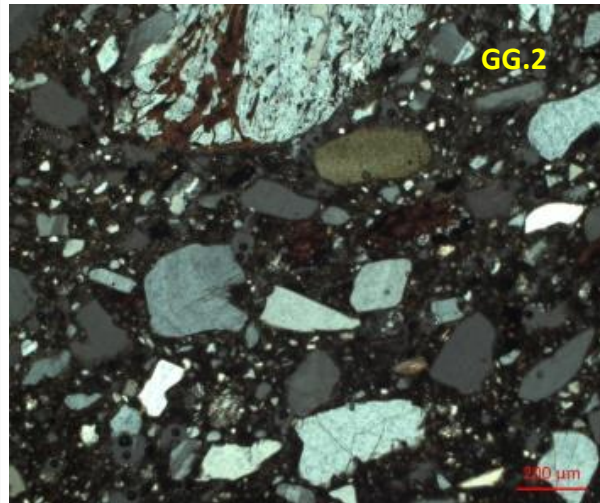
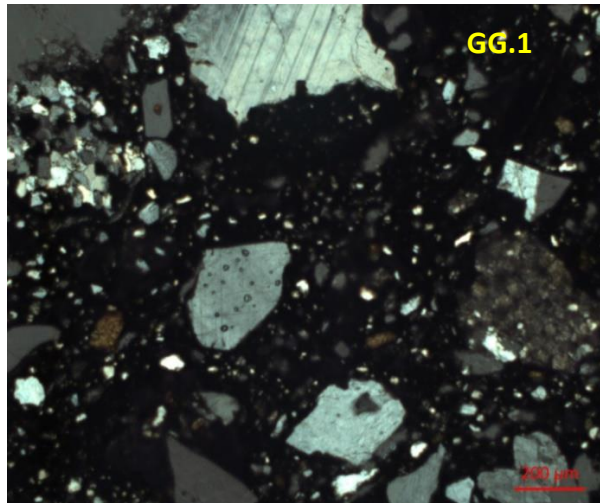
The next step was the establishment of fabric definitions based on compositional similarities among samples, focusing on the aforementioned attributes of type, frequency, sorting, angularity, and alteration of inclusions as the primary criteria for assignment (firing was not used as one of the criterion, although it was noted in the descriptions). Each sample was observed again under the microscope, and if a certain fragment belonged with one that had already been seen it was added to that group, which was accompanied by a short description to remind me of the characteristics of that fabric. By the time the last fragment was reached, over thirty groups had been created and the boundaries between many of the fabrics were somewhat hazy. However, certain features that were useful for distinguishing among fabrics had come to light and a better understanding of the variability encompassed by the samples had been attained.

Next, the samples classified within each of the initial fabrics that had been identified were assessed to ensure that they actually had similar enough compositions to be grouped together. If a sample actually didn't belong, in terms of the grouping criteria as stated previously, to the group to which it was originally assigned, it was added to a list of samples needing reassessment. Once it had been determined that each of the fabrics was consistent in its constituents, the established fabrics were reevaluated to combine ones that were similar enough in composition. Most of these had been originally separated due to slight differences or rare

inclusions that in the end were not significant enough to justify their distinction. Once all of the fabrics were confirmed, the unassigned samples were placed into the appropriate groups. If they didn't fit into any of the existing groups, a new one was formed, though this was a rare occurrence.

Finally, the fabrics were finalized, for a total of sixteen groups. Four highly related fabrics were given identifiers beginning with GG, because they were only distinguished on the basis of the composition of their lithic inclusions. The two fabrics beginning with DD were identified as such on similar grounds as were the two fabrics beginning with CC. All other fabrics began with unique double-letter identifiers. Fabric descriptions based on the modified Whitbread system described in Quinn (2013:80-81) were written for each group; these descriptions included summaries and comments sections for easier presentation and comprehension, allowing for simple interpretations of possible sources or processing techniques to be noted along with the major identifying characteristics of that paste. The summaries and comments are presented in the following section. See Figure 3, below, for selected micrographs from each fabric.





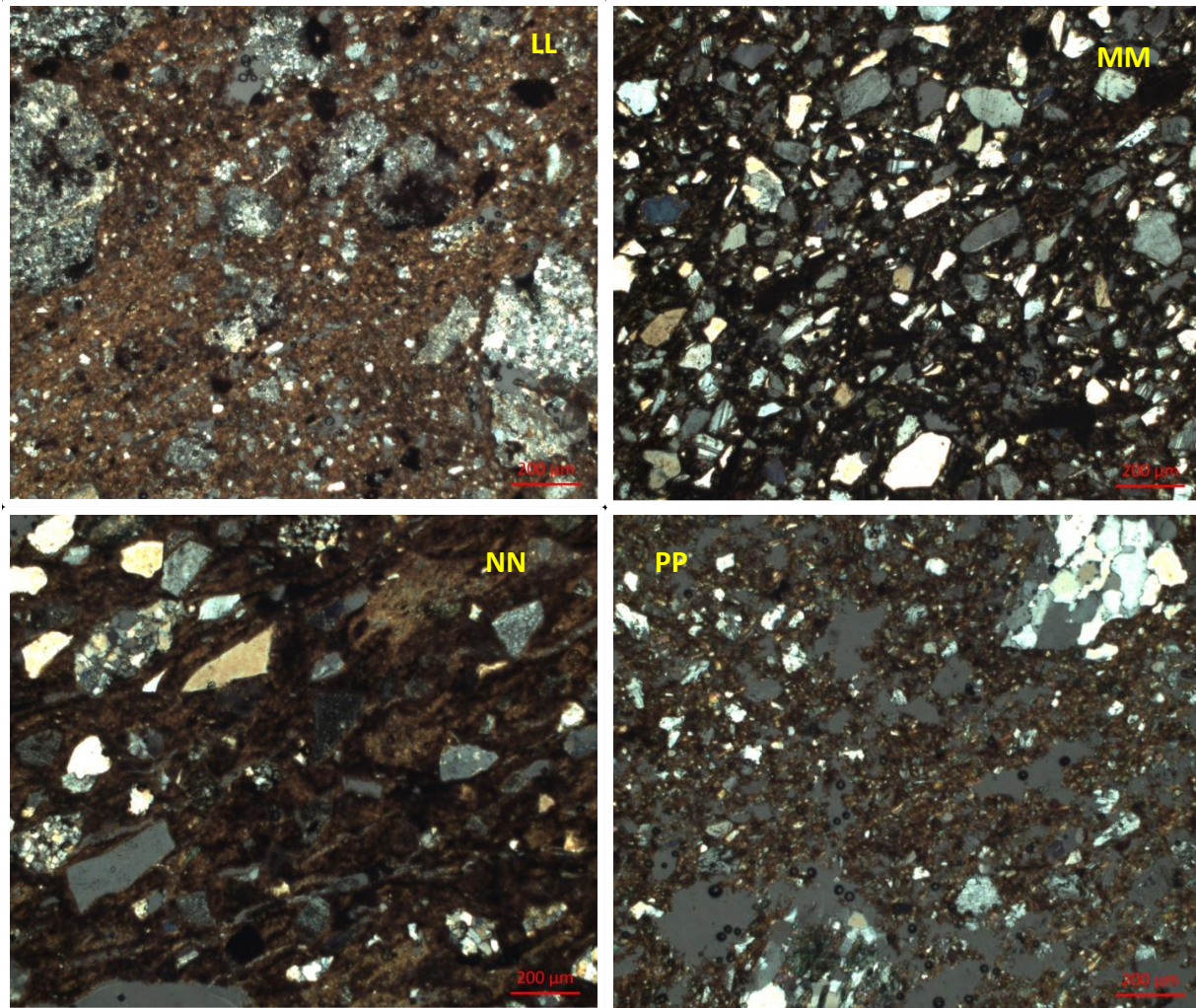


Figure 3. Micrographs. One sample chosen to represent each fabric. XP. Scale bar is 200 microns.

Fabric Summaries

BB – Very-poorly-sorted altered fabric

Samples: 30-12 (6), 34-15 (15), 34-20 (16), 35-1 (20), 35-7 (22), 150-6 (30), 157-68 (43), G1-2-22 (63), D2-1 (72), D13-20 (74)

Summary: Inclusions 40%, matrix 55%, voids 5%. Orangey brown fabric generally turned black and optically inactive due to firing. Inclusions are sub-rounded to rounded,

though semi-elongate, and are very poorly sorted. Inclusions are mostly felsic (primarily plagioclase, quartz), though some fine-grained biotite and occasional other mafic minerals are present. There are also some sedimentary lithic inclusions, which are mainly chert, mudstone, micrite, and some quartz arenite (with some slightly metamorphosed quartzite). Inclusions other than quartz tend to be significantly altered, especially plagioclase altering to sericite. Clay pellets are also present.

Comments: There is notable variation in the particular composition of the different samples encompassed by this fabric. However, the general nature and form of the inclusions is similar. The eclectic nature and high alteration of inclusions could be resultant from lack of intentional tempering or treatment of clay, but rather a use of a natural clay source as encountered in situ.

CC.1—Sub-rounded, moderately-sorted mineral-rich fabric

Samples: 30-3 (1), 30-9 (4), 61-16 (28), G2-2-7 (65), D13-19 (73)

Summary: Inclusions 55%, matrix 43%, voids 2%. Beige, optically active paste with moderately sorted inclusions of a fine-grained, generally sub-angular to sub-rounded nature. Inclusions are mostly plagioclase or quartz, with some k-spar, pyroxenes, hornblende, and micas. Felsic intrusive igneous lithic clasts are occasionally present. Inclusions show some slight alteration.

Comments: The slight alteration and composition of inclusions, suggest a sand temper source, likely derived from parent rock of an intrusive igneous nature due to the presence of such lithic clasts, either with extra processing to attain a consistent fineness of grains or attention given to use naturally sorted sediments as temper. However, the inclusions could have been found naturally in a riverine clay deposit. This fabric is very similar to

CC.2 but its inclusions distinctly sorted in comparison, and the sand used is less mature, probably from a slightly different depositional environment, such as more slow-moving water.

CC.2—Rounded, poorly-sorted mineral-rich fabric

Samples: 30-4 (2), 30-11 (5), 30-17 (7), 30-27 (10), 34-8 (14), 169-3 (56), 170-1 (57), 170-2 (58), G1-2-7 (59), G1-2-10 (60), G1-2-14 (61), G2-2-5 (64), G3-2-1 (66), G3-2-2 (67), G5-3-1 (70), G6-1 (71)

Summary: Inclusions 45%, matrix 50%, voids 5%. Reddish, optically active fabric.

Inclusions are sub-rounded to rounded and semi-equant, and tend to be significantly altered. They are moderately to poorly sorted. The primary inclusions are plagioclase, quartz, k-spar, hornblende, and pyroxene, with the amount of biotite differing among samples. There are also some lithic clasts, generally of intrusive igneous origin.

Comments: The roundedness and sphericity of inclusions suggests a mature sedimentary origin. This could be expected if river sand, which could be found near the site of Chavín de Huántar along the Mosna or Huacheqsa Rivers, was used as temper or present naturally in the clay deposit. This fabric is similar to CC.1 but more poorly sorted and rounded, suggesting a slightly different deposition or processing of the sand.

DD.1—Well-sorted altered Fabric

Samples: 30-24 (8), 35-3 (21), 35-11 (23), 150-12 (32), 157-58 (42), G1-2-20 (62)

Summary: Inclusions 40%, matrix 55%, voids 5%. Beige (though often gray due to firing), optically inactive fabric. Inclusions are well-sorted and rounded. The primary inclusions are clay pellets or mudstone (and possibly micrite) fragments, chert fragments, and quartz, and highly altered feldspars, as well as opaque minerals that are likely iron

oxides. There are some intrusive igneous fragments as well, but there are very few mafic minerals apart from ones occurring as elements of lithic clasts.

Comments: When considered with the composition of the inclusions (in particular the high frequency of small clay pellets), the high sorting, roundedness, and alteration of inclusions could indicate that a fairly pure and mature sedimentary clay source (derived from sedimentary source rock) that had achieved a high degree of alteration was used for this fabric, without addition of other temper. Fabric DD.2 is similar but also contains schist clasts, suggesting a slightly different source but of very similar type of deposition.

DD.2—Poorly-sorted altered fabric with quartz-mica metamorphic clasts

Samples: 30-26 (9)

Summary: Inclusions 30%, matrix 65%, voids 5%. Brown, optically inactive paste.

Inclusions are poorly sorted, sub-angular to angular, and generally highly altered.

Primary inclusions are quartz, feldspars, sedimentary lithic clasts (chert and mudstone) and metamorphic lithic clasts consisting primarily of mica and quartz.

Comments: The poor sorting, high angularity, and high alteration of these inclusions, could indicate their presence in the clay from derivation in situ by weathering from a metamorphic and sedimentary (inferred from composition) source rock. This fabric is similar to DD.1 except that it contains the schist clasts, suggesting a similar type of deposit but from a slightly different source.

FF—Angular felsic intrusive-igneous fabric

Samples: 30-30 (11), 169-2 (55), G5-2-1 (69)

Summary: Inclusions 35%, matrix 60%, voids 5%. Red-orange, optically active fabric.

Inclusions are very poorly sorted and angular, and are primarily feldspar and quartz with

many felsic intrusive igneous lithic clasts consisting of these minerals. There are very few mafic minerals present, either as individual inclusions or as elements of lithic fragments.

Comments: The angularity and lack of alteration of inclusions, as well as very uniform composition, suggests the crushing of a felsic intrusive igneous source rock for use as temper. This would have been added to a very pure or to an intentionally purified clay, judging by the lack of other inclusions.

GG.1—Angular unaltered fabric with sedimentary lithic clasts

Samples: 61-1 (24), 61-19 (29), 157-20 (36)

Summary: Inclusions 40%, matrix 55%, voids 5%. Orange-beige, optically active fabric (though significant portions of some samples are gray-black and optically inactive due to firing). Very poorly sorted. Inclusions are sub-angular to angular. Mineral inclusions are most commonly quartz and feldspars, with some hornblende and biotite and little pyroxene. Large clay pellets or mudstone fragments and fragments of quartzites or quartz arenites are frequently present. A small amount of extrusive igneous clasts can be seen. There is little alteration of inclusions.

Comments: The angularity and unaltered state of the inclusions suggests that they are the result of tempering with materials from glacial deposits that include rock of volcanic origin. The mineral inclusions and extrusive igneous clasts of this fabric seem to be highly related to Fabrics, GG.2, GG.3, and especially GG.4. However, the frequency of clay pellets and sedimentary lithic clasts, sometimes more altered and rounded than the volcanic inclusions, suggests that this fabric may result from the mixing of two different pastes or from the use of a less pure clay source.

GG.2—Sub-angular unaltered fabric with metamorphic clasts

Samples: 157-71 (45)

Summary: Inclusions 45%, matrix 50%, voids 5%. Beige, optically inactive fabric.

Inclusions are sub-rounded to sub-angular. Very poorly sorted. Mineral inclusions are primarily quartz and plagioclase (with some other feldspars), with hornblende and iron oxides also in notable quantities. There are some extrusive igneous lithic clasts, but more prevalent are metamorphic lithic clasts, with poikilitic grains and foliated micas. Some small clay pellets are present. There is significant alteration of the metamorphic inclusions but little alteration of other inclusions.

Comments: Once again, the angularity and lack of alteration of inclusions suggests a glacial till temper. While the volcanic-derived elements of this fabric are similar to Fabrics GG.1 and GG.4, none of the samples of those pastes contained the metamorphic material that is a significant part of this one. This likely is simply the result of using different specific of glacial deposits for the temper, with this including material from metamorphic parent rock.

GG.3—Angular unaltered fabric with quartz-mica metamorphic clasts

Samples: 157-9 (34), 157-23 (38), 157-30 (40), 157-43 (41), 157-83 (47), 157-97 (48), 157-109 (50), 157-11 (51)

Summary: Inclusions 40%, matrix 55%, voids 5%. Orangey-brown (though often blackened due to firing), optically active fabric that is very poorly sorted. Inclusions are sub-rounded to angular, and the primary mineral inclusions are felsic (quartz, plagioclase, some other feldspars), though there are some smaller mafic minerals (hornblende in particular). Notably, there are significant amounts of metamorphic lithic clasts from

phyllite or schist consisting primarily of muscovite and quartz. These clasts tend to be more angular and altered than the other inclusions.

Comments: The primary mineral constituents seem to be of volcanic origin (as suggested by embaying and composition), and their angularity and unaltered state suggests that they come from glacial deposits used as temper similar to that used for Fabrics GG.1, GG.2, and GG.4. The schist inclusions would indicate a distinct source of this till including material derived from metamorphic parent rock, although the somewhat heightened alteration and heightened angularity of these elements could suggest that they may come from a separate source, therefore indicating the mixing of two fabrics, the addition of temper to a fabric containing one type of inclusion, or the addition of two different tempers to the clay. Although Fabric GG.2 also contains metamorphic lithic clasts, they are of a much different character than those found in this fabric.

GG.4—Sub-angular unaltered fabric with extrusive igneous clasts

Samples: 30-8 (3), 30-38 (13), 34-21 (17), 34-23 (18), 34-29 (19), 61-7 (25), 61-8 (26), 150-22 (33), 157-27 (39), 157-70 (44)

Summary: Inclusions 40%, matrix 55%, voids 5%. Orangey brown (though often with significant gray-black portions due to firing), optically active fabric. Inclusions are very poorly sorted and sub-angular to sub-rounded. Primary mineral inclusions are plagioclase, quartz, hornblende, and biotite, with some pyroxenes. Also, lithic fragments (often from extrusive igneous rocks including volcanic tuff), sometimes in the coarse size range, are often present. The inclusions show very little alteration.

Comments: The poor sorting of inclusions, semi-angularity, and lack of alteration likely indicate a temper from glacial deposits derived from volcanic parent rock (and likely

pyroclastic, due to presence of tuff) judging by mineral composition, presence of extrusive igneous lithic clasts, and embaying of inclusions. This fabric is similar to GG.1, GG.2, and GG.3 but likely comes from a distinct specific source as indicated by differences in lithic clasts.

HH—Angular diorite fabric

Samples: 30-31 (12), 61-15 (27), 157-75 (46), 157-108 (49), 157-115 (53)

Summary: Inclusions 35%, matrix 60%, voids 5%. Reddish brown (though often gray-black due to firing), optically inactive fabric. Very poorly sorted. Inclusions are angular and consist almost entirely of intrusive igneous lithic clasts of a granodioritic or dioritic composition. These inclusions have a coarse-grained internal composition with lath-like feldspars in great abundance, and are often experiencing ferrous alteration.

Comments: Because of the uniformity and angularity of the inclusions, it appears that the potters intentionally crushed intrusive igneous rock sources to produce temper to add to their clay. Furthermore, the lack of other types of inclusions, except for as very fine grains, indicates either a very pure clay source or processing of the clay to remove natural inclusions before adding the temper.

KK—Angular schist fabric

Samples: 157-21 (37), 157-117 (54)

Summary: Inclusions 30%, matrix 65%, voids 5%. Light reddish brown (with graying due to firing in 157-21), optically inactive fabric. Inclusions are very poorly sorted and sub-angular to angular. They are limited almost exclusively to a single type: lithic fragments of a fine-grained phyllite or schist consisting primarily of muscovite and quartz.

Comments: There is some alignment of inclusions, though not necessarily to boundaries of fragment or any consistent direction. The inclusions, because of their uniformity and angularity, seem to have been purposely added as temper. Furthermore, the lack of other inclusions except of a very fine-grained nature suggests that the paste was made from either a very pure clay source or from clay that was processed to remove natural inclusions before the temper was added. The phyllite or schist would have come from a source of metamorphic rock, though it appears there were some differences in stresses present during formation since some lithic clasts exhibit more intense crenulation than others.

LL—Sub-rounded quartz arenite fabric

Samples: 157-114 (52)

Summary: Inclusions 35%, matrix 60%, voids 5%. Orange-red, optically active fabric with sub-rounded and very poorly sorted inclusions. Inclusions are almost exclusively quartzite or quartz arenite that is heavily altered, with some chert and other sedimentary lithic fragments as well.

Comments: The uniformity of the inclusions suggests their intentional addition as temper, and the most likely way to achieve such uniformity would be purposely crush the sedimentary parent rock and add it to a pure or purified clay. However, their roundedness could alternatively suggest that they were not freshly crushed from a rock source, but rather may have been collected from a sedimentary deposit or a deposit due to weathering of the parent rock.

MM--Mineral-rich fabric with very frequent inclusions

Samples: 157-19 (35), G3-2-5 (68)

Summary: Inclusions 60%, matrix 38%, voids 2%. Reddish-brown, optically active fabric with very frequent inclusions. Inclusions are well-sorted and angular to sub-angular, showing some alteration, especially sericitic alteration of feldspars. Most inclusions are single mineral grains, especially of quartz, plagioclase, and other feldspars. There are significant amounts of biotite, and also some hornblende and pyroxenes.

Comments: The composition and alteration of the inclusions suggests addition of a sand temper. If the inclusions are sedimentary in origin, they lack maturity as evidenced by their angularity and therefore probably were not have transported far enough and at a high enough energy to achieve their level of sorting. They therefore would have required addition steps by the potter to achieve this before being added to the clay. This fabric is similar to CC.1 but the inclusions are much more frequent.

NN—Moderately-sorted, angular elongate fabric

Samples: 150-9 (31)

Summary: Reddish brown, optically active fabric. Inclusions are moderately sorted, angular and elongate, and are notably oriented parallel to the vessel walls. There are also long, thin voids parallel to the vessel walls that have been filled by secondary mineralization. Inclusions are almost entirely felsic minerals (quartz and feldspars) or sedimentary lithic clasts composed of these minerals (fragments mainly from quartzite or quartz arenite, chert, mudstone, and some micrite). There is significant alteration of many inclusions.

Comments: The high angularity and unaltered state of the inclusions suggests that they are the result of tempering from a glacial deposit or an untampered, immature, primary clay deposit from sedimentary parent rock. The sorting could suggest that extra

processing steps may have been taken to control for a specific grain size, but this also could be the result of natural deposition.

PP—Angular altered fabric with metamorphic clasts

Samples: K21-1 (75)

Summary: Inclusions 40%, matrix 35%, voids 5%. Orange-red, optically active coarse fabric. Inclusions are poorly sorted and sub-angular to angular. Mineral inclusions are mainly quartz and feldspars with significant amphiboles, muscovite, and other minerals found mainly in metamorphic rocks. There are also metamorphic lithic clasts consisting of muscovite, actinolite, sillimanite, and other minerals.

Comments: The angularity and distinctively metamorphic composition (though of a different composition than that of the metamorphic materials seen in other fabrics) of the inclusions suggests the use of a clay derived from weathering of a metamorphic parent rock, though flaws in the thin section make the sample difficult to analyze.

Comparison with the Macroscopic Analysis

Overall, the petrographic analysis of the thin sections confirmed the results of the initial macroscopic analysis; these confirmed trends, as well as ones newly observed during the petrographic analysis, will be discussed in detail later. However, certain discrepancies came out between the macroscopic and microscopic analyses that, while not invalidating the patterns observed or the interpretations made during the macroscopic analysis, are worthy of note for their pertinence to methodological choices.

Generally, the fragments that in the end fell under the same petrographic fabric came from the same macroscopic group or small set of groups. The cases in which several original

macroscopic groups became combined in one petrographic fabric are of interest here. Often, these groups had been separated at the macroscopic level because they exhibited a difference in firing, size or frequency of inclusions present that would indicate a difference in make from the other groups. However, in some cases, with the greater detail possible with the petrographic analysis, it was possible to determine that the type, sorting, alteration, and angularity or roundedness of the inclusions were actually of a similar enough nature to classify the groups as the same fabric. The differences observed at the macroscopic level were due to small differences in processing or firing techniques rather than differences in composition of the fabrics. This does not mean that the differences noted between fragments are insignificant; rather, it means that even though the vessels were made with the same sort of materials, there was a lack of standardization in production that resulted in different end products which could indicate the involvement of multiple producers, traditions or workshops operating under little centralized control. Therefore, both the distinctions made during the initial analysis and those made during the petrographic analysis (which focused on composition and did not use firing as a criterion) are of use in their own ways.

An almost opposite type of discrepancy occurred with some of the other fragments that at the macroscopic level had been grouped together. In these cases, the size, frequency, angularity, and alteration of the inclusions, as well as the color and firing of the fragments, made the pastes seem similar enough to group together. Their inclusions generally seemed to be of the same type based on proportions of mafic, felsic, and lithic inclusions, with certain more specific identification of distinctive features such as mica inclusions possible only on occasion. However, at the petrographic level, when identification of mineral and lithic components was possible, what had seemed to be similar inclusions at the macroscopic level were actually revealed to be of

different composition. This was especially true in cases of certain felsic lithic clasts, which had extremely similar appearances at the macroscopic level, but when examined under the petrographic microscope turned out to be rocks of very different character and origin, including intrusive igneous rocks and metamorphic rocks of various compositions. Once again, this does not serve to discredit the utility of the macroscopic analysis, because it seems that though the specific sources of these fragments' inclusions may have varied, their general nature (for example, crushed rock temper versus river sand temper versus inclusions naturally found in clay) held more or less true within the macroscopic groups, so more general interpretations using these observations would still be of great use.

What the comparison between the macroscopic and petrographic analyses carried out on this sample serves to highlight is that both approaches are useful as long as one is careful to recognize what the variability seen through each method actually represents. Nevertheless, it would be very difficult to select appropriate samples for thin section without the initial macroscopic analysis. While it could be useful, and more time- and cost-effective, to perform only the macroscopic analysis, petrographic analysis can significantly add to the data available for interpretation, and therefore the techniques are best used in tandem. However, once petrographic analysis has been performed on selected samples, comparison between this and the macroscopic analysis of those samples can be used to inform more detailed interpretations of macroscopic observations of similar fabrics.

Sourcing

The comments section for the description of each petrographic fabric mentions possible interpretations of source for that fabric; here, general patterns in sourcing among fabrics are

detailed. Since these thin sections have not been tested against comparative samples of clays, sediments, and rocks from within the region, determining provenance to a very specific resource location is impossible at this point. Furthermore, as discussed earlier in this paper, specific sourcing even with the aid of comparative samples can be quite problematic and inconclusive. However, this petrographic analysis can be used to look at patterns of provenance at a broader scale that is actually quite telling about the production of this pottery. There are four main categories of fabric that can be determined as relates to their sourcing: those pastes that are tempered by what seems to be glacial till, those that appear to be tempered by riverine sand, those that are tempered by crushed rock, and those that seem to include no intentional temper but rather natural inclusions from the clay used. A 1:100,000-scale geological map by Ingemmet of Peru, specifically the Recuay 20-i quadrant (Cobbing and Sanchez 1996, accessible at <http://www.ingemmet.gob.pe>, was used for the general sourcing.

The glacial till category encompasses the GG fabrics, composed of sub-fabrics GG.1, GG.2, GG.3, GG.4, and NN. These fabrics all contain fairly angular, poorly-sorted inclusions with very little alteration and a predominance of felsic minerals. The lack of alteration, angularity, and lack of sorting of the grains are characteristic of glacial deposits, and the presence of non-uniform and mostly infrequent lithic clasts would suggest that these inclusions are not from intentionally crushed rock, even though such action can also produce such angular grains. Also, these inclusions seem to have been added as temper rather than included naturally in the clay source due to their lack of alteration, often large size, and angularity. If this material is indeed of glacial origin, then it would not be found in the valley bottom or valley slopes around Chavín. Rather, it would have to be collected from the higher-altitude puna or mountain peaks containing such deposits, which can be seen on a geological map of the area. These

sources would generally be at least 5-15 kilometers away, and therefore classified as non-local but not long-distance. Also, the presence of distinct lithic clasts which is the basis of the subgrouping of the GG-related fabrics indicates that this material was likely taken from a different specific source for each subgroup. This sourcing is for the raw materials, although these might have been carried to the river valley or another area for the production of the pottery.

The category characterized by a riverine sand temper is comprised by Fabrics CC.1, CC.2, and MM (see Figure 2 for an example from Fabric CC.2). The roundedness, and often sorting, of grains, infrequency of lithic clasts, and variation in exact percentages of each type of inclusions, within certain ranges, is suggestive of an aquatic deposition of moderate maturity. The moderate alteration of minerals and presence of those typically found in such deposits further supports this, and the regularity and sorting of the material would also suggest an intentional temper added to a clay of unknown provenance. Such a depositional environment can be found on the borders of the Mosna and Huacheqsa Rivers, which conjoin at the site of Chavín. While it would be nearly impossible to determine where specifically this sand was taken from, and it could possibly be from another valley, it is very likely that the ceramics of these fabrics were made locally within the Callejón de Conchucos.

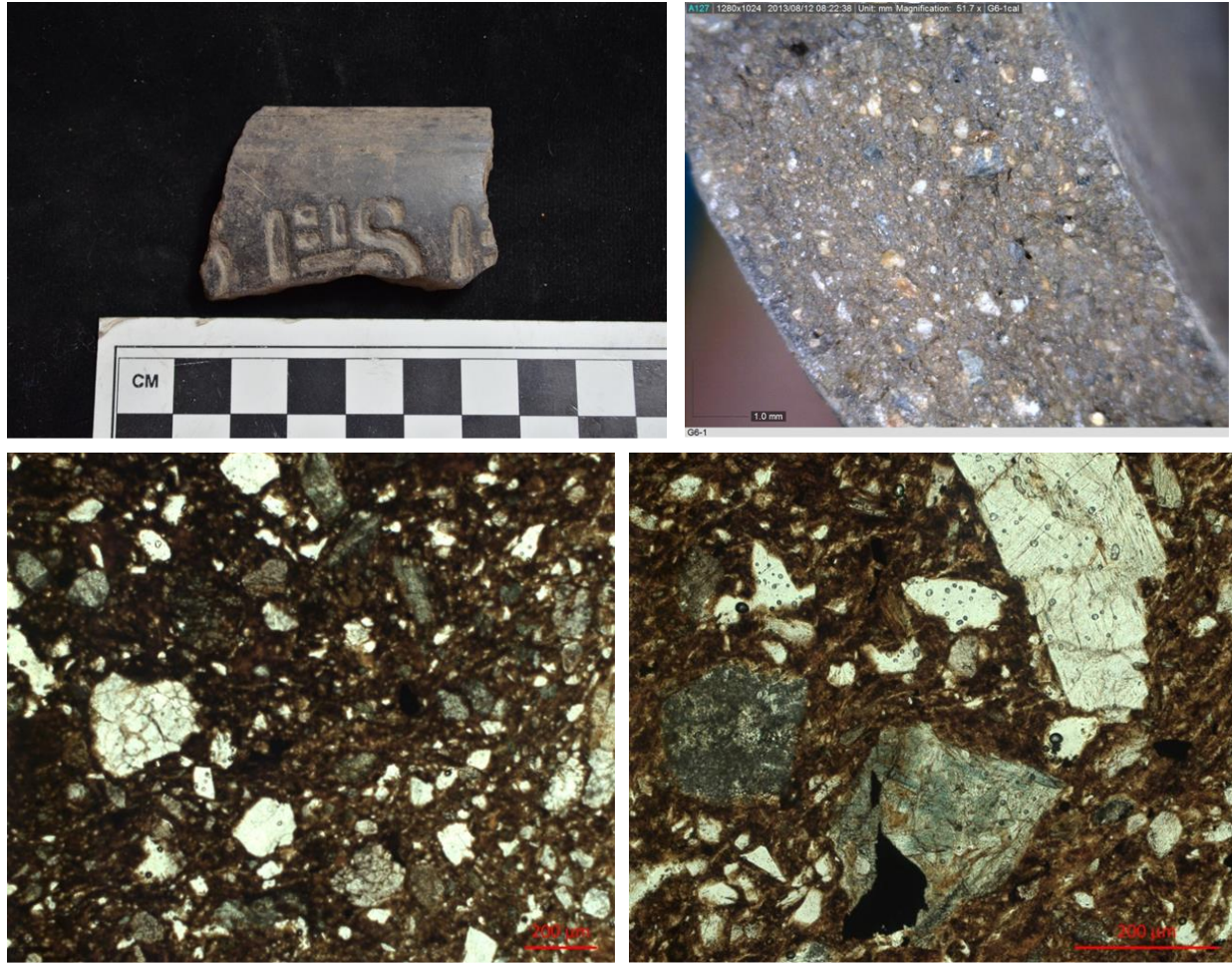


Figure 2. Fragment G6-1, from LB-S3-U9-C3 Level 4. Petrographic Fabric CC.2, Macroscopic Fabric V. This fabric is the river-sand-tempered fabric recognized as the dominant group for La Banda at both the macroscopic and microscopic levels. Upper left: photograph of exterior surface. Upper right: Macroscopic photo of the paste at 55x. Lower left: micrograph, PPL, scale at 200 microns. Lower right: micrograph, PPL, scale at 200 microns.

The next category is the fabrics of crushed-rock temper, which include FF, HH, KK, and LL (see Figure 4 for an example of Fabric HH). While there is quite a bit of difference between the characters of the rocks used for fabrics, they are strikingly similar in that each one contains almost exclusively inclusions of that rock except for very fine inclusions that were likely present

in the clay used. Furthermore, the lithic fragments are angular and often are poorly sorted with grain sizes up to very coarse. The aforementioned features indicate strongly that these fabrics result from intentional tempering by crushing of certain rock sources, as sedimentary deposits or natural inclusions would show more variety in composition. Yet it is difficult to say where these rock sources may have come from. The area immediately around Chavín consists mainly of geological formations of limestones, shales, quartz arenites, and quartzites, so only the temper of Fabric LL, from quartzite or quartz arenite, would seem to have been able to come from here. The intrusive igneous clasts found in Fabrics FF and HH could possibly have come from igneous deposits around 10-20km away from the site. It is the metamorphic schist/phyllite clasts of Fabric KK that are the most intriguing. No metamorphic formations appear in Chavín's quadrant on the geological map, which would seem to suggest that this temper came from over approximately 20km away. However, the presence of metamorphic clasts in the previously discussed temper of seemingly glacial origin, Fabrics GG.2 and GG.3, would indicate that it would have been possible to find metamorphic rock within the glacial deposits. Whether these rocks would have been substantial enough to provide the temper for Fabric KK is impossible to know. While the schist could possibly have come from a smaller, exceptional outcrop found more locally and not recognized by the resolution of the geological map, it likely would have been at a higher altitude than the river valley and of limited size and access. If this temper came from glacial deposits or from farther away, as appears most likely, it seems that it would have required travel of at least 10-20km, with much elevation change, to reach Chavín and is therefore classified as non-local.

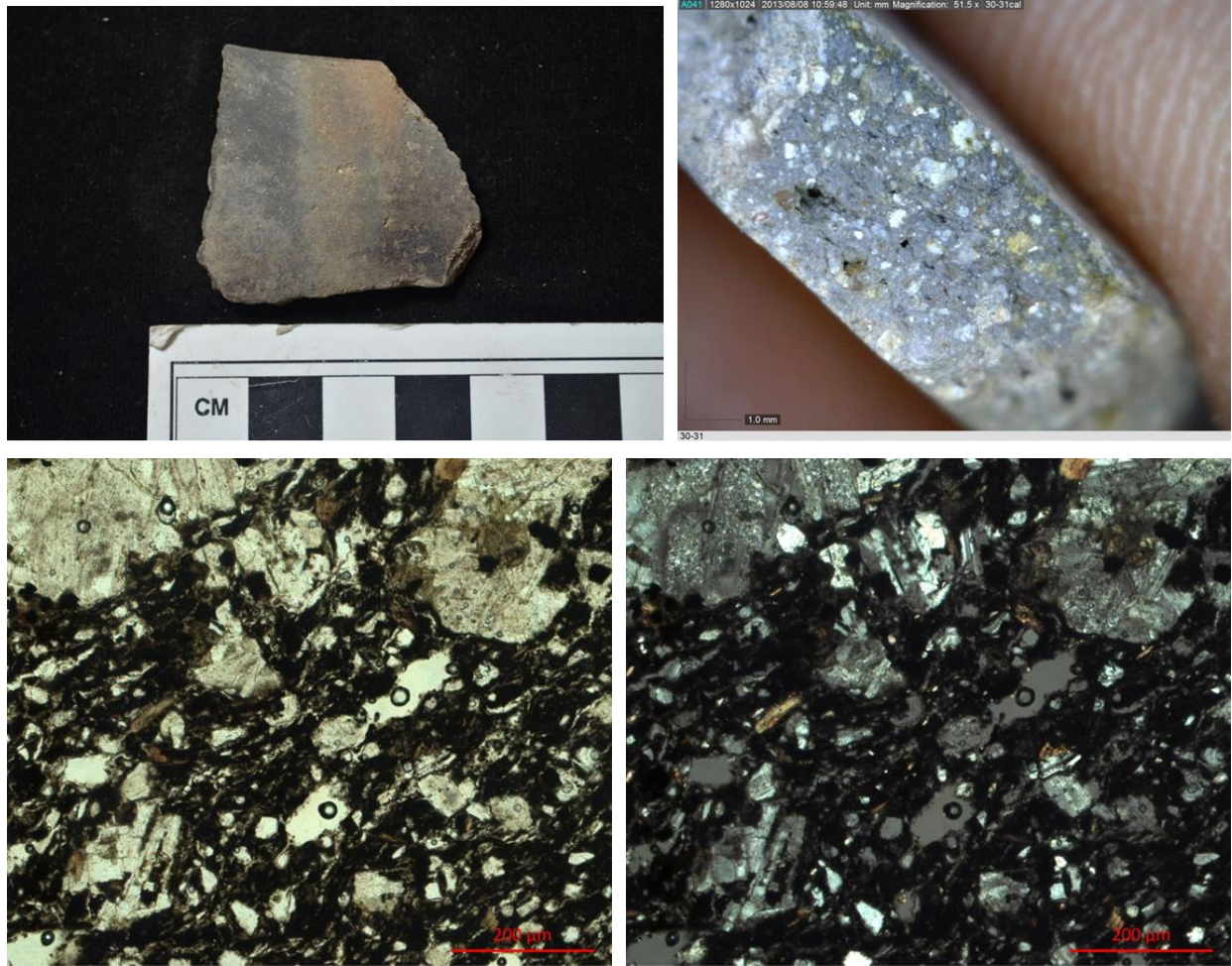


Figure 4. Fragment 30-31, from CdH-EC-CE2 O Level 1. Petrographic Fabric HH, Macroscopic Fabric H. This fabric contains the crushed-diorite temper found in the later levels above Canal 6. Upper left: photograph of exterior surface. Upper right: Macroscopic photo of the paste at 55x. Lower left: micrograph, PPL, scale at 200 microns. Lower right: micrograph, PPL, scale at 200 microns.

The final category of fabrics is of those that have no strong indication of tempering, but rather seem to rely on naturally occurring inclusions in the clay used, often from sedimentary parent rock. Fabrics BB, DD.1, DD.2, and PP fall into this category. The high alteration and

diversity of types of inclusions makes it very difficult to speak to the source of this material. However, it seems that generally it would have been possible to produce these fabrics from fairly local sources of sedimentary outcrops.

Overall, there is no strong indication of the pottery in this sample having been made with materials from very far away, with the possible exception of the metamorphic-derived fabrics. For the most part, it could have been obtained within a 20-km distance of the site. However, just because the materials could have been gathered around the vicinity of Chavín does not mean that they were, and sources yielding similar materials could feasibly be found at much farther distances. It would require a much larger sample, as well as extensive comparative geological samples from around Chavín as well as from other areas, to shed more light on this, and even then the results would likely be uncertain. However, the distinction between different general types of sources made here and the differentiation between those that would likely be found in the valley versus at higher altitudes can lead to interesting interpretations even without further investigation.

Patterns and Interpretations

The variability in fabric seen within this sample suggests a rather diverse production of the ceramic materials deposited at Chavín de Huántar. There is little evidence of standardization in the sense of paste recipes, centralized production, or highly controlled firing techniques, which could indicate that there are various producers without control by a dominant authority. There are patterns that suggest general trends in production that could correspond to the groups of people making the pottery and the purpose this pottery was meant to serve at the site (see Appendix 1 for charts visualizing trends).

One strong trend is that almost all of the fragments that fall into the glacial till or crushed rock categories are from the monumental core rather than the La Banda contexts, and a majority of the monument fragments have these fabrics, with the highest frequency in the glacial till fabrics. While the glacial till does not necessarily require extra processing for use as temper, it would have required at least some travel, even if only a day's walk, to get from the source to Chavín. This suggests could suggest a higher investment of time by potters from Chavín to retrieve materials to bring back to make their vessels, suppliers of raw materials who would bring the temper to the potters, or potters from outside of the immediate site of Chavín who would bring the finished ceramics to the site. While it is difficult to establish which, if any, of these scenarios is represented by the data, all of the possible options suggest that the vessels represented by these fragments, mostly found at the monumental core, required a greater investment of time and energy in transportation of materials or wares than those that were made with materials that could have been found in the valley bottom. Furthermore, the fabrics with crushed rock temper necessitate the added step of processing the rock for addition to the clay, suggesting even higher investment (see Figure 5 for examples of crushed-rock-tempered fabrics). Since these materials would have been noticeable and accessible on likely routes of travel to Chavín, it is uncertain whether the materials were gathered and processed by people local to Chavín to make the pottery or by outsiders coming as pilgrims or for other reasons.

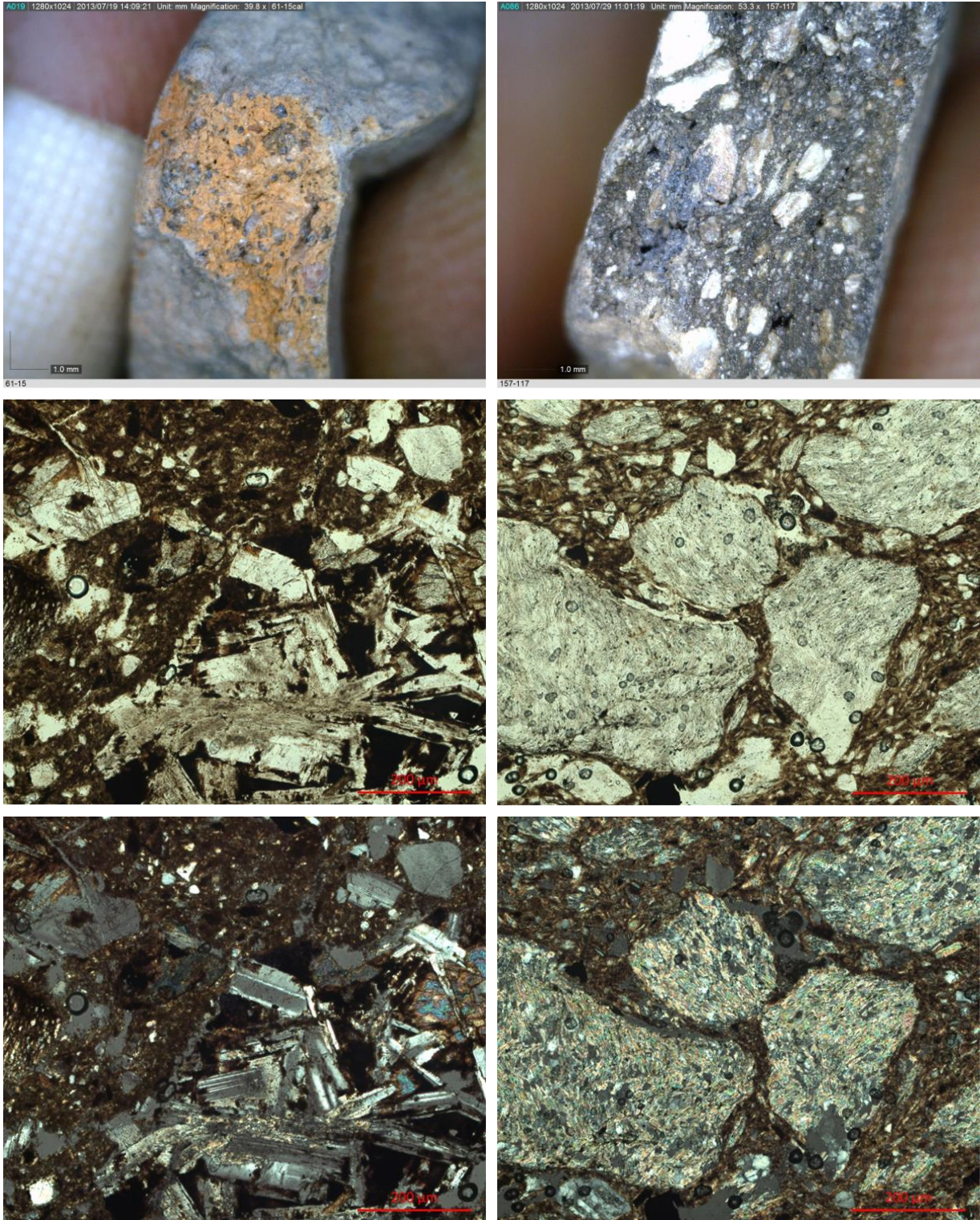


Figure 5. Comparison of crushed-diorite temper versus crushed-schist temper. Upper, middle, and lower left: Dino-lite image taken at 55x and micrographs in PPL and XP, respectively, of

Fragment 61-15 from CdH-EC-HH15 NE Level 3, Fabric HH. Upper, middle, and lower right: Dino-lite image taken at 55x and micrographs in PPL and XP, respectively, of Fragment 157-17 CdH-EC-HH15 NE Level 1, Fabric KK. Dino-Lite image scale bars at 1 millimeter and thin-section micrograph scale bars at 200 microns.

The vessels that were made from clays without addition of temper or with addition of riverine sand as temper could be made with fairly low investment in obtaining and processing of raw materials, though there are indicators that some of the clays may have been processed to control for coarseness of inclusions. Furthermore, these ceramics could have been produced locally, in the immediate vicinity of Chavín in the Callejón de Conchucos. The majority of the fragments from La Banda contexts fall into this category, whereas very few fragments from the monumental core do so. This would suggest that the ceramics deposited in the residential sector tended to be made with more immediately local materials and perhaps lower investment in resource procurement and processing than those of the monumental center.

Another interesting trend is that these more local fabrics tend to show a great deal of internal variability. Even though the La Banda fragments show less variability in terms of their placement into fabrics than those from the monumental core, possibly reflecting a more limited resource base, within those fabrics there is diversity in terms of frequency and percentages of types of inclusions. This could simply be a result of variability in the sand and clay deposits utilized for raw materials, but also could suggest a lack of centralization or uniformity of production, an interpretation which is backed up by differences in firing, finish, and decoration. This could indicate that multiple potters, workshops, or production entities were operating independently in the valley, especially at the residential level of production. Another interesting

note is that the common sand temper and natural inclusion fabrics of La Banda were used for both decorated vessels such as polished, stamped bowls and non-decorated, coarser wares such as large neckless jars. It seems that differences in style and possibly use are not necessarily reflected in fabric differences in the residential area.

Within the fragments from the monumental core, there is much more variability in fabric placement, even of fragments of similar decorative styles and forms (see Figure 6). Furthermore, there seems to be a disparity between the two different canal contexts. Out of thirteen Canal 2 samples, 9 fabrics are represented; much less diversity is present in the Canal 6 fragments, even though more samples were analyzed from it than from Canal 2. While with this limited sample it is difficult to determine what this difference might mean, it appears that the canals are not only incorporating vessels from a variety of fabrics but that there is also a distinction between the assemblages of the two canals, which could possibly indicate that different people or groups are responsible for the deposit of the materials in each canal. However, the lack of ability to control precisely for time in this sample means that the differences could be the result of temporal factors as well.



Figure 6. Comparison of fragments of vessels of similar style and form with different fabrics. Upper left and upper right: Fragment 35-7 from CdH-EC-GG15 NE/CE6 O Level 2, Fabric BB. Photograph of exterior and micrograph in XP with scale bar at 200 microns, respectively. Lower left and lower right: Fragment 30-9 from CdH-EC-CE2 O Level 1, Fabric CC.1. Photograph of exterior and micrograph in XP with scale bar at 200 microns, respectively.

A situation which does indeed seem to be the result of temporal differences is seen in the fabrics of crushed rock temper. All such fragments are from the monumental core, but even more distinctive is that all but one of the fragments are from the levels of the unit above Canal 6. They are undecorated sherds and cannot be fit into a chronology based on typology. However, their

stratigraphic context would suggest that they may date to post-Chavín times. This would suggest a significant change in ceramic production or provenance during the later time periods. Since the plain sherds from within the canals, with the one exception, do not exhibit this type of fabric, it could be a useful way of distinguishing plain sherds from different time periods which would help in the dating of stratigraphic layers and the development of a ceramic chronology.

Conclusion

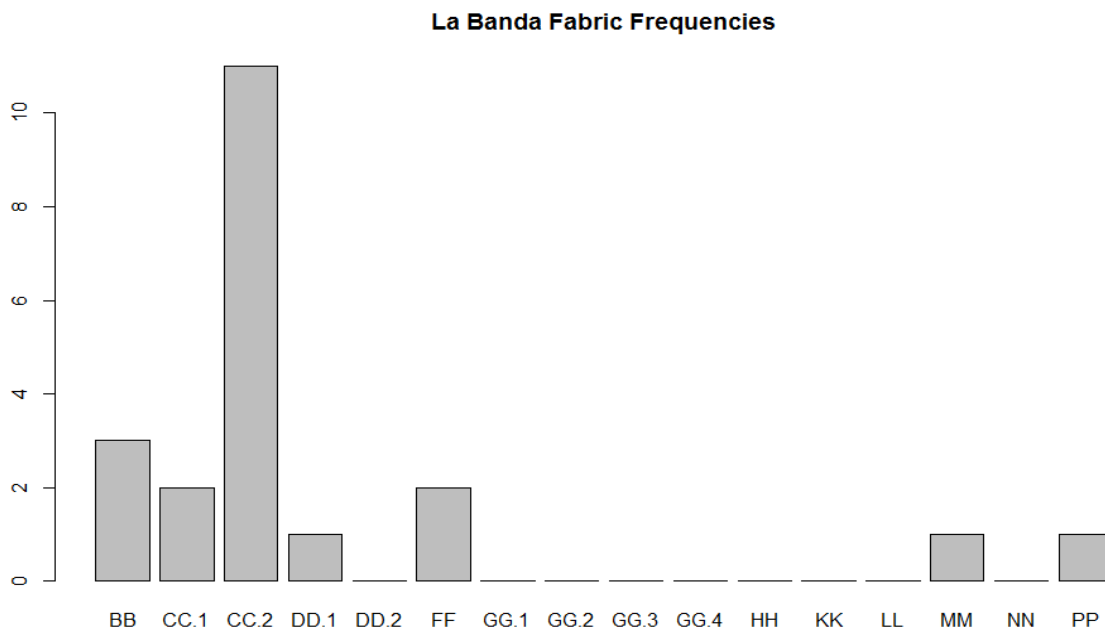
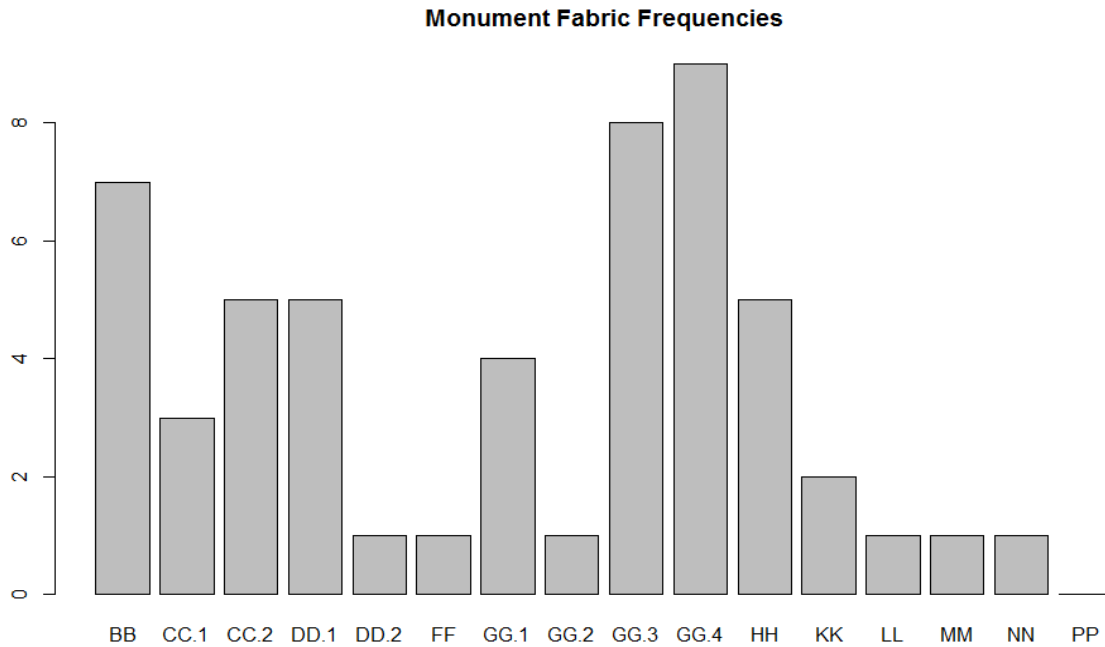
This petrographic analysis of pottery from Chavín de Huántar has elucidated patterns of variability and differentiation within the site. The data seems to support the current understandings of the site as a center for ritual activity where material culture, including pottery, played an important role, possibly as a form of sacrifice. The high degree of variability within the ceramics of the ceremonial area could indicate a system in which different groups or individuals were making contributions from areas outside the direct vicinity of the site, possibly as part of a system of multiple religious groups or cults with differential access to areas of the site. This sample also points to a divide between the ceremonial center and the surrounding residential area. It appears that the general population living in the valley may have had little influence and interaction in the ceremonial aspect of the site, suggesting that the authorities at Chavín, whether local or foreign themselves, didn't rely upon the common people for their activities or production of materials, or that they were even locals intentionally attempting to distinguish themselves from the rest of the people through differences in material culture and access to resources.

The preceding interpretations were made based on strong patterning seen in this sample, which included several specific contexts from excavations of both the residential area of La

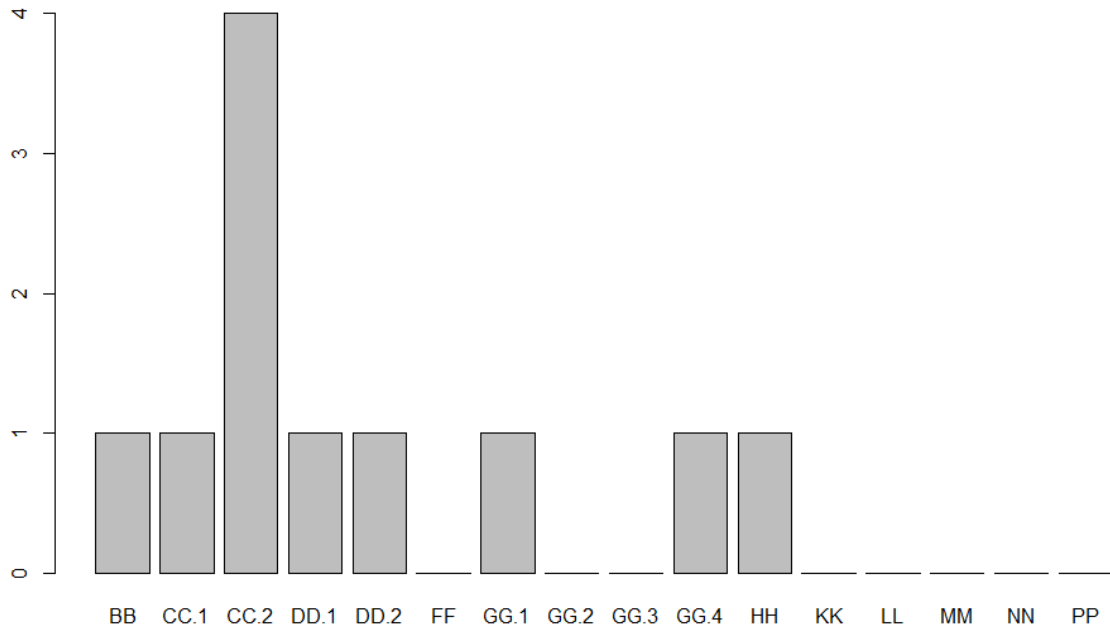
Banda and the ceremonial center of Chavín de Huántar. The evidence would be more conclusive if further analysis were to be carried out on a larger body of ceramic materials from the site, targeting intact contexts which have been confidently dated in order to provide more detailed information on temporal and depositional factors. This study has shown the utility of ceramic paste analysis at both the macroscopic and microscopic levels, especially when used in conjunction, in exploring variability in material culture in archaeological contexts, which can have myriad applications to interpretations about aspects of social structure such as stratification, ritual, and authority. Used in conjunction with other lines of evidence, ceramic petrography can be a powerful tool for understanding the past through its material culture.

Appendix 1: Charts

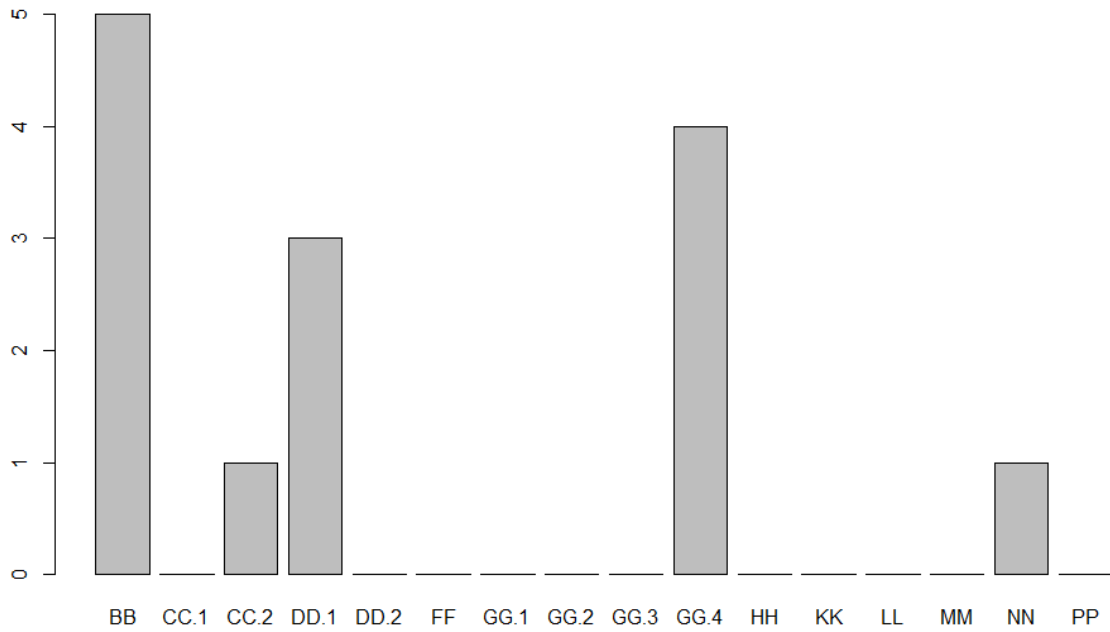
The following charts show frequencies (y-axis) of sherds from the petrographic analysis assigned to the fabric groups or group types (x-axis) from the context specified by the chart's title.



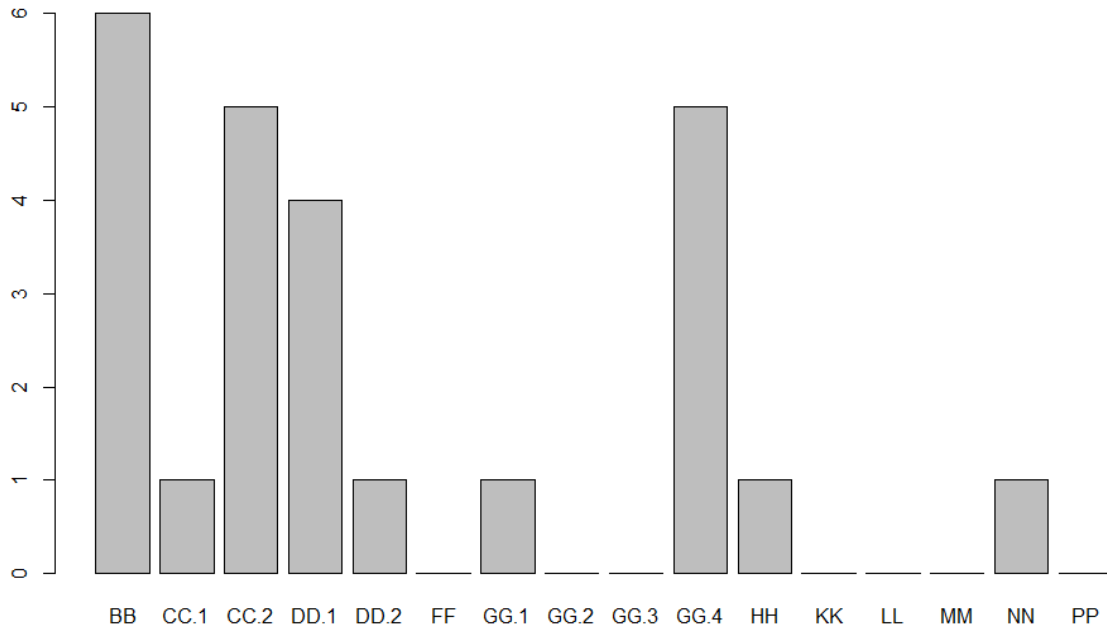
Canal 2 Fabric Frequencies



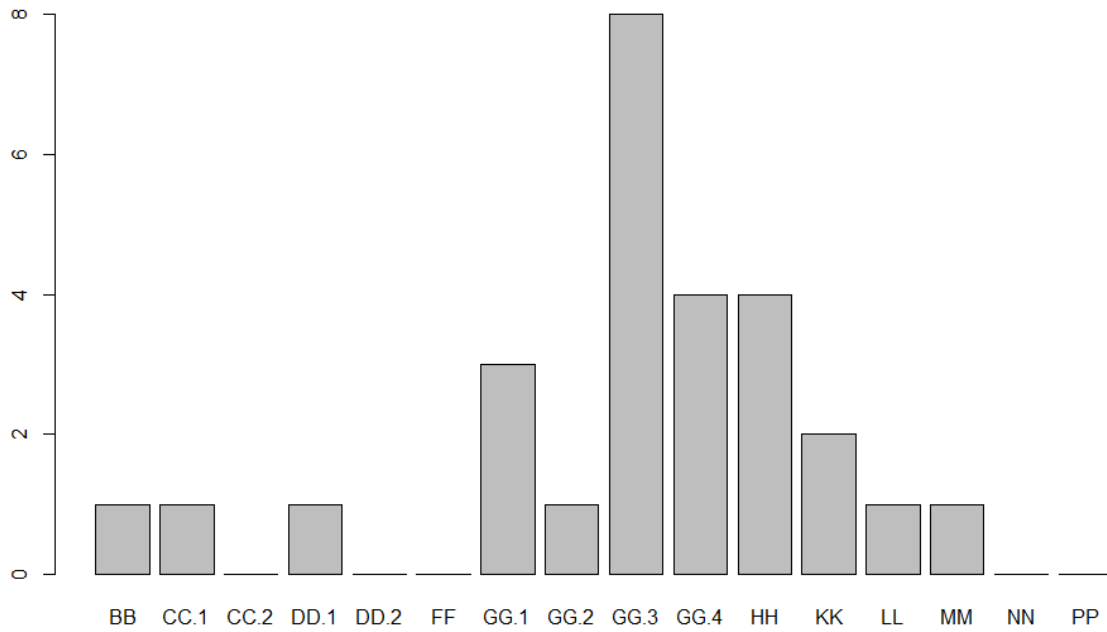
Canal 6 Fabric Frequencies



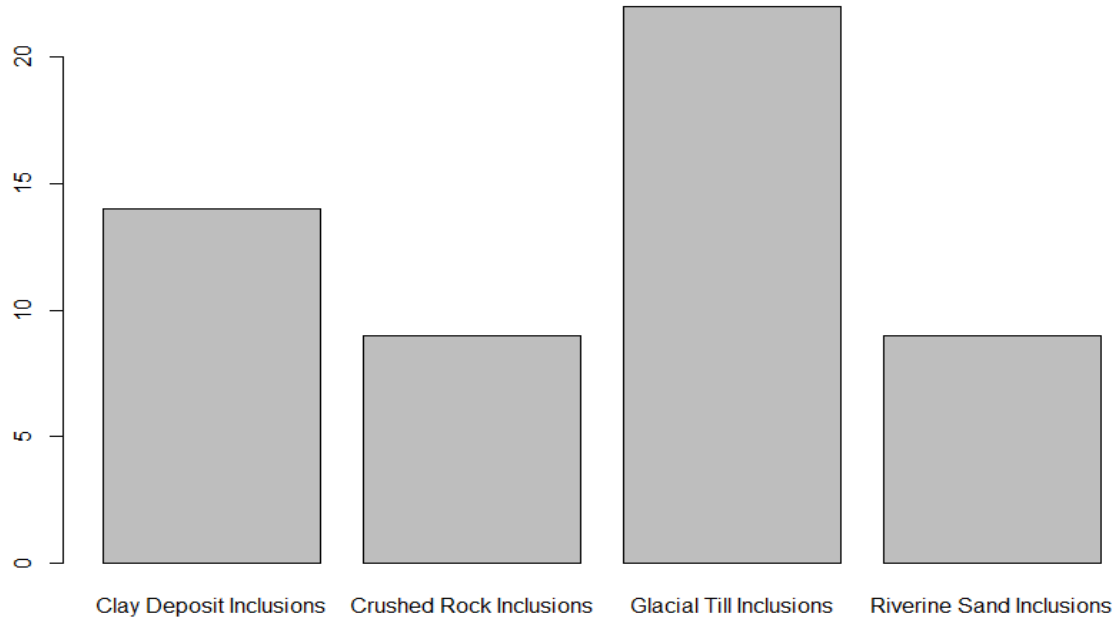
Canal 2 and Canal 6 Fabric Frequencies



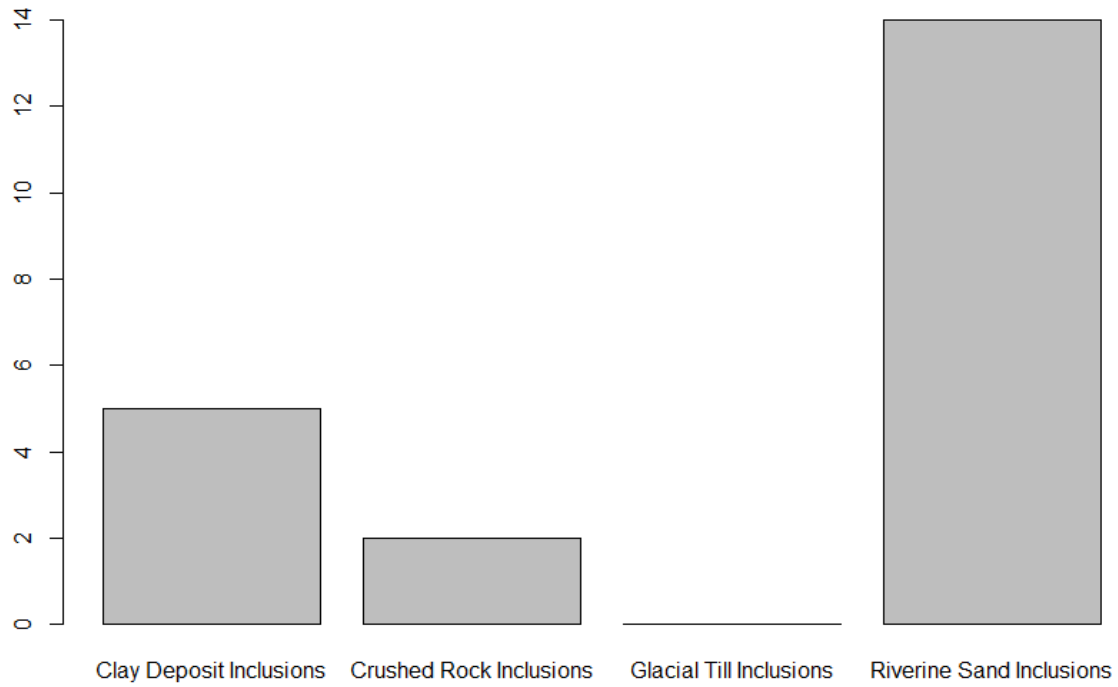
Unit Above Canal 6 Access Point Frequencies



Monument Fabric Type Frequencies



La Banda Fabric Type Frequencies



Appendix 2: Condensed Data Table

The following is data table, sorted by “Petro Fabric Group” (Petrographic Fabric Group) containing selected information for each sherd analyzed during the petrographic analysis.

Thin Section Number	Fragment Number	Petro Fabric Group	Macro Fabric Group	Unit	Level	Vessel Type	Exterior Treatment	Exterior Color	Decoration
6	30-12	BB	F	CdH-EC-CE2 O	1	8. Cantaro	5. Brunido uniforme	pinkish gray	0. No presente
15	34-15	BB	B	CdH-EC-GG15 NE/CE6 E02	3 Rasgo 1	3. Tazon	4. Pulido	dark gray	0. No presente
16	34-20	BB	B	CdH-EC-GG15 NE/CE6 E02	3 Rasgo 1	3. Tazon	4. Pulido	black	0. No presente
20	35-1	BB	A	CdH-EC-GG15 NE/CE6 O	2	5. Botella	5. Pulido	gray	20. Modelado-inciso
22	35-7	BB	A	CdH-EC-GG15 NE/CE6 O	2	5. Botella	4. Pulido	dark gray	19. Inciso grueso
30	150-6	BB	X	CdH-EC-GG15 NE/CE6 E09	3	5. Botella	4. Pulido	gray	0. No presente
43	157-68	BB	P	CdH-EC-HH15 NE	2	0. No identificado	3. Brunido	pinkish gray	0. No presente
63	G1-2-22	BB	A	LB-S3-U9-C3	5	5. Botella	4. Pulido	black	19. Inciso grueso
72	D2-1	BB	V	LB-S3-U9	7 Estructura 1A	0. No identificado	4. Pulido	red	21. Inciso con grafito
74	D13-20	BB	D	LB-S3-U9-C4	5	0. No identificado	5. Brunido uniforme	red	1. Inciso fino
1	30-3	CC.1	B	CdH-EC-CE2 O	1	5. Botella	4. Pulido	black	0. No presente
4	30-9	CC.1	B	CdH-EC-CE2 O	1	5. Botella	4. Pulido	black	0. No presente
28	61-16	CC.1	B	CdH-EC-HH15 NE	3	0. No identificado	3. Brunido	brown	19. Inciso grueso
65	G2-2-7	CC.1	V	LB-S3-U9-C2	5	0. No identificado	4. Pulido	black	1. Inciso fino
73	D13-19	CC.1	V	LB-S3-U9-C4	5	5. Botella	4. Pulido	black	1. Inciso fino
2	30-4	CC.2	B	CdH-EC-CE2 O	1	3. Tazon	4. Pulido	dark gray	0. No presente
5	30-11	CC.2	B	CdH-EC-CE2 O	1	8. Cantaro	5. Brunido uniforme	gray	0. No presente
7	30-17	CC.2	B	CdH-EC-CE2 O	1	7. Olla sin cuello	3. Brunido	light gray	0. No presente
10	30-27	CC.2	H	CdH-EC-CE2 O	1	5. Botella	4. Pulido	black	0. No presente
14	34-8	CC.2	B	CdH-EC-GG15 NE/CE6 E02	3 Rasgo 1	3. Tazon	3. Brunido	black	0. No presente
56	169-3	CC.2	V	CdH-LB N606 E674 Cuadrante NE	6	7. Olla sin cuello	4. Pulido	black	19. Inciso grueso
57	170-1	CC.2	V	CdH-LB N604 E676	6	7. Olla sin cuello	3. Brunido	gray	0. No presente
58	170-2	CC.2	V	CdH-LB N604 E676	6	4. Cuenco	4. Pulido	black	0. No presente
59	G1-2-7	CC.2	V	LB-S3-U9-C3	5	0. No identificado	4. Pulido	black	18. Estampado complejo
60	G1-2-10	CC.2	V	LB-S3-U9-C3	5	0. No identificado	4. Pulido	black	6. Estampado

									simple
61	G1-2-14	CC.2	V	LB-S3-U9-C3	5	0. No identificado	4. Pulido	black	6. Estampado simple
64	G2-2-5	CC.2	V	LB-S3-U9-C2	5	0. No identificado	3. Brunido	black	19. Inciso grueso
66	G3-2-1	CC.2	V	LB-S3-U9-C5	6	4. Cuenco	4. Pulido	black	6. Estampado simple
67	G3-2-2	CC.2	V	LB-S3-U9-C5	6	0. No identificado	4. Pulido	black	6. Estampado simple
70	G5-3-1	CC.2	B	LB-S3-U9	6	4. Cuenco	5. Brunido uniforme	black	19. Inciso grueso
71	G6-1	CC.2	V	LB-S3-U9-C3	4	4. Cuenco	4. Pulido	black	19. Inciso grueso
8	30-24	DD.1	A	CdH-EC-CE2 O	1	0. No identificado	5. Brunido uniforme	beige	20. Modelado-inciso
21	35-3	DD.1	F	CdH-EC-GG15 NE/CE6 O	2	5. Botella	4. Pulido	dark gray	20. Modelado-inciso
23	35-11	DD.1	J	CdH-EC-GG15 NE/CE6 O	2	5. Botella	4. Pulido	very dark gray	19. Inciso grueso
32	150-12	DD.1	W	CdH-EC-GG15 NE/CE6 E09	3	5. Botella	4. Pulido	gray	0. No presente
42	157-58	DD.1	D	CdH-EC-HH15 NE	2	0. No identificado	3. Brunido	beige	0. No presente
62	G1-2-20	DD.1	L	LB-S3-U9-C3	5	0. No identificado	5. Brunido uniforme	orangey beige	19. Inciso grueso
9	30-26	DD.2	G	CdH-EC-CE2 O	1	5. Botella	4. Pulido	gray	0. No presente
11	30-30	FF	B	CdH-EC-CE2 O	1	0. No identificado	5. Brunido uniforme	pinkish gray	0. No presente
55	169-2	FF	C	CdH-LB N606 E674 Cuadrante NE	6	7. Olla sin cuello	4. Pulido	red	13. Aplicado
69	G5-2-1	FF	D	LB-S3-U9	6	0. No identificado	4. Pulido	red	21. Inciso con grafito
3	30-8	GG.1	H	CdH-EC-CE2 O	1	0. No identificado	4. Pulido	red-orange	3. Peinado
24	61-1	GG.1	N	CdH-EC-HH15 NE	3	8. Cantaro	0. No identificado	beige	0. No presente
29	61-19	GG.1	Q	CdH-EC-HH15 NE	3	8. Cantaro	3. Brunido	brown	0. No presente
36	157-20	GG.1	N	CdH-EC-HH15 NE	2	0. No identificado	3. Brunido	reddish gray	0. No presente
45	157-71	GG.2	D	CdH-EC-HH15 NE	2	0. No identificado	3. Brunido	orange-brown	0. No presente
34	157-9	GG.3	N	CdH-EC-HH15 NE	2	0. No identificado	2. Alisado grueso	dark gray	0. No presente
38	157-23	GG.3	N	CdH-EC-HH15 NE	2	0. No identificado	2. Alisado grueso	beige	0. No presente
40	157-30	GG.3	B	CdH-EC-HH15 NE	2	0. No identificado	3. Brunido	gray	0. No presente
41	157-43	GG.3	B	CdH-EC-HH15 NE	2	0. No identificado	2. Alisado grueso	gray	0. No presente
47	157-83	GG.3	N	CdH-EC-HH15 NE	2	0. No identificado	2. Alisado grueso	beige	0. No presente
48	157-97	GG.3	N	CdH-EC-HH15 NE	2	0. No identificado	3. Brunido	light brown	0. No presente
50	157-109	GG.3	T	CdH-EC-HH15 NE	2	0. No identificado	3. Brunido	pinkish gray	0. No presente

51	157-111	GG.3	P	CdH-EC-HH15 NE	2	0. No identificado	2. Alisado grueso	dark gray	0. No presente
13	30-38	GG.4	G	CdH-EC-CE2 O	1	8. Cantaro	4. Pulido	gray-brown	0. No presente
17	34-21	GG.4	B	CdH-EC-GG15 NE/CE6 E02	3 Rasgo 1	0. No identificado	5. Brunido uniforme	black	0. No presente
18	34-23	GG.4	F	CdH-EC-GG15 NE/CE6 E02	3 Rasgo 1	3. Tazon	5. Brunido uniforme	red-orange	0. No presente
19	34-29	GG.4	F	CdH-EC-GG15 NE/CE6 E02	3 Rasgo 1	7. Olla sin cuello	3. Brunido	yellowish red	0. No presente
25	61-7	GG.4	Q	CdH-EC-HH15 NE	3	8. Cantaro	1. Alisado fino	brown	0. No presente
26	61-8	GG.4	B	CdH-EC-HH15 NE	3	3. Tazon	3. Brunido	gray	0. No presente
33	150-22	GG.4	X	CdH-EC-GG15 NE/CE6 E09	3	3. Tazon	5. Brunido uniforme	red	0. No presente
39	157-27	GG.4	P	CdH-EC-HH15 NE	2	0. No identificado	2. Alisado grueso	orangeish beige	0. No presente
44	157-70	GG.4	B	CdH-EC-HH15 NE	2	0. No identificado	3. Brunido	dark gray	0. No presente
12	30-31	HH	H	CdH-EC-CE2 O	1	7. Olla sin cuello	5. Brunido uniforme	black	0. No presente
27	61-15	HH	M	CdH-EC-HH15 NE	3	8. Cantaro	3. Brunido	brown	0. No presente
46	157-75	HH	M	CdH-EC-HH15 NE	2	0. No identificado	3. Brunido	gray	0. No presente
49	157-108	HH	S	CdH-EC-HH15 NE	2	0. No identificado	3. Brunido	pinkish gray	0. No presente
53	157-115	HH	S	CdH-EC-HH15 NE	2	0. No identificado	3. Brunido	pinkish gray	0. No presente
37	157-21	KK	U	CdH-EC-HH15 NE	2	0. No identificado	4. Pulido	dark brown	0. No presente
54	157-117	KK	N	CdH-EC-HH15 NE	2	0. No identificado	2. Alisado grueso	black	0. No presente
52	157-114	LL	D	CdH-EC-HH15 NE	2	0. No identificado	3. Brunido	black	0. No presente
35	157-19	MM	B	CdH-EC-HH15 NE	2	0. No identificado	3. Brunido	brown	0. No presente
68	G3-2-5	MM	V	LB-S3-U9-C5	6	4. Cuenco	4. Pulido	black	19. Inciso grueso
31	150-9	NN	W	CdH-EC-GG15 NE/CE6 E09	3	3. Tazon	4. Pulido	black	0. No presente
75	K21-1	PP	V	CdH-LB19-CSW	9	3. Tazon	5. Brunido uniforme	black	22. Inciso con cinabrio

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