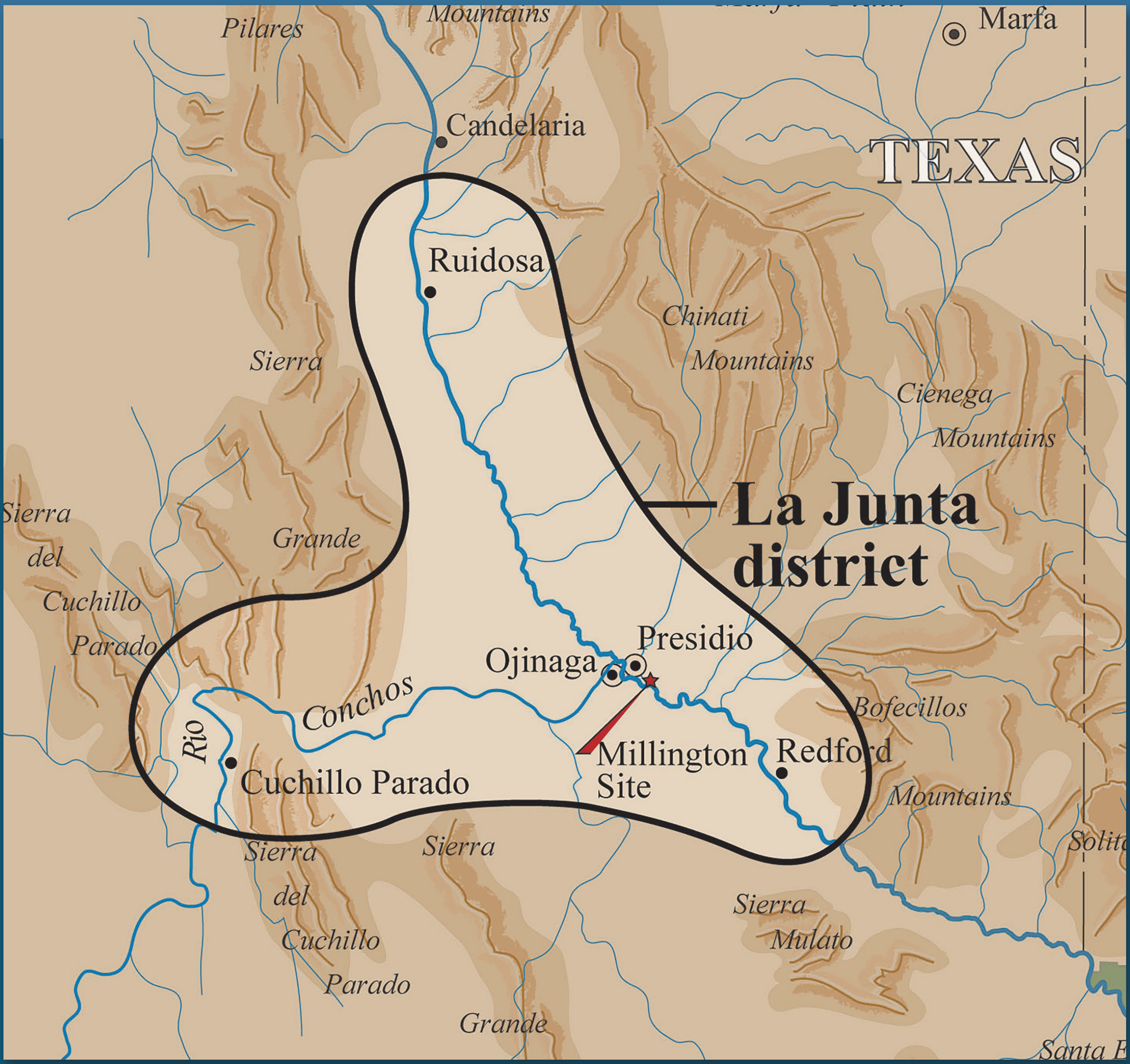
A Case Study of Protohistoric and Historic Brownwares from La Junta de los Ríos, Presidio County, Texas, and Ojinaga Municipality, Chihuahua

William A. Cloud and Richard W. Walter



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Cover Image: : La Junta Archaeological District Map

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Abstract

This monograph presents data on late-period (A.D. 1450–1760) ceramics from villages in the vicinity of the confluence of the Rio Grande and Chihuahua's Río Conchos, an area called *La Junta de los Ríos* or *La Junta* by early Spaniards. Ceramic sherds in archaeological repositories from four sites along the Rio Grande in proximity to the confluence—Millington/San Cristobal (41PS14), Polvo/Tapacolmes (41PS21), Kopenborger (41PS16), and San Bernardino (CH-E7-2)—were analyzed through both instrumental neutron activation analysis and petrography during the project. The former uncovered an unexpected compositional variability among the samples, given that all sites from which the specimens were found occur along the Rio Grande, while the latter was distinguished by the presence of a wide range of paste groups and tempering constituents. Overall, these findings indicate a robust brownware tradition was in place at La Junta during the period under study, strengthening thoughts on local manufacture originally espoused by J. Charles Kelley, a preeminent archaeological researcher of the region. Although the project did not identify discrete locations where clay and tempering materials were procured, patterning in the data from each of the analyses offers the beginnings of such an understanding.

Acknowledgements

The authors would like to thank a number of individuals for their help and support in bringing this project to a successful completion. For their interest and strong encouragement in launching this study of Protohistoric-period brownwares at *La Junta de los Ríos,* we thank Aina Dodge, Archeology Laboratory Director with the Texas Parks and Wildlife Department (TPWD); Tim Roberts, TPWD Cultural Resources Coordinator Region 1; Dr. Nancy Kenmotsu, principal investigator for Geo-Marine Inc.; and Dr. Darrell Creel, retired director of the Texas Archeological Research Laboratory and Professor Emeritus of The University of Texas at Austin.

Special thanks are extended to the researchers who completed the analytical portions of the study: Dr. Jeffery Ferguson of the University of Missouri Research Reactor Center Archaeometry Laboratory, and Dr. David Robinson, independent researcher. Dr. Ferguson completed the instrumental neutron activation analysis and Dr. Robinson the petrography analysis; each solely authored the respective reports that appear in this publication as appendices and are thanked for their professionalism throughout the project.

Two other individuals that reside in the Trans-Pecos, Dr. Lynn Loomis, a soil scientist with the United States Department of Agriculture-Natural Resources Conservation Service, and Pauline Hernandez, a local potter, are acknowledged, respectively, for sharing information on local clay sources and clays suitable for the manufacture of pottery.

Finally, Center for Big Bend Studies Director, Dr. Bryon Schroeder, and contract editor Susan Chisholm are thanked for their roles in bringing this project to completion. Dr. Schroeder offered encouragement and support throughout the process, and Mrs. Chisholm improved the readability of the report through her focused and detailed editorial prowess.

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Introduction

Sedentary and semi-sedentary native villagers in the American Southwest and northern Mexico are distinguished through their agricultural pursuits and attendant material culture, including a wide variety of pottery vessels needed to cook and store the produce grown; ceramics were critical for such lifeways. Such was the case for the Protohistoric period (ca. A.D. 1535–1800) villages centered around the confluence of the Rio Grande and Chihuahua's Río Conchos, an area called *La Junta de los Ríos* or *La Junta* by early Spaniards venturing into the region.

The La Junta villages sprang up by ca. A.D. 1200, most likely through migration or cultural diffusion, and the villagers initially obtained their ceramics from extra-local sources to the north and northwest—the Jornada Mogollon culture area and the great redistribution center known as Paquimé/Casas Grandes (Kelley et al. 1940; Cloud 2004; Robinson 2004; Rodríguez-Alegría et al. 2004; Kenmotsu 2013). After those trade networks collapsed around A.D. 1450, the villages are thought to have been partially or completely abandoned for 50 to 100 years (Kelley 1990). New sources of ceramics were needed when the villages were reoccupied and, based on his findings in the 1930s through the 1950s, preeminent La Junta researcher J. Charles Kelley theorized the various wares associated with these later occupations (ca. A.D. 1450–1760) were locally manufactured (Kelley et al. 1940; Kelley 1947, 1986). Kelley came up with type names for many of these—Chinati Plain, Chinati Filleted Rim, Chinati Scored, Capote Plain, Capote Red-on-Brown, Conchos Plain, and Conchos Red-on-Brown—but never completed formal type descriptions; in 2004 Kelley's preliminary descriptions for these types were published posthumously with his widow's permission (Kelley et al. 1940; Kelley 2004).

Kelley's body of work at La Junta (Kelley 1939, 1947, 1949, 1951, 1952a, 1952b, 1953, 1985, 1986, 1990, 2004; Kelley et al. 1940; Kelley and Kelley 1990; see also Shackelford 1951, 1955) included excavations at four important villages on the Texas side of the river—Millington/San Cristóbal (41PS14), Polvo/Tapacolmes (41PS21), Loma Alta/San Juan Evangelista (41PS15), and Shiner (Shafter 6:1)—and one on the Chihuahua side, Loma Seca (CH-E7-5). In addition, he visited numerous other La Junta sites while conducting reconnaissance surveys and spot visits to sites on both sides of the river. During these many investigations, which included two reconnaissance surveys up the Río Conchos in 1949 and 1951, Kelley recovered a great many ceramic sherds that are now curated at Sul Ross State University in Alpine, Texas (Museum of the Big Bend and the Center for Big Bend Studies), and the Texas Archeological Research Laboratory (TARL) at The University of Texas at Austin.

Kelley's sherd collections have been used on several occasions in the last 15 years for analyses—instrumental neutron activation analysis (NAA) and petrography—to research La Junta ceramics and further refine our understanding of their production locality/localities (Cloud 2004; Rodríguez-Alegría et al. 2004; Robinson 2004, 2017a, 2017b; Speakman and Glascock 2005; Wiseman 2008; Kenmotsu 2013; Ferguson and Glascock 2017; Roberts et al. 2017). These studies have helped to establish chemical and compositional baseline data for La Junta ceramics for both those from the earlier occupations as well as those from the later ones. Furthermore, these studies have helped to confirm Kelley's original thoughts concerning manufacturing localities for ceramics from both the earlier and later occupations—extra-local manufacture for the earlier ceramics and local manufacture for the later ones.

In order to continue research on late-period La Junta ceramics (ca. A.D. 1450–1760) and further refine our understanding of their production locality/localities, the project herein reported was initiated through funding provided by a Texas Preservation Trust Fund grant and matching funds from the Trans-Pecos Archaeological Program (TAP) of the Center for Big Bend Studies (CBBS) of Sul Ross State University (SRSU). After the CBBS selected 279 sherds collected by J. Charles Kelley over 70 years ago from four La Junta sites (Millington, Kopenborger, and Polvo in Texas, and San Bernardino/CH-E7-2 in Chihuahua)—located in three separate curatorial facilities—pieces of each sherd were used for both NAA and petrographic studies. The NAA for this project was conducted by Jeffrey R. Ferguson of the University of Missouri Research Reactor Center (MURR); financial support was provided in part by a National Science Foundation grant to the MURR Archaeometry Laboratory (grant #1621158). Ferguson's complete report is provided in Appendix A. David G. Robinson conducted the petrographic analysis, following up on his previous work with La Junta ceramics (Robinson 2004, 2017a, and 2017b). His complete report is provided in Appendix B.

Geological Background

The project area lies within the northeastern portion of the vast Chihuahuan Desert, one of America's largest deserts, depending on the defining criteria (Powell and Hilsenbeck 1995). It stretches north-south from south-central New Mexico to just north of Mexico City and east-west from the Pecos River in West Texas to the central portion of the Mexican state of Chihuahua. Much of the desert environs in the region are relatively rugged and stark, although more hospitable settings are found along the Rio Grande (Río Bravo del Norte) and Río Conchos of northeastern Chihuahua. These ribbons of life meander through the parched area, joining in what has long been known as La Junta de los Ríos near the sister cities of Presidio, Texas, and Ojinaga, Chihuahua. The confluence occurs at an elevation of about 780 meters (m) above mean sea level (AMSL), and areas downstream along the Rio Grande have the lowest elevations found in the region.

La Junta is situated within the Basin and Range province, a broad area in the western United States and northern Mexico typified by southeast/northwest-trending fault-block mountain ranges separated by extensive sediment-filled basins or bolsons (Fenneman 1931). More specifically, the ranges on either side of the Rio Grande in the Big Bend are within the Mexican Highlands section of the province (Fenneman 1931; Thornbury 1965; Groat 1972). Henry (1998) has indicated that normal faulting in the region, beginning in the late Miocene and terminating at the end of the Pliocene (ca. 23.7–1.6 million years ago), produced a complex system of horsts (uplifted blocks or ranges) and grabens (down-dropped blocks or basins) which resulted in the formation of two closed basins. Subsequently, these basins were filled with thick detritus shed from the adjacent mountains, thus forming the Presidio Bolson and downstream, the much smaller, but interconnected Redford Bolson. These closed basins were then breached when the ancestral Rio Grande formed about two million years ago and cut a path through their lower areas (Groat 1972; Henry 1998). Since that time, extensive erosion from both downcutting and lateral movement of the river, and the development of associated tributary drainages have helped shape the modern landscape.

The Presidio and Redford basins are bordered by mountainous terrain created over millennia through volcanic eruptions and basin-and-range faulting. On the Texas side of the Rio Grande, from northwest to southeast, the Presidio Bolson is flanked by the Sierra Vieja, the Chinati Mountains, the Cienega Mountains, and the Bofecillos Mountains; in Chihuahua from north to south, it is defined by the Sierra Pinosa, the Sierra de la Parra, the Sierra Grande, the Sierra de la Mula, and the Sierra Rica (Mraz and Keller 1980). The Redford Bolson is ringed by the Bofecillos Mountains, the Sierra de la Mula, and the Sierra Rica. These ranges contain a plethora of igneous and metamorphic rock outcrops distinguished by various granites, basalts, porphyries, and weathered rhyolitic and ash-flow tuffs, with a lesser quantity of Cretaceous limestones and other sedimentary rocks (McKnight 1970;

Groat 1972; Henry 1998; Robinson 2004). The basins are eroded reflections of these parent materials, with the addition of alluvium from the two rivers. Igneous and metamorphic rocks are dominant and each of the mountain ranges and basins contains unique suites of rocks and minerals, with tuffs being particularly ubiquitous across the landscape. Groat (1972:26–28) noted that the rounded, mainstream gravels in the bolsons were distinct from the angular side-stream gravels, an important distinction in light of Robinson's (Appendix A) petrography report.

Relative to the ceramic study reported here, the assumption is that clays and tempering materials available at La Junta would differ from such constituents in other parts of the region or farther afield. Furthermore, these ceramic constituents along the Rio Grande—available at each of the pueblos—would have differed from one another to some degree based on their respective locations. The San Bernardino site lies the arthest upstream, on the Chihuahuan side of the river; the Polvo site is situated the farthest downstream on the Texas side of the river, the only site in the study within the Redford Bolson; the Millington and Kopenborger sites lie in the interim, both on the Texas side in the approximate area the Rio Grande-Río Conchos confluence.

San Bernardino

The San Bernardino site is positioned on a Quaternary gravel terrace just above the Rio Grande floodplain about 43 km upstream from the La Junta confluence. It is adjacent to the lower reaches of Mimbres Arroyo and near Cerro Alto and its smaller companion, Sierrita, both of which are Lower Cretaceous overthrusts of Loma Plata Limestone that also contain nodular micrite, chert, hematite, and shale. This formation overlies exposures of the Ojinaga Formation which contains shale, silty limestone, calcareous siltstone, and gypsum. This area also contains exposures of Buda Limestone of the Del Rio Formation and massive limestone of the Benigo Formation that includes micrite, biomicrite, calcarenite, and sandstone. Here colluvial movement and arroyos relocate rocks and sediments toward the river from the adjacent Sierra Pinosa and the Sierra de la Parra; across the river in Texas, the Sierra Vieja and the Chinati Mountains provide sources for these materials. While the Chinati Mountains contain extensive igneous deposits, carbonate-bearing formations also occur, although they are more prevalent on the Chihuahuan side of the river, especially in the Sierra de la Parra (Gries 1970; Barnes 1979; Keller 2019).

Kopenborger

The Kopenborger site (41PS16) covers a ca. 300 x 360 m area within coppice sand dunes (Recent Quaternary alluvium) along an eroded edge of the first alluvial terrace of the Rio Grande, immediately adjacent to its confluence with the Río Conchos and a short distance northwest of Presidio, Texas (Barnes 1979). Severe erosion has impacted the site, both along the terrace edge and in its central portion where moderately deep gullies cut through the partially stabilized dunes. Blanketed by these dunes—some stabilized by cacti and mesquite trees—the site area occurs a short distance east of Arroyo Rodríguez and ca. 2.8 km west of Arroyo Mimbroso, which parallels the larger Cibolo Creek (located ca. 0.4 km further east). Both of the latter arroyos head to the northeast near Shafter, Texas, where Cretaceous-aged formations (the Shafter and Del Carmen Limestone) supply limestone, sandstone, shale, marl, and carbonates to their bedloads. An unnamed braided drainage truncates the southern portion of the site, and the site area is mapped as Recent (Holocene) Windblown sand (Barnes 1979).

Millington

The Millington site (41PS14) lies on a pronounced, relatively flat alluvial terrace (Recent Quaternary alluvium) adjacent to the Rio Grande floodplain at the southeastern edge of Presidio, Texas (Barnes 1979). It is situated about 1.6 km north-northeast of the Rio Grande at an elevation of 782 m AMSL; however, in 1747, Spanish Captain Commander Joseph de Ydoiaga indicated the riverbank was right up against the terrace edge at the site (Madrid 1992:60–61). The site area was initially reported to be ca. 80 x 320 m—the long axis paralleling the terrace edge—but since that time, construction of residential areas has resulted in severe impacts to its northern and eastern portions. While several unnamed arroyos in the general vicinity of the Millington site have been diverted by these construction activities, larger tributaries of the river occur to both the east and northwest. Cibolo Creek—the largest drainage in the immediate area—is ca. 2.4 km northwest of the site, and Arroyo Tortola is located ca. 0.9 km to the east. Both watercourses drain from the Shafter, Texas, area, with the latter bounded on the east in this area by the Cienega Mountains. Parent materials from formations in this area (including the Del Carmen Limestone, Shafter, and Morita Ranch formations) include limestone, shale, sandstone, marl, peralkaline rhyolite, rhyolitic tuff, and rhyolite; additionally, the Shafter Formation also yields fossils of *Exogyra texana* and *Orbitolina texana* (Barnes 1979). Materials derived from these formations likely contribute in part to the carbonates and fossils identified in the pastes of some of the ceramics in the study.

Polvo

The Polvo site (41PS21) is located on a prominent terrace adjacent to the Rio Grande ca. 1.6 km south of Redford, Texas, and, as stated previously, is the farthest downstream of the sites in the study (ca. 29 km downriver from the Rio Grande-Río Conchos confluence) and the only one within the Redford Bolson. At an elevation between 762 and 768 m AMSL, it lies on the site of the old Mexican-American village of Polvo that was established in the late nineteenth century downstream from the La Junta confluence. The site is cut by a typically dry arroyo—Church Creek or Arroyo de la Iglesia—that flows from east to west and exclusively drains the Rawls Formation of the Bofecillos Mountains (Barnes 1979). An unnamed arroyo, partially redirected by an artificial earthen levee, forms the northwestern site boundary prior to joining Church Creek at the western edge of the site; the two then debauch into the Rio Grande as a minor tributary. The Rawls Formation represents a mixture of extrusive volcanic flows, exposures of intrusive materials, and sedimentary rocks. The complex formation contains basalts, trachytic basalts, rhyolites, tuffs (ash-flow and ash-fall with some modification into lithic and welded tuffs), diorites, latites, andesite—and porphyritic versions of each of these—as well as conglomerates, breccias, and sandstones (Barnes 1979). Each of these contributes to the bedload found in Church Creek. A drainage that heads in the Sierra de la Mula of Chihuahua, El Arroyo de Valle Nuevo—known locally as El Arroyo de la Mula or Arroyo del Canoncito (it has also been reported as Arroyo Bayo Nuevo)—flows into the Rio Grande directly across from the Polvo site, bringing a different suite of materials to the immediate vicinity.

Previous La Junta Ceramic Analyses

Recent studies of La Junta ceramics over the past 15 years have rejuvenated research of these vessels (Cloud 2004; Robinson 2004, 2017a, 2017b; Rodríguez-Alegría et al. 2004; Speakman and Glascock 2005; Wiseman 2008; Ferguson and Miller 2010; Kenmotsu 2013; Ferguson and Glascock 2017; Roberts et al. 2017). These research efforts have steadily supplied important data to a growing La Junta ceramic database, each to a degree building on the previous work.

In 2004, an investigation sponsored by the Texas Department of Transportation (TxDOT) and conducted by the CBBS led to analyses of sherds from two La Junta sites, Arroyo de la Presa (41PS800) and Millington (41PS14). The TxDOT testing and data recovery project was conducted at the former, a non-village site between the Millington and Polvo sites, where five untyped ceramic sherds (designated undifferentiated Chihuahuan brownwares) were recovered. These sherds were subjected to neutron activation and petrographic analyses along with 27 sherds of various types from Kelley's and Donald J. Lehmer's investigation of the Millington site in 1938 and 1939. Four La Junta soil samples and a possible tempering agent were also analyzed during the NAA study.

These ceramic studies provided chemical and compositional baseline data for the analyzed samples, with the specimens from Millington consisting of 5 El Paso Polychrome sherds and 22 sherds representing seven of Kelley's preliminary types (Chinati Plain, Chinati Filleted Rim, Chinati Scored, Capote Plain, Capote Red-on-Brown, Conchos Plain, and Conchos Red-on-Brown). The NAA (Rodríguez-Alegría et al. 2004) indicated 4 of 5 El Paso Polychrome sherds fit within the previously established El Paso Core chemical group, indicating "they were manufactured in the El Paso area" (Rodríguez-Alegría et al. 2004:222), while the petrography analysis concluded distinctive qualities and constituents of these same sherds pointed toward non-local manufacture (Robinson 2004:231). Together, these analyses supported Kelley's (Kelley 1939; Kelley et al. 1940) original thoughts that this distinctive Jornada Mogollon type was manufactured in the El Paso area (core area of the Jornada Mogollon culture) and subsequently brought to La Junta through migration or trade. Both analyses also strongly suggested the undifferentiated Chihuahuan brownwares from the Arroyo de la Presa site were unique when compared to the other samples and were manufactured outside the La Junta region.

The NAA data for the other samples allowed placement in two distinct chemical groups—the Main Playas Red group (15 sherds and 3 soil samples) and a new Capote-1 group (5 sherds)—while 6 samples (4 sherds, the possible tempering agent, and a soil sample) were unassigned. The 18 samples placed in the previously identified Main Playas Red group consisted of 13 sherds placed in a subgroup (the Main Playas Red Mimbres-5 subgroup) and 5 samples (2 Chinati Plain sherds and 3 soil samples) not assigned to any subgroup. Sherds in the subgroup consisted of 7 Chinati ware sherds (2 Chinati Plain, 3 Chinati Scored, and 2 Chinati Filleted Rim), 4 Conchos ware sherds (2 Conchos Plain and 2 Conchos Red-on-Brown), and 2 Capote Red-on-Brown sherds (Rodríguez-Alegría et al. 2004:219). Notably, all but one of the Chinati wares and all Conchos wares in the study were members of the Main Playas Red group (which includes the subgroup). The new Capote-1 group contained all the Capote Plain sherds in the study and the researchers noted the group had a similar composition as the Main Playas Red group. With the majority of late-period sherds residing in these two chemically similar groups (20 of 22 sherds), Rodríguez-Alegría et al. (2004:223) offered two possible explanations: 1) these wares were imported from the Mimbres Valley, or 2) the ceramics "were produced in the La Junta area with local clays that resemble clays from the Mimbres Valley." In regard to the latter possibility, it was suggested the clays within the adjacent basins of the Rio Grande and Mimbres River in New Mexico would be expected to have similar compositions, but that further research would be needed to make more definitive statements. Robinson's (2004:233) petrographic analysis of these same sherds led to the conclusion that the rocks and minerals in the Conchos, Chinati, and Capote wares "are reflective of the geology of the La Junta region, and one could not argue logically for manufacture in another region on the basis of petrography."

A few years after the Arroyo de la Presa analysis, Regge Wiseman (2008), a CBBS Research Associate and longtime archaeologist and ceramic analyst in New Mexico, undertook an evaluation of two of Kelley's La Junta plain brownwares: Capote Plain and Conchos Plain. Utilizing over 600 sherds from the Millington site curated at TARL, that Kelley collected and analyzed by type, Wiseman's (2008:27) detailed analysis of the paste, tempering materials, metrics, etc., led him to conclude there was "no way to confirm the existence of the pottery types Capote Plain and Conchos Plain as proposed by Dr. J. Charles Kelley." He indicated that while possible trends in the data were noted, further analysis was needed of sherds obtained through modern controlled excavations to more appropriately evaluate these possible types.

Also following up on the Arroyo de la Presa analysis, Nancy Kenmotsu (2013:15) selected 101 sherds for another NAA study of sherds recovered from La Junta with the primary goal "to determine whether the El Paso Polychrome and the La Junta wares have distinct chemical signatures that reflect manufacture in their respective regions." This analysis was also conducted at MURR and consisted of sherds from 17 Presidio County sites—including sherds from the Millington, Polvo, and Kopenborger sites—two Hudspeth County sites, and one site in Jeff Davis County (Speakman and Glascock 2005). In order to address the problematic results in the Rodríguez-Alegría et al. (2004) study regarding the Main Playas Red group and its Mimbres-5 subgroup, the MURR researchers re-analyzed all 32 sherds in that study; this overall investigation also included data from "over 2,000 Mimbres and Jornada pottery samples previously run at MURR and Texas A&M University" (Kenmotsu 2013:18).

The 51 El Paso wares (35 El Paso Polychrome and 16 El Paso Plain samples) analyzed in this study included 14 sherds from two Hudspeth County sites excavated by Kelley—12 El Paso wares and 2 sherds that resembled La Junta wares (1 Chinati Plain sherd and 1 Capote Plain sherd). Importantly, the vast majority (46 of the 51 samples) of the El Paso wares formed a chemically distinct group that closely matched the El Paso Core group previously established through NAA studies. Since this is a well-established group, the data indicate most El Paso wares at La Junta sites were made in the El Paso, Texas, area (Speakman and Glascock 2005:8; Kenmotsu 2013:19), thus adding more confirmation to the suggestions of Rodríguez-Alegría et al. (2004) and Robinson (2004) in the earlier analyses.

Perhaps of even more significance, especially in regard to the analyses herein reported, were the findings concerning the suspected late-period La Junta wares. Speakman and Glascock (2005:7) indicated:

> Of particular relevance here is that Cloud's earlier sample [the 2004 analysis] of Capote, Chinati, and Conchos sherds together with the similar pottery types analyzed for the current study [the 67 sherds submitted by Kenmotsu] can now be shown to form

> a group that is both **distinct** from other Mimbres/Jornada compositional groups **and statistically viable**—as we would expect given the distance between El Paso and Presidio County [emphasis in original].

Moreover, the study supported the formation of a new compositional group, the Presidio County reference group, found to include 56 of the 67 La Junta samples; those not placed in the group were unassigned. These findings further support Robinson's (2004:231) findings concerning 22 Capote, Chinati, and Conchos sherds, yet the unassigned 11 samples indicated the need for additional research. Both the NAA researchers and Kenmotsu (2013:22) noted the paucity of samples subjected to NAA from south of the border, suggesting such data might help with the unassigned samples.

Smaller NAA and petrographic studies were published in 2017 for 9 ceramic sherds—including 6 late-period La Junta wares (1 Capote Plain, 2 Chinati Plain, 2 Conchos Plain, and 1 Conchos Red-on-Brown)—recovered from surface contexts at seven sites located within Texas Parks and Wildlife Department's (TPWD) Big Bend Ranch State Park (BBRSP) (Ferguson and Glascock 2017; Roberts et al. 2017; Robinson 2017a, 2017b). Sherds in the study were selected from 309 native-made brown earthenwares collected during trail surveys conducted from 2004 to 2010 (Roberts et al. 2017). The park is positioned along the Rio Grande below Presidio, with one section adjacent to the downstream extension of the La Junta archaeological district—the area of the district containing the Polvo site.

The TPWD-sponsored NAA study fell on the heels of an effort by Ferguson and Miller (2010) to reorganize the NAA Mogollon Brownware Database. During this process, the previous NAA studies of 80 La Junta samples were reorganized into four groups: Group 51, Group 52a, Group 52b, and Group 53. Of the nine samples analyzed during the TPWD study, Ferguson and Glascock (2017) placed two in Group 51 (1 Conchos Plain sherd and 1 Conchos Red-on-Brown sherd), and four adhered to placement in either Group 51 or Group 52b (1 Conchos Plain sherd, 2 Chinati Plain sherds, and 1 unknown sherd); three were considered outliers (1 Babicora/Ramos Polychrome sherd, 1 Capote Plain sherd, and 1 unknown sherd). The researchers (Ferguson and Glascock 2017:515) noted that "[a] more extensive and intensive sampling strategy in the region may allow for the eventual establishment of robust compositional groups with identified production locations as has been established in other regions such as the Mimbres Valley and Cibola region of Arizona and New Mexico."

Robinson's (2017a) petrographic thin-section analysis of these same 9 sherds was conducted in tandem with analysis of 10 comparative sediment samples from arroyos in the park, the latter effort to assist in finding locations of constituents within the ceramics (i.e., clay and tempering materials). The thin-section analysis resulted in the formation of four paste groups: A (n=4 sherds), B (n=2 sherds), C (n=2 sherds), and D (n=1 sherd). The 4 sherds in Paste Group A consisted of 2 Conchos Plain sherds, 1 Conchos Red-on-Brown sherd, and 1 untyped brownware sherd; Paste Group B was comprised of 2 Chinati Plain sherds; Paste Group C contained a Capote Plain sherd and an untyped brownware sherd, although Robinson (2017a:499) indicated the latter (a ripple rim/"pie crust" sherd) had also been considered a possible Capote Red-on-Brown sherd; and Paste Group D was comprised of a single Babicora or Ramos Polychrome sherd (both types are Chihuahuan Brownwares).

While comparing findings in this analysis with the thin section analysis from the Arroyo de la Presa site (Cloud 2004; Robinson 2004), Robinson (2017a:499) indicated striking similarities between the Babicora/Ramos Polychrome sherd (Paste Group D) and the Undifferentiated Chihuahuan Brownware II sherd (OBE32) in that study. He suggested both were likely Casas Grandes brownwares that originated in the northern Chihuahua region, although importantly noting the locational suggestion was based on typology rather than petrography (Robinson 2017a:504). Robinson also indicated general similarities between the Capote Plain sherd (Paste Group C) and 8 sections of that ware in the Cloud (2004) study; and the Chinati Plain sherds (Paste Group B) compared well with 10 Chinati Plain sherds in the Arroyo de la Presa study, although it was suggested they were manufactured in the BBRSP area rather than La Junta. In contrast, the 3 Conchos wares (Paste Group

A) were found to be much different from the sherds of that type in the previous study, and he (Robinson 2017a:504) thought this indicated "selective exploitation of different ceramic source beds within the La Junta/ Big Bend region, at least for the Conchos types."

The analysis of sediment samples from arroyos in BBRSP led Robinson (2017a:501) to conclude:

> The most general and fundamental finding of the BBRSP petrographic study is that the ancient ceramics had far less diversity in their rock and mineral content than the local stream beds had in theirs. The sediment samples have strikingly greater diversity than the ceramic sections…This disparity implies a significant degree of selection of all materials entering the ceramic manufacturing process. And this interpretation is sufficiently robust to apply to most of the La Junta/Big Bend region earthenware ceramics. Simplistic models of expedient collection of clays and sands from nearby stream beds, commonly held in archeology, are not indicated by these data.

Despite the above statement, Robinson cautioned that additional data and approaches would be needed to fully address manufacturing localities and the post-manufacturing movement of ceramics in the region.

Robinson (2017b) scrutinized the two separate analyses and noted an overall agreement in the results while indicating contrastive findings were related to unresolved research issues. He pointed out general agreements in the analyses for his breakdowns involving his Paste Groups A, B, and D, with less alignment for his Paste Group C. Robinson indicated 3 of 4 Paste Group A members (all Conchos wares) were classified as members of Compositional Groups 51 or 52b, two groups with a strong overlap; the other Paste Group A member, an untyped sherd, being an outlier in the NAA study. He indicated a solid agreement between the two studies for his Paste Group B (both Chinati Plain members) and Ferguson and Glascock's (2017) assignment for these sherds in their compositional Group 51/52b. He also indicated congruence for his Paste Group D, representing a single sherd (Babicora/Ramos Polychrome), as it was classified as an outlier in the NAA study. Some discrepancy was noted by Robinson for NAA findings for the 2 sherds in his Paste Group C—a Capote Plain sherd and a possible Capote Red-on-Brown sherd—as Ferguson and Glascock (2017) classed these, respectively, as an outlier and a compositional Group 51/52b member. Recognizing issues in these and previous analyses of Capote wares, Robinson (2017b:522) offered that "Capote types may simply have a wider area of manufacturing and distribution than the other regional types." In closing, Robinson (2017b:524) offered that future efforts to match clay and sherd samples might be more productive if residual clay samples rather than those from alluvial sources were targeted for analysis.

Project Design

Previous analyses of La Junta ceramics—mostly aimed at deciphering manufacturing locations—have concentrated on studies of specific Southwestern types (e.g., El Paso Polychrome and Playas Red) and local/regional "types" initially proposed by J. Charles Kelley such as Capote, Chinati, Palomas, and Conchos wares (Kelley et al. 1940; Kelley 1947, 1986, and 1990; Kelley and Kelley 1990). Kelley's (2004) preliminary type descriptions for most of these proposed wares were published posthumously with his widow's permission, and several subsequent research efforts have furthered our understanding of these ceramics while using these types and associated descriptions (Wiseman 2008; Kenmotsu 2013; Roberts et al. 2017). In fact, discussions between these and other La Junta researchers interested in this topic led to the current study.

These discussions focused on late-period (Concepción and Conchos phases; i.e., ca. A.D. 1450–1760) La Junta wares and whether Kelley's thoughts on local manufacture (Kelley et al. 1940; Kelley 1947, 1986) were correct, bringing to light the need for further analyses—petrographic thin-sectioning and NAA—of specimens from sites in the district. It was agreed that a large number of sherds would be needed for these analyses to achieve statistically viable results; the researchers decided ca. 300 sherds would be sufficient. Subsequently, in January 2016, the CBBS submitted a Texas Preservation Trust Fund (TPTF) grant application to the Texas Historical Commission (THC) for petrographic and NAA studies of Protohistoric and Historic pottery from La Junta village sites. Following THC review, the CBBS was selected to submit a formal proposal in July 2016 (Walter and Cloud 2016). After a subsequent review, the THC awarded the CBBS a TPTF matching grant on November 7, 2016.

Once the project was approved with funding in place, the junior author began the lengthy process of initiating the petrography and NAA studies, while simultaneously tracking down sherds to be used in the analyses. David G. Robinson agreed to conduct the petrographic thin-sectioning and Jeffrey R. Ferguson of MURR was lined up for the NAA study. For the latter, the CBBS submitted a proposal to MURR to be eligible to receive a discount on the analysis through the National Science Foundation Subsidy Program of Archaeological Research (Walter and Cloud 2017a). With some adjustments, the proposal was ultimately approved, although a component of the study—analysis of select sediment samples—was omitted due to the reviewer's concerns about the effectiveness of such research based on previous studies both at La Junta (see Rodrgíuez-Alegría et al. 2004 and Ferguson and Glascock 2017) and in the southern American Southwest.

While the previous studies used Kelley's preliminary types (e.g., Conchos Plain, Capote Red-on-Brown, Chinati Filleted Rim, etc.), the present project took on a more descriptive approach because of the state of the curated collections; i.e., because a substantial number of sherds were needed and the concomitant limited number of specimens classified as to "type" in the various repositories. As a result, it was decided to organize the collection to be analyzed (n=279 sherds) by descriptions of surface treatments: plain (n=112), slipped (n=76), painted/decorated (n=57), and surface-treated (n=34). For the purpose of this analysis, surface-treated sherds consist of those that are brushed, burnished, or smoothed.

In addition, for viable results aimed at learning manufacturing localities across the district, sherds were needed from multiple sites, especially some of the more prominent sites. While sherds from excavations versus surface contexts were prioritized for the analyses, few such sherds were curated with these data, largely due to the early dates and associated field and curatorial techniques in use during those times for most of the La Junta projects from which sherds were collected. Accordingly, sherds from four sites—Millington (n=81 sherds), Polvo (n=59 sherds), Kopenborger (n=80 sherds), and San Bernardino (n=59 sherds)—were selected from the collections held at TARL (The University of Texas at Austin), and from Museum of the Big Bend and CBBS collections (Sul Ross State University). Since the proposed analyses are destructive, the TARL Deaccession Committee required a scientific proposal which was completed by Walter and Cloud (2017b). Research questions in the proposals submitted to TARL and MURR include:

1. Did La Juntans from the various villages obtain clay and temper from single or multiple source areas?

2. Does the current study continue to demonstrate compositional uniformity of Protohistoric and Historic sherds at La Junta?

3. Is there differentiation of clay and temper used for the different classes of pottery (i.e., plain, surface-treated, painted/decorated, and slipped)?

4. Is there mineralogical and/or geochemical evidence indicating trade/interaction with groups outside of La Junta?

Sherds chosen for the study were individually documented at the CBBS by Walter following Wiseman (2008) prior to initiation of the petrographic and NAA studies. Documentation was performed through visual inspection utilizing a 20X eye-loupe magnifier and a Munsell® (Munsell Color Company 1994) color chart; measurements were taken with a Mitutoyo digital caliper. Attributes recorded consisted of sherd thickness; vessel form if identifiable; rim type if applicable; interior and exterior colors; interior and exterior textures (i.e., smoothing and polish); surface treatment (i.e., plain, slipped, painted/decorated, and surface-treated); temper size using the Wentworth (1922) scale; and general descriptions of tempering materials (i.e., shape, translucency, and color). Additionally, any evidence of construction techniques (e.g., coiling) was also documented. Specimens were then broken to allow submission of fragments from each sherd to the respective analysts.

Summaries of Analytical Findings

While both the NAA and petrography reports for this project indicate spatial patterning, each contains discrete data useful in understanding the production and movement of ceramics at La Junta. Below are synopses of both studies; see Appendix A (the NAA) and Appendix B (the petrographic analysis) for the complete analyses.

Neutron Activation Analysis

The NAA produced elemental concentration values for 33 elements for most of the 279 sherds analyzed and allowed Ferguson (see Appendix A) to construct eight compositional groups containing ca. 74 percent of the specimens analyzed; 73 specimens were classified as either individual outliers (n=8) or unassigned samples (n=65). The eight compositional groups consist of six small groups (Groups 1–6) comprised of from 2 to 20 specimens each, and two large groups, Group 10 and Group 20, containing 58 and 112 specimens, respectively. Importantly, all of the small groups reveal striking spatial patterning, each comprised of specimens from a single site. Ferguson used the following site acronyms to distinguish specimens from the individual sites in the analysis: MNN (Millington), KBN (Kopenborger), PVN (Polvo), and SBN (San Bernardino).

Group 1 is comprised of 2 specimens (MNN025 and MNN026), both plainwares with relatively low chromium concentrations; both are from the Millington site. Group 2 contains 3 specimens (KBN029, KBN038, and KBN040) from the Kopenborger site, all slipped wares with low concentrations of chromium and samarium. Three specimens also comprise Group 3. All are from the San Bernardino site and have high chromium values; 2 of these (SBN011 and SBN065) are plainwares, the other (SBN026) a slipped ware. Group 4, the largest of the small groups, contains 20 specimens, all from the Polvo site with high chromium and tantalum concentrations. This group is comprised of 12 plainwares (PVN001, PVN004, PVN009, PVN010, PVN013, PVN082, PVN084, PVN86, PVN087, PVN088, PVN090, and PVN094), 5 painted/decorated wares (PVN021, PVN022, PVN023, PVN024, and PVN027), 2 slipped wares (PVN063 and PVN065), and 1 surface-treated ware (PVN041). Group 5 contains 3 specimens from the Polvo site isolated in a chromium-samarium plot; 2 are plainwares (PVN003 and PVN085), the other (PVN069) a slipped ware. Five specimens from the Polvo site with high samarium concentrations comprise Group 6; 3 of these (PVN007, PVN012, and PVN092) are plainwares, the other 2 (PVN064 and PVN070) are slipped wares.

Following the removal of outliers and the six small groups, the remaining cluster of samples evinced slight separation into two parts. Ferguson (see Appendix A, pg. 8) indicated “further refinement through many rounds of group membership probabilities using Mahalanobis distance calculations based on both elemental and PCA [principal components analysis]" yielded the two large groups (Groups 10 and 20) and a large number of unassigned samples (n=65). Group 10 and Group 20 together contain 170 specimens or ca. 61 percent of the analyzed specimens. Both groups contain specimens from all four sites, although in different percentages. The overwhelming majority of specimens in Group 10 (n=55; ca. 95 percent) are from the two northernmost sites, San Bernardino and Kopenborger. The former contained most of the specimens in this group (n=41; ca. 75 percent), the latter contained 14 specimens. Also included in the group are 1 specimen from Millington and 2 specimens from Polvo. Brownware "types" in Group 10 are more evenly distributed, with plainwares and slipped wares both comprising ca. 34 percent of the total and painted/decorated wares and surface-treated wares representing ca. 20 and 12 percent, respectively. Group 20 specimens are also primarily from two sites, the centrally located ones in the study, Millington and Kopenborger. Fifty-three specimens in the group are from Millington (ca. 47 percent), 50 from Kopenborger (ca. 47 percent), 8 from Polvo (ca. 7 percent), and only 1 from San Bernardino (ca. 0.9 percent). As with Group 10, Group 20 brownware types are relatively evenly distributed, with ca. 31 percent classified as plainwares (n=35), ca. 28 percent as slipped wares (n=31), ca. 26 percent as painted/decorated wares (n=29), and ca. 15 percent as surface-treated wares (n=17).

The outliers (n=8), which were individually separated in multiple plots in the analysis, and unassigned specimens (n=65) represent ca. 26 percent of the samples in the NAA study. The majority of outliers (n=5) are from the Millington site, with individual samples from each of the other three sites comprising the total. These specimens consist of 3 plainwares, 2 slipped wares, 2 painted/decorated wares, and 1 surface-treated ware.

The unassigned samples (n=65) consist of 20 specimens from Millington, 20 from Polvo, 13 from San Bernardino, and 12 from Kopenborger. The majority of unassigned samples are plainwares (n=33; ca. 51 percent); the remaining specimens are comprised of 14 slipped wares (ca. 22 percent), 10 painted/decorated wares (ca. 15 percent), and 8 surface-treated wares (ca. 12 percent).

The eight groups formed through the NAA revealed significant site-specific findings and spatial patterning for all four sites in the study. Each of the small groups are composed of specimens from single sites, and the large groups show strong associations across two sites each. Ferguson (see Appendix A, pg. 12) suggested these data point toward "both little movement of Brownware ceramics between the sites in the study as well as surprisingly distinct paste recipes for such relatively short distances." He was unsure about what was driving the compositional variability seen in the study, suggesting the petrographic analysis might help resolve this issue.

Petrography Analysis

The petrography analysis by Robinson (see Appendix B) mirrored the NAA study in that it was conducted on the same ceramic sherds from four La Junta sites (Millington, Polvo, Kopenborger, and San Bernardino), with the exception of a single sherd from the Millington site (MNP066) potentially lost during the thin-sectioning process. Thus, 278 ceramic sherds were analyzed in the petrography analysis compared to the 279 sherds analyzed during the NAA study. Robinson used the following site acronyms to distinguish specimens from the individual sites in his analysis: MNP (Millington), KBP (Kopenborger), PVP (Polvo), and SBP (San Bernardino).

Robinson's analysis resulted in the formation of six broad classes of pastes for the sherds: Mica-Present (n=41), Mica-Absent (n=106), Carbonate (n=107), Melilite (n=17), Bone-Temper (n=3), and Nonlocal and Miscellaneous (n=4). These groups were further divided into 49 paste groups (Paste Groups A through WW) to identify and describe similar ceramic fabrics. These divisions are based on four stratified classifications: 1) the presence of telltale signature minerals or other materials (i.e., mica, carbonates, melilite, and bone temper); 2) paste characteristics (i.e., optical colors under both plane- and cross-polarized views, the silt-sized particle fraction, and void shapes and patterns); 3) characteristics of the temper particles, including sizes and angularity; and 4) the presence and traits of minor minerals. The largest classes in the study are the Mica-Present group which contained 10 paste groups (Groups A through J), the Mica-Absent group with 13 paste groups (Groups K through W), the Carbonate group containing 15 paste groups (Groups X through LL), and the Melilite group with 5 paste groups (Groups MM through QQ). The smaller classes in the study are the Bone-Temper class containing 2 paste groups (Group RR and Group SS) and the Nonlocal and Miscellaneous class with four paste groups (Groups TT through WW).

Twenty-six of the 49 paste groups contain sherds from more than one site. Nine of these are comprised of sherds from all four sites in the study: Mica-Present group A; Mica-Absent groups K and N; and Carbonate groups X, Y, AA, BB, DD, and EE. In addition, 5 paste groups contain sherds from three of the sites in the study: Mica-Absent groups L, M, T, and U, and Carbonate group Z. Twelve of the paste groups contain specimens from two of the study sites, while the remaining 23 paste groups are comprised solely of sherds from individual sites. The majority of the single-site paste groups are from the Millington (n=10) and Kopenborger (n=8) sites, with San Bernardino (n=3) and Polvo (n=2) also represented. Paste groups only from the Millington site consist of Mica-Present groups C, F, and H; Mica-Absent groups S and W; Carbonate group JJ; Bone-Temper groups RR and SS—the only bone-temper groups in the analysis; and Nonlocal and Miscellaneous groups TT and WW. Single-site paste groups from the Kopenborger site are comprised by Mica-Present group D; Carbonate groups GG, KK, and LL; Melilite groups MM, OO, and PP; and Nonlocal and Miscellaneous group VV. The San Bernardino site is represented amongst these single-site groups by Mica-Present groups E and I, and Melilite group QQ. Mica-Absent group P and Nonlocal and Miscellaneous group UU are the single-site paste groups from the Polvo site.

Robinson (see Appendix B) noted the relatively even spread of paste groups across the sites, arguing the local and regional minerals, rock particles, and ceramic pastes of iron-rich clays combined to produce similar-looking ceramics at all of the villages. The many shared paste groups were thought to indicate that transport of vessels at La Junta was common, although difficulties in determining where vessels were manufactured and where they were transported to were noted. Robinson also indicated the majority of La Junta vessels were for domestic use. Furthermore, he suggested there were many potential reasons for inter-site vessel transport at La Junta, including family and feasting obligations, partner trade/exchange, etc., while societal or familial reasons might be responsible for unshared and not-heavily-shared paste groups. In addition, Robinson noted those groups lacking volcanic tuff were clearly manufactured outside the tuff-rich La Junta region; conversely, groups containing tuffs were thought to have been produced in the region.

Summary Discussion

This research reports separate but interconnected NAA and petrographic studies of almost 300 untyped ceramic brownware sherds from four sites in the La Junta de los Ríos area of West Texas and northeastern Mexico—Millington, Polvo, and Kopenborger in Texas, and San Bernardino in Chihuahua. The analyses focus on ceramics in use in the La Junta archaeological district during the Concepción and Conchos phases or from ca. A.D. 1450–1760. Wares previously identified at these sites by preeminent La Junta researcher J. Charles Kelley consist primarily of Southwestern types—such as El Paso Polychrome, various Chihuahua Polychromes (e.g., Babicora and Villa Ahumada), Playas Red, Ramos Black, and Chupadero Black-on-White—and several unknown types with suspected local/regional origins. The Southwestern wares were in use in the district during the La Junta phase (ca. A.D. 1200–1450) prior to the fall of Casas Grandes/Paquimé in ca. A.D. 1450 (Kelley et al. 1940; Kelley 1947, 1985, and 1986; Ravesloot 1988), and the untyped specimens were suspected of having been produced locally during the subsequent Concepción and Conchos phases. Since each specimen in the study was subjected to both analyses, the combined data recovered offers a unique glimpse of ceramic pastes and tempering materials in use after the collapse of trade networks that previously supplied pottery to La Junta or from ca. A.D. 1450–1760 (Concepción and Conchos phases).

To more completely understand the findings, one must look at each analysis separately and then compare it with the data from the other. First, we will compare the NAA results with those from the petrography analysis. The NAA study of 279 specimens identified eight groups—six relatively small groups (Groups 1–6) and two large groups (Groups 10 and 20)—a small number of outlier specimens (n=8), and a larger number of unassigned specimens (n=65). Importantly, the small groups only contain specimens from single sites, providing significant spatial data.

Given Robinson's breakdown of the 278 specimens he analyzed into 49 separate paste groups, perhaps the simplest comparison with the NAA is to focus on the six classes of pastes formulated in his analysis—Mica-Present (n=41 sherds), Mica-Absent (n=106 sherds), Carbonate (n=107 sherds), Melilite (n=17 sherds), Bone-Temper (n=3 sherds), and Nonlocal and Miscellaneous (n=4 sherds)—which show some congruence as well as some differences with the NAA data. For example, both NAA Groups 1 (2 specimens) and 2 (3 specimens) contain specimens from a single class of pastes—Mica-Absent and Carbonate, respectively. Although not as robust, a similar pattern occurs in Groups 3 and 5, each with 2 of 3 specimens falling within a single class of pastes—Mica-Present and Mica-Absent, respectively. The largest of the NAA small groups, Group 4 with 20 members, contains 10 Carbonate sherds, 8 Mica-Absent sherds, and 2 Mica-Present sherds, indicating a moderate alignment between the two studies. Group 6 in the NAA study, with five members, is comprised of three different paste classes—Mica-Present (n=2), Mica-Absent (n=2), and Melilite (n=1)—and clearly is the least congruent of the small NAA groups with Robinson's classes of pastes.

Both large groups in the NAA study, Group 10 (n=58 sherds) and Group 20 (n=112 sherds; 1 of these was missing in the petrography study), have the majority of their members within the Mica-Absent and Carbonate paste classes, revealing a degree of congruence between the two studies. Sherds within Group 10 mainly populate the Mica-Absent class (n=27 sherds) and the Carbonate class (n=23 sherds), representing 86 percent of specimens within the group. Similarly, 77 percent of Group 20 specimens were placed within the Mica-Absent (n=42 sherds) and Carbonate (n=43 sherds) classes. Additionally, 5 of 8 outliers in the study are classified in the Mica-Absent class; 2 of the other 3 fall in the Carbonate class. The unassigned samples (n=65) are represented in all six of Robinson's classes, with Carbonate (n=25 sherds), Mica-Absent (n=18 sherds), and Mica-Present (n=14 sherds) specimens dominating this assemblage.

A closer look at how the NAA groups compare to the individual paste groups in the petrography study illuminates this discussion. Two of the six small NAA groups, Groups 2 and 4, show some patterning with paste groups identified in the petrography analysis. Two of 3 Group 2 members in the NAA study fall within Paste Group AA and the other in Paste Group FF, while 9 of 20 members of Group 4 are within three paste groups (three members each in Paste Groups L, Y, and DD). It is notable, however, that the other 11 members of Group 4 reside in 10 different paste groups (A, G, K, O, P, U, V, X, EE, and FF); the occurrence of 13 different paste groups for the 20 members of NAA Group 4—all from the Polvo site—illustrates the complexity of this exercise. In fact, this is a common theme amongst the small NAA groups, with Groups 1, 3, 5, and 6 (all with sherds from single sites; Groups 5 and 6 are also from the Polvo site) each comprised of sherds from completely different paste groups. The two members of Group 1 are within Paste Groups N and W; the three members of Group 3 are in Paste Groups E, B, and QQ; Paste Groups Y, K, and T are represented amongst the three members of Group 5; and the five members of Group 6 are within Paste Groups A, G, K, V, and NN.

The larger NAA groups also reveal patterning, further illustrating the complexity of matching sherds to source materials. Sixty-four percent of sherds in Group 10 fall within seven paste groups: A (4 sherds), K (12 sherds), M (6 sherds), N (3 sherds), Y (4 sherds), Z (3 sherds), and BB (5 sherds). Similarly, 75 percent of sherds in Group 20 reside in 13 paste groups: A (9 sherds), K (14 sherds), M (7 sherds), N (5 sherds), T (4 sherds), X (7 sherds), Y (4 sherds), Z (6 sherds), AA (5 sherds), BB (9 sherds), DD (4 sherds), EE (4 sherds), and MM (5 sherds). Notably, all 8 outliers in the NAA study are classed in eight different paste groups, while 31 of the 65 unassigned samples are within nine paste groups—A (6 sherds), K (3 sherds), O (3 sherds), V (3 sherds), Y (3 sherds), Z (3 sherds), AA (4 sherds), BB (3 sherds), and EE (3 sherds).

Turning this analysis around, we look now at the petrography study and compare those results with the NAA findings. Robinson used six classes of pastes broken down into 49 individual paste groups in his petrography analysis. The Mica-Present class, comprised of 41 sherds, aligns primarily with NAA Group 20 (15 sherds) and the unassigned class (14 sherds), with Group 3 (2 sherds), Group 4 (2 sherds), Group 6 (2 sherds), Group 10 (5 sherds), and the outlier class (1 sherd) also represented. Of these, Group 3 (all three sherds from San Bernardino) aligns best with this class, with two of three specimens represented. In the NAA study, the 106 Mica-Absent sherds correspond mostly to Group 20 (42 sherds), Group 10 (27 sherds), and the unassigned class (n=19 sherds), while Group 1 (2 sherds), Group 4 (8 sherds), Group 5 (2 sherds), Group 6 (2 sherds), and the outlier class (n=4) are also represented. This class aligns best with Groups 1 (2 of 3 sherds from Millington), 4 (8 of 20 sherds), and 5 (2 of 3 sherds), the latter two containing sherds exclusively from the Polvo site. The Carbonate class—the largest class (n=107) in the petrography study—aligns similarly as the Mica-Absent class, with Group 20 (42 sherds), Group 10 (24 sherds), and the unassigned class (n=25 sherds) dominating; NAA Group 2 (3 sherds), Group 4 (10 sherds), Group 5 (1 sherd), and the outlier class (2 sherds) are also represented. Of these, Groups 2 and 4 align best, with all three Group 2 sherds and 10 of 20 Group 4 sherds represented. The majority of specimens in the Melilite class (n=17) fall within Group 20 (10 sherds), with Group 3 (1 sherd), Group 6 (1 sherd), Group 10 (3 sherds), and the unassigned class (n=2) also occurring. All three specimens in the Bone-Tempered class are unassigned in the NAA study, and 3 of 4 sherds in the Nonlocal and Miscellaneous class are unassigned (the other specimen in this class falls within Group 20).

Focusing on the 49 paste groups (A–WW) provides another way to compare the two studies. Sixteen of these paste groups contain single members, and eight of these, Paste Groups F, I, S, JJ, SS, TT, UU, and WW contain sherds that fall within the NAA unassigned class; five, Paste Groups C, D, LL, PP, and VV, have sherds classified within NAA Group 20; the sherds in Paste Groups E and QQ both fall within Group 3; and the Paste Group KK sherd is classified within Group 10. Twenty-nine of the remaining 33 paste groups are distinguished by having the majority of their members within one of the two large NAA groups (Group 10 or Group 20), the unassigned group, or the outlier group. In fact, these four NAA groups contain 243 of the 279 specimens in the study (87 percent), illustrating the difficulty of matching sherd compositions from discrete sites over a lengthy period in such a dynamic geological setting.

Another way of looking at the data from these two analyses is to focus on their findings from each of the four sites in the study. In the NAA study, sherds from all four sites occur within the large groups (Groups 10 and 20) as well as the unassigned and outlier classes. Although all four sites are represented in these four groups, there are stark differences in the actual number of sherds from each. For example, 95 percent of the 58 Group 10 members are from the two northernmost sites, Kopenborger and San Bernardino, with the latter accounting for ca. 71 percent of the total. These data appear to suggest clay sources in this portion of La Junta were used almost exclusively by residents of these two sites with the overwhelming majority aligning with the more remote and upstream San Bernardino site. Conversely, only 1 sherd (less than 1 percent) of the 112 Group 20 specimens is from San Bernardino, with 92 percent of this group from the two central sites in the study, Millington (n=53 sherds) and Kopenborger (n=50 sherds)—the closest two sites in the study (ca. 4.0 km apart). In tandem with the geographical setting, this finding suggests common clay sources were accessible to residents of these two sites compared to those from the more distant sites, Polvo and San Bernardino. As stated above and in the NAA report (see Appendix A), the six small groups formed in the NAA study (Groups 1–6) revealed striking spatial data with each comprised of sherds from individual sites: Group 1 (Millington), Group 2 (Kopenborger), Group 3 (San Bernardino), and Groups 4–6 (Polvo). Furthermore, Robinson (see Appendix B, pgs. 48–49) offered several site-specific conclusions in his report: 1) potters at Polvo exploited at least two clay beds, one with abundant mica and the other lacking it; 2) Millington and Kopenborger potters accessed carbonate-laden beds as well as those with and without mica; and 3) San Bernardino potters utilized carbonate-laden beds similar to those used by Millington and Kopenborger potters, although likely from more nearby local sources.

Other than the single-member groups, 17 of Robinson's paste groups contain strong spatial data, similar to findings from the six small groups in the NAA study. Six of these exclusively contain two specimens each from individual sites, with Millington (Paste Groups H, W, and RR), Kopenborger (Paste Groups GG and OO), and Polvo (Paste Group P) represented. The other 11 paste groups in this discussion have a majority of their members from one site—5 of these are from Polvo, 3 from Kopenborger, 2 from Millington, and 1 from San Bernardino. Polvo is represented here by Paste Groups G (5 of 6 sherds), L (4 of 6 sherds), O (6 of 10 sherds; the other 4 are from Millington), V (5 of 6 sherds), and FF (2 of 3 sherds); Kopenborger by Paste Groups II (2 of 3 sherds), MM (all 7 sherds), and NN (5 of 6 sherds); Millington by Paste Groups J (2 of 3 sherds) and R (4 of 5 sherds); and San Bernardino by Paste Group B (3 of 4 sherds). As highlighted by Robinson (see Appendix

B, pg. 44), all but two sherds in the Melilite class (15 of 17 sherds) are from Kopenborger, showing a very strong alignment likely related to arroyos near the site and their carbonate-laden bedloads.

Each of the analyses reported here, on their own, have supplied significant data on late-period La Junta ceramics, providing important information on their makeup (i.e., ceramic pastes and tempering materials) and spatial relationships between sherds and sites; however, taken together, the analyses underscore the many complexities involved in attempting to delineate areas of ceramic manufacture in the La Junta archeological district. Both the small and large NAA groups, as well as many of the petrographic paste groups, reveal strong site-specific patterning for each site in the study, yet much of the data—such as the outliers and unassigned specimens in the NAA study and the many paste groups representing multiple sites in the petrography analysis—provides ample evidence of the difficulty of correlating the two analyses. The geographical and geological setting of the four sites in the study—spanning ca. 72 km along the Rio Grande and including multiple geologic formations—undoubtedly plays a role in this lack of coordination. Geologically, the region is extremely dynamic, with a very complex past including marine and alluvial depositions, volcanic eruptions, extensive erosion, etc., resulting in different suites of clays and tempering materials broadly spread across the region. Cultural factors are likely at play, as there was not a single culture per se at La Junta over the ca. 300-year period represented by sherds in the study, especially at the four different sites in the study. At times there was more solidarity among the different groups that occupied the region, but at other times the groups were less coordinated (Hammond and Rey 1929; Kelley 1947 and 1986; Madrid 1992). In addition, by the late seventeenth century and into the eighteenth century, some groups were decimated by hostile raiding groups (e.g., the Apache) and forced to coalesce at sites near the Rio Grande-Río Conchos confluence for protection (Kelley 1952a). In fact, one of the sites in this study, Polvo, was abandoned before the 1747–1748 Ydoiaga expedition, and the occupants moved upstream closer to the confluence (Madrid 1992:57). These and other movements of inhabitants between sites, such as relocations resulting from intermarriage, would have potentially resulted in a wide range of constituents in the ceramics as well as different manufacturing technologies. Individual potters may also have helped drive the data complexity seen in the analyses. A final factor involves the length of time represented by sherds in the study—ca. 300 years—an extremely long period during which changing cultural and environmental factors would have resulted in many different pastes, tempers, and technologies used in the district. These factors led to ceramics in this study having a wide range of pastes and tempering constituents as illustrated by Robinson's 49 paste groups and by a large number of unassigned specimens and the two large groups in Ferguson's analysis.

While Robinson (2017b) has previously indicated the need to sample residual sources upslope away from the Rio Grande to identify clay beds used in ceramic manufacture at La Junta, he more recently weighed in on the subject subsequent to completion of the current report (David G. Robinson, e-mail communication July 11, 2019):

> The general findings of the petrographic study, allied with NAA, give clues pointing away from riverine clay beds generally uphill toward more residual clay beds. This may account also for the findings of eroded, rounded particles in pastes with fresh, angular, and very angular resident silt fractions: the clays and aplastic temper particles came from two different sources. Sherds with materials suggestive of alluvial clay deposits formed minor paste groups within the larger classes.

These most recent thoughts on La Junta ceramic manufacture by Robinson help show the complexity of the questions raised in the analyses herein reported. Only through additional sampling and analyses will our understanding of the late-period pottery tradition at La Junta become clearer.

The NAA and petrographic studies of late-period ceramics reported here provide evidence of a robust brownware tradition at La Junta, reinforcing and strengthening Kelley's thoughts on local manufacture

(Kelley et al. 1940; Kelley 1947, and 1986). Ferguson (see Appendix A, pg. 12) noted remarkable compositional variability amongst the samples, given the setting of all four sites along the Rio Grande. Yet, it will likely require NAA of many clay beds in the region, including residual clay beds away from the river as suggested by Robinson (2017b, e-mail communication July 11, 2019), to identify sources used by La Junta potters through time and understand this variability. While a comparison of the NAA and petrography studies shows some corresponding results, it provides strong evidence of the extremely dynamic geological and geographical setting of La Junta as a whole, where there appears to have been multiple clay and tempering material sources in use through the ca. 300 years represented in the analyses.

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Contributors

William A. (Andy) Cloud is a native Texan with over 40 years of experience in Texas archaeology. He received both his B.A. (Archeological Studies) and M.A. (Anthropology with a focus on Archeology) degrees from The University of Texas at Austin. Subsequent to positions with the Arkansas Archeological Survey, the Texas Archeological Survey, Big Bend National Park, Texas Parks and Wildlife Department, the Texas Historical Commission, and several private firms, he began his tenure with the Center for Big Bend Studies (CBBS) as a staff archaeologist in 1995. He was promoted to CBBS Director in September 2008 and served in that position until retirement in December 2019. Author or co-author of numerous publications on the archaeology of Texas and the Big Bend, he has focused his research on hunter-gatherers, lithic analyses, and prehistoric-protohistoric occupants at *La Junta de los Ríos*.

Richard W. Walter began his professional career in 1990 as a laboratory technician at the Lubbock Lake Landmark and then continued for the next 14 years as a field archaeologist in Texas and the Greater Southwest. He was a staff archaeologist at the Center for Big Bend Studies from 2004 until his retirement in 2020.

APPENDIX A

Archaeometry Laboratory

Neutron Activation Analysis of Brownware Ceramics from Four Sites along the Texas-Chihuahua Border

ANIDS: SRU001 – SRU279

Report Prepared by:
Jeffrey R. Ferguson
Archaeometry Laboratory
Research Reactor Center
University of Missouri
Columbia, MO 65211

Report Prepared For:
Richard Walter
Center for Big Bend Studies
Sul Ross State University
Box C-71
Alpine, Texas 79832
Office: 432-837-8825
Mobile: 432-386-3386
Fax: 432-837-8827
rwalter@sulross.edu

June 27, 2019

INTRODUCTION

This report describes the preparation, analysis, and interpretation of 279 Brownware ceramic specimens from four sites along the Texas-Chihuahua border. Eight compositional groups are identified within the dataset and these groups show significant spatial patterning. The group assignments for each specimen as well as some descriptive information are listed in Table 5 at the end of this report.

SAMPLE PREPARATION

Pottery specimens were prepared for neutron activation analysis (NAA) using procedures standard at the University of Missouri Research Reactor Center (MURR). Fragments of about 1 cm^2 were removed from each specimen and abraded using a silicon carbide burr in order to remove slip, paint, and adhering soil, thereby reducing the risk of measuring contamination. The samples were washed in deionized water and allowed to dry in the laboratory. Once dry, the individual sherds were ground to powder in an agate mortar to homogenize the samples. Archival samples were retained from each sherd (when possible) for future research.

Two analytical samples were prepared from each source specimen. Portions of approximately 50 mg of powder were weighed into clean high-density polyethylene vials used for short irradiations at MURR. At the same time, 200 mg samples were weighed into clean high-purity quartz vials used for long irradiations. Individual sample weights were recorded to the nearest 0.01 mg using an analytical balance. Both vials were sealed prior to irradiation. Along with the unknown samples, Standards made from National Institute of Standards and Technology (NIST) certified standard reference materials of SRM-1633b (coal fly ash) and SRM-688 (basalt rock) were similarly prepared, as were quality control samples (e.g., standards treated as unknowns) of SRM-278 (obsidian rock) and Ohio Red Clay (a standard developed for in-house applications).

IRRADIATION AND GAMMA-RAY SPECTROSCOPY

Neutron activation analysis of ceramics at MURR, which consists of two irradiations and a total of three gamma counts, constitutes a superset of the procedures used at most other NAA laboratories (Glascock 1992; Neff 1992, 2000). As discussed in detail by Glascock (1992), a short irradiation is carried out through the pneumatic tube irradiation system. Samples in the polyvials are sequentially irradiated, two at a time, for five seconds by a neutron flux of 8×10^{13} n cm^{-2} s^{-1}. The 720-second count yields gamma spectra containing peaks for nine short-lived elements: aluminum (Al), barium (Ba), calcium (Ca), dysprosium (Dy), potassium (K), manganese (Mn), sodium (Na), titanium (Ti), and vanadium (V). The samples are encapsulated in quartz vials and are subjected to a 24–hour irradiation at a neutron flux of 5×10^{13} n cm^{-2} s^{-1}. This long irradiation is analogous to the single irradiation utilized at most other laboratories. After the long irradiation, samples decay for seven days, and then are counted for 1,800 seconds (the "middle count") on a high-resolution germanium detector coupled to an automatic sample changer. The middle count yields determinations of seven medium half-life elements, namely arsenic (As), lanthanum (La), lutetium (Lu), neodymium (Nd), samarium (Sm), uranium (U), and ytterbium (Yb). After an additional three- or four-week decay, a final count of 8,500 seconds is carried out on each sample. The latter measurement yields the following 17 long half-life elements: cerium (Ce), cobalt (Co), chromium (Cr), cesium (Cs), europium (Eu), iron (Fe), hafnium (Hf), nickel (Ni), rubidium (Rb), antimony (Sb), scandium (Sc), strontium (Sr), tantalum (Ta), terbium (Tb), thorium (Th), zinc (Zn), and zirconium (Zr). The element concentration data from the three measurements are tabulated in parts per million.

INTERPRETING CHEMICAL DATA

The analyses at MURR, described above, produced elemental concentration values for 33 elements in most of the analyzed samples. Data for Ni in many samples was below detection limits (as is the norm for most New World ceramics) and was removed from consideration during the statistical analysis.

Use of log concentrations rather than raw data compensates for differences in magnitude between the major elements, such as calcium, and trace elements, such as the rare earth or lanthanide elements (REEs). Transformation to base-10 logarithms also yields a more normal distribution for many trace elements.

The interpretation of compositional data obtained from the analysis of archaeological materials is discussed in detail elsewhere (e.g., Baxter and Buck 2000; Bieber et al. 1976; Bishop and Neff 1989; Glascock 1992; Harbottle 1976; Neff 2000) and will only be summarized here. The main goal of data analysis is to identify distinct homogeneous groups within the analytical database.

Based on the provenance postulate of Weigand et al. (1977), different chemical groups may be assumed to represent geographically restricted sources. For lithic materials such as obsidian, basalt, and cryptocrystalline silicates (e.g., chert, flint, or jasper), raw material samples are frequently collected from known outcrops or secondary deposits and the compositional data obtained on the samples is used to define the source localities or boundaries. The locations of sources can also be inferred by comparing unknown specimens (i.e., ceramic artifacts) to knowns (i.e., clay samples) or by indirect methods such as the "criterion of abundance" (Bishop et al. 1992) or by arguments based on geological and sedimentological characteristics (e.g., Steponaitis et al. 1996). The ubiquity of ceramic raw materials usually makes it impossible to sample all potential "sources" intensively enough to create groups of knowns to which unknowns can be compared. Lithic sources tend to be more localized and compositionally homogeneous in the case of obsidian or compositionally heterogeneous as is the case for most cherts.

Compositional groups can be viewed as "centers of mass" in the compositional hyperspace described by the measured elemental data. Groups are characterized by the locations of their centroids and the unique relationships (i.e., correlations) between the elements. Decisions about whether to assign a specimen to a particular compositional group are based on the overall probability that the measured concentrations for the specimen could have been obtained from that group.

Initial hypotheses about source-related subgroups in the compositional data can be derived from non-compositional information (e.g., archaeological context, decorative attributes, etc.) or from application of various pattern-recognition techniques to the multivariate chemical data. Some of the pattern recognition techniques that have been used to investigate archaeological datasets are cluster analysis (CA), principal components analysis (PCA), and discriminant analysis (DA). Each of the techniques has its own advantages and disadvantages which may depend upon the types and quantity of data available for interpretation.

The variables (measured elements) in archaeological and geological datasets are often correlated and frequently large in number. This makes handling and interpreting patterns within the data difficult. Therefore, it is often useful to transform the original variables into a smaller set of uncorrelated variables in order to make data interpretation easier. Of the above-mentioned pattern recognition techniques, PCA is a technique that transforms the data from the original correlated variables into uncorrelated variables most easily.

PCA creates a new set of reference axes arranged in decreasing order of variance subsumed. The individual PCs are linear combinations of the original variables. The data can be displayed on combinations of the new axes, just as they can be displayed on the original elemental concentration axes. PCA can be used in a pure pattern-recognition mode (i.e., to search for subgroups in an undifferentiated dataset), or in a more evaluative mode (i.e., to assess the coherence of hypothetical groups suggested by other criteria). Generally, compositional differences between specimens can be expected to be larger for specimens in different groups than for specimens in the same group, and this implies that groups should be detectable as distinct areas of high point density on plots of the first few components. It is well known that PCA of chemical data is scale dependent (Mardia et al. 1979), and analyses tend to be dominated by those elements or isotopes for which the concentrations are relatively large. This is yet another reason for the log transformation of the data.

One frequently exploited strength of PCA, discussed by Baxter (1992), Baxter and Buck (2000), and Neff (1994, 2002), is that it can be applied as a simultaneous R- and Q-mode technique, with both variables (elements) and objects (individual analyzed samples) displayed on the same set of principal component reference axes. A plot using the first two principal components as axes is usually the best possible two-dimensional representation of the correlation or variance-covariance structure within the dataset. Small angles between the vectors from the origin to variable coordinates indicate strong positive correlation; angles at 90 degrees indicate no correlation; and angles close to 180 degrees indicate strong negative correlation. Likewise, a plot of sample coordinates on these same axes will be the best two-dimensional representation of Euclidean relations among the samples in log-concentration space (if the PCA was based on the variance-covariance matrix) or standardized log-concentration space (if the PCA was based on the correlation matrix). Displaying both objects and variables on the same plot makes it possible to observe the contributions of specific elements to group separation and to the distinctive shapes of the various groups. Such a plot is commonly referred to as a "biplot" in reference to the simultaneous plotting of objects and variables. The variable inter-relationships inferred from a biplot can be verified directly by inspecting bivariate elemental concentration plots. (Note that a bivariate plot of elemental concentrations is not a biplot.)

Whether a group can be discriminated easily from other groups can be evaluated visually in two dimensions or statistically in multiple dimensions. A metric known as the Mahalanobis distance (or generalized distance) makes it possible to describe the separation between groups or between individual samples and groups on multiple dimensions. The Mahalanobis distance of a specimen from a group centroid (Bieber et al. 1976, Bishop and Neff 1989) is defined by:

$$D^2_{y,X} = [y - \overline{X}]^t I_x [y - \overline{X}]$$

where y is the 1 x m array of logged elemental concentrations for the specimen of interest, X is the n x m data matrix of logged concentrations for the group to which the point is being compared with, $\overline{X}$ being its 1 x m centroid, and I_x the inverse of the m x m variance-covariance matrix of group *X*. Because Mahalanobis distance takes into account variances and covariances in the multivariate group it is analogous to expressing distance from a univariate mean in standard deviation units. Like standard deviation units, Mahalanobis distances can be converted into probabilities of group membership for individual specimens. For relatively small sample sizes, it is appropriate to base probabilities on Hotelling's T^2, which is the multivariate extension of the univariate Student's *t*.

When group sizes are small, Mahalanobis distance-based probabilities can fluctuate dramatically depending upon whether or not each specimen is assumed to be a member of the group to which it is being compared. Harbottle (1976) calls this phenomenon "stretchability" in reference to the tendency of an included specimen to stretch the group in the direction of its own location in elemental concentration space. This problem can be circumvented by cross-validation, that is, by removing each specimen from its presumed group before calculating its own probability of membership (Baxter 1994; Leese and Main 1994). This is a conservative approach to group evaluation that may sometimes exclude true group members.

Small sample and group sizes place further constraints on the use of Mahalanobis distance: with more elements than samples, the group variance-covariance matrix is singular thus rendering calculation of I_x (and D^2 itself) impossible. Therefore, the dimensionality of the groups must somehow be reduced. One approach would be to eliminate elements considered irrelevant or redundant. The problem with this approach is that the investigator's preconceptions about which elements should be discriminate may not be valid. It also squanders the main advantage of multielement analysis, namely the capability to measure a large number of elements. An alternative approach is to calculate Mahalanobis distances with the scores on principal components extracted from the variance-covariance or correlation matrix for the complete dataset. This approach entails only the assumption, entirely reasonable in light of the above discussion of PCA, that most group-separating differences should be visible on the first several PCs. Unless a dataset is extremely complex, containing numerous distinct groups, using enough components to subsume at least 90 percent of the total variance in the data can be generally assumed to yield Mahalanobis distances that approximate Mahalanobis distances in full elemental concentration space.

Lastly, Mahalanobis distance calculations are also quite useful for handling missing data (Sayre 1975). When many specimens are analyzed for a large number of elements, it is almost certain that a few element concentrations will be missed for some of the specimens. This occurs most frequently when the concentration for an element is near the detection limit. Rather than eliminate the specimen or the element from consideration, it is possible to substitute a missing value by replacing it with a value that minimizes the Mahalanobis distance for the specimen from the group centroid. Thus, those few specimens which are missing a single concentration value can still be used in group calculations.

RESULTS

The initial evaluation of the dataset involved no inclusion of any descriptive information (i.e., site, type, temper, etc.). The initial step involved the identification of a small number (n=8) of outliers that individually separate in multiple plots. Following the removal of the outliers, six small groups (Fig. 1) were identified using visual inspection of elemental scatterplots. Most of the more robust statistical methods used for group assessment (such as membership probabilities derived from Mahalanobis distances) are not applicable to groups with small membership. More detailed descriptions of each group are provided in the following section.

After removing the outliers and six small groups, the remaining cluster appeared to have some slight separation into two parts. The separate groups were initially identified by visual inspection of bivariate plots with considerable further refinement through many rounds of group membership probabilities using Mahalanobis distance calculations based on both elemental and PCA variables. The resulting two groups (Group 10 and Group 20, Fig. 2) are not perfectly separated and a number of samples in the general cluster remain unassigned (n=65). It is possible to continue to tighten the groups but this would result in more unassigned and some statistical limitations as group sizes get smaller. Similarly, more of the unassigned samples could be forced into the two groups, but this would result in less distinct group separation. The current groups represent a reasonable compromise between these two options. In many studies, the separation of a large cluster does not result in any meaningful patterns and may just reflect a largely random shift in the data, but as explained below in the detailed group descriptions, there are very interesting differences between the two large groups.

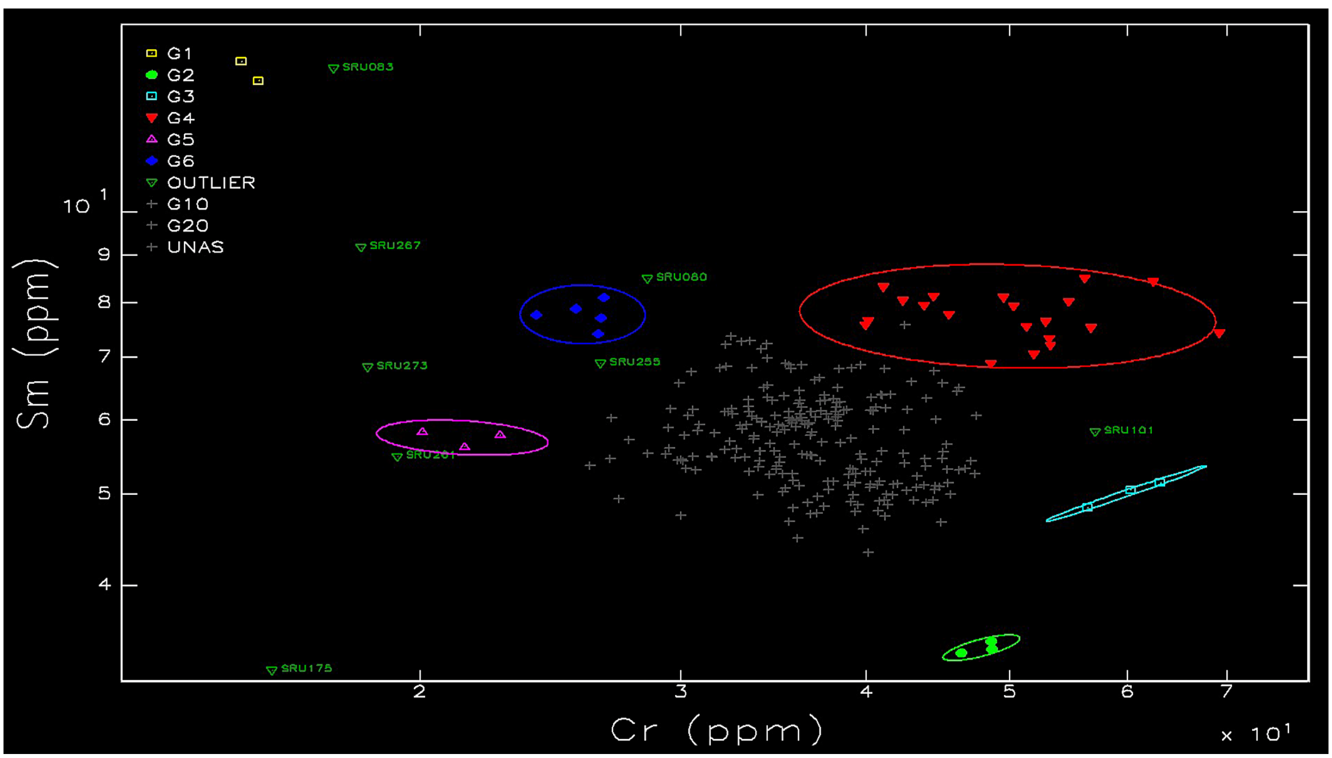

Figure 1. Log-log scatterplot of chromium and samarium showing the outliers (individually labeled) and the six small groups (ellipses shown except for Group 1; Group 1 specimens [n=2] cluster in the upper left corner of the scatterplot). Ellipses represent 90 percent confidence intervals for group membership.

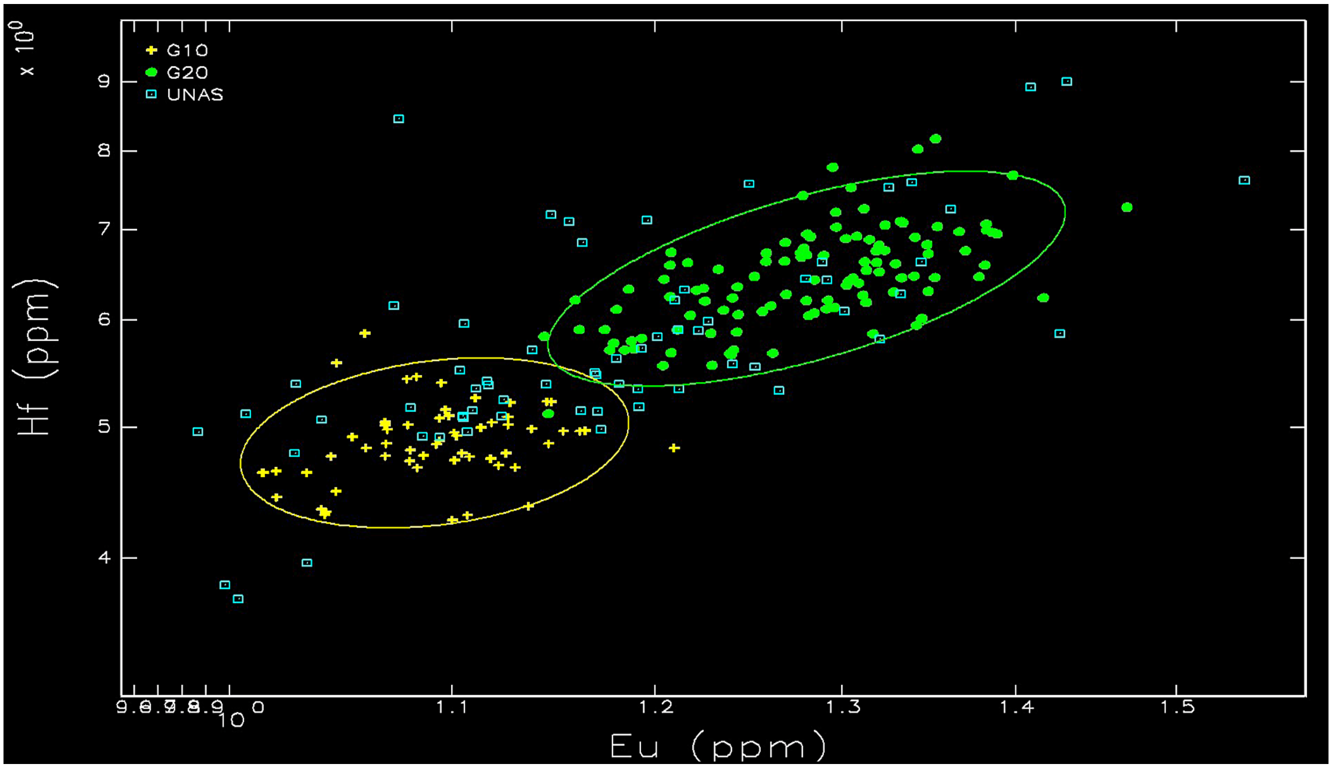

Figure 2. Log-log scatterplot of europium and hafnium showing the separation between Group 10 and Group 20. Ellipses represent 90 peercent confidence intervals for group membership.

The groups reveal significant patterns by recovery site (as described below). The only other descriptive variable provided that might yield compositional patterning would be the ceramic type. In this study there are no specific types provided and thus "type" refers only to provided descriptions of surface decoration. All of the specimens in the study were various decorative variations of Brownwares, and there is no patterned separation by type as seen in the distribution by compositional group (Table 1) or a plot of the various types (Fig. 3).

Group Descriptions and Site Patterns

Each of the groups were initially identified by visual inspection of arrays of elemental scatterplots. Groups

Table 1: Distribution of Ceramic Type by Compositional Group.

Ware	g1	g10	g2	g20	g3	g4	g5	g6	out	unas	total
Painted/Decorated Brownware		11		29		5			2	10	57
Plain Brownware	2	20		35	2	12	2	3	3	33	112
Slipped Brownware		20	3	31	1	2	1	2	2	14	76
Surface-Treated Brownware		7		17		1			1	8	34
Total	2	58	3	112	3	20	3	5	8	65	279

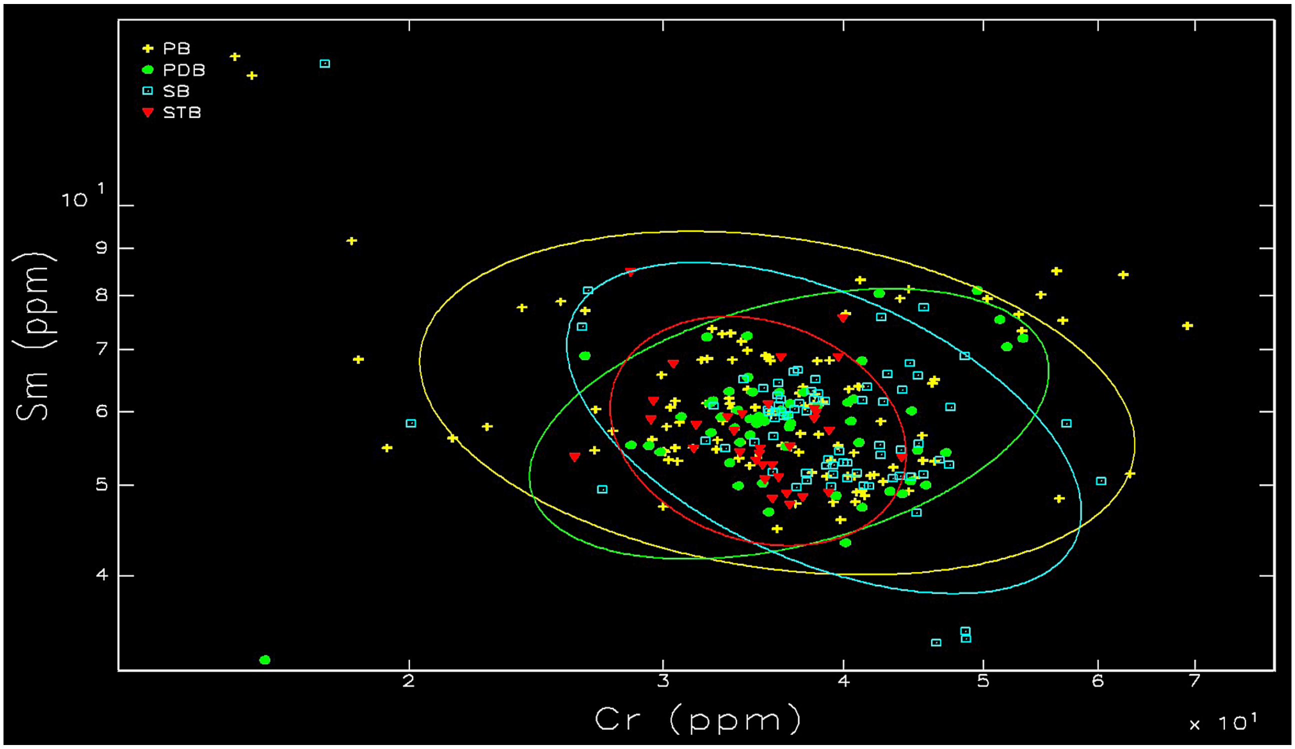

Figure 3. Log-log scatterplot of chromium and samarium showing the lack of separation between the various ceramic types (PB=Plain Brownware, PBD=Painted/Decorated Brownware, SB= Slipped Brownware, and STB=Surface-Treated Brownware). Ellipses represent 90 percent confidence intervals for group membership.

10 and 20 were further refined through numerous rounds of group membership probabilities based on Mahalanobis distance calculations. Further statistical testing of the initial six smaller groups was not possible given their small membership size. Table 2 provides a distribution of the compositional groups by site.

Group 1 (n=2): Group 1 consists of a single pair of samples with relatively low chromium concentrations. Both members are from the Millington site.

Group 2 (n=3): This group includes three members with low chromium and samarium concentrations. All three members are from the Kopenborger site.

Table 2: Distribution of Compositional Group by Site.

Site	g1	g10	g2	g20	g3	g4	g5	g6	out	unas	Total
Kopenborger Site (KBN)		14	3	50					1	12	80
Millington Site (MNN)	2	1		53					5	20	81
Polvo Site (PVN)		2		8		20	3	5	1	20	59
San Bernardino Site (SBN)		41		1	3				1	13	59
Total	2	58	3	112	3	20	3	5	8	65	279

Group 3 (n=3): Group 3 also includes only three members. All members are from the San Bernardino site and show high chromium values.

Group 4 (n=20): This group is by far the largest of the "small groups" with 20 members. The members have high chromium and tantalum and all 20 members are from the Polvo site. This group also has a higher proportion of Plain Brownwares than most other groups.

Group 5 (n=3): Group 5 includes only three members isolated in a chromium/samarium plot and all three members are from the Polvo site.

Group 6 (n=5): Group 6 has high samarium concentrations and all five members are from the Polvo site.

Group 10 (n=58): Group 10 includes 58 members and the vast majority are from the two most northern sites (Kopenborger and San Bernardino).

Group 20 (n=112): Group 20 consists of 112 members, with the majority evenly split between Kopenborger and Millington.

All of the small groups are from only a single site, including all 20 members of Group 4. The three more northern sites all have one small group each that is unique to that site. The most southern site, Polvo, has three unique small groups that account for almost half of the sample from that site. The distributions of the two larger groups are also interesting. Group 10 is almost entirely from the two northernmost sites (San Bernardino and Kopenborger), while Group 20 is almost entirely from the central two sites (Kopenborger and Millington).

The patterned spatial distribution of the compositional groups is remarkably distinct and suggests both little movement of Brownware ceramics between the sites in the study as well as surprisingly distinct paste recipes for such relatively short distances. The compositional variability is even more remarkable given the likely abundance of alluvial clays along the Rio Grande that would tend to produce minimal compositional variability. It is difficult to assess what might be causing the compositional differences. Petrographic analysis might be able to more specifically identify mineral (likely from temper) components that could be driving the variability.

External Data Comparisons

A detailed comparison using a Euclidian distance search of the MURR Southwest NAA database resulted in an almost complete lack of similar previously analyzed samples. Only two small previous projects showed any possible overlap. Both projects were from Presidio County, one for William A. (Andy) Cloud and the other for Aina Dodge. The previous studies show general similarity to the current data, but a Mahalanobis distance projection against Groups 10 and 20 revealed no reasonable matches.

Additional searches of the MURR master database revealed a project omitted from the Southwest database with definite overlap with this current project. Nancy Kenmotsu submitted 100 sherd specimens in 2004 from more than a dozen sites in Presidio County and two additional sites in Hudspeth County (Kenmotsu 2013). The sherds are mostly from excavations by J. Charles Kelley in the 1930s and 1940s and include a wide variety of ceramic wares and types. Many wares present in the assemblage had no clear membership in the groups presented in this report, including Chihuahuan wares and El Paso Brownwares. Of the 43 La Junta Brownwares, 16 showed clear associations with three of the groups in this study. Figure 4 shows the Kenmotsu samples with membership in Groups 4 (n=3), 10 (n=4), and 20 (n=9).

The 16 Kenmotsu samples with membership in Groups 4, 10, and 20 include a variety of types as listed in Table 3. The matching specimens are from seven of the 16 sites in Presidio County included in the Kenmotsu sample (Table 4).

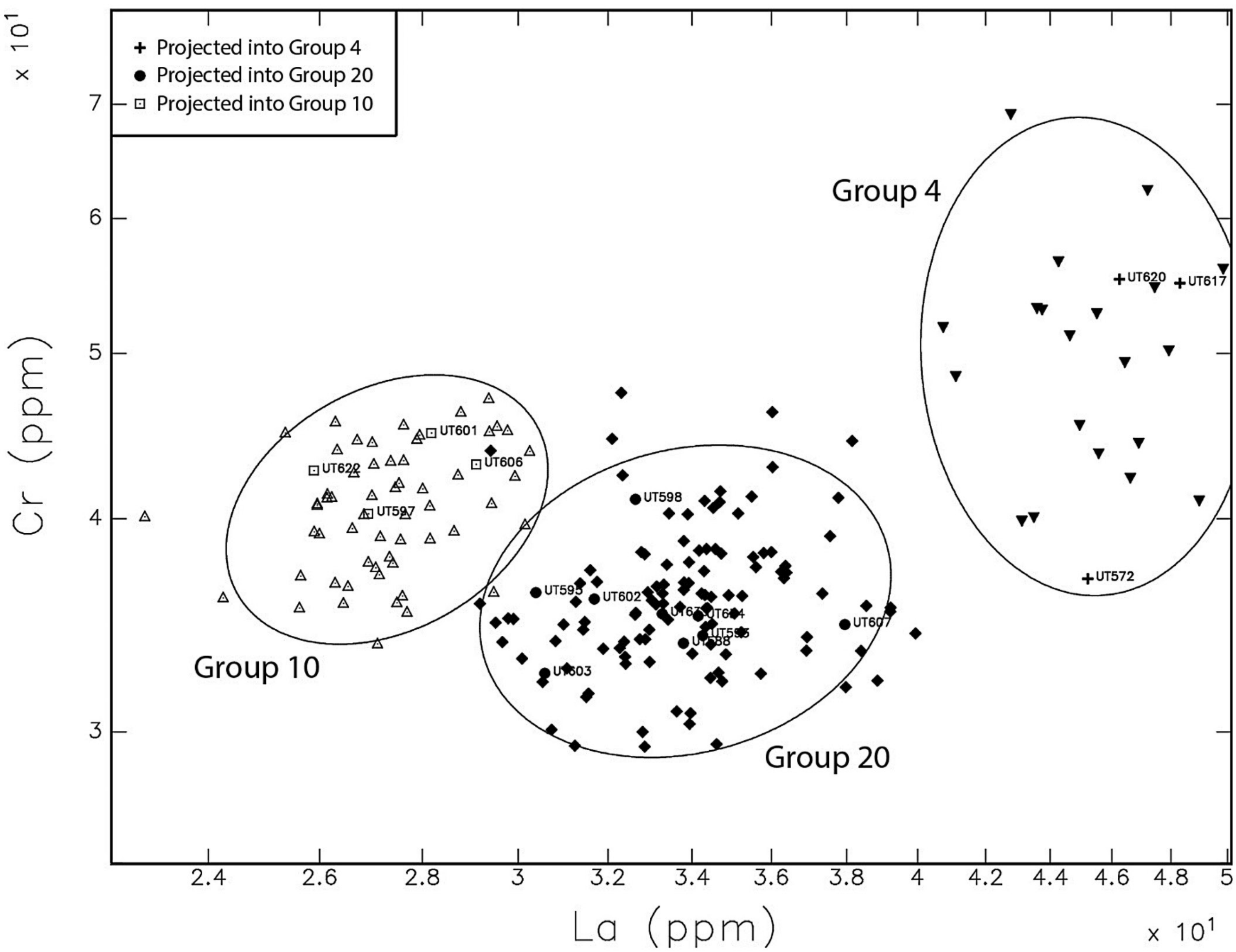

Figure 4. Log-log scatterplot of lanthanum and chromium showing the overlap between some specimens submitted by Kenmotsu and the large groups identified in this study. Kenmotsu samples are individually plotted and labeled. Ellipses represent 90 percent confidence intervals for group membership.

CONCLUSIONS

The 279 Brownware specimens are distributed among eight compositional groups with approximately 26 percent of the sample remaining as either individual outliers (n=8), or unassigned samples (n=65) from the large cluster that was split into Groups 10 and 20. The compositional groups show strikingly strong spatial patterning with the small groups (Group 1–6) all recovered from individual sites and the two large groups showing strong associations across two sites each. The ongoing petrographic study may provide specific details as to the mineralogical differences likely driving the compositional variability.

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Table 3: Compositional Group Projections by Type for Samples Submitted by Kenmotsu.

	Compositional Group				
La Junta Type	**10**	**20**	**4**	**Unassigned**	**Grand Total**
Capote Plain	1	1		6	8
Capote Red-on-Brown	1	1	1	3	6
Chinati Plain			1	4	5
Chinati Scored		1		4	5
Conchos Plain				7	7
Conchos Red-on-Brown	1	5			6
Paloma				2	2
Paloma Plain	1				1
Paloma Red-on-Gray		1		1	2
Plain Brownware			1		1
Grand Total	4	9	3	27	43

Table 4: Compositional Group Projections by Site for Samples Submitted by Kenmotsu.

	Compositional Group				
Site	**10**	**20**	**4**	**Unassigned**	**Grand Total**
41HZ12				5	5
41HZ16				9	9
41PS10			1	3	4
41PS11				2	2
41PS12				6	6
41PS13				1	1
41PS14/MNN	1	1		11	13
41PS15	1		1	5	7
41PS16/KBN	1	3		2	6
41PS21/PVN			1	4	5
41PS22				1	1
41PS3				8	8
41PS5				16	16
41PS56		2		1	3
41PS58				1	1
41PS8				3	3
41PS87	1	3		3	7
41PS9				3	3
Grand Total	4	9	3	84	100

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Table 5: Select Descriptive Data and Group Assignments.

ANID	Comp Group	Alternate ID	State/ Province	County/ District	Site Name	Brownware
SRU001	g4	PVN001	Texas	Presidio	Polvo	Plain
SRU002	unas	PVN002	Texas	Presidio	Polvo	Plain
SRU003	g5	PVN003	Texas	Presidio	Polvo	Plain
SRU004	g4	PVN004	Texas	Presidio	Polvo	Plain
SRU005	unas	PVN005	Texas	Presidio	Polvo	Plain
SRU006	unas	PVN006	Texas	Presidio	Polvo	Plain
SRU007	g6	PVN007	Texas	Presidio	Polvo	Plain
SRU008	g20	PVN008	Texas	Presidio	Polvo	Plain
SRU009	g4	PVN009	Texas	Presidio	Polvo	Plain
SRU010	g4	PVN010	Texas	Presidio	Polvo	Plain
SRU011	unas	PVN011	Texas	Presidio	Polvo	Plain
SRU012	g6	PVN012	Texas	Presidio	Polvo	Plain
SRU013	g4	PVN013	Texas	Presidio	Polvo	Plain
SRU014	unas	PVN014	Texas	Presidio	Polvo	Plain
SRU015	unas	PVN015	Texas	Presidio	Polvo	Plain
SRU016	g20	PVN016	Texas	Presidio	Polvo	Plain
SRU017	unas	PVN017	Texas	Presidio	Polvo	Plain
SRU018	unas	PVN018	Texas	Presidio	Polvo	Plain
SRU019	unas	PVN019	Texas	Presidio	Polvo	Plain
SRU020	g20	PVN020	Texas	Presidio	Polvo	Plain
SRU021	g4	PVN021	Texas	Presidio	Polvo	Painted/Decorated
SRU022	g4	PVN022	Texas	Presidio	Polvo	Painted/Decorated
SRU023	g4	PVN023	Texas	Presidio	Polvo	Painted/Decorated
SRU024	g4	PVN024	Texas	Presidio	Polvo	Painted/Decorated
SRU025	unas	PVN025	Texas	Presidio	Polvo	Painted/Decorated
SRU026	unas	PVN026	Texas	Presidio	Polvo	Painted/Decorated
SRU027	g4	PVN027	Texas	Presidio	Polvo	Painted/Decorated
SRU028	unas	PVN028	Texas	Presidio	Polvo	Painted/Decorated
SRU029	unas	PVN029	Texas	Presidio	Polvo	Painted/Decorated
SRU030	g4	PVN041	Texas	Presidio	Polvo	Surface-Treated
SRU031	unas	PVN042	Texas	Presidio	Polvo	Surface-Treated
SRU032	unas	PVN043	Texas	Presidio	Polvo	Surface-Treated
SRU033	g20	PVN061	Texas	Presidio	Polvo	Plain
SRU034	unas	PVN062	Texas	Presidio	Polvo	Slipped
SRU035	g4	PVN063	Texas	Presidio	Polvo	Slipped

Table 5: Select Descriptive Data and Group Assignments. (continued)

ANID	Comp Group	Alternate ID	State/ Province	County/ District	Site Name	Brownware
SRU036	g6	PVN064	Texas	Presidio	Polvo	Slipped
SRU037	g4	PVN065	Texas	Presidio	Polvo	Slipped
SRU038	g20	PVN067	Texas	Presidio	Polvo	Slipped
SRU039	g10	PVN068	Texas	Presidio	Polvo	Slipped
SRU040	g5	PVN069	Texas	Presidio	Polvo	Slipped
SRU041	g6	PVN070	Texas	Presidio	Polvo	Slipped
SRU042	unas	PVN071	Texas	Presidio	Polvo	Slipped
SRU043	unas	PVN072	Texas	Presidio	Polvo	Slipped
SRU044	g10	PVN080	Texas	Presidio	Polvo	Plain
SRU045	g20	PVN081	Texas	Presidio	Polvo	Plain
SRU046	g4	PVN082	Texas	Presidio	Polvo	Plain
SRU047	g20	PVN083	Texas	Presidio	Polvo	Plain
SRU048	g4	PVN084	Texas	Presidio	Polvo	Plain
SRU049	g5	PVN085	Texas	Presidio	Polvo	Plain
SRU050	g4	PVN086	Texas	Presidio	Polvo	Plain
SRU051	unas	MNN001	Texas	Presidio	Millington	Plain
SRU052	g20	MNN002	Texas	Presidio	Millington	Plain
SRU053	unas	MNN003	Texas	Presidio	Millington	Plain
SRU054	g20	MNN004	Texas	Presidio	Millington	Plain
SRU055	unas	MNN005	Texas	Presidio	Millington	Plain
SRU056	unas	MNN006	Texas	Presidio	Millington	Plain
SRU057	g20	MNN007	Texas	Presidio	Millington	Plain
SRU058	g20	MNN008	Texas	Presidio	Millington	Plain
SRU059	g20	MNN009	Texas	Presidio	Millington	Plain
SRU060	g20	MNN010	Texas	Presidio	Millington	Plain
SRU061	unas	MNN011	Texas	Presidio	Millington	Plain
SRU062	g20	MNN012	Texas	Presidio	Millington	Plain
SRU063	g20	MNN013	Texas	Presidio	Millington	Plain
SRU064	g20	MNN014	Texas	Presidio	Millington	Plain
SRU065	unas	MNN015	Texas	Presidio	Millington	Plain
SRU066	g20	MNN016	Texas	Presidio	Millington	Plain
SRU067	g20	MNN017	Texas	Presidio	Millington	Plain
SRU068	unas	MNN018	Texas	Presidio	Millington	Plain
SRU069	unas	MNN019	Texas	Presidio	Millington	Plain
SRU070	unas	MNN020	Texas	Presidio	Millington	Plain

Table 5: Select Descriptive Data and Group Assignments. (continued)

ANID	Comp Group	Alternate ID	State/ Province	County/ District	Site Name	Brownware
SRU071	g20	MNN041	Texas	Presidio	Millington	Surface-Treated
SRU072	g20	MNN042	Texas	Presidio	Millington	Surface-Treated
SRU073	g20	MNN043	Texas	Presidio	Millington	Surface-Treated
SRU074	g20	MNN044	Texas	Presidio	Millington	Surface-Treated
SRU075	g20	MNN045	Texas	Presidio	Millington	Surface-Treated
SRU076	unas	MNN046	Texas	Presidio	Millington	Surface-Treated
SRU077	g20	MNN047	Texas	Presidio	Millington	Surface-Treated
SRU078	unas	MNN048	Texas	Presidio	Millington	Surface-Treated
SRU079	g20	MNN049	Texas	Presidio	Millington	Surface-Treated
SRU080	out	MNN050	Texas	Presidio	Millington	Surface-Treated
SRU081	g20	MNN051	Texas	Presidio	Millington	Surface-Treated
SRU082	unas	MNN061	Texas	Presidio	Millington	Slipped
SRU083	out	MNN062	Texas	Presidio	Millington	Slipped
SRU084	g20	MNN063	Texas	Presidio	Millington	Slipped
SRU085	g20	MNN064	Texas	Presidio	Millington	Slipped
SRU086	g20	MNN065	Texas	Presidio	Millington	Slipped
SRU087	g20	MNN066	Texas	Presidio	Millington	Slipped
SRU088	g20	MNN067	Texas	Presidio	Millington	Slipped
SRU089	unas	MNN068	Texas	Presidio	Millington	Slipped
SRU090	g20	MNN069	Texas	Presidio	Millington	Slipped
SRU091	g20	MNN070	Texas	Presidio	Millington	Slipped
SRU092	g20	MNN071	Texas	Presidio	Millington	Slipped
SRU093	unas	MNN072	Texas	Presidio	Millington	Slipped
SRU094	g20	MNN073	Texas	Presidio	Millington	Slipped
SRU095	g20	MNN074	Texas	Presidio	Millington	Slipped
SRU096	g20	MNN075	Texas	Presidio	Millington	Slipped
SRU097	g20	MNN076	Texas	Presidio	Millington	Slipped
SRU098	g20	MNN077	Texas	Presidio	Millington	Slipped
SRU099	g20	MNN078	Texas	Presidio	Millington	Slipped
SRU100	unas	MNN079	Texas	Presidio	Millington	Slipped
SRU101	out	MNN080	Texas	Presidio	Millington	Slipped
SRU102	g20	MNN081	Texas	Presidio	Millington	Painted/Decorated
SRU103	g20	MNN082	Texas	Presidio	Millington	Painted/Decorated
SRU104	g20	MNN083	Texas	Presidio	Millington	Painted/Decorated
SRU105	g20	MNN084	Texas	Presidio	Millington	Painted/Decorated

Table 5: Select Descriptive Data and Group Assignments. (continued)

ANID	Comp Group	Alternate ID	State/ Province	County/ District	Site Name	Brownware
SRU106	g20	MNN085	Texas	Presidio	Millington	Painted/Decorated
SRU107	g20	MNN086	Texas	Presidio	Millington	Painted/Decorated
SRU108	g20	MNN087	Texas	Presidio	Millington	Painted/Decorated
SRU109	g20	MNN088	Texas	Presidio	Millington	Painted/Decorated
SRU110	g20	MNN089	Texas	Presidio	Millington	Painted/Decorated
SRU111	g20	MNN090	Texas	Presidio	Millington	Painted/Decorated
SRU112	g20	MNN091	Texas	Presidio	Millington	Painted/Decorated
SRU113	g20	MNN092	Texas	Presidio	Millington	Painted/Decorated
SRU114	g20	MNN093	Texas	Presidio	Millington	Painted/Decorated
SRU115	unas	MNN094	Texas	Presidio	Millington	Painted/Decorated
SRU116	g10	MNN095	Texas	Presidio	Millington	Painted/Decorated
SRU117	g20	MNN096	Texas	Presidio	Millington	Painted/Decorated
SRU118	g20	MNN097	Texas	Presidio	Millington	Painted/Decorated
SRU119	unas	MNN098	Texas	Presidio	Millington	Painted/Decorated
SRU120	g20	MNN099	Texas	Presidio	Millington	Painted/Decorated
SRU121	g20	MNN100	Texas	Presidio	Millington	Painted/Decorated
SRU122	g10	SBN001	Chihuahua	Ojinaga	San Bernardino	Plain
SRU123	unas	SBN002	Chihuahua	Ojinaga	San Bernardino	Plain
SRU124	g10	SBN003	Chihuahua	Ojinaga	San Bernardino	Plain
SRU125	g10	SBN004	Chihuahua	Ojinaga	San Bernardino	Plain
SRU126	g10	SBN005	Chihuahua	Ojinaga	San Bernardino	Plain
SRU127	g10	SBN006	Chihuahua	Ojinaga	San Bernardino	Plain
SRU128	g10	SBN007	Chihuahua	Ojinaga	San Bernardino	Plain
SRU129	g10	SBN008	Chihuahua	Ojinaga	San Bernardino	Plain
SRU130	g10	SBN009	Chihuahua	Ojinaga	San Bernardino	Plain
SRU131	unas	SBN010	Chihuahua	Ojinaga	San Bernardino	Plain
SRU132	g3	SBN011	Chihuahua	Ojinaga	San Bernardino	Plain
SRU133	g10	SBN012	Chihuahua	Ojinaga	San Bernardino	Plain
SRU134	unas	SBN013	Chihuahua	Ojinaga	San Bernardino	Plain
SRU135	g10	SBN014	Chihuahua	Ojinaga	San Bernardino	Plain
SRU136	g10	SBN015	Chihuahua	Ojinaga	San Bernardino	Plain
SRU137	g10	SBN016	Chihuahua	Ojinaga	San Bernardino	Plain
SRU138	g10	SBN017	Chihuahua	Ojinaga	San Bernardino	Plain
SRU139	g10	SBN018	Chihuahua	Ojinaga	San Bernardino	Plain
SRU140	unas	SBN019	Chihuahua	Ojinaga	San Bernardino	Plain

Table 5: Select Descriptive Data and Group Assignments. (continued)

ANID	Comp Group	Alternate ID	State/ Province	County/ District	Site Name	Brownware
SRU141	g10	SBN020	Chihuahua	Ojinaga	San Bernardino	Plain
SRU142	unas	SBN021	Chihuahua	Ojinaga	San Bernardino	Slipped
SRU143	g20	SBN022	Chihuahua	Ojinaga	San Bernardino	Slipped
SRU144	g10	SBN023	Chihuahua	Ojinaga	San Bernardino	Slipped
SRU145	g10	SBN024	Chihuahua	Ojinaga	San Bernardino	Slipped
SRU146	g10	SBN025	Chihuahua	Ojinaga	San Bernardino	Slipped
SRU147	g3	SBN026	Chihuahua	Ojinaga	San Bernardino	Slipped
SRU148	g10	SBN027	Chihuahua	Ojinaga	San Bernardino	Slipped
SRU149	g10	SBN028	Chihuahua	Ojinaga	San Bernardino	Slipped
SRU150	g10	SBN029	Chihuahua	Ojinaga	San Bernardino	Slipped
SRU151	g10	SBN030	Chihuahua	Ojinaga	San Bernardino	Slipped
SRU152	g10	SBN031	Chihuahua	Ojinaga	San Bernardino	Slipped
SRU153	g10	SBN032	Chihuahua	Ojinaga	San Bernardino	Slipped
SRU154	g10	SBN033	Chihuahua	Ojinaga	San Bernardino	Slipped
SRU155	g10	SBN034	Chihuahua	Ojinaga	San Bernardino	Slipped
SRU156	unas	SBN035	Chihuahua	Ojinaga	San Bernardino	Slipped
SRU157	unas	SBN036	Chihuahua	Ojinaga	San Bernardino	Slipped
SRU158	g10	SBN037	Chihuahua	Ojinaga	San Bernardino	Slipped
SRU159	unas	SBN038	Chihuahua	Ojinaga	San Bernardino	Slipped
SRU160	unas	SBN039	Chihuahua	Ojinaga	San Bernardino	Slipped
SRU161	g10	SBN040	Chihuahua	Ojinaga	San Bernardino	Slipped
SRU162	g10	SBN041	Chihuahua	Ojinaga	San Bernardino	Slipped
SRU163	g10	SBN042	Chihuahua	Ojinaga	San Bernardino	Slipped
SRU164	g10	SBN043	Chihuahua	Ojinaga	San Bernardino	Slipped
SRU165	g10	SBN044	Chihuahua	Ojinaga	San Bernardino	Slipped
SRU166	g10	SBN045	Chihuahua	Ojinaga	San Bernardino	Slipped
SRU167	unas	SBN046	Chihuahua	Ojinaga	San Bernardino	Slipped
SRU168	unas	SBN051	Chihuahua	Ojinaga	San Bernardino	Painted/Decorated
SRU169	g10	SBN052	Chihuahua	Ojinaga	San Bernardino	Painted/Decorated
SRU170	g10	SBN053	Chihuahua	Ojinaga	San Bernardino	Painted/Decorated
SRU171	g10	SBN054	Chihuahua	Ojinaga	San Bernardino	Painted/Decorated
SRU172	g10	SBN055	Chihuahua	Ojinaga	San Bernardino	Painted/Decorated
SRU173	g10	SBN056	Chihuahua	Ojinaga	San Bernardino	Painted/Decorated
SRU174	unas	SBN057	Chihuahua	Ojinaga	San Bernardino	Painted/Decorated
SRU175	out	SBN058	Chihuahua	Ojinaga	San Bernardino	Painted/Decorated

Table 5: Select Descriptive Data and Group Assignments. (continued)

ANID	Comp Group	Alternate ID	State/ Province	County/ District	Site Name	Brownware
SRU176	g10	SBN061	Chihuahua	Ojinaga	San Bernardino	Plain
SRU177	unas	SBN062	Chihuahua	Ojinaga	San Bernardino	Plain
SRU178	g10	SBN063	Chihuahua	Ojinaga	San Bernardino	Plain
SRU179	g10	SBN064	Chihuahua	Ojinaga	San Bernardino	Plain
SRU180	g3	SBN065	Chihuahua	Ojinaga	San Bernardino	Plain
SRU181	g20	KBN001	Texas	Presidio	Kopenborger	Plain
SRU182	g20	KBN002	Texas	Presidio	Kopenborger	Plain
SRU183	g20	KBN003	Texas	Presidio	Kopenborger	Plain
SRU184	g10	KBN004	Texas	Presidio	Kopenborger	Plain
SRU185	g20	KBN005	Texas	Presidio	Kopenborger	Plain
SRU186	unas	KBN006	Texas	Presidio	Kopenborger	Plain
SRU187	g20	KBN007	Texas	Presidio	Kopenborger	Plain
SRU188	g20	KBN008	Texas	Presidio	Kopenborger	Plain
SRU189	g20	KBN009	Texas	Presidio	Kopenborger	Plain
SRU190	unas	KBN010	Texas	Presidio	Kopenborger	Plain
SRU191	unas	KBN011	Texas	Presidio	Kopenborger	Plain
SRU192	g20	KBN012	Texas	Presidio	Kopenborger	Plain
SRU193	g20	KBN013	Texas	Presidio	Kopenborger	Plain
SRU194	g20	KBN014	Texas	Presidio	Kopenborger	Plain
SRU195	g20	KBN015	Texas	Presidio	Kopenborger	Plain
SRU196	g20	KBN016	Texas	Presidio	Kopenborger	Plain
SRU197	g20	KBN017	Texas	Presidio	Kopenborger	Plain
SRU198	g20	KBN018	Texas	Presidio	Kopenborger	Plain
SRU199	unas	KBN019	Texas	Presidio	Kopenborger	Plain
SRU200	unas	KBN020	Texas	Presidio	Kopenborger	Plain
SRU201	g20	KBN021	Texas	Presidio	Kopenborger	Slipped
SRU202	g10	KBN022	Texas	Presidio	Kopenborger	Slipped
SRU203	g20	KBN023	Texas	Presidio	Kopenborger	Slipped
SRU204	g20	KBN024	Texas	Presidio	Kopenborger	Slipped
SRU205	g20	KBN025	Texas	Presidio	Kopenborger	Slipped
SRU206	g20	KBN026	Texas	Presidio	Kopenborger	Slipped
SRU207	g20	KBN027	Texas	Presidio	Kopenborger	Slipped
SRU208	g20	KBN028	Texas	Presidio	Kopenborger	Slipped
SRU209	g2	KBN029	Texas	Presidio	Kopenborger	Slipped
SRU210	unas	KBN030	Texas	Presidio	Kopenborger	Slipped

Table 5: Select Descriptive Data and Group Assignments. (continued)

ANID	Comp Group	Alternate ID	State/ Province	County/ District	Site Name	Brownware
SRU211	g20	KBN031	Texas	Presidio	Kopenborger	Slipped
SRU212	g20	KBN032	Texas	Presidio	Kopenborger	Slipped
SRU213	g20	KBN033	Texas	Presidio	Kopenborger	Slipped
SRU214	g20	KBN034	Texas	Presidio	Kopenborger	Slipped
SRU215	g20	KBN035	Texas	Presidio	Kopenborger	Slipped
SRU216	g20	KBN036	Texas	Presidio	Kopenborger	Slipped
SRU217	g20	KBN037	Texas	Presidio	Kopenborger	Slipped
SRU218	g2	KBN038	Texas	Presidio	Kopenborger	Slipped
SRU219	g20	KBN039	Texas	Presidio	Kopenborger	Slipped
SRU220	g2	KBN040	Texas	Presidio	Kopenborger	Slipped
SRU221	g10	KBN041	Texas	Presidio	Kopenborger	Surface-Treated
SRU222	g20	KBN042	Texas	Presidio	Kopenborger	Surface-Treated
SRU223	g10	KBN043	Texas	Presidio	Kopenborger	Surface-Treated
SRU224	unas	KBN044	Texas	Presidio	Kopenborger	Surface-Treated
SRU225	g20	KBN045	Texas	Presidio	Kopenborger	Surface-Treated
SRU226	g20	KBN046	Texas	Presidio	Kopenborger	Surface-Treated
SRU227	g10	KBN047	Texas	Presidio	Kopenborger	Surface-Treated
SRU228	g20	KBN048	Texas	Presidio	Kopenborger	Surface-Treated
SRU229	g10	KBN049	Texas	Presidio	Kopenborger	Surface-Treated
SRU230	g10	KBN050	Texas	Presidio	Kopenborger	Surface-Treated
SRU231	g20	KBN051	Texas	Presidio	Kopenborger	Surface-Treated
SRU232	unas	KBN052	Texas	Presidio	Kopenborger	Surface-Treated
SRU233	g20	KBN053	Texas	Presidio	Kopenborger	Surface-Treated
SRU234	g20	KBN054	Texas	Presidio	Kopenborger	Surface-Treated
SRU235	unas	KBN055	Texas	Presidio	Kopenborger	Surface-Treated
SRU236	g20	KBN056	Texas	Presidio	Kopenborger	Surface-Treated
SRU237	unas	KBN057	Texas	Presidio	Kopenborger	Surface-Treated
SRU238	g20	KBN058	Texas	Presidio	Kopenborger	Surface-Treated
SRU239	g10	KBN059	Texas	Presidio	Kopenborger	Surface-Treated
SRU240	g10	KBN060	Texas	Presidio	Kopenborger	Surface-Treated
SRU241	g20	KBN061	Texas	Presidio	Kopenborger	Painted/Decorated
SRU242	g10	KBN062	Texas	Presidio	Kopenborger	Painted/Decorated
SRU243	g20	KBN063	Texas	Presidio	Kopenborger	Painted/Decorated
SRU244	g10	KBN064	Texas	Presidio	Kopenborger	Painted/Decorated
SRU245	g20	KBN065	Texas	Presidio	Kopenborger	Painted/Decorated

Table 5: Select Descriptive Data and Group Assignments. (continued)

ANID	Comp Group	Alternate ID	State/ Province	County/ District	Site Name	Brownware
SRU246	g10	KBN066	Texas	Presidio	Kopenborger	Painted/Decorated
SRU247	g20	KBN067	Texas	Presidio	Kopenborger	Painted/Decorated
SRU248	g20	KBN068	Texas	Presidio	Kopenborger	Painted/Decorated
SRU249	g20	KBN069	Texas	Presidio	Kopenborger	Painted/Decorated
SRU250	unas	KBN070	Texas	Presidio	Kopenborger	Painted/Decorated
SRU251	g20	KBN071	Texas	Presidio	Kopenborger	Painted/Decorated
SRU252	g20	KBN072	Texas	Presidio	Kopenborger	Painted/Decorated
SRU253	unas	KBN073	Texas	Presidio	Kopenborger	Painted/Decorated
SRU254	g20	KBN074	Texas	Presidio	Kopenborger	Painted/Decorated
SRU255	out	KBN075	Texas	Presidio	Kopenborger	Painted/Decorated
SRU256	g10	KBN076	Texas	Presidio	Kopenborger	Painted/Decorated
SRU257	g20	KBN077	Texas	Presidio	Kopenborger	Painted/Decorated
SRU258	g20	KBN078	Texas	Presidio	Kopenborger	Painted/Decorated
SRU259	g10	KBN079	Texas	Presidio	Kopenborger	Painted/Decorated
SRU260	g20	KBN080	Texas	Presidio	Kopenborger	Painted/Decorated
SRU261	out	MNN021	Texas	Presidio	Millington	Plain
SRU262	g20	MNN022	Texas	Presidio	Millington	Plain
SRU263	g20	MNN023	Texas	Presidio	Millington	Plain
SRU264	unas	MNN024	Texas	Presidio	Millington	Plain
SRU265	g1	MNN025	Texas	Presidio	Millington	Plain
SRU266	g1	MNN026	Texas	Presidio	Millington	Plain
SRU267	out	MNN027	Texas	Presidio	Millington	Plain
SRU268	g20	MNN028	Texas	Presidio	Millington	Plain
SRU269	unas	MNN029	Texas	Presidio	Millington	Plain
SRU270	unas	MNN030	Texas	Presidio	Millington	Plain
SRU271	g4	PVN087	Texas	Presidio	Polvo	Plain
SRU272	g4	PVN088	Texas	Presidio	Polvo	Plain
SRU273	out	PVN089	Texas	Presidio	Polvo	Plain
SRU274	g4	PVN090	Texas	Presidio	Polvo	Plain
SRU275	unas	PVN091	Texas	Presidio	Polvo	Plain
SRU276	g6	PVN092	Texas	Presidio	Polvo	Plain
SRU277	unas	PVN093	Texas	Presidio	Polvo	Plain
SRU278	g4	PVN094	Texas	Presidio	Polvo	Plain
SRU279	g20	PVN095	Texas	Presidio	Polvo	Plain

APPENDIX B

Ceramic Petrography of Four Sites in La Junta de los Ríos, Eastern Trans-Pecos, Texas, and Chihuahua, Republic of Mexico

By David Glen Robinson

INTRODUCTION

In late 2018 and early 2019, a petrographic thin section analysis was conducted on 278 ceramic sherds from four sites in the *La Junta de los Ríos* region in the eastern Trans-Pecos zone of West Texas. One thin section (Specimen MNP066) was unaccounted for and may have been lost during the preparation of thin sections. Instrumental neutron activation analysis (INAA) was conducted in tandem on 279 sherds of the same collection, with the exception of the aforementioned missing companion sherd selected for petrographic analysis. The sherds submitted for these analyses were chosen from the Polvo (41PS21), Millington (41PS14), and Kopenborger (41PS16) sites in Presidio County, Texas, and the San Bernardino site (CH-E7-2) in Chihuahua, Republic of Mexico.

The focus of this research was to determine localities of ceramic production, and the relations between the various occupants of the aforementioned pueblos based on the production of ceramics. Were all ceramics produced locally, produced in one locality and distributed all around, or imported from outside regions? Answers to these questions could potentially enhance our understanding of the scales of ceramic movement, trade mechanisms, and extra-regional relationships.

The Center for Big Bend Studies (CBBS) of Sul Ross State University implemented this research under the terms of a grant from the Texas Preservation Trust Fund administered by the Texas Historical Commission. The author carried out the ceramic petrographic analysis at the Texas Archeological Research Laboratory (TARL), The University of Texas at Austin. The Missouri University Research Reactor (MURR) laboratory conducted the INAA research on the ceramic assemblage. That research is reported separately.

GEOLOGICAL BACKGROUND

La Junta de los Ríos is a region of largely igneous rocks, and within that designation is immense complexity. The surface formations range from acidic, intermediate, and alkalic rocks; felsic and mafic; and granular, fine-grained, aphanitic, and porphyritic. The rocks are intrusive and extrusive—occasionally over short lateral distances—and ash and tuff falls from several volcanic eruptions over the course of the Tertiary have blanketed the region, sometimes with severity sufficient to cause die-offs of the plants and animals over a wide area.

The local geography of La Junta de los Ríos is of a desert river valley; the rivers are the Rio Grande, transiting the region, and the Río Conchos, flowing into the Rio Grande at Ojinaga, Chihuahua-Presidio, Texas after draining the mountains of Chihuahua to the west. The Rio Grande is an ancient river heading in the Rocky Mountains of Colorado and the four sites studied here all lie on alluvial terraces of this river. The terraces are deep and multilayered, of great age or more recent origin (geologic maps label them merely Quaternary), and they may have rock fragments and particles originating ultimately over hundreds of thousands of square miles.

Second-order streams on the Texas side of the river flow generally southwest, occasionally under structural controls, and empty into the Rio Grande. Their bedloads reflect the diversity of the rock formations of the region; as expected, sands, gravels, and clay comprise their sediments. All the streams' bedloads are mapped as Quaternary and Recent alluvium. Alluvial clay deposits are assumed in these formations, but residual clay beds lack any mapping or descriptions in the literature. A few mapped intermittent streams head in the Cretaceous formations to the northeast around the mines and settlement of Shafter, Texas. They flow into the Rio Grande in the vicinities of the Kopenborger and Millington sites. Evidence from the petrographic work suggests that these stream courses transport carbonate materials (limestone, dolomite, calcite, and a few marine shell fossils) downstream that have become part of some of the ceramic pastes. The Cretaceous formations may also be the sources for the rare mineral melilite, a key paste marker in some of the collection sherds. Further, Cibolo and Alamito creeks head well to the north of La Junta; but their streams also drain heavily basaltic and tuffaceous terranes on and near the Marfa Plains. Additionally, Cibolo Creek also drains the Cretaceous formations near Shafter and flows into the Rio Grande at Presidio-Ojinaga between the Millington and Kopenborger sites (Barnes 1979).

This diverse geological background would be mirrored, to varying degrees, in any ceramic earthenwares produced regionally, and this can be seen generally in the ceramics of the study presented here. Additional implications can also be seen. The ubiquity of tuff and tuffaceous deposits in the wider region render the material void as a marker of production locality, either local or nonlocal. A complete absence of tuff would demonstrate an extra-regional point of manufacture but would suggest little else without additional information. There are at least two examples of tuff-less potsherds in the collection.

Site Settings

The physiographic site settings are important to identifying possible local resources and their variations. In the cases of these four sites, the similarities of setting make nonlocal resources, if any, stand out by contrast to the local materials. The sites are set on river terraces of the Rio Grande, and the river flows past them, forming a linear connection between them. The Río Conchos flows into the Rio Grande from the west, near and across the Rio Grande from the Millington and Kopenborger sites, just upstream from Presidio and Ojinaga.

The Polvo Site/41PS21 (PVP)

The Polvo site is the farthest downstream of the set of four sites. It lies in the Rio Grande terrace system near and along the stream bed of Church Creek/*Arroyo de la Iglesia*, a minor tributary of the Rio Grande. The locale is slightly more than a mile downriver from Redford, Texas (Cloud 2004:13). Church Creek, near PVP, is a young stream draining the Rawls Formation exclusively. The Rawls Formation (Barnes 1979) is an extensive body of mixed volcanic flows of extrusive rocks, exposures of intrusive rocks, and sedimentary rocks. The formation has alternating outcrops of basalts; tuffs; trachytic basalts, diorites, latites, andesite, and porphyritic variants of all these; and sandstones, conglomerates, and breccias. The tuffs are of ash fall and ash flow varieties, both of which could be buried by later lava flows to form lithic tuffs of ignimbritic and other varieties, including welded tuffs. Outcrops of all these could alternate over small areas in the formation, and all can be found in the bedload of Church Creek.

The Millington Site/41PS14 (MNP)

The site lies in the town of Presidio on upper alluvial terraces near the lower reaches of Cibolo Creek. Earlier Quaternary alluvium lies upstream toward Shafter, as mentioned above. These deposits may have sufficient age to form residual clay beds; but again, any such are not mapped. The upstream Cretaceous formations are Del Carmen Limestone and the Shafter Formation. The Del Carmen is limestone with massive chert deposits and the Shafter is limestone, sandstone, shale, and marl. The latter formation also yields fossils of *Exogyra texana* and *Orbitolina texana* (Barnes 1979). Materials derived ultimately from both of these formations contributed the carbonates and fossil fragments to the ceramic collections.

The Kopenborger Site/41PS16 (KBP)

The site lies in a setting similar to MNP on a mapped area of Recent Windblown sand. A visit to KBP by CBBS reported the sands as coppice dunes, very active in spite of partial stabilization by brush and cactus (Walter and Keller 2018). As with MNP, the local sources for ceramics at KBP are the Rio Grande and Cibolo Creek alluvial deposits, with contributions from the Cretaceous carbonate formations up-creek near Shafter. The rock-forming mineral melilite, found almost exclusively in some of the KBP ceramics may also be sourced in the Cretaceous formations, although this is unconfirmed at this time.

San Bernardino Pueblo/CH-E7-2 (SBP)

The site is the most distant from the other La Junta villages studied here, approximately 27 miles upriver on low Rio Grande alluvial terraces, on the Chihuahua side. The mouth of Pinto Canyon empties into the Rio Grande across the river from SBP. Nearby intermittent stream courses on the Texas side of the river head northeastward in the same carbonate formations that serve KBP and MNP ceramics; other drainages in this area enter the large and extensive zone of intrusive igneous rocks that in part formed the Chinati Mountains. This diverse set of formations contains basalts, various trachytes, rhyolite, phonolite, latite, and coarse-grained rocks. The streams also crosscut early Quaternary alluvial deposits that may have remained in place long enough to form residual clay deposits in favored settings. Similar potential clay forming environments in the Chinati Mountains lay a minimum of seven miles uphill northeastward (Barnes 1979). Mountains in Chihuahua lie an equivalent distance to the southwest, characterized by a massive limestone uplift (Richard W. Walter, personal communication 2019). Neither alluvial nor residual clay deposits are mapped on the terraces, slopes, or mountains on either side of the river.

METHODS

The petrographic analysis of the pottery was accomplished by microscope thin section analysis, pioneered in archaeology by Shepard (1942, 1976). National Petrographic Inc. of Houston, Texas prepared the thin sections of the ceramic sample. Identification and quantification of the sample specimens were conducted on an Olympus stereo petrographic, polarizing light microscope with a rotating stage at TARL. After the various minerals, rocks, and other discernible bodies were identified with confidence, a point count was made of each thin section. The slide was traversed at approximately 0.5 mm intervals, and all bodies falling directly in the center of the field of view were counted; traverses continued in this manner until a count of 200 was achieved or until the area of the slide was fully covered in the counting. This procedure follows Chayes (1949) supplemented with published charts concerning percentage coverage of microscopic observation fields. This method is especially effective for the counting of silt particles whose maximum diameters of grain sizes range from 0.002–.05 mm. The clay body, all solid inclusions, and pore spaces, or voids, were included in the count summation as they all pattern the ceramics. In all mechanically consistent processes such as point counting, rare and unrepresentative (but potentially signal) phenomena may fail to enter the sample. When rare minerals were observed, but did not enter the point count, they were entered on the tabulation sheet as "tr." for trace. In this way, their presence and contribution were noted without violating the consistency of the point count. The outcome of the point count is a quantified assessment of the collection's ceramic attributes, a body of data amenable to comparisons with other similarly gained data and manipulated by a variety of statistical measures. The spreadsheet of the point count data reports the proportions of the point count, not the exact count. In other words, the point count data are percentages of a count of 200. Therefore, to obtain the exact count of a given thin section, one would simply multiply the point count figure by two.

A supplement to the overall method is the Particle Diversity Index or PDI. The index lies apart from the point count. The PDI figure is calculated simply by adding the different types of bodies and particles in a thin section, minus the voids. The sum is the index value. The index number, summed individually for all the thin sections, provides a rough but useful comparative measure of the complexity and diversity across the collection.

PASTE GROUPS

Ceramic paste groups were defined for the collection as a way of identifying and describing similar ceramic fabrics. Paste groups are the first level of pattern recognition, or discrimination, in the analysis, and the individual thin sections are organized and described within the defined paste groups. Further issues in defining paste groups are discussed in the results sections.

NOTES ON PASTE CHARACTERISTICS, ROCKS, AND MINERALS

Ceramic pastes have relatively simple distinguishing features (Table 1). The optical colors vary between the plane-polarized view and the cross-polarized view. Isotropy refers to the basic quality of crystalline materials of transmitting light in all directions (isotropic materials) or distorting the pathway of light in the cross-polarized state (anisotropic materials). This is one of the few observable properties of clay minerals, as they are extremely small particles. The patterns of voids in pastes may also indicate differences. The numbers of voids encountered in the point count are tallied in the voids column just like any of the solid particles in their own columns (although of course the voids do not enter the PDI). All colors reported from the microscopic analysis are optical colors. The paste colors do not correspond to the plain light colors reported in megascopic analyses of hand specimens of ceramics. "Med" means median, as in median particle size, another general comparative measure.

Silt Fraction

The silt-sized particle fraction in every thin section exists as small resident particles in the original clay resource material of the clay paste. As a result, comparative observations of the silts may indicate similarities or differences in clay sources; however, the small sizes of silt particles allow few mineralogical data feature determinations. The mineral origin of the silt particles is assumed in all cases, as a silicate mineral. Beyond this, particle angularity and proportions in the paste are the few useful measures of the silts. Silts entered the counts, but assessments that are more accurate were gained by comparison to sets of visual standards for proportional coverage of the field and angularity/roundness. The silt fraction is a trait assessed at the paste characteristics level of paste group identification.

Rocks and Minerals

Most tempering materials in the current study consist of rocks, minerals, and volcanic rock fragments (VRFs). It should be noted that VRFs is a collective term for petrologists that represents all broken pieces of volcanic rocks and minerals seen in thin section, with the exception of silicates and carbonates. The general classes of rocks and minerals identified in this study are provided below.

Silicates

Silicates are usually the most common rock group in regions all over the world. Silicates identified during the current petrographic analysis consist of common quartz, composite quartz, chert, quartzite, and sandstone. As used in geology, silicates are various rock types formed of quartz, silicon dioxide. All the forms of silicates have the common constituent silicon, Si, in various molecules.

The molecule of quartz, SiO_2, is extremely stable, a quality that gives quartz its hardness and the persistence of silicates in the lithosphere of the earth.

Tuffs

Volcanic ash or tuff, also known as tufa, is an extrusive glassy material that can take different forms. These have been classed as vitric tuffs, crystal tuffs, and lithic tuffs (Williams et al. 1954:149–156). These types have optical distinctions, and they are recorded separately in this study as they may reveal differences. Tuffs are extremely common in the region, and tuffs from widely separate sites may or may not reveal significant patterns.

Carbonates

Limestones and companion dolomites are common in the eastern peripheries of the Trans-Pecos and of course form the Stockton and Edwards plateaus east of the region. Relatively minor outcrops of the same eastward formations outcrop north and northeastward of the Presidio area around Shafter. These may be the sources of carbonates in the intermittent streams near the Kopenborger and Millington sites and in some of their ceramics. Carbonates comprise a telltale in the first level of division of the paste groups.

Melilite

Another key telltale mineral in the first level of division is melilite. A general formula for common melilite is $(Ca,Na)_2(Al, Mg, Fe^{2+})[(Al, Si)SiO_7]$. Melilite is of a group of relatively rare rock forming minerals of tetragonal symmetry that may be formed by the interaction of basic magmas with carbonate rocks (Deer et al. 1980:76). This formative interaction may have taken place with eruptions of the Chinati Mountains through the preexisting Cretaceous limestones, dolomites, and marls near Shafter. Melilite seems to be associated with the carbonates in the collection, and the melilite paste groups are almost exclusively associated with the Kopenborger site.

Trachytes

Trachyte refers to rocks infused with iron and other mafics in their environment of formation. Trachyte appears as fields and masses of dark microlites (small medium silt-sized and smaller mineral particles) in groundmasses of rock particles and iron drapes on crystals. The defining minerals of the rock may be almost entirely obscured; thus, the rocks are classified in this study as trachyte, although the underlying mineralogy may vary.

Diabase and Basalt

Diabase and basalts are extrusives having plentiful plagioclase feldspar and mafics. The two classes vary across gradational textural boundaries. Progressively smaller phenocrysts grade from diabase into basalt. Differences between the two may indicate different formations, but the various formations are extremely common throughout the eastern Trans-Pecos.

Iron

Iron in the form of oxides and minerals are extremely common in the region, and iron is a principal mafic or dark mineral. The mineral forms other than the iron oxides are mixed allomorphs of iron, and they are classified as iron ores. They may also be constituents of textural rock classes. Variations in types and amounts of iron in the sherd collection may indicate different origins.

Olivine and Pyroxene Signatures

Olivine and pyroxene are classed as mafics, although they are highly colored anisotropic minerals. They are constituent minerals of several intermediate and alkalic granular rocks and they occur occasionally in thin sections as individual particles.

Micas

Muscovite, biotite, and chlorite are members of the mica group and are extremely common in the earth. They form and reform in numerous environments on the earth's surface, due partially to their relatively simple platy crystalline molecular structures, related to those of clay minerals. Occasional micas observed in the thin sections may hail from sources in the Rio Grande alluvial terraces at a distance or from other formations located off-site such as clays exposed in nearby arroyos.

The presence or absence of mica is one of the signatures or telltale minerals used in the division of pastes into groups (Henry 1998).

Plagioclase/Alkali Feldspar Balance

Plagioclase and alkali feldspars describe the binary distinction between acid and alkali feldspars, but there are several distinct minerals in both categories. Alkali feldspars are constituents in granites and similar rocks, while plagioclase is common in diorites, diabase, gabbros, and similar granular rocks. It is also the commonest phenocryst in basalts. Individual crystals in ceramic pastes may indicate source proximities to the above rock types. Intermediate and basic rocks are common in the Rawls Formation.

GENERAL RESULTS

Hierarchical Determination of Paste Groups

Determining paste groups helps to find out the nature of materials and source beds of ceramic raw materials. A paste group itself is a material thing, a set of natural materials held together in a ceramic matrix formed by vessel firing. This method of determining paste groups is hierarchical, and in this analysis based on four stratified classifications. The first level of division is based on the presence of telltale signature minerals. They are:

1. mica group, presence or absence
2. carbonates
3. melilite
4. bone temper

The second stratification is paste characteristics, including optical colors of the paste, the silt fraction, and the shapes and patterns of voids. These traits are variables that take their character in forming and firing. The overall abundance of all the aplastic inclusions may vary with potters' ceramic practice and technology, and the requirements of ceramic firings. Void patterns may indicate firing variables, maximum heating levels attained, and the rate of heating/cooling.

The third level of division is the characteristics of the temper particles. In most cases, the temper in these collections are comprised of multiple types of mineral and volcanic rock fragments, and together they may suggest the geological locality of resources. Size and angularity may point toward eroded river terrace sources or fresher, more angular sources.

The fourth level of classification is the presence and traits of minor minerals that may be resident in the clay material or added along with the tempering material. They may be present as minor suites of material or singly. Micas, carbonates, and the rare mineral melilite are so compelling telltale signatures, that they crosscut the hierarchy of the designation of paste groups and form their own paste group classes. Two rare rock fragments occurring in only a single section each defined their own single-sherd paste groups. These are orthoclase feldspar, in Specimen KBP015; and large, elongated crystals of ilmenitic iron ore, in Specimen SBP065 (Fig. 1).

As mentioned above, telltale minerals or bodies, defined classes of paste groups, and paste characteristics and temper suites defined the actual paste groups within the overarching classes. It is important to note that minor minerals and VRFs may enter the ceramic paste with the clay or the added temper, and thus are usually not determinative. Those telltale minerals that can be confidently identified are used to define classes, and they have been elevated to the first level of classification. The presence of two class-signature minerals together required judgment calls on the priorities of paste group classification. These decisions were made to create the most distinctive "hybrid" paste groups. Accordingly, melilite was preeminent, subordinating over both carbonates and mica while carbonates were secondary influencers, subordinating over mica. With these decisions made, the paste group identifications could proceed as normal.

PASTE GROUPS AND THIN SECTION DESCRIPTIONS

All of the petrographic data recorded in this study are presented in Table 1. For better comprehensibility, the data was separated into two tables showing paste characteristics and the rock and mineral composition (Tables 2 and 3). A summary of paste groups and distribution within the sites are provided in Table 4. The text below provides descriptions of the classes of pastes, paste

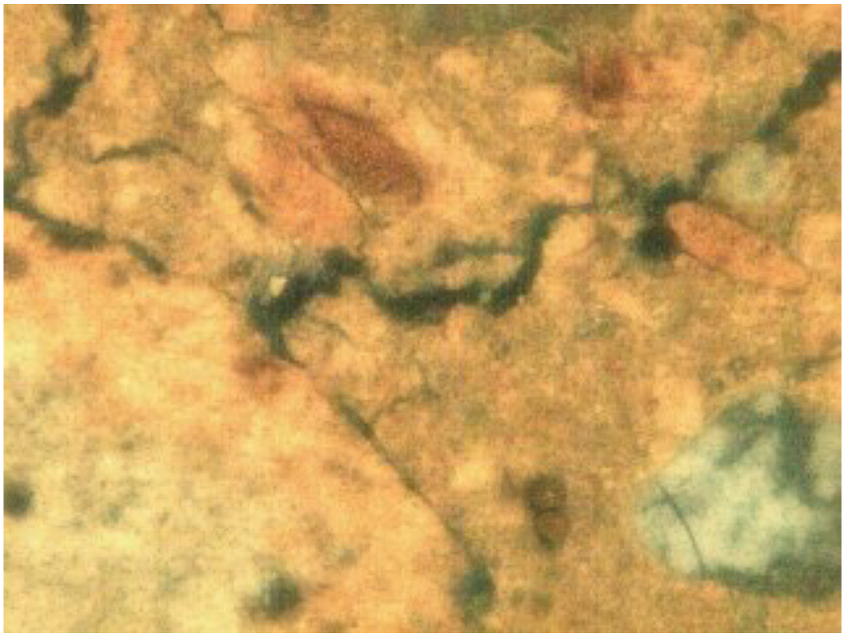

Fig. 1. Example of ilmenitic iron ore temper particles in reflected light in Specimen SBP065. Ilmenite particles may have many colors, shapes, and sizes. Here, the salmon pink particles, blood red particles, and the large, light whitish particle in the lower left quarter of the image are all ilmenite ore. (Reflected light at 175X; photo by David Robinson).

groups, and summarized descriptions of each section under a given paste group. Almost all the pastes are optically isotropic with only a few sherds that exhibit anisotropic pastes. As mentioned earlier, colors reported in the petrographic analysis are optical colors and not the same as those seen in hand specimens. Specimen colors are provided under both plane and cross-polarized light, respectively. Those listed with a single color have the same color under both light sources.

Mica-Present Class

Paste Group A (n=21)

This group is one of the most common in the project, having optically black (iron-rich) pastes, low to moderate silts, high silicates (common quartz, composite quartz, and chert), and large amounts of tuffs in all three varieties. Also, there are large amounts of VRFs with combinations of acidic and alkalic granular and fine-grained rocks; they do not indicate a single formation or set of similar formations that can be identified.

PVP002. This sherd has an optically black paste and high amounts of silicates, voids, tuffs, and VRFs. The mica in it is biotite. The PDI is 17 due to the large number of VRFs.

PVP005. The optically black paste has high amounts of silicates, tuffs, VRFs, and voids which show its group membership. The mica is biotite.

PVP006. The sherd has black paste and high amounts of silicates, tuffs, VRFs, and voids; and the mica is biotite. The section is very similar to Specimens PVP002 and PVP005.

PVP063. Optically black paste and muscovite mark the sherd's membership in the paste group. It varies in having slightly lower amounts of quartz and tuffs. Again, the VRFs are mixed.

PVP064. The paste color is black, with lower silts, but high silicates, tuffs, and mixed VRFs. The PDI is 15. The mica is muscovite.

PVP067. The optically black paste is typical, as are the high amounts of silicates, tuffs, and VRFs.

MNP018. The optically black paste has both muscovite and biotite in the paste.

MNP082. The sherd has black paste and high amounts of silts, silicates, and tuffs. It varies in having fewer VRF types. The mica is biotite. The PDI is 11.

MNP084. The sherd is typical in having optically black paste and high voids, silts, quartz, tuffs, and moderate amounts of VRFs. The mica is biotite.

MNP097. The section has optically black paste, high voids, silicates, and tuffs. The mica is muscovite, scattered through the paste in low amounts as silt-sized spicules. A variation is the low number of VRFs. The PDI is 11.

KBP003. The black paste has large amounts of voids, quartz, and tuffs. The micas are biotite and muscovite. The PDI is 12.

KBP028. The black paste is typical, along with high silts, high silicates, high tuffs, and high VRFs. Muscovite mica is sprinkled through the paste.

KBP037. The section has black paste, high voids, high silicates, high tuffs, and high VRFs. The mica is muscovite.

KBP063. The section has black paste, high voids, high silicates, high tuffs, and biotite mica.

KBP067. The section is a variant in that it has a very thin, discontinuous layer of a paint or slip on its exterior. Otherwise, the paste is black and dense, and with relatively lower amounts of voids, silts, quartz, tuffs, and VRFs. The mica is muscovite.

SBP012. The sherd has black paste, high voids, very high silicates, high tuffs, oddly low VRFs, and biotite mica. The PDI is 11.

SBP015. The section is black, with high silts, high silicates, high tuffs, relatively high VRFs, and muscovite mica.

SBP038. The section is black, with high voids, high silts, high silicates, high tuffs, and biotite mica.

SBP040. The section is black, with relatively high silts, high silicates, very high tuffs, relatively low VRFs, and biotite mica.

SBP052. The section has black paste, high voids, high silts, high silicates, high tuffs, and high VRFs. The mica is muscovite.

SBP062. The black section has low voids and silts, very high silicates, moderate tuffs, and high VRFs. The mica is muscovite.

Paste Group B (n=4)

This group also has optically black sections, with low amounts of silts and voids, and generally low amounts of VRFs. PDIs are generally low, ranging from 8 to 10. Three sections have muscovite mica, one biotite.

MNP098. The section has black paste, low voids, low silts, high silicates, high tuffs, and muscovite mica.

SBP026. The paste is black, with low amounts of voids, silts, and quartz, but exceptionally high tuffs. The mica is biotite.

SBP027. The paste is black, with relatively high silts and voids, and low silicates. Tuffs are high and there is a small amount of muscovite.

SBP058. The paste is black, with low voids and silts, high silicates, high tuffs, low VRFs, and muscovite mica.

Paste Group C (n=1)

The paste group is distinctive for having a large number of different VRFs in large sizes; this large suite of tempering particles was significantly rounded, showing collection of tempering particles—not necessarily the clay paste material—from a river terrace with eroded and rounded resident particles.

MNP070. The paste is black, with high voids, low silts, high silicates, moderate tuffs, and high VRFs; they are also diverse. The PDI is high at 19. As stated above, the silicates, tuffs, and VRFs are coarse sand-sized and larger, and significantly rounded. This shows clear evidence of particles gained from alluvial terraces. The silt fraction, however, is notably angular and very angular; thus, the clay paste may have been gained from a different, non-alluvial source. The mica is muscovite.

Paste Group D (n=1)

The section has reddish-black paste in plane-polarized light, black in cross-polarized light. The colors are uncommon in this collection of black pastes. They may be due to rare elements mixed into the clay, or minor firing variations, or both. The section has notably high silts and notably low quartz. The mixtures here are unusual and distinctive.

KBP036. The paste is red-black/black and has high silts and low quartz; tuffs and VRFs are in moderate proportions. The mica is muscovite. Particle angularity does not suggest alluvial terrace sources.

Paste Group E (n=1)

The optical colors are reddish-black and black. The single-section paste group is a highly distinctive section with 40 percent silts, high quartz, and vitreous tuffs at 20 percent.

SBP011. The paste is optically reddish-black and black, and silts are 40 percent of the point count. Silicates are relatively high, as are vitreous tuffs at 20 percent. There are no identified crystal tuffs or lithic tuffs, companions to vitreous tuffs elsewhere in the collection. Micas are muscovite and biotite. There are no other particle types in the section, and the PDI is 7. Although distinctive, the components of the paste and temper are the same as those found locally and in the other sections in the collection. The sherd is probably a local sherd made from a single batch of ceramic paste.

Paste Group F (n=1)

The optical colors are brown and black. The void proportions are low, but silicates, silts and VRFs are remarkably high and diverse.

MNP005. Optical colors are brown and black. Silts, silicates, tuffs, and VRFs are high and diverse. The PDI is 16. The mica is muscovite. Silts are notably angular, but the large temper particles are predominantly rounded and subrounded, suggesting that the temper fraction was gained from alluvial terraces. Although it is a single paste group section with significant distinctiveness, the paste group is local.

Paste Group G (n=6)

The paste group has greenish-brown and black optical paste colors and otherwise has high silts, high quartz, moderate to high tuffs, and generally high VRFs in various types.

PVP027. The optical paste colors are dark greenish-gray and black, due to different paste elements or firing variations. The paste has very high silts, relatively moderate quartz and tuffs, and high VRFs, including exceptionally high plagioclase feldspar. The mica is biotite.

PVP028. The paste colors are brownish-black and black, indicating variant paste elements or firing variations. The silts are low, with high counts of quartz, tuffs, and a high number and diverse suite of VRFs. The paste contains both muscovite and biotite mica.

PVP061. Paste colors are dark greenish-gray and black, due perhaps to variant paste elements or firing patterns. Voids are high, but silts are low, and quartz and tuffs are moderate. The counts and diversity of VRFs are very high. Grains of quartz and tuffs are notably rounded, while grains of silts are notably angular. The conspicuous occurrence of rounded grains of quartz strongly suggests that the temper for this vessel was gathered from alluvial terraces. The mica is muscovite.

PVP062. The optical paste colors are dark gray-green and black, again due to varying elements or firing conditions. Silts are low while quartz is high, and tuffs and VRFs are moderate. The mica is muscovite.

PVP070. The optical colors are greenish-gray and black, suggesting different elements or firing variations. Silts, silicates and tuffs are high, while VRFs are low. The mica is muscovite.

KBP074. The optical colors are greenish-brown and black, suggesting different elements or firing variations.

Silts are low, and silicates and tuffs are moderate. VRFs are high, especially particles of ferrous hematite iron ore. The mica is biotite.

Paste Group H (n=2)

This paste group stands out for having wide, wavy, parallel void strips that constrain the amount of black matrix and particles between them. The group has companion paste groups in the mica-absent class (Paste Group O) and the carbonates class (Paste Groups GG and HH). Further, most of the examples have rounded and large temper particles, suggesting sources in alluvial terraces. Silt angularity was in a wide range, so its sources cannot be estimated, nor can the sources of the clay paste.

MNP019. The section has high silts and quartz, moderate tuffs, and high and diverse VRFs. The PDI is high at 19. The micas are biotite and muscovite. Silt angularity is in a wide range from well-rounded to very angular, and all the larger particles are predominantly rounded, suggesting sources in the alluvial terraces. The section is a close companion to Specimen MNP020.

MNP020. The section is a companion to Specimen MNP019, perhaps from the same vessel. The section has high silts and quartz, moderate tuffs, and high and diverse VRFs. The PDI is 19. The mica is biotite. The particles are predominantly rounded and are probably from alluvial terraces, as are the clays for the paste.

Paste Group I (n=1)

The section has high voids, silicates, and tuffs, but low VRFs. The mica is chlorite. Gabbro is relatively rare in the collection. The overall look is dissimilar from many of the other ceramics, but the sherd is local.

SBP002. The optical paste colors are red-brown and black, due probably to elemental and firing variations. The sherd has high voids, moderate silts, and high silicates and tuffs, with chlorite mica. Gabbro in the paste has a micaceous groundmass, rare in the region. San Bernardino Pueblo is appreciably upriver from the other sites in the study and might be expected to show minerals otherwise rare in the collection. Gabbro formations are found in the region.

Paste Group J (n=3)

The paste group is distinctive in having anisotropic pastes, indicated by changes in the brightness or color under cross-polarized light—called the B-fabric—while rotating the stage. The colors are optical colors and not those observable in hand specimens. These changes indicate different clay minerals in the matrix. Anisotropic pastes are exceedingly rare in the collection, and they definitely indicate different sources. Further, the A-fabric colors are greenish-brown, gray-brown, and gray-green, indicating other possible differences. The silicates, tuffs, and VRFs otherwise look like those in the collection. Sources in alluvial terraces are not suggested. The materials indicate one or more rarely used clay sources within the region, probably not near the sites.

MNP008. The optical colors are gray-brown and black. The paste is anisotropic. The paste has high silts, high silicates, high tuffs, and moderate VRFs. The mica is muscovite.

MNP011. The paste optical colors are gray-green and black-to-gold. The paste is anisotropic. The section has moderate silts, high silicates, moderate tuffs, and moderate VRFs. The mica is muscovite.

KBP068. The paste optical colors are light greenish-brown and black-to-gray in the B-fabric. The section has high voids, moderate silts, high silicates, and moderate VRFs. The mica is muscovite.

Mica-Absent Class

Paste Group K (n=32)

The paste group is common within the region, having isotropic pastes, high silts, high silicates, high tuffs, and moderate VRFs. The VRFs are diverse, a mixture of acidic and alkali rocks with a few sedimentary types and forms of iron, including ore particles and iron oxides. The paste group is similar to Paste Group A, except for the lack of mica.

PVP007. The paste colors are black, with high silts, high silicates, high tuffs, and moderate VRFs.

PVP008. The paste colors are black, with high silts, high silicates, and high tuffs. VRFs are diverse but in low quantities. The PDI is 17.

PVP069. The paste is black and isotropic, and the section has high silicates, high tuffs, and high VRFs.

PVP086. The paste is black and isotropic, and the section has high voids and silts, but low silicates and high VRFs. The PDI is 12.

MNP023. The paste is optically black, and has high silts, low silicates, moderate tuffs, and low VRFs. The PDI is 9, relatively low for the paste group.

MNP051. The dark brown/black paste has low silts, very high common quartz, and moderate tuffs and VRFs.

MNP64. The paste has black optical color and high voids in jagged strips. The section also has high silicates, high tuffs, and high VRFs.

MNP072. The optically black matrix of the section is very dense and contains moderate silts, silicates, tuffs, and VRFs.

MNP073. The optically black paste has very high silts at 20 percent, moderate silicates, low tuffs, and moderate VRFs.

MNP078. The paste is optically black with moderate silts, very high silicates, low tuffs, and moderate VRFs.

MNP087. The optically black paste has very high voids and silts, high silicates, and high tuffs. The section has low VRFs.

MNP089. The optically black paste has moderate silts, silicates, and VRFs, but very high volcanic tuffs.

MNP090. The paste is optically black, with high silts, very high silicates, high tuffs, and notably low VRFs. The PDI is 8, very low.

MNP099. The optically black paste has high silts, high silicates, high tuffs, and high VRFs. The PDI is 10.

MNP100. The optically black paste has high voids, high silicates, high tuffs, and high VRFs.

KBP001. The optically black paste has low voids, high silts, high silicates, high tuffs, and high VRFs.

KBP045. The dense, optically black paste has low voids and silts, high silicates, high tuffs, and moderate VRFs.

KBP072. The optically black paste has high strip voids, high silts, low silicates, moderate tuffs, and high VRFs.

KBP073. The optically black paste has very high silts, moderate silicates, low tuffs, and low VRFs.

KBP076. The paste is optically black, with high voids, low silts, high silicates, high tuffs, and moderate VRFs.

SBP001. The optically black paste has moderate silts and silicates, and high tuffs and VRFs.

SBP004. The optically black paste has low silts, high silicates, high tuffs, and very low VRFs.

SBP010. The optically black paste has high silts, very high silicates, high tuffs, and low VRFs.

SBP020. The paste is optically black, with low silts, low silicates, high tuffs, and moderate VRFs.

SBP024. The optically black paste has high silts, high silicates, very high tuffs, and a single VRF, with trachyte at 5 percent.

SBP030. The optically black paste has moderate voids and silts, high silicates, very high tuffs, and low VRFs.

SBP034. The optically black paste has moderate voids, silts, and silicates; and very high tuffs.

SBP037. The optically black paste has moderate silts, high silicates, moderate tuffs, and low VRFs.

SBP043. The optically black paste has very high voids, moderate silts, high silicates, high tuffs, and low VRFs.

SBP044. The paste is optically black with moderate silts, very high silicates, high tuffs, and moderate VRFs.

SBP053. The optically black paste has moderate silts, very high silicates, high tuffs, and low VRFs.

SBP063. The optically black paste has low voids, moderate silts, high tuffs, and moderate VRFs.

Paste Group L (n=6)

The paste group has optically black pastes and high silicates, including common quartz, composite quartz, chert, quartzite, sandstone, and a few examples of volcanic quartz and spherulitic quartz. Other particles vary between moderate and high. None of the pastes in this paste group show particles or materials that may have been derived from alluvial terraces.

PVP014. The paste is optically black with high silicates, high tuffs, and low VRFs.

PVP021. The optically black paste has high voids, low silts, high silicates, high tuffs, and moderate VRFs. The PDI is 17.

PVP022. The optically black paste has high voids, low silts, high silicates, moderate tuffs, and high VRFs. The PDI is 18.

PVP084. The optically black paste has low voids and silts, high silicates, low tuffs, and high and diverse VRFs, including exceptionally high basalt (17 percent), diabase (15 percent), and plagioclase (12 percent). In this suite of rocks and minerals, many plagioclase lathes could have eroded out of the basalt and the diabase. The PDI is 14.

MNP065. The optically black paste has low voids and silts, moderate silicates, and high VRFs. The PDI is 10.

SBP057. The optically black paste has high voids, low silts, very high silicates, moderate tuffs, and low VRFs.

Paste Group M (n=14)

The paste group has generally dense pastes and high void proportions. The group also has low numbers of particles overall—the PDI—although the proportions of silicates and tuffs are high. Suites of VRFs are low in their proportions. Iron particles in the form of oxides and ores are notably absent from the paste group, and this is a key to the distinctiveness of the group. Rounded and eroded particles suggesting sources in alluvial terraces are also absent.

MNP049. The optically black paste has moderate voids, high silicates, and high tuffs, particularly lithic tuffs (12 percent). The PDI is 12.

MNP071. The optically black paste has an exceptionally dense matrix and high voids. Silts and silicates are low, while tuffs and VRFs are moderate. The PDI is 11.

MNP077. The optically black paste has high matrix and voids. Silts are low and silicates are high. Tuffs are moderate and VRFs are low.

MNP088. The section has optically black paste, moderate paste density and high voids, moderate silts, low silicates, and exceptionally high tuffs. VRFs are exceptionally low (8 percent basalt as the only VRF).

MNP091. The optically black paste has a high matrix, low voids, and high silts. Silicates are low, and tuffs are very high. VRFs are moderate, and the PDI is 10.

KBP017. The optically black paste is moderate, and has moderate voids, silts, silicates, and tuffs. VRFs are low, and the PDI is 8.

KBP030. The optically black paste is exceptionally dense, but has low voids, silts, and silicates. Tuffs are moderate and VRFs are low. The PDI is 9.

KBP043. The optically black paste has moderate voids, silts, and silicates. Tuffs are high and VRFs are moderate.

KBP058. The optically black paste has low voids and silts, and moderate silicates, tuffs, and VRFs. The PDI is 10.

SBP014. The optically black paste has high voids, low silts, and high silicates and tuffs. VRFs are very low. The PDI is 9.

SBP023. The optically black paste has a low density but a large proportion of voids, with low silts, low silicates, very high tuffs, and VRFs restricted to 2 percent basalt. The PDI is 8.

SBP033. The paste is optically black, with low voids, high silts, and moderate silicates. Tuffs are very high and VRFs are restricted to 1 percent plagioclase. The PDI is 8.

SBP042. The optically black paste has high voids, low silts, and very high silicates. Tuffs are also very high and VRFs are very low. The PDI is 10.

SBP045. The optically black paste has high voids, silts, silicates, and tuffs. VRFs are restricted to 3 percent trachyte. The PDI is 9.

Paste Group N (n=11)

The paste group has generally high tuffs and moderate silicates but lacks materials indicative of river terrace sources. It has diverse VRFs.

PVP093. The optically black paste is dense and has high voids, high silts, high silicates, and moderate tuffs. VRFs are moderate.

MNP025. The optically black paste is dense, with low voids, high silts, and moderate silicates. Tuffs are high and VRFs are low. The PDI is 8.

MNP030. The optically black paste has low voids and silts, and high silicates. Tuffs are very high, and VRFs are restricted to ferrous hematite iron ore at 3 percent. The PDI is 7.

KBP007. The optically black paste has high voids and low silts. Silicates are moderate, but tuffs are extremely high. VRFs are low. The PDI is 8.

KBP016. The optically black paste is very dense, with high voids, high silts, and high silicates. Tuffs and VRFs are moderate.

KBP051. The optically black paste is dense, with moderate voids, low silts, and high silicates. Tuffs are high and VRFs are low. The PDI is 10.

KBP062. The optically black paste is dense, with low voids and silts, and moderate silicates. Tuffs and VRFs are high.

KBP078. The optically black paste is dense with high voids and moderate silts. Silicates, tuffs, and VRFs are moderate.

SBP007. The optically black paste is moderate, with low voids and silts. Silicates are high and tuffs are exceptionally high. VRFs are very low.

SBP022. The optically black paste has low voids, but high silts and moderate silicates. Tuffs are exceptionally high while VRFs are very low.

SBP029. The optically black paste has high voids, low silts, and high silicates. VRFs and tuffs are also high.

Paste Group O (n=10)

The group is the wide-void paste group in the class of mica-free groups. The void strips, while long and jagged, are nevertheless parallel in alignment, and they run almost the full length of the section. This is a highly distinctive void pattern, thought to be the result of a combination of favorable clays and perhaps innovative firing technology. Silts in the pastes are generally low while other particle counts are high; and PDI ranges up to 17, indicating many different kinds of aplastics.

PVP010. The optically black paste is interrupted by many wide voids. The silt fraction is less than 1 percent, and silicates are high, as are VRFs. Tuffs are also notably high.

PVP068. The optically black paste has very high voids, low silts, and high silicates, tuffs, and VRFs.

PVP071. The optically black paste has very high voids and very low silts. Silicates, tuffs, and VRFs are high. The PDI is relatively high at 15.

PVP072. The optically black paste has high voids and low silts. The section also has high silicates, moderate tuffs, and low VRFs.

PVP080. The optically black paste has high voids, low silts, high silicates, moderate tuffs, and moderate VRFs. The PDI is relatively low at 10.

PVP081. The optically black paste has high voids and very low silts, with high silicates, moderate tuffs, and high VRFs. The PDI is 13.

MNP004. The optically black paste has high voids and silts. Silicates are exceptionally high, and tuffs and VRFs are moderate.

MNP006. The optically black paste has high voids and silts. Silicates are high and VRFs are moderate. Lithic tuffs are high at 12 percent in contrast to low vitric tuffs and low crystal tuffs. The explanation for this contrast is unknown.

MNP016. The optically black paste has high voids and moderate silts, with high silicates, high tuffs, and moderate VRFs.

MNP050. The optically black paste has high voids, moderate silts, and very low silicates. Tuffs are very high and VRFs are high. The PDI is relatively low at 9.

Paste Group P (n=2)

The group is composed of two sections with unusual dark gray pastes. The pastes are isotropic in that they are black under cross-polarized light (xpl) and don't change any optical aspect when the stage is rotated. The paste colors could imply a seldom-used source bed without micas or carbonates, or firing vagaries. The pastes of both sections also contain high silts, high silicates, and a wide variety of VRFs. PDIs are high, at 16 (Specimen PVP011) and 18 (Specimen PVP024).

PVP011. The dark gray/black isotropic paste has high silts and high voids, with high silicates, moderate tuffs, and high VRFs. The section has eight different types of VRFs.

PVP024. The dark gray/black isotropic paste has high voids and silts, and moderate silicates and tuffs. The VRFs are exceptionally high, with 10 different types of these fragments. Basalt, diorite, and ferrous hematite iron ore are exceptionally high within the VRFs, comprising 10.5 percent, 12.5 percent, and 11.5 percent, respectively.

Paste Group Q (n=2)

The paste group is formed of two sections—one each from the Millington and Kopenborger sites—that have highly aberrant void patterns in the paste that may imply a seldom used clay source or significantly different firing technology, or a combination of both. Otherwise, the pastes have the regionally typical tuff-heavy aplastics and VRFs. The VRFs are typical as well and do not point toward a specific area or formation. The differences between the sections' aplastics are such that they did not belong to the same vessel, but they may have had the same clay source.

MNP083. The optically black paste has high irregular voids, very low silts, high silicates, moderate tuffs, and moderate VRFs.

KBP047. The optically black paste has moderate but exceptionally irregular voids, low silts, low silicates, low VRFs, and exceptionally high tuffs.

Paste Group R (n=5)

This paste group is distinguished in the mica-free class by having large particles of rounded tuffs in quantity. It is likely that the temper material was collected from alluvial terraces with considerable fluvial transport of its sediments. Silt fractions in the paste appear to be notably angular, suggesting a non-alluvial source bed. The clays and tempers were collected from different sources and combined in the paste-forming process. The paste characteristics and aplastics look local/regional.

MNP002. The optically black paste has high voids, silts, silicates, and VRFs. Tuffs are moderate and well rounded, as are some of the VRFs.

MNP069. The optically black paste has a very dense matrix with high voids and moderate angular and subangular silts. Silicates are moderate, and tuffs and VRFs are high.

MNP075. The optically black paste has low voids and moderate silts. The paste has exceptionally high tuffs and VRFs. A peculiarity of this section is its exceptionally low silicates, limited to sandstone at 3 percent.

MNP080. The optically black paste has a dense matrix with low voids, low silts (although notably angular), and low silicates. Tuffs and VRFs are moderate and notably rounded.

SBP032. The optically black paste has high voids and low silts that are notably angular. Silicates are moderate and include common quartz, chert, quartzite, and sandstone. Tuffs are extremely high, and VRFs are extremely low, limited to rhyolite at 4 percent.

Paste Group S (n=1)

The paste group is very distinctive for having a dense paste and only a few particles of crystal tuff in the paste. The section otherwise has the regional common mix of VRFs, but atypically low amounts of quartz. The sherd is local, but probably produced in the region outside of the La Junta district.

MNP062. The optically black paste is dense with high voids and silts, but low common quartz in temper-sized particles. VRF tempering is high, but a peculiarity is the near lack of tuffs; only a small amount of crystal tuff was found in the paste. The ceramic materials were probably found in a tuff-poor locality of the region distant from La Junta.

Paste Group T (n=9)

The paste group has optical red-brown, very dark reddish-gray, and greenish red-brown pastes; all black under cross-polarized light and isotropic. These differences are enough to suggest pastes with different elemental contributions or varying firing conditions. The aplastics are the regional suites of silicates, tuffs, and VRFs.

PVP085. The optically red- and greenish-brown/black isotropic paste has low voids, high silts, and very high silicates. Tuffs, especially lithic tuffs, are very high, and VRFs, especially ferrous iron hematite, are high.

MNP007. The optically reddish-brown/black isotropic paste has moderate voids, moderate silts, and very high silicates. Tuffs are high and VRFs are moderate.

MNP063. The optically red-brown/black isotropic paste has moderate voids and silts, and high silicates. Tuffs are high and VRFs are low. The PDI is 8.

KBP010. The optically red-brown/black isotropic paste has a dense matrix, low voids, very high silicates, and moderate tuffs. VRFs are low, having only three types in the section. The PDI is 10.

KBP020. The optically reddish-brown/black paste is of low density but has very high voids. Silts and silicates are low, and tuffs are very high. VRFs are low and limited to two types (rhyolite and ferrous hematite).

KBP032. The optically red-brown/black paste has a high density, low voids, moderate silts, and low silicates. Tuffs are high and VRFs are moderate.

KBP039. The optically red-brown/black paste has high density, moderate voids, high silts, and very low silicates. Tuffs and VRFs are moderate. The PDI is 10.

KBP041. The optically red-brown/black isotropic paste is dense, and has high voids and silts. Silicates, tuffs, and VRFs are moderate.

KBP075. The optically red-brown/black isotropic paste is very dense, and has low voids, silts, and silicates. Tuffs are high and VRFs are moderate. The PDI is 9.

Paste Group U (n=6)

This paste group has very dark reddish-gray pastes, black in cross-polarized light and isotropic. The clays may vary in their elemental constituents and/or there may be firing variations. The sections generally have a high diversity of aplastic particles, all typical of the region.

PVP013. The reddish-gray/black isotropic paste has high voids, silts, and silicates. Tuffs are moderate, and VRFs are moderate and diverse, but they generally have low numbers of each particle type. The PDI is 18.

PVP015. The dark reddish-gray/black paste has high voids, moderate silts, and high silicates. Tuffs are high, and VRFs are high and diverse.

MNP014. The dark reddish-black/black paste is moderate, and it has high voids, low silts, and high silicates. Tuffs are high, as are VRFs.

KBP004. The red-gray/black paste has low voids, high silts, and moderate silicates. Tuffs are high and VRFs are moderate.

KBP018. The red-gray/black paste is dense and has low voids, silts, and silicates. Tuffs are high and VRFs are moderate.

KBP053. The red-gray/black paste has high voids, low silts, and high silicates. Tuffs are high and VRFs are moderate.

Paste Group V (n=6)

The paste group has greenish-brown and greenish-gray pastes in plane polarized light, black and isotropic in cross-polarized light. The pastes suggest a local, infrequently used clay deposit and/or firing variations. The paste has large numbers of VRFs. A peculiarity of the group is that five of its sections come from the Polvo site and one from the San Bernardino site. The other two sites are not represented. The similar Paste Group W described below, has two sections, both from the Millington site.

PVP018. The optically greenish-brown and black isotropic paste has very high voids and silicates, but very low silts. The section has very high tuffs and high VRFs. The PDI is 17.

PVP020. The optically dark grayish-green and black isotropic paste has very high voids, moderate silts, and moderate silicates. Tuffs are high and VRFs are moderate, although showing 11 different rock types. The PDI is 20.

PVP026. The optically greenish-brown and black isotropic paste has high voids, low silts, high silicates, high tuffs, and high VRFs. The PDI is 21.

PVP082. The optically gray-green and black isotropic paste has low voids and silts, and high silicates. Tuffs are moderate and VRFs are high. The PDI is 13.

PVP092. The greenish-brown and black isotropic paste has low voids, very high silts, and high silicates. Tuffs and VRFs are low.

SBP035. The optically greenish-black and black isotropic paste has high voids, low silts, and moderate silicates. The section has exceptionally high tuffs, but very low VRFs, represented only by basalt at 2 percent. The PDI is 9.

Paste Group W (n=2)

The two sections from the Millington site have greenish-brown and black isotropic pastes similar to those of Paste Group V, but the sherds in this group have generally fewer types of aplastic particles. They also reflect a seldom-used clay source or firing variations.

MNP026. The optically greenish-brown and black isotropic paste has very low voids and very high silts. Silicates and tuffs are also high, but VRFs are represented only by ferric hematite iron ore at 5 percent. The PDI is 8.

MNP027. The optically greenish-brown and black isotropic paste has very low voids, low silts, and high silicates. Tuffs are high and VRFs are low. The PDI is 10.

Carbonate Class

Paste Group X (n=12): The group and the class as a whole contain carbonate particles, including limestone, dolomite, calcite, and a few calcareous marine shell fossils. They are listed under the VRFs on the spreadsheet. As with all the paste groups and section descriptions, exact proportions of all bodies are reported on the spreadsheet. The group also has the regionally typical black isotropic pastes, generally high tuffs, and numerous, diverse VRFs. This paste group has no indications of eroded alluvial terrace deposits.

PVP001. The optically black and isotropic paste has high voids, silts, and silicates. Tuffs are moderate. VRFs are diverse but not numerous. The PDI is 19.

PVP017. The optically black and isotropic paste has high voids, high silts, and exceptionally high silicates. Tuffs are moderate, and VRFs are high and diverse. The PDI is 16.

PVP095. The optically black paste is dense with low voids, silts, and silicates. Tuffs are high and VRFs are moderate. The PDI is 13.

MNP022. The optically black paste has high voids, high silts, and low silicates. Tuffs are high and VRFs are low.

KBP008. The optically black paste has high voids, moderate silts, and low silicates. Tuffs are high and diverse VRFs are low.

KBP014. The optically black paste has high voids, high silts, and high silicates. Tuffs are high, and VRFs, including carbonates (limestone and calcite) are low.

KBP023. The optically black paste has high silts, high voids, and low silicates. Tuffs are high, and the diverse, numerous VRFs are high.

KBP035. The optically black paste has low voids, high silts, and moderate silicates. Tuffs are moderate and VRFs are low.

KBP065. The optically black paste has very high voids, high silts, and very high silicates. Tuffs are moderate, as are VRFs.

SBP019. The optically black paste has moderate voids, high silts, and moderate silicates. Tuffs are high and VRFs are low.

SBP025. The optically black paste has moderate voids, high silts, and moderate silicates. Tuffs are high and VRFs are low.

SBP056. The optically black paste has low voids, low silts, and very high silicates. Tuffs are high, as are VRFs.

Paste Group Y (n=16)

The carbonate group lacks evidence of alluvial materials in its pastes. The group is also a non-mica bearing unit, and as a whole, it has high proportions of VRFs and low to moderate tuffs.

PVP003. The optically black paste has high voids, moderate silts, and moderate silicates. The section has moderate tuffs and high and very numerous VRFs in a large number of rock types (n=14). The PDI is 24.

PVP004. The optically black paste has very high voids and silts, and moderate silicates. Tuffs are low and VRFs are moderate. The PDI is 18.

PVP009. The optically black paste has high voids, silts, silicates, and tuffs. VRFs are numerous and sum to a high proportion of the aplastics. The PDI is 18.

PVP088. The optically black paste has low voids and silicates, and very high silts. Tuffs are moderate, as are VRFs.

MNP021. The optically black paste has very low voids, silts, and silicates. Tuffs are very high and VRFs are low.

MNP076. The optically black paste has high voids, high silts, and low silicates. Tuffs, especially lithic tuffs, are high, as are VRFs.

MNP085. The optically black paste has high voids, very low silts, and moderate silicates. Tuffs are moderate and VRFs are high.

MNP086. The optically black paste has high voids, and moderate silts and silicates. Tuffs, especially lithic tuffs, are high, and VRFs are moderate.

MNP095. The optically black paste has low voids, high silts, and high silicates. Tuffs, especially lithic tuffs, are high, and VRFs are moderate.

KBP024. The optically black paste has low voids, silts, and silicates. Tuffs are low and VRFs are high.

KBP055. The optically black pastes have moderate voids and silts, and high silicates. Tuffs are very high and VRFs are low.

SBP005. The optically black pastes have low voids, low silts, and very high silicates. Tuffs are high, and VRFs consist of small amounts of limestone (3 percent) and calcite (5 percent).

SBP006. The optically black paste has low voids and silts, but very high silicates. Tuffs and VRFs are moderate.

SBP017. The optically black paste has low voids, high silts, and high silicates. Tuffs are exceptionally high and VRFs are low.

SBP021. The optically black paste has low voids, silts, and silicates. Tuffs are exceptionally high and VRFs are very low.

SBP039. The optically black paste has low voids, very low silts, high silicates, and very high tuffs. VRFs are low. Carbonates are represented by 1 percent calcite.

Paste Group Z (n=12)

This carbonate group lacks mica, but all the sections have evidence of contributions of materials from alluvial terraces, primarily eroded and rounded larger tempering aplastics. The pastes are black and isotropic.

MNP042. The optically black paste has low voids, moderate silts, and extremely high silicates. Tuffs are moderate, as are VRFs, although the latter are diverse. The PDI is 16.

MNP067. The optically black paste has high voids, low silts, and very high silicates. Tuffs and VRFs are high.

MNP068. The optically black paste has moderate voids, moderate silts, and high silicates. Tuffs are high and VRFs are moderate.

MNP079. The optically black paste has high voids, low silts, and high silicates. Tuffs are moderate and VRFs are high.

MNP081. The optically black paste has low voids, low silts, and low silicates. Tuffs are high and VRFs are moderate.

MNP092. The optically black paste has moderate voids and silts, and high silicates. Tuffs are very high and VRFs are high.

KBP021. The optically black paste has high voids, and low silts and silicates. Tuffs, especially lithic tuffs, are high, and VRFs are low.

KBP052. The optically black paste has high voids, low silts, and high silicates. Tuffs are very high and VRFs are moderate.

KBP056. The optically black paste has high voids, low silts, and high silicates. Tuffs are very high and VRFs are low.

SBP016. The optically black paste has high voids, low silts, and high silicates. Tuffs are very high and VRFs are moderate.

SBP028. The optically black paste has high voids, low silts, and high silicates. Tuffs are exceptionally high and VRFs are low.

SBP055. The optically black paste has high voids, silts, and silicates. Tuffs are high and VRFs are moderate.

Paste Group AA (n=13)

This carbonate paste group has mica, but it lacks indications of materials from alluvial terrace clays. Pastes are optically black and isotropic. The group has generally high silicates and low to moderate tuffs. VRFs are diverse.

PVP016. The optically black paste has low voids, moderate silts, and very high silicates. Tuffs are moderate, as are VRFs.

PVP042. The optically black paste has moderate voids, very low silts, and very high silicates. Tuffs are high, and VRFs are moderate and diverse.

PVP091. The optically black paste has low voids and silts, and very high silicates. Tuffs and VRFs are low.

MNP009. The optically black paste has low voids, moderate silts, and high silicates. Tuffs are high, as are VRFs.

MNP044. The optically black paste has moderate voids and silts, and very high silicates. Tuffs, especially lithic tuffs, are very high. VRFs are low.

MNP074. The optically black paste has high voids, moderate silts, and unusually low silicates. Tuffs are moderate and VRFs are high.

KBP029. The optically black paste has moderate voids, silts, and silicates. Tuffs are high and VRFs are moderate.

KBP038. The optically black paste has moderate voids, low silts, and moderate silicates. Tuffs are low and VRFs are high.

KBP077. The optically black paste has high voids, low silts, and high silicates. Tuffs are low and VRFs are high.

SBP031. The optically black paste has high voids, silts, and silicates. Tuffs are very high and VRFs are low.

SBP036. The optically black paste has very high voids and silts, and high silicates. Tuffs are high and VRFs are low.

SBP051. The optically black paste has high voids, silts, and silicates. Tuffs are moderate and the diverse VRFs are high.

SBP061. The optically black paste has high voids, moderate silts, and high silicates. Tuffs are moderate and VRFs are low in numbers, but very diverse.

Paste Group BB (n=17)

The pastes of this group are red-brown or reddish-gray in plane-polarized light, and black and isotropic in cross-polarized light. These are optical colors and not those seen in plain light in megascopic hand specimens. They stand in contrast to the black/black isotropic pastes prevalent in the collection and they can suggest different clay sources with different elemental suites, or they can reveal firing variations. The sections here lack mica in any form. Their materials do not suggest origins in river terraces.

PVP019. The reddish-gray/black paste has high voids, high silts, and low silicates. Tuffs are low and VRFs are high. Carbonates are low.

MNP010. The reddish-brown/black paste has high voids, silts, and silicates. Tuffs and VRFs are moderate.

MNP024. The red-brown/black paste has very high voids, low silts, and moderate silicates. Tuffs are very high and VRFs are moderate.

MNP028. The red-black/black paste has low voids, very high silts, and low silicates. Tuffs are high and VRFs are low. The PDI is 10.

MNP043. The reddish-gray/black paste has low voids, high silts, and high silicates. Tuffs are exceptionally high, particularly lithic tuffs. VRFs are low.

MNP045. The reddish-gray/black paste has extremely low voids (2 percent) and moderate silts. Silicates are high, as are tuffs. VRFs are moderate.

MNP093. The red-brown/black paste has extremely high voids, high silts, and extremely low silicates. Tuffs are moderate and VRFs are high.

KBP013. The red-brown/black paste has moderate voids and silts, and extremely high silicates. Tuffs and VRFs are moderate.

KBP022. The reddish-black/black paste has moderate voids and silts, and high silicates. Tuffs are high and VRFs are moderate.

KBP042. The red-gray/black paste has moderate voids, silts, and silicates. Tuffs and VRFs are low, but the section has at least two calcareous marine fossil shell fragments.

KBP046. The reddish-brown/black paste has low voids and silts, and moderate silicates. Tuffs are high and VRFs are low.

KBP048. The red-brown/black paste has high voids, low silts, and high silicates. Tuffs and VRFs are moderate.

KBP049. The red-brown/black paste has moderate voids, high silts, and low silicates. Tuffs are high, as are the VRFs.

SBP003. The red-brown/black paste has high voids, moderate silts, and high silicates. Tuffs and VRFs are high.

SBP008. The red-brown/black paste has high voids, moderate silts, and high silicates. Tuffs are very high and VRFs are moderate.

SBP018. The red-brown/black paste has low voids, high silts, and high silicates. Tuffs are high and VRFs are low.

SBP046. The black and red-brown/black paste has high voids, low silts, and moderate silicates. Tuffs are high, VRFs are low, and carbonates are restricted to 3 percent limestone.

Paste Group CC (n=4)

This carbonate group is a group with alluvial terrace materials, and indications and traces of mica.

MNP001. The brown-gray/black paste has high voids, low silts, and high silicates. Tuffs are moderate and the diverse VRFs are high. The PDI is 19.

MNP047. The dark reddish-brown/black paste has high voids, low silts, and high silicates. Tuffs are high and VRFs are low.

KBP019. The reddish-black/black paste has high voids, low silts, and very high silicates. Tuffs are high and VRFs are very low. The PDI is 10.

KBP050. The red-brown/black paste has high voids, and moderate silts and silicates. Tuffs are moderate and VRFs are low.

Paste Group DD (n=9)

This carbonate group has mica and indications of alluvial terrace materials. Plane-polarized light paste colors are reddish-browns and grays. The pastes generally have high tuffs.

PVP023. The optical reddish-brown/dark gray isotropic paste has high voids, silts, and silicates. Tuffs are moderate and VRFs are diverse and high. The PDI is 21.

PVP025. This reddish-gray/black paste has high voids, moderate silts, and very high silicates. Tuffs, especially lithic tuffs, are very high. The diverse VRFs are moderate. The PDI is 19.

PVP065. The red-brown/black paste has low voids and silts, but moderate silicates. Tuffs are also moderate, and the diverse VRFs are high.

PVP083. The grayish-brown/black paste has moderate voids, moderate silts, and high silicates. Tuffs are moderate, as are VRFs.

PVP094. The red-brown/black paste has low voids, high silts, and low silicates. Tuffs are high and the diverse VRFs are high. The PDI is 15.

MNP012. The red-brown/black paste has low voids, and high silts and silicates. Tuffs are moderate and the diverse VRFs are very high.

MNP017. The red-black/black paste has low voids, moderate silts, and high silicates. Tuffs are moderate and VRFs are high.

KBP005. The red-brown/black paste has low voids, very high silts, and low silicates. Tuffs are very high, as are VRFs.

SBP054. The red-brown/black paste has low voids, low silts, and moderate silicates. Tuffs are high, as are VRFs.

Paste Group EE (n=11)

This paste group and the following Paste Group FF are carbonate paste groups with greenish-gray, greenish-brown, and greenish gray-brown optical colors. They are isotropic, meaning that the B-fabric is unchanging. They are also black in cross-polarized light. The two groups are also distinguished by the presence of mica in Paste Group EE and its absence in Paste Group FF.

PVP041. The greenish-gray/black paste has moderate voids, silts, and silicates. Tuffs are low and the diverse VRFs are extremely high. The PDI is 19.

PVP043. The greenish-gray/black paste has very high voids, low silts, and high silicates. Tuffs are moderate and VRFs are diverse and high. The PDI is 18.

PVP087. The greenish-brown/black paste has extremely low voids, high silts, and moderate silicates. Tuffs are moderate and VRFs are high.

MNP013. The dark gray-brown/black paste has low voids, low silts, and high silicates. Tuffs and VRFs are moderate.

MNP041. The dark greenish-gray/black paste has high voids, low silts, and high silicates. Tuffs are low and VRFs are high.

MNP096. The green-gray/black paste has moderate voids and silts, and high silicates. Tuffs are high and VRFs are low.

KBP044. The greenish gray-brown/dark gray paste has moderate voids and silts, and moderate silicates. The section has moderate tuffs, and very high and diverse VRFs.

KBP064. The greenish-gray/black paste has high voids, low silts, and low silicates. Tuffs are high, as are the diverse VRFs.

KBP069. The gray-brown/black paste has moderate voids, silts, and silicates. Tuffs and VRFs are high.

SBP013. The green-gray/black paste has low voids, silts, and silicates. Tuffs are high and VRFs are very high.

SBP041. The greenish-black/black paste has moderate voids, low silts, and moderate silicates. Tuffs are very high and VRFs are low.

Paste Group FF (n=3)

This paste group has greenish-gray and greenish-brown, and black isotropic pastes. The differing optical paste colors of the two paste groups indicate varying elemental suites in the clays, variant firing, or both. Paste Group FF is distinguished from Paste Group EE by the absence of mica. Some groups and classes of aplastics appear to be stream-rolled, but this attribution cannot be made with certainty.

PVP089. The optically greenish-brown/black paste has high voids, low silts, and moderate silicates. Tuffs and VRFs are moderate.

PVP090. The optically greenish-brown/black paste has low voids and moderate silicates. The silt fraction is bifurcate because the sherd has two layers of paste with varying clay and differing amounts of silt in each disparate layer. A heavily silted layer of olive green clay extends partly through the center of the sherd. The layer does not extend completely through the sherd but ends partway through it at a rounded terminus. The light brown paste on either side of the center clay contains all the aplastics of the section larger than medium silt. Silicates and VRFs are moderate in the outer pastes. Silt in the outer paste layer is 20 percent, while in the center paste layer it is 50 percent. The average of silt for the entire sherd is 35 percent.

KBP040. The greenish-gray/black paste has low voids and silts, and high silicates. Tuffs are moderate, as are VRFs.

Paste Group GG (n=2)

This group is the carbonate class equivalent of Paste Group H in the mica-present class and Paste Group O in the mica-absent class of paste groups, those with notably wide void strips. These sections have numerous carbonate particles, yet the group lacks indications of materials from alluvial terraces.

KBP006. The optically black paste has 15 percent wide voids, low silts, and low silicates. Tuffs are very high and VRFs are moderate.

KBP057. The optically black paste has 20 percent wide voids in long strips, moderate silts, and low silicates. Tuffs are high and VRFs are low.

Paste Group HH (n=2)

This carbonate paste group is the companion to Paste Group GG above, with wide void strips. It varies in having mica in the paste.

MNP061. The optically black paste has 40 percent wide-spaced voids, very low silts, and high silicates. Tuffs, especially lithic tuffs, are high, and VRFs are very low.

SBP009. The optically black paste has 27.5 percent wide voids in long strips, moderate silts, and high silicates. Tuffs and VRFs are high.

Paste Group II (n=3)
The group is set apart by their optical yellow-brown and yellowish brown, and black isotropic pastes, and typical sets of aplastics. The optical paste colors are likely due to varying chemical composition of the clays of the pastes which stand out in the regional collection. Firing variations may also have produced the differences. The sections show no indications of materials from alluvial terraces.

KBP002. The optically yellow-brown/black paste has very high voids, silts, and silicates. Tuffs are moderate, as are VRFs.

KBP012. The optically yellow-brown/black paste has high voids, silts, and silicates. Tuffs and VRFs are extremely high.

SBP064. The optically yellow-gray/black paste has low voids, moderate silts, and high silicates. Tuffs are high and VRFs are very high.

Paste Group JJ (n=1)
The optically brown/brown and isotropic paste colors are similar to Paste Group II, and similarly suggest varying paste composition from the common clays in the region. Typical aplastics suggest the sherd is nevertheless from within the region.

MNP003. The optically brown/brown paste has high voids, very high silts, and high silicates. Tuffs and VRFs are high.

Paste Group KK (n=1)
The paste group stands out for having an exceptionally dense paste and red-black/black isotropic optical colors.

KBP079. The optically red-black/black isotropic is extremely dense and has only a few voids (2 percent), moderate silts, and low silicates. Tuffs and VRFs are high.

Paste Group LL (n=1)
The single member paste group is distinctive for having orthoclase feldspar temper. Large particles of orthoclase were added to the paste for temper, with some assistance from added tuffs. The aplastic suites suggest manufacture within the locality or region; the tempering, unique in the collection, may perhaps show a single ceramic batch preparation.

KBP015. The optical black paste has high voids, high silts, and low silicates. Tuffs are moderate, as are VRFs, except for orthoclase feldspar. The feldspar temper is in very coarse sand-sized white particles in a proportion of 8 percent.

Melilite Class
Paste Group MM (n=7)
The melilite class sections include the black, reddish-brown, greenish-brown, yellowish-brown, and other paste colors typical of the regional clay pastes. Paste group MM sections have all black/black isotropic pastes and high numbers of aplastics in addition to melilite particles.

KBP025. The optically black paste has low voids, high silts, and moderate silicates. Tuffs are high, and VRFs are diverse but low in abundance.

KBP026. The optically black paste has moderate voids, silts, and silicates. Tuffs are high and VRFs, including melilite, are high.

KBP033. The optically black paste has moderate voids, and high silts and silicates. Tuffs and VRFs are low.

KBP034. The optically black paste has high voids, moderate silts, and high silicates. Tuffs and VRFs are moderate.

KBP061. The optically black paste has high voids, silts, and silicates. Tuffs are moderate, as are VRFs.

KBP066. The optically black paste has high voids, low silts, and low silicates. Tuffs and VRFs are low.

KBP070. The optically black paste has high voids, low silts, and moderate silicates. Tuffs are high, and VRFs are low except for melilite at 10 percent.

Paste Group NN (n=6)

The group has reddish-black and red-brown isotropic pastes. Aplastic inclusions are diverse and abundant in the group.

PVP012. The optically reddish-black/black isotropic paste has high voids, silts, and silicates. Tuffs, especially lithic tuffs, are high, as are the diverse VRFs. The PDI is 21.

KBP011. The optically red-brown/black isotropic paste has high voids, silts, and silicates. Tuffs and VRFs are moderate.

KBP027. The optically red-brown/black isotropic paste has high voids, low silts, and moderate silicates. Tuffs and VRFs are high.

KBP031. The optically red-black/black isotropic paste has very high voids, and moderate silts and silicates. Tuffs are moderate, as are VRFs.

KBP059. The optically red-brown/black isotropic paste has high voids, low silts, and moderate silicates. Tuffs and VRFs are moderate.

KBP071. The optically red-brown/black isotropic paste has low voids, high silts, and low silicates. Tuffs and VRFs are high.

Paste Group OO (n=2)

These sections are the melilite paste group with dark gray-brown and greenish-brown pastes.

KBP009. The optically dark gray-brown/black isotropic paste has high voids, low silts, and moderate silicates. Tuffs are high, as are VRFs.

KBP060. The optically greenish-brown/black isotropic paste has high voids, high silts, and high silicates. Tuffs are high and VRFs are low.

Paste Group PP (n=1)

This section has a rare yellow-brown paste, found in only a few other sections in the collection.

KBP080. The optically yellow-brown/black isotropic paste has high voids, silts, and silicates. Tuffs and VRFs are high. Melilite is at 10 percent.

Paste Group QQ (n=1)

This group is a near-unique section tempered with almost 25 percent of hematitic and ilmenitic iron ore, crushed into sizes up to granule, with a median size of coarse sand. The paste characteristics and other aplastics resemble local ceramic pastes. The paste may have been a rare single batch paste mix, or an import from elsewhere in the region.

SBP065. The optically black and isotropic paste has moderate voids, low silts, and low silicates. Tuffs are high, and other aplastics are rare except for the abundant ilmenitic iron ore temper.

Bone Temper Class (Nonlocal)

Paste Group RR (n=2)

The bone temper class is nonlocal, standing out among the prevailing local dark iron-rich pastes tempered with quartz, tuff, and VRFs. The two sections of Paste Group RR are very similar, and they may belong to the same vessel. Their pastes are brown/black and isotropic. They each have silicates, basalt, mica, and lithic tuff aplastics, in addition to 25 percent bone temper. All the sherds of the bone-tempered class were found on the Millington site. The tuffs in Paste Group RR suggest that these sherds originated on the peripheries of the tuffaceous eastern Trans-Pecos zone, but not near the tuff-rich La Junta district.

MNP046. The optically brown/black isotropic paste has very high voids, very low silts, and a moderate amount of silicates. The section shows a moderate amount of basalt and lithic tuffs, but no other form of tuff. The section has 25 percent crushed bone temper, in sizes ranging from medium sand to granule.

MNP048. The optically brown/black isotropic paste has very high voids, very low silts, and a moderate amount of silicates. The section has a moderate amount of VRFs and a very low amount of lithic tuffs (1 percent). The section has 25 percent bone temper in sizes ranging from medium sand to granule.

Paste Group SS (n=1)

The section is clearly nonlocal by virtue of a large amount of crushed bone temper, a complete lack of tuffs, and the VRFs typical of the eastern Trans-Pecos region. Bone-tempered ceramics lacking volcanic tuffs are produced eastward on the Stockton and Edwards plateaus, largely east of the Pecos River. The paste bears some resemblance to Leon Plain ceramics, which have much variation but are never tuffaceous.

MNP029. The optically red-black/black isotropic paste has exceptionally high silts (50 percent), exceptionally low voids (1 percent), and exceptionally low silicates (1 percent). The paste contains medium silt-sized spicules of muscovite mica. The ceramic is tempered with 40 percent crushed bone in sizes from medium sand to coarse sand.

Nonlocal and Miscellaneous Class

Paste Group TT (n=1)

Although this section has local materials, its preparation and production differ greatly from the practices of the potters at the four sites. In short, the clays were prepared to a much greater degree, and the tempering materials appear to be more highly selected before they were added to the clay. Firing indicators seem to be the same as the local ceramics. Temper is a very large amount (50 percent) of volcanic tuffs and a large amount (20 percent) of crushed common quartz.

MNP094. The optically black isotropic paste has high voids, low silts, and high silicates, the latter as a tempering material (20 percent). The paste has very high tuffs, and these too are temper (50 percent). VRFs are low. None of the materials appear to be derived from alluvial terraces.

Paste Group UU (n=1)

The section is distinguished by its anisotropic paste, extremely rare in the region. The anisotropic quality of the paste may be due to mica in the clays, but this is speculative. Otherwise, the paste has a great diversity of typical silicates, VRFs, and tuffs. The PDI is 21. The sherd is nonlocal, but manufactured elsewhere in the region from clays not available to the La Junta potters.

PVP029. The optical greenish-brown/black to dark gold anisotropic paste has moderate voids and silts, and high silicates. Tuffs are high and the diverse VRFs are very high. The material is not derived from alluvial terraces.

Paste Group VV (n=1)

The paste is clearly nonlocal but within the region. It has optical green-brown and black color, and is isotropic. The feature of greatest contrast is the virtual lack of tuffs; one grain of vitreous tuff was observed in the section. Silicates are also low to moderate, and it seems that the paste was tempered with a variety of regional VRFs.

KBP054. The optically green-brown/black isotropic paste has high voids, high silts, and moderate silicates. The paste has only one particle of vitreous tuff. VRFs are diverse and in large particle sizes. The VRFs are the likely tempering agent of the ceramic. They are all common to the rock and mineral deposits of the La Junta district. The near absence of tuff and the unusual clay colors indicate sourcing and manufacture elsewhere in the region. Materials in the section do not seem to come from alluvial terraces.

Paste Group WW (n=1)

The section is notable for its optically red-brown/black isotropic paste, uncommon in the collection, but is exceptional for having no tuffs whatsoever in it. Clay source areas without tuffs are virtually impossible to find in the locality. High silicates in large particle sizes indicate the tempering agents of the ceramic. The VRFs are common in the region however, and the sherd was very likely produced in the volcanic Trans-Pecos zone away from the heavily tuffaceous districts in and around La Junta. Zones upriver to the northwest several tens of miles may be possible source areas.

MNP015. The optically red-brown/black isotropic paste has high voids and low silts. The sherd has very high silicates which are its temper. VRFs are relatively low, and tuffs are entirely absent, both very uncommon in the regional ceramics. The sherd is nonlocal, not manufactured in the district. It was produced elsewhere in the volcanic region.

SUMMARY AND DISCUSSION

The mica-present, mica-absent, and carbonate classes clearly represent very common wares in the region. They were assembled and manufactured in or near the sites. It is clear, too, that ceramics were shared across the sites in many cases, and wares present on sites may not mean that they were manufactured on the site, but may have been transported regularly from the nearby villages. Sharing is a neutral term and does not imply a mechanism of transport. Some of the ways pottery was moved among the sites are mentioned below. Paste groups that are distributed evenly (approximately the same numbers on all the sites) were probably manufactured on all the sites. A measure of ware centrality would be if half or more of the sherds in a paste group were found on one site and the remainder spread over the other sites. These rough measures are explored below. For this study, a paste group "belongs" to a site if half or more of the sherds in the group were found on the site.

One glaring pattern is perhaps the most significant finding of the entire petrographic project. The melilite paste groups concentrate heavily at the Kopenborger site. One melilite sherd was found at the Polvo site (6 percent of melilite sherds) and one was found at the San Bernardino site (also 6 percent); the rest are from Kopenborger. Melilite is thought to be associated with carbonates, and Kopenborger is near the unnamed intermittent drainages that transport carbonates downstream.

Residual clay deposits may perhaps be found in the same locality near the Millington and Kopenborger sites. Sections with rounded, eroded materials show the exploitation of alluvial beds, but often the eroded traits on tempering particles did not match the silts in the section. The disparity may indicate that different sources of key materials were visited for useful ceramic resources. In the ideal situation, the eroded particles in sherds may show the use of alluvial clay beds very near the sites, but no individual sections in the collection showed any such relationship. The major classes of paste groups could not be distinguished on an alluvial versus residual basis, however. More precise determinations may be made in the future with direct fieldwork and comparative analyses of clay beds and other samples. Additional technical analyses, such as X-ray diffraction and other methods that identify clay minerals, may assist in the effort.

Site Findings

The Polvo Site

The Polvo Site is the farthest downriver of the four, and it lies in a zone of abundant VRFs. Its paste group concentrations are in the mica-absent and carbonate classes. Its shared paste groups are:

Paste Group:	**Shared to:**
G	the Kopenborger site
L	the Millington site, the San Bernardino site
O	the Millington site
V	the San Bernardino site
FF	the Kopenborger site.

Unshared paste groups at the Polvo site are: P and UU.

The Millington Site

The Millington ceramic assemblage contains three bone-tempered sherds in the collection. Its shared paste groups are:

Paste Group:	**Shared to:**
J	the Kopenborger site
R	the San Bernardino site
Z	the Kopenborger site, the San Bernardino site.

Besides having both unshared bone-tempered groups (RR and SS), the Millington site also has the following unshared paste groups: C, F, H, S, W, JJ, TT, and WW.

The Kopenborger Site

The Kopenborger site has an emphasis on the carbonate paste groups and the affiliated melilite groups, as mentioned. The shared paste groups are:

Paste Group:	Shared to:
T	the Millington site, the Polvo site
U	the Polvo site, the Millington site
II	the San Bernardino site
NN	the Polvo site.

The unshared paste groups from the Kopenborger site consist of Paste Groups D, GG, KK, LL, MM, OO, PP, and VV, many which represent a single sherd. The MM paste group is notable with a total of seven sherds.

The San Bernardino Site

The San Bernardino site has fewer shared paste groups and fewer unshared paste groups. The shared paste groups are:

Paste Group:	Shared to:
B	the Millington site.

Single-sherd unshared paste groups are: E, I, and QQ. The QQ paste group is a melilite group.

Overall Observations

A final pattern worth mentioning is the even spread of paste groups across the sites. They are admittedly the larger groups; statistically when the number of a group goes up the spread or outliers are likely to increase. The commonly manufactured paste groups are A, K, N, X, Y, AA, BB, DD, and EE. Of these, groups X through EE are carbonate paste groups. Three paste groups (Q, CC, and HH) have members that are evenly divided between two sites. Paste Group Q (a mica-absent group) has single sherds from the Millington and Kopenborger sites; Paste Group CC (a carbonate group) contains four sherds evenly divided between the Millington and Kopenborger sites; and Paste Group HH (a carbonate group) has single sherds from the Millington and San Bernardino sites.

The Community Production Model

The findings of this large study warrant and support the building of a community production model to describe and explain the ceramics recovered from La Junta de los Ríos sites. The local and regional minerals, rock particles, and ceramic pastes of iron-rich clays combined to produce similar-looking ceramics at all the villages. At the same time, rare bodies in pastes such as bone temper and melilite suggest distant or exclusively used source beds or manufacture inside or outside the region. An accurate, sparing, and usefully simplified model to account for this cultural behavior and diversity will provide satisfying explanations for the data. The findings of the model can then be cross-referenced to typological classifications to give deeper perspectives on the research.

Community production models have been produced rarely and left largely implicit in most regions. Some work has been published in northeast Texas on Caddo models of ceramic production, use, and trade (Perttula and Ellis 2012:206–207; Reese-Taylor 1995, 1997; Skokan-Switek 1998). Research in other regions is usually not as well advanced. These studies share interpretive findings that ceramics were produced in the sites where the sherds were found, with minor findings of a few sherds which were produced elsewhere and introduced to the sites. This is the essence of the community production model.

The potters at the Polvo site exploited at least two clay beds, one with abundant mica particles in it, the other without mica. This is a minimal statement as there may have been multiple beds with mica, and multiple beds without it. Potters from the Millington and Kopenborger sites accessed resource beds with carbonates (limestone, calcite, and dolomite particles) as well as beds with and without mica. They also gathered tempering particles and perhaps some clay loads from alluvial terrace deposits with more river-rolled and rounded particles. The San Bernardino site ceramic assemblage looks similar to ceramic assemblages from the Millington and Kopenborger sites. Although the San Bernardino site is the most distant village from the small cluster of sites at the La Junta confluence, the intermittent streams nearby head in the Chihuahua mountains—formed partially by Cretaceous carbonate formations—providing similar source materials in drainages near the Millington and Kopenborger sites that emanate from the Shafter, Texas, area. In this case, the distinctiveness of the site ceramics is obscured rather than clarified on the basis of carbonates from different sources. Of significance, the majority of ceramic production in La Junta de los Ríos sites was for domestic use.

Shared paste groups show that transport of vessels among the villages near La Junta was common, so much so that the villages where the local vessels were manufactured and transported to is difficult to determine. The total number of shared paste groups is 26. The purposes of inter-site vessel transport are many, including family and feasting obligations, partner trade, and others. Note that these potential motivating factors would have implied two-way movement, with vessels moving to and from each village. Paste groups that were not heavily shared may not have participated in these mechanisms, again possibly for societal or familial reasons.

Nonlocal paste groups tell different stories of trade/transport. Sherds distinctively different in materials and composition from most or all of the paste groups at a site came from outside the region. The three bone-tempered sherds from the Millington site (Specimens MNP029, MNP046, and MNP048) are the most distinctive nonlocal sherds in the large collection. Additional nonlocal sherds are Specimens PVP029, MNP015, MNP094, and KBP054. Those whose pastes were strewn with volcanic tuff were produced in the eastern Trans-Pecos region but at a distance from the La Junta de los Ríos ceramic system. Those entirely lacking in tuffs are clearly extra-regional in origin. These, although low in number, signal interregional trade/transport in ceramics.

The Community Production Model can account for the ceramics produced and flowing through the La Junta village societies. The model can help structure sociocultural constructs for testing with ceramics, other material classes, and spatial site and regional data.

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Table 1. Proportions of Rocks and Minerals in Batch 1. Petrographic Data, La Junta de los Rios, CBBS/SRSU by David Glen Robinson. All counts are proportions of a 200 point count except PDI. tr. = trace

		Paste properties							Rocks and minerals																													
Site No.	sherd No.	Matrix	voids	silt fraction	PDI	med. Particle size	optical paste colors	Paste Group	common Qtz	compos-ite Qtz	chert	quartz-ite	sand-stone	vitr tuff	crys tuff	lith tuff	glass	plagio-clase	alkali feldspar	olivine	diorite	diabase	andesite	granite	gabbro	trachyte	rhyo-lite	nephe-line	basalt	ferric hematite	ferrous hematite	iron ore (var.)	musco-vite	biotite	limestone/ micrite	calcite/ caliche	melilite	miscellaneous
41PS21	PVP001	9	12	7.5	19	fine sand	dk. brown/ black	X	10	3	0.5			2	1.5	6		7	2.5	1	5	9	1	0.5			0.5			8.5					4			egg case-0.5 clinopy-roxene-0.5 nepheline syanite-1.5
41PS21	PVP002	12.5	16.5	4.5	17	fine sand	black/black	A	22	2.5	1			1	7	15.5		5.5	2.5	3				0.5						3				1				unk min-0.5
41PS21	PVP003	7.5	12.5	7.5	24	med. sand	black/black	Y	9	1.5	7		3	5.5	9.5	3		0.5	4			5	1	1		6			1	1.5					3.5			
41PS21	PVP004	20	16.5	12.5	18	med. sand	black/black	Y	11.5		1		0.5	1	0.5			5	1	3	0.5	23							1		0.5				1.5			pyroxenite-0.5 unk orange-1
41PS21	PVP005	2	6	1	16	med. sand	black/black	A	45.5	3.5	3			17.5	4	8		5		1		1		0.5					1		1.5			0.5				unk orange-0.5
41PS21	PVP006	7.5	12.5	9	18	fine sand	black/black	A	34.5	1	2.5		2	4	1	9		6	1.5	2		1		0.5					2		4.5			1.5				bone-0.5
41PS21	PVP007	22.5	15	15.5	17	fine sand	blackish-red/ black	K	17	2	2		1	5	2	9		4.5	1			0.5	0.5	0.5							0.5							felsite-1 volc. Qtz-1
41PS21	PVP008	7.5	11.5	17.5	17	c. silt	black/black	K	19.5	2.5	3		1	19	15	5		5	1.5			1		0.5					2									felsite-1 myrmekite-0.5
41PS21	PVP009	6	12.5	12.5	18	c. silt	black/black	Y	15.5	1			0.5	1	3	1.5		3	6			27		0.5		2.5			3.5		4.5				2			volc. Qtz-0.5
41PS21	PVP010	4	16.5	tr.	17	med. sand	black/black	O	19.5				0.5	19	0.5			4.5	2			17.5			2.5	3	2	2	5.5	0.5								
41PS21	PVP011	17.5	12.5	27.5	16	c. silt	dk. gray/ black	P	11	1	2			4.5	2	2.5			0.5	0.5				1		4			0.5		7							perovskite? 6 Leucite-0.5
41PS21	PVP012	6.5	12.5	17	21	fine sand	red-black/ black	NN	12.5	1	6.5		1	4.5	1	13.5		7.5	1			0.5	2			2.5		2.5	0.5		6			1			0.5	clinopyroxene-0.5 nephe-line syanite-0.5
41PS21	PVP013	3.5	13	17.5	18	fine sand	red-black/ black	U	9.5	1	2.5		0.5	4.5	2			5	0.5	0.5		22.5			0.5	0.5		5	3		8							clinopyroxene-0.5
41PS21	PVP014	6	17	5	18	med. sand	black/black	L	34.5	2.5	4		0.5	4.5	0.5	12.5		4.5	2	0.5		1.5				1						2						orthopyroxene-0.5
41PS21	PVP015	4	17.5	7.5	24	fine sand	dk. red-gray/ black	U	24	1.5	8		1	15	2.5	4		3	0.5			2.5				1					5.5							basaltic tuff-2.5
41PS21	PVP016	5.5	9	15.5	21	c. silt	black/black	AA	27	15	7		4	4.5	2	2.5		1	0.5	1	0.5		2.5			1		0.5		0.5	7		4		2			unk orange-tr. Basaltic tuff-1
41PS21	PVP017	4.5	11.5	7.5	16	fine sand	black/black	X	31.5		2.5		8.5	5	3.5	6.5		1.5	0.5		2					10	1		2									basaltic tuff-1
41PS21	PVP018	4	18.5	3	17	med. Sand	green-brown/ black	V	15.5	1.5	5			12	2	3.5		6.5			3		1			5.5		5	2.5		4							basaltic tuff-0.5 unk clastic-7

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		Paste properties							Rocks and minerals																													
Site No.	sherd No.	Matrix	voids	silt fraction	PDI	med. Particle size	optical paste colors	Paste Group	common Qtz	composite Qtz	chert	quartzite	sandstone	vitr tuff	crys tuff	lith tuff	glass	plagioclase	alkali feldspar	olivine	diorite	diabase	andesite	granite	gabbro	trachyte	rhyolite	nepheline	basalt	ferric hematite	ferrous hematite	iron ore (var.)	muscovite	biotite	limestone/ micrite	calcite/ caliche	melilite	miscellaneous
41PS21	PVP019	10.5	17	21.5	16	c. silt	red-gray/ black	BB	8				1	2		7		4		0.5	0.5	4			5	1		0.5		15.5						1.5		clinopyroxene-0.5
41PS21	PVP020	6.5	22	7.5	20	c. silt	dk. gray-green/black	V	8.5	1	1.5		2	8	6.5	15.5		0.5	0.5		0.5	1.5	1		1.5	8		1	1.5		5.5							unk clastic-2.5
41PS21	PVP021	7	20	6	17	fine sand	black/black	L	14.5		1.5			3	0.5	3		3.5	1	1.5	5	10				7.5	2	2	8.5		3.5							
41PS21	PVP022	7	13.5	5.5	18	fine sand	black/black	L	21	1	1			2	1	5.5		3.5	3	1.5	5.5	20				2.5	2	1	3									unk clastic-0.5
41PS21	PVP023	13	10.5	14	21	fine sand	red-brown/ dk. gray	DD	9.5	0.5	1			1.5	1.5	5.5		2	1	1.5	12.5	10				2	1	1.5	3		2.5		5.5			0.5		
41PS21	PVP024	4	10	15	18	fine sand	dk. gray/ black	P	9.5		0.5		0.5	2	1	3		4	2	0.5	12.5	7				2	2.5	2	10.5			11.5						
41PS21	PVP025	3.5	15.5	7	19	fine sand	red-gray/ black	DD	19.5	1	12		1.5	4.5	2.5	16.5		0.5		0.5		2.5				5	1		2		4		0.5			0.5		spher. Qtz?-0.5
41PS21	PVP026	4	17.5	4	21	f. sand	gr-brown/ black	V	15	1				12		4.5			1	1.5			1	1	3	2			0.5	8.5								
41PS21	PVP027	5	11.5	21.5	13	f. sand	dk. Gr. gray/ black	G	6					5.5				4.5			9	9.5					1.5	4	7.5		10			3.5				opalized chert-1
41PS21	PVP028	10	7.5	5	16	f. sand	brownish-black/black	G	23.5		8			13.5	1.5			7.5	1.5	5.5						3.5	5.5		1.5		0.5		3	1				orthoclase-1.5
41PS21	PVP029	4.5	8	5	21	f. sand	gr-brown/ black*	UU	8.5	1.5	3	4		1		6		4.5		2				0.5		4	2	3.5	6.5		12		7.5	2.5		1.5		
41PS21	PVP041	4	9	6	19	f. sand	gr. gray-black	EE	6					7		6.5		5	tr.	2.5	10	10				0.5	6	3	8	8.5			4.5			2		pyroxene-1
41PS21	PVP042	13.5	8	2	19	c. silt	black-black	AA	17.5	2.5		5.5		15	5.5	5.5		1.5	0.5		1.5	0.5	1			8	1.5	5	1				4			0.5		
41PS21	PVP043	6.5	21	5	18	f. sand	gr. gray-black	EE	15.5	1				7.5	3.5	1.5		3	1		4	7.5	1			3	2		14		7.5		0.5			0.5		
41PS21	PVP061	5.5	22.5	5	18	c.silt	dk. greenish-gray/black	G	12.5	1.5	3.5	2		5		4		3	0.5		3	2.5				5	5.5		5		9.5		0.5					unk VRFs-4
41PS21	PVP062	21	10	2	15	med. Sand	dk. Gr. gray/ black	G	20	1	2			14.5	5	2		3				1				3				8			5					sheared m. quartz-0.5
41PS21	PVP063	8	6.5	10	15	f. sand	black-black	A	10					1	0.5	2		5		3		7				4	3		15		12		5					
41PS21	PVP064	15	15	5	15	f. sand	black-black	A	20	3				10		3	3	4				3			0.5	2		1	6		7		2.5					
41PS21	PVP065	11	3	5	17	f. sand	red-brown/ black	DD	11					4	2	7		3			8	16	2			6		4	7.5		5		4			0.5		
41PS21	PVP067	14	3	2	14	med. Sand	black-black	A	8	1	3			3		18					15	3				3		16					5	1				

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		Paste properties							Rocks and minerals																													
Site No.	sherd No.	Matrix	voids	silt fraction	PDI	med. Particle size	optical paste colors	Paste Group	common Qtz	compos-ite Qtz	chert	quartz-ite	sand-stone	vitr tuff	crys tuff	lith tuff	glass	plagio-clase	alkali feldspar	olivine	diorite	diabase	andesite	granite	gabbro	trachyte	rhyo-lite	nephe-line	basalt	ferric hematite	ferrous hematite	iron ore (var.)	musco-vite	biotite	limestone/ micrite	calcite/ caliche	melilite	miscellaneous
41PS21	PVP068	10	20	2	13	fine sand	black-black	O	8			5		4	8	16		2	2						1	8		5										
41PS21	PVP069	5	5	5	14	med. Sand	black-black	K	5		8	12		15	3	10		3	5			1				8		9			6							
41PS21	PVP070	15	8	10	13	c. silt	greengray/ black	G	20					6	10	12		4		0.5		1							2	7.5			2					
41PS21	PVP071	4.5	20	2	15	f. sand	black-black	O	8	1	12	5		4	8	16		2	2						1	8		5										
41PS21	PVP072	30	15	5	11	f. sand	black-black	O	11		7	9		5	2	4		4								3		5										
41PS21	PVP080	19	20	2	10	f. sand	black-black	O	15	9	8			6		11		2				3				5												
41PS21	PVP081	12	20	2	13	f. sand	black-black	O	12		6			2	1	8		4			5	7				6		12	3									
41PS21	PVP082	22	5	2	13	f. sand	gr. green-black	V	10		5			2	2	6	3	6			6	15							8		8							
41PS21	PVP083	19.5	10	10	14	f. sand	gr-brown/ black	DD	11	1	10	3		5	4	6	1	11				3											5			0.5		
41PS21	PVP084	4.5	6	5	14	f. sand	black-black	L	10		2			3.5	1	6	1	12		6		15				6			17			8						
41PS21	PVP085	6.5	6	10	13	med. Sand	red-brown/ black	T	15		11	3		5	2	13	0.5	4		2						8					15							
41PS21	PVP086	20	10	10	12	c. silt	black-black	K	5		tr.			8	2	14		3				7				3		6	12									
41PS14	MNP001	4	15	2	19	f. sand	brown-gray/ black	CC	4	4	9	8	1	7		7		2				1				6	2	3	12	4					2			granophyre-5 dolomite-2
41PS14	MNP002	24	10	10	14	med sand	black-black	R	10		8	10		5	0.5	5	0.5	4			1		5				5	2										
41PS14	MNP003	10	16	20	13	c. silt	brown-brown	JJ	11			6		3		6	2					3	5						8		6		3			1		
41PS14	MNP004	6	15	15	11	f. sand	black-black	O	18	4	8			6	1	5		6		2											14							
41PS14	MNP005	16.5	5	5	16	f. sand	brown/black	F	5		2	12		5	2	8	0.5				1	3				7	2		5	6			5					
41PS14	MNP006	12	20	5	10	med. Sand	black-black	O	25		10	5		3	1	12		5			2																	
41PS14	MNP007	8	7.5	7.5	13	c. silt	red-brown/ black	T	21		0.5	8		10	8	12		3			6	3				5			0.5									
41PS14	MNP008	9.5	9	10	16	c. silt	gr-brown/ black-A	J	15		5	6		5	5	7		4		0.5	3	3	10						2		3		3					
41PS14	MNP009	19	5	10	13	f. sand	black-black	AA	12					6	5	12		6			7	4					5		1				5			3		
41PS14	MNP010	17	9	10	13	f. sand	red-brown/ black	BB	18		11			9	2	7	tr.	4	2		2	1							3							5		

Table 1. Proportions of Rocks and Minerals in Batch 1. Petrographic Data, La Junta de los Rios, CBBS/SRSU by David Glen Robinson. All counts are proportions of a 200 point count except PDI. tr. = trace (continued)

		Paste properties							Rocks and minerals																													
Site No.	sherd No.	Matrix	voids	silt fraction	PDI	med. Particle size	optical paste colors	Paste Group	common Qtz	compos-ite Qtz	chert	quartz-ite	sand-stone	vitr tuff	crys tuff	lith tuff	glass	plagio-clase	alkali feldspar	olivine	diorite	diabase	andesite	granite	gabbro	trachyte	rhyo-lite	nephe-line	basalt	ferric hematite	ferrous hematite	iron ore (var.)	musco-vite	biotite	limestone/ micrite	calcite/ caliche	melilite	miscellaneous
41PS14	MNP011	22	5	10	12	f. sand	gr. green-black-A	J	12		9			3	2	7					2	1					15		7				5					
41PS14	MNP012	16	5	12	11	f. sand	red-brown/ black	DD	12					3	2	8	0.5	9			1					6			15				8			3		
41PS14	MNP013	20	2.5	2	15	med sand	dk. Gr. gray/ black	EE	5	1		15		9	2	8			2		1	3				15			5		0.5					1		
41PS14	MNP014	15.5	10	5	14	c. silt	red-black/ black	U	10		3	3		15	2	8		6	2								1				16							
41PS14	MNP015	28	15	5	11	c. silt	red-brown/ black	WW	20		16	4						4				2	2									2				2		orthopyroxene-0.5
41PS14	MNP016	25	20	10	13	med sand	black-black	O	7		4	2.5		4	6	7		3.5			2		1						2		5							
41PS14	MNP017	25	5	10	16	f. sand	red-black/ black	DD	11		2	3		3	4.5	6		3.5		1.5		7						3.5	5				3	2		5		
41PS14	MNP018	27	5	5	13	f. sand	brownish-black/black	A	15			4.5		8	6	10.5	1	3			2	3.5										6.5		3				
41PS14	MNP019	17	15	10	19	med sand	black-black	H	10	1.5	6	6	0.5	4.5	0.5	3.5	1	4.5	2.5		2						1				2		3					
41PS14	MNP020	4.5	5	10	19	f. sand	black-black	H	11	2	8	5		9	3	11	2	10	3	1.5	2						1	1	2		7			2				
41PS14	MNP041	17	10	5	16	c. silt	dk greenish-gray/black	EE	10	2.5	6.5	2.5	0.5	4	2.5	5.5						1				2			3		3				2	0.5		
41PS14	MNP042	14.5	5	7.5	16	c. silt	black-black	Z	12	0.5	12	11	0.5	7	8	8							0.5					2	4		3				3			felsite-2
41PS14	MNP043	16.5	5	10	13	c. silt	reddish-gray/ black	BB	5		10	13	tr.	6	4	19		4		0.5							4								1.5	1.5		
41PS14	MNP044	20	5	7.5	14	c. silt	black-black	AA	11	12		2		3.5	1.5	15.5		6.5							2	3.5				7.5				1		2		
41PS14	MNP045	17	2	10	14	c. silt	reddish-gray/ black	BB	8		12	10		12	8	6		2.5									2		2.5			3			2	3		
41PS14	MNP046	30	20	2	7	f. sand	brown/black	RR	10.5		0.5					11													10				1					bone temper-25
41PS14	MNP047	29	15	3	12	f. sand	dk. red br/ black	CC	12		7	5		3	6	12					3					3	1				1							
41PS14	MNP048	30	20	2	8	f. sand	brown/black	RR	10.5		0.5					1													10				1					bone temper-25
41PS14	MNP049	12.5	12.5	5	12	c. silt	black/black	M	12	3				15	8	12	3	2		2						7			6									
41PS14	MNP050	20	10	5	9	f. sand	black/black	O	1					15	15	20										7	3	4										
41PS14	MNP051	8	3.5	7	11	f. sand	dk. brown/ black	K	50					6	3	8			0.5							2.5	4	1		6.5								

Table 1. Proportions of Rocks and Minerals in Batch 1. Petrographic Data, La Junta de los Rios, CBBS/SRSU by David Glen Robinson. All counts are proportions of a 200 point count except PDI. tr. = trace (continued)

		Paste properties							Rocks and minerals																													
Site No.	sherd No.	Matrix	voids	silt fraction	PDI	med. Particle size	optical paste colors	Paste Group	common Qtz	composite Qtz	chert	quartz-ite	sand-stone	vitr tuff	crys tuff	lith tuff	glass	plagio-clase	alkali feldspar	olivine	diorite	diabase	andesite	granite	gabbro	trachyte	rhyo-lite	nephe-line	basalt	ferric hematite	ferrous hematite	iron ore (var.)	musco-vite	biotite	limestone/ micrite	calcite/ caliche	melilite	miscellaneous
41PS14	MNP061	30	40	1	10	f. sand	black/black	HH	10					1	2	15											tr.	1					tr.		tr.			
41PS14	MNP062	30	10	7	9	f. sand	black/black	S	2.5						3				5		10	15				9.5			8									
41PS14	MNP063	26	5.5	5	8	c. silt	red-br/black	T	15					17	9	11			5													7.5						
41PS14	MNP064	15	12	7	12	f. sand	black/black	K	8		12			10	4	8		8	4								3	2				6						
41PS14	MNP065	13.5	8	5	10	f. sand	black/black	L	12					8	7.5	15	1	10	8								2											
41PS14	MNP067	7.5	15	5	14	f.sand	black/black	Z	20		5	2		10	7	15						5				2		1.5	3							1		volc. Qtz-1
41PS14	MNP068	20	10	10	12	f. sand	black/black	Z	15			6		15	6	8					2								3		3				1	1		
41PS14	MNP069	30	15	7	13	f. sand	black/black	R	5		5	4		3	5	12										5	2		4			1.5						unk VRFs-1.5
41PS14	MNP070	39	10	5	19	f. sand	black/black	C	5		1		3	5	5	7	2	4	1	tr.	1					3		4	1		3		1					
41PS14	MNP071	45	15	5	11	f. sand	black/black	M	4					3	2	9	1	5	1							5	5											
41PS14	MNP072	37.5	10	10	13	f. sand	black/black	K	7			3	1	3	3	5		7		0.5						5	3					5						
41PS14	MNP073	21	20	15	12	f. sand	black/black	K	7			3		2	3	5		7		1						5			1			5						
41PS14	MNP074	35	10	7	15	f. sand	black/black	AA	2			3		6	2	10	3	7	1							4			2				2			5		ilmenite-1
41PS14	MNP075	13	5	10	13	med. Sand	black/black	R					3	11	8	15	3	4	2			2				7			6		6							
41PS14	MNP076	19	10	10	15	f. sand	black/black	Y	2				4	3	7	12			3			6				5	5	2	4			6				2		
41PS14	MNP077	28	10	5	11	f. sand	black/black	M	12			8	6	3	6	9										5	4		4									
41PS14	MNP078	32.5	5	7	13	f. sand	black/black	K	12	8		7		5	3	2		7	1		5	5				0.5												
41PS14	MNP079	27	15	5	12	coarse silt	black/black	Z	10		1	5		6	3	6			15							4					2					1		
41PS14	MNP080	58	3	2	12	c. silt	black/black	R	1			4		3	2	7	3	4				5				1			5									volc qtz-1
41PS14	MNP081	50	3	2	13	c. silt	black/black	Z	1			4		8	8	6		3				1				4			5							4		volc qtz-1
41PS14	MNP082	15	15	7	11	f. sand	black/black	A	7	4		2		8	11	12		4				14												1				
41PS14	MNP083	26	20	3	12	f. sand	black/black	Q	15	5		4		4	2	6		5								5		1	4									
41PS14	MNP084	27.5	10	10	12	f. sand	black/black	A	9					10	7	6		5			3							3	5					3				ilmenite-0.5
41PS14	MNP085	12.5	20	1	13	f. sand	black/black	Y	12		1.5	4		7	4	8		8				2				6			7			2				5		
41PS14	MNP086	16	15	10	13	f. sand	black/black	Y	7			3		8	7	11			4			3				3	8				2					3		
41PS14	MNP087	5	15	15	10	f. sand	black/black	K	10			8		8	8	15						5				3	8											
41PS14	MNP088	20	15	10	7	c. silt	black/black	M	6					12	11	20													8									
41PS14	MNP089	22.5	7	10	11	f. sand	black/black	K	3					15	12	12	2	3								4	7.5		4									
41PS14	MNP090	12	10	20	8	c. silt	black/black	K	20				10	5	6	12																5						
41PS14	MNP091	21.5	7	10	10	c. silt	black/black	M	7		2			15	12	15						4				6												felsite-0.5
41PS14	MNP092	15	7	10	12	f. sand	black/black	Z	15		8			11	12	9	2					3							2							4		dolomite-2

Table 1. Proportions of Rocks and Minerals in Batch 1. Petrographic Data, La Junta de los Rios, CBBS/SRSU by David Glen Robinson. All counts are proportions of a 200 point count except PDI. tr. = trace (continued)

		Paste properties							Rocks and minerals																													
Site No.	sherd No.	Matrix	voids	silt fraction	PDI	med. Particle size	optical paste colors	Paste Group	common Qtz	compos-ite Qtz	chert	quartz-ite	sand-stone	vitr tuff	crys tuff	lith tuff	glass	plagio-clase	alkali feldspar	olivine	diorite	diabase	andesite	granite	gabbro	trachyte	rhyo-lite	nephe-line	basalt	ferric hematite	ferrous hematite	iron ore (var.)	musco-vite	biotite	limestone/ micrite	calcite/ caliche	melilite	miscellaneous
41PS14	MNP093	36	30	15	12	f. sand	red-br/black	BB	2					3	8	4	5					4				5	12											calc-3 caliche-5
41PS14	MNP094	10	10	5	10	f. sand	black/black	TT	20					20	10	20	2			1														1		1		
41PS14	MNP095	6	5	10	15	f. sand	black/black	Y	15	5	6	5		8	4	12	5	5					1			3			5									
41PS14	MNP096	7	5	7	14	f. sand	green-gray/ gr. black	EE	15			9		8	8	12	7					2							5			3	6			4		dolomite-2
41PS14	MNP097	40	5	3	11	c. silt	black/black	A	14			9		10	4.5	9		3			1							0.5					1					
41PS14	MNP098	21	3	7	9	c. silt	brown/black	B	20		10			12	8	14		3															2					
41PS14	MNP099	23	5	10	10	c. silt	black/black	K	15					6	8	12						5	3			10	3											
41PS14	MNP100	14	12	10	13	f. sand	black/black	K	13		2	4		6	7	12	3	6										3				7						
CH-E7-2	SBP001	21.5	10	10	11	f. sand	black/black	K	5			6		15	6	12		7	4	0.5											3							
CH-E7-2	SBP002	14	15	7	14	f. sand	red-br/black	I	12	2	4			15	5	10	tr.								2	3			4	6								chlorite-1
CH-E7-2	SBP003	6	10	5	15	f. sand	red-br/black	BB	10	5	7			15	12	9		2								4	3		3		3				3			
CH-E7-2	SBP004	3	15	5	11	f. sand	black/black	K	14	7	6	7		15	12	9			4													3						
CH-E7-2	SBP005	32	3	3	10	f. sand	black/black	Y	10	10		8		10	8	8																			3	5		
CH-E7-2	SBP006	17	5	5	15	c. silt	black/black	Y	12	8		7	6	8	8	6		3	2										2			4			3	4		
CH-E7-2	SBP007	11	5	3	10	f. sand	black/black	N	15		7	8		12	15	20																3						unk orange-1
CH-E7-2	SBP008	10	15	7	14	f. sand	red-brown/ black	BB	8	3		8		10	10	16	1	1								2	2									7		
CH-E7-2	SBP009	11.5	27.5	5	16	f. sand	black/black	HH	8		4			7	9	15	3	3										1					1	0.5	5	5		dolomite-5
CH-E7-2	SBP010	5	5	15	11	c. silt	black/black	K	20		8	8	3	11	8	12	3	2																				
CH-E7-2	SBP011	16.5	3	40	7	c. silt	red-black/ black	E	10		5			20																			5	0.5				
CH-E7-2	SBP012	11	7	2	11	f. sand	black/black	A	20	3	8	10		20	11			2			1													5				
CH-E7-2	SBP013	45	2	2	11	med. Sand	green-gr./ black	EE	5		2			10	5	2	5									5							5		5	10		
CH-E7-2	SBP014	20	15	5	9	f. sand	black/black	M	10			6		15	15	10				1								3		tr.								
CH-E7-2	SBP015	10	10	15	12	c. silt	black/black	A	5		5	10		15	6	9	2									9					2		2					
CH-E7-2	SBP016	6.5	10	5	15	f. sand	black/black	Z	10		2	4	1	15	12	10			2	1						10									6	5		bone-0.5
CH-E7-2	SBP017	7	5	10	12	c. silt	black/black	Y	10		7	10		20	8	10		1												2					5	5		
CH-E7-2	SBP018	15	3	10	10	f. sand	red-brown/ black	BB	8			7		15	12	18											2								5	5		
CH-E7-2	SBP019	28	10	15	9	f. sand	black/black	X	5		4	3		15	5	7		2		1															3	2		
CH-E7-2	SBP020	30	10	3	12	f. sand	black/black	K	5		2	2	1	15	10	12		2								5				3								
CH-E7-2	SBP021	23.5	7	3	8	c. silt	black/black	Y	10					20	15	20													0.5							1		

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		Paste properties							Rocks and minerals																												
Site No.	sherd No.	Matrix	voids	silt fraction	PDI	med. Particle size	optical paste colors	Paste Group	common Qtz	composite Qtz	chert	quartzite	sandstone	vitr tuff	crys tuff	lith tuff	glass	plagioclase	alkali feldspar	olivine	diorite	diabase	andesite	granite	gabbro	trachyte	rhyolite	nepheline	basalt	ferric hematite	ferrous hematite	iron ore (var.)	muscovite	biotite	limestone/ micrite	calcite/ caliche	melilite	miscellaneous
CH-E7-2	SBP022	9	7	15	9	c. silt	black/black	N	5			2		20	15	20										4						3						
CH-E7-2	SBP023	8	20	3	8	med. Sand	black/black	M	6					20	20	20													2									volc. Quartz-1
CH-E7-2	SBP024	7	5	15	8	f. sand	black/black	K	15		3			20	15	15										5												
CH-E7-2	SBP025	38	7	10	11	c. silt	black/black	X	5				2	10	7	12		2								4									1	2		
CH-E7-2	SBP026	25	5	5	8	c. silt	black/black	B	5					20	15	22																2		1				
CH-E7-2	SBP027	23	10	15	8	f. sand	black/black	B	5			3		15	8	20																	1					
CH-E7-2	SBP028	14	10	5	9	f. sand	black/black	Z	10			3		20	15	20													2							1		
CH-E7-2	SBP029	12	15	7	13	f. sand	black/black	N	10	2		4		20	10	5						1				3	4		3			4						
CH-E7-2	SBP030	10	8	5	11	f. sand	black/black	K	10		4	5	2	12	15	20										6			3									
CH-E7-2	SBP031	5	15	10	12	f. sand	black/black	AA	10			5		18	15	12	3				3													3		1		
CH-E7-2	SBP032	18	10	5	10	f. sand	black/black	R	4		3	4	2	20	12	18											4											
CH-E7-2	SBP033	18	5	15	8	f. sand	black/black	M	5			5		15	17	19		1																				
CH-E7-2	SBP034	18	10	10	8	f. sand	black/black	K	5			3		20	13	20																						granophyre-1
CH-E7-2	SBP035	13	15	5	9	f. sand	gr.-black/ black	V	5		10	3		20	12	15													2									
CH-E7-2	SBP036	8	20	20	11	c. silt	black/black	AA	10				2	8	8	15	1												2				3			3		
CH-E7-2	SBP037	27	2	10	12	c. silt	black/black	K	15		4	12		7	8	5				0.5			0.5			2						7						
CH-E7-2	SBP038	13	15	10	12	f. sand	black/black	A	10		2	4	3	12	9	15													3		3			1				
CH-E7-2	SBP039	12	5	2	11	f. sand	black/black	Y	12		4	2	6	18	14	16		2													6					1		
CH-E7-2	SBP040	11.5	5	7	12	f. sand	black/black	A	12			5	3	20	15	12				0.5									3			5		1				
CH-E7-2	SBP041	36.5	7	5	10	f. sand	gr.-black/ black	EE	5			4		18	12	8																			2	2		felsite-0.5
CH-E7-2	SBP042	27	12	7	10	c. silt	black/black	M	15		2	7		8	7	12													2									granophyre-1
CH-E7-2	SBP043	13	20	10	10	f. sand	black/black	K	20		5		2	8	10	6										4			2									
CH-E7-2	SBP044	21	5	10	12	c. silt	black/black	K	15		3	7	3	8	9	10						2				3			4									
CH-E7-2	SBP045	24	10	15	9	c. silt	black/black	M	12	2		4		10	8	12										3												
CH-E7-2	SBP046	27	10	3	11	c. silt	red-brown/ black	BB	7			4	3	15	12	9											2		5						3			
CH-E7-2	SBP051	10	10	10	16	c. silt	black/black	AA	15		5	3		5	8	7			4	3		2							2		5		5	5		2		
CH-E7-2	SBP052	10	15	15	13	c. silt	black/black	A	12		2	5		7	8	10	2	2			3	4											5					
CH-E7-2	SBP053	31	5	10	12	c. silt	black/black	K	15		2	10		8	4	7			3							2	1											
CH-E7-2	SBP054	37	3	3	13	med. Sand	black/black	DD	10					8	4	10				3						4			2		3			3	5	5		

Table 1. Proportions of Rocks and Minerals in Batch 1. Petrographic Data, La Junta de los Rios, CBBS/SRSU by David Glen Robinson. All counts are proportions of a 200 point count except PDI. tr. = trace (continued)

		Paste properties							Rocks and minerals																													
Site No.	sherd No.	Matrix	voids	silt fraction	PDI	med. Particle size	optical paste colors	Paste Group	common Qtz	compos-ite Qtz	chert	quartz-ite	sand-stone	vitr tuff	crys tuff	lith tuff	glass	plagio-clase	alkali feldspar	olivine	diorite	diabase	andesite	granite	gabbro	trachyte	rhyo-lite	nephe-line	basalt	ferric hematite	ferrous hematite	iron ore (var.)	musco-vite	biotite	limestone/ micrite	calcite/ caliche	melilite	miscellaneous
CH-E7-2	SBP055	18	10	10	11	f. sand	black/black	Z	15		4			9	8	10					2								4						5	5		
CH-E7-2	SBP056	16	7	7	14	c. silt	black/black	X	12		8			10	7	8		7			3	3								3	3			4		2		
CH-E7-2	SBP057	32	10	5	12	f. sand	black/black	L	20		3	7	4	6	2	3										5			2									
CH-E7-2	SBP058	31	5	7	10	c. silt	black/black	B	10			4		6	8	12		5								8							4					
CH-E7-2	SBP061	26.5	8.5	5	19	c.silt	black/black	AA	17.5	0.5	3.5		1.5	14	4	3.5	0.5				2.5	0.5		2		2.5	2.5		tr.		1.5			0.5		3		
CH-E7-2	SBP062	35	7	3	14	f. sand	black/black	A	10	3	4		2	4	6	8				1	3	3							9				2					
CH-E7-2	SBP063	33.5	3	12	13	c. silt	black/black	K	5		2	7		4	9	8	4		3					0.5		6	3											
CH-E7-2	SBP064	25	3	7	14	c. silt	yellow-gray/ black	II	10			3		8	7	8		3			2						3	2			10		5		4			
CH-E7-2	SBP065	31	7	3	10	med. Sand	black/black	QQ	4		2	2		8	9	5										4			4			25						
41PS16	KBP001	23	15	10	11	c. silt	black/black	K	8		5			8	7	8	3	4								5			4									
41PS16	KBP002	30	15	10	12	f. sand	yellow-brown/black	II	8		2			6	4	8	4	5											3			2				3		
41PS16	KBP003	17	15	15	12	f. sand	black/black	A	8			5		5	3	7										7			3			5	5	5				
41PS16	KBP004	12.5	5	20	13	c. silt	red-gray/ black	U	5	2		8		12	6	15	0.5	3			2					6					3							
41PS16	KBP005	9.5	5	30	14	c. silt	red-brown/ black	DD	4					12	7	5		4								3			2	3	3		4			4		fossil snail-0.5
41PS16	KBP006	17	15	2	12	med. Sand	black/black	GG	4		4			12	11	15												3	3		5				4	5		
41PS16	KBP007	14	15	3	8	f. sand	black/black	N	10					14	18	18		5														3						
41PS16	KBP008	24	15	7	13	f. sand	black/black	X	5		6			12	6	8			2		2					3			4						3	3		
41PS16	KBP009	36	10	5	12	f. sand	dk. gray brown/black	OO	8					8	7	5		2			3	5					4		2								5	
41PS16	KBP010	20	5	15	10	c. silt	red-brown/ black	T	15			12		3	5	10											3		9			3						
41PS16	KBP011	10.5	15	20	15	f. sand	red-brown/ black	NN	10		3			7	3	8	2										4		2	3	1					1	10	Qtz w/rutile-0.5
41PS16	KBP012	15.5	10	10	18	f. sand	yellow-brown/black	II	8	2	5		2	10	8	10		1	0.5			1		1			6		1		4				2	3		
41PS16	KBP013	33.5	7	5	14	f. sand	red-brown/ black	BB	12	2	12			8	2	4		3	5					0.5		3			1							2		
41PS16	KBP014	30	10	10	12	f. sand	black/black	X	18		1			8	6	4				1						4	5								1	2		

Table 1. Proportions of Rocks and Minerals in Batch 1. Petrographic Data, La Junta de los Rios, CBBS/SRSU by David Glen Robinson. All counts are proportions of a 200 point count except PDI. tr. = trace (continued)

		Paste properties							Rocks and minerals																													
Site No.	sherd No.	Matrix	voids	silt fraction	PDI	med. Particle size	optical paste colors	Paste Group	common Qtz	composite Qtz	chert	quartzite	sandstone	vitr tuff	crys tuff	lith tuff	glass	plagioclase	alkali feldspar	olivine	diorite	diabase	andesite	granite	gabbro	trachyte	rhyolite	nepheline	basalt	ferric hematite	ferrous hematite	iron ore (var.)	muscovite	biotite	limestone/ micrite	calcite/ caliche	melilite	miscellaneous
41PS16	KBP015	24	10	15	14	c. silt	black/black	LL	5					7	6	5	3	1	8		3					5	4				3				1			
41PS16	KBP016	30	15	15	12	c. silt	black/black	N	5					8	3	8	4	2	1			4						2	3									
41PS16	KBP017	27	10	10	8	f. sand	black/black	M	10					10	10	10		8									5											
41PS16	KBP018	44	3	2	10	f. sand	red-gray/ black	U	44					10	8	11		6				3				3	5											
41PS16	KBP019	23	20	5	10	f. sand	red-gray/ black	CC	15		3	6		12	4	8										4									4			
41PS16	KBP020	13	25	10	9	f. sand	red-gray/ black	T	5			4		15	8	12											5				3							
41PS16	KBP021	33	10	5	14	f. sand	black/black	Z	4		4	3		8	4	12	3	1				2					2					4				5		
41PS16	KBP022	32	7	5	11	c. silt	reddish-black/black	BB	12		5	6		8	10	6											2								2	5		
41PS16	KBP023	21.5	7	10	17	f. sand	black/black	X	5					3	11	10		2	3	0.5	2	4				2	2		2	5					5	5		
41PS16	KBP024	43	5	3	15	f. sand	black/black	Y	10					4	7	5			3	4	3	4			2		1		2						2	2		
41PS16	KBP025	34.5	2	15	14	c. silt	black/black	MM	4			3		8	6	10		3				3					3	1	3			4					0.5	
41PS16	KBP026	29	5	5	14	f. sand	black/black	MM	8					10	7	9		2							1		6		4									
41PS16	KBP027	10	10	3	14	f. sand	red-brown/ black	NN	8					12	10	13	5	4									5		6			4		3		5	2	
41PS16	KBP028	25.5	5	10	14	f. sand	black/black	A	5			3	2	8	6	9		5		0.5						3		2	6				5					
41PS16	KBP029	26	10	10	11	c. silt	black/black	AA	8					8	10	7											2			3			3	10	3			
41PS16	KBP030	62	7	3	9	f. sand	black/black	M	5			2		5	7	3											3		3									
41PS16	KBP031	31	20	5	15	f. sand	reddish-black/black	NN	6					5	7	3	1			1		5				2	3		1						1	2	7	
41PS16	KBP032	33	5	10	11	c. silt	red-brown/ black	T	8					5	10	7		2				4					6		5			5						
41PS16	KBP033	36	7	10	13	c. silt	black/black	MM	15			2		4	5	3	3	1				4				3	5										2	
41PS16	KBP034	43	10	7	12	f. sand	black/black	MM	12				1	5	5	2						4						2	3					1			5	
41PS16	KBP035	49	5	10	11	c. silt	black/black	X	7				2	5	5	5	5					2													3	2		
41PS16	KBP036	37	2	25	12	c. silt	reddish-black/black	D	2					6	7	4	4					2						1	3	2			5					
41PS16	KBP037	34	10	10	12	c. silt	black/black	A	4				2	12	3	7	5				5						2		3				3					
41PS16	KBP038	38	10	3	11	f. sand	black/black	AA	8					4	5	3	2								10									12	2	3		
41PS16	KBP039	47	10	15	10	f. sand	red-brown/ black	T	5	1				3	3	4		2				6								4								

Table 1. Proportions of Rocks and Minerals in Batch 1. Petrographic Data, La Junta de los Rios, CBBS/SRSU by David Glen Robinson. All counts are proportions of a 200 point count except PDI. tr. = trace (continued)

		Paste properties							Rocks and minerals																													
Site No.	sherd No.	Matrix	voids	silt fraction	PDI	med. Particle size	optical paste colors	Paste Group	common Qtz	composite Qtz	chert	quartzite	sandstone	vitr tuff	crys tuff	lith tuff	glass	plagioclase	alkali feldspar	olivine	diorite	diabase	andesite	granite	gabbro	trachyte	rhyolite	nepheline	basalt	ferric hematite	ferrous hematite	iron ore (var.)	muscovite	biotite	limestone/ micrite	calcite/ caliche	melilite	miscellaneous
41PS16	KBP040	45	5	5	13	f. sand	greenish gray/black	FF	10		3		4	2	8	4		5											3			2				3		ilmenite-1
41PS16	KBP041	39	10	10	13	med. Sand	red-brown/ black	T	8	2	1			10	2	4	2	4									1		4		3							
41PS16	KBP042	55	7	5	13	c. silt	red-gray/ black	BB	8		3			5	2	3											1	2			5				2			dolomite-1 fossil shell-1
41PS16	KBP043	18	10	7	11	f. sand	black/black	M	10		5	4		12	8	10		6				5							5									
41PS16	KBP044	23	9	10	20	c. silt	greenish gray/black	EE	13.5		1.5	2	1	16	3	2	5.5	0.5						1	0.5	1.5	3.5		3.5		7.5		1		2			
41PS16	KBP045	44	5	7	13	f. sand	black/black	K	10					5	5	5	2	4			1	3				4			3			2						
41PS16	KBP046	41	5	7	12	c. silt	red-brown/ black	BB	12				1	8	10	5						1				1			2		5					2		
41PS16	KBP047	27	10	5	9	c. silt	black/black	Q	10			3		13	15	10										4			3									
41PS16	KBP048	40	12	3	12	f. sand	red-brown/ black	BB	15					5	4	6		4				2				4					1				1	3		
41PS16	KBP049	33	7	15	12	f. sand	red-brown/ black	BB	5					10	4	2										2			4						5	6		oolites-4 dolomite-3
41PS16	KBP050	53	10	7	10	f. sand	red-brown/ black	CC	8	2			1	5	2	4															1					2		
41PS16	KBP051	37	10	7	10	f. sand	black/black	N	10				2	10	8	10	2												5		1							
41PS16	KBP052	22	7	5	14	f. sand	black/black	Z	12		5	6		15	8	5	3								1		5	2	2									dolomite-2
41PS16	KBP053	17	15	5	13	f. sand	red-black/ black	U	10		6	5		8	10	6		1								3	4		2			8						
41PS16	KBP054	36.5	10	15	14	f. sand	gr./brown/ black	VV	5		8	4		0.5				6			1			3	4				3		2			2		2		non-local
41PS16	KBP055	27	7	5	10	c.silt	black/black	Y	10			8		12	18	10											2											unk VRF-0.5 fossil shell-0.5-calc.
41PS16	KBP056	28	10	3	11	f. sand	black/black	Z	5			10		12	11	9		5										2			3				2			
41PS16	KBP057	31.5	20	7	13	f. sand	black/black	GG	5					12	10	3	3	2						2										1	2			dolomite-1 fossil-0.5-calc
41PS16	KBP058	47	5	5	10	f. sand	black/black	M	7		3			6	5	5	5							8														unk VRF-4
41PS16	KBP059	37	10	5	14	c.silt	red-brown/ black	NN	8					5	5	5	4	4	1					5			3		2							3	3	
41PS16	KBP060	19	15	10	12	f. sand	gr./brown/ black	OO	10				4	8	8	6			3										2							4	6	unk VRF-5
41PS16	KBP061	40	10	10	12	f. sand	black/black	MM	10		5			6	4	3		4									5					5				1	1	

Table 1. Proportions of Rocks and Minerals in Batch 1. Petrographic Data, La Junta de los Rios, CBBS/SRSU by David Glen Robinson. All counts are proportions of a 200 point count except PDI. tr. = trace (continued)

		Paste properties							Rocks and minerals																													
Site No.	sherd No.	Matrix	voids	silt fraction	PDI	med. Particle size	optical paste colors	Paste Group	common Qtz	composite Qtz	chert	quartz-ite	sand-stone	vitr tuff	crys tuff	lith tuff	glass	plagio-clase	alkali feldspar	olivine	diorite	diabase	andesite	granite	gabbro	trachyte	rhyo-lite	nephe-line	basalt	ferric hematite	ferrous hematite	iron ore (var.)	musco-vite	biotite	limestone/ micrite	calcite/ caliche	melilite	miscellaneous
41PS16	KBP062	39	3	5	14	f. sand	black/black	N	5		3	3	3	2	7	12		4				2		1			8			3								
41PS16	KBP063	16	20	5	14	f. sand	black/black	A	10					4	8	9	4	2		1		4				2	8			5				2				
41PS16	KBP064	22.5	15	4	14	c. silt	greenish gray/black	EE	5		4			15	6	5		1								7	10					4	tr.		1			fossil-0.5 (ls. Oolitic)
41PS16	KBP065	7	20	10	12	f. sand	black/black	X	20					8	8	6	2					4					8							4		2		unk VRF-1
41PS16	KBP066	53.5	10	5	12	c.silt	black/black	MM	5		5			3	3	4			4									3	2		2						0.5	
41PS16	KBP067	66	3	3	13	c.silt	black/black	A	5			3		5	5	3	1	2		0.5									1		2		0.5					
41PS16	KBP068	36	10	7	13	c.silt	gr./brown/ black-A	J	12		2	4		5	4	3	4				2						5		1	10			5					
41PS16	KBP069	33	7	7	12	c.silt	gr./brown/ black	EE	5					8	6	7		4									5		2		6	Il-men.-2		5		3		
41PS16	KBP070	35	15	3	9	c.silt	black/black	MM	8					10	7	8						2							2								10	
41PS16	KBP071	29	3	10	12	c.silt	red-brown/ black	NN	5					9	10	5		4	2								8		6			8					1	
41PS16	KBP072	31.5	15	10	12	c.silt	black/black	K	5	0.5				5	8	6						3					2		2	4		8						
41PS16	KBP073	38	3	20	14	c.silt	black/black	K	8	2	4	4		3	4	2	1		2		2	2							2									
41PS16	KBP074	46	2	5	12	c.silt	gr./brown/ black	G	10					6	4	3		2				2					6		2			8		4				
41PS16	KBP075	50	2	7	9	c.silt	red-brown/ black	T	4					8	8	8											8		2		5							
41PS16	KBP076	10	20	5	11	f. sand	black/black	K	15		6			10	6	12		1									10		2		3							
41PS16	KBP077	42	10	5	12	f. sand	black/black	AA	10					5	7	4	1	2									5				3			2		4		
41PS16	KBP078	30	15	7	12	f. sand	black/black	N	10					8	7	6	2	2				2				3	6		2									
41PS16	KBP079	57	2	5	5	c.silt	red-black/ black	KK	4					8	6	5						2							2						4	5		
41PS16	KBP080	26	10	10	12	f. sand	yellow-brown/black	PP	10					8	4	8	2			2		3							3	4							10	
41PS14	MNP021	44	3	3	10	f. sand	black/black	Y	4					15	12	8	2										6	1								2		
41PS14	MNP022	29	15	15	10	c.silt	black/black	X	8					12	4	8						4						2								2		unk Orange-1
41PS14	MNP023	51	3	10	9	f. sand	black/black	K	6					6	7	8			2								5		2									
41PS14	MNP024	17	15	5	9	f. sand	red-brown/ black	BB	7					15	15	12		2														8				4		
41PS14	MNP025	43	2	15	8	c.silt	black/black	N	5					12	10	5											5			3								

Table 1. Proportions of Rocks and Minerals in Batch 1. Petrographic Data, La Junta de los Rios, CBBS/SRSU by David Glen Robinson. All counts are proportions of a 200 point count except PDI. tr. = trace (continued)

		Paste properties							**Rocks and minerals**																													
Site No.	**sherd No.**	**Matrix**	**voids**	**silt fraction**	**PDI**	**med. Particle size**	**optical paste colors**	**Paste Group**	**common Qtz**	**compos-ite Qtz**	**chert**	**quartz-ite**	**sand-stone**	**vitr tuff**	**crys tuff**	**lith tuff**	**glass**	**plagio-clase**	**alkali feldspar**	**olivine**	**diorite**	**diabase**	**andesite**	**granite**	**gabbro**	**trachyte**	**rhyo-lite**	**nephe-line**	**basalt**	**ferric hematite**	**ferrous hematite**	**iron ore (var.)**	**musco-vite**	**biotite**	**limestone/ micrite**	**calcite/ caliche**	**melilite**	**miscellaneous**
41PS14	MNP026	34	1	15	8	c.silt	gr./brown/ black	W	15			8		10	4	8																5						
41PS14	MNP027	51.5	2	5	10	med. Sand	gr./brown/ black	W	12					7	8	6			4								2	2										clinopyroxene-0.5
41PS14	MNP028	39	5	15	10	c.silt	red-black/ black	BB	5					10	12	7		2										1	2						2			ls. Oolitic
41PS14	MNP029	6	1	50	5	c.silt	red-black/ black	SS	1																								2					bone temper-40
41PS14	MNP030	45	3	3	7	med. Sand	black/black	N	15	3				12	6	10																3						
41PS21	PVP087	4	1	30	13	c.silt	gr./brown/ black	EE	8					10	7	5		2	5		6	5							7			5		3				
41PS21	PVP088	36	5	25	13	c.silt	black/black	Y	5	2				4	3	2		2			3	4							5			2				2		
41PS21	PVP089	39	15	2	12	med. Sand	gr./brown/ black	FF	8					5	6	4			2		6	4							5						2	2		
41PS21	PVP090	11	3	35	12	c.silt	gr./brown/ black	FF	6					3	1	2					6	8					3		6		12					4		two pastes in sherd
41PS21	PVP091	44	3	7	12	c.silt	black/black	AA	12	4		5	4	4	3	2																7		2				
41PS21	PVP092	45	2	20	12	c.silt	gr./brown/ black	V	6	2	1	8	1	5	1	3											3					3						
41PS21	PVP093	24	15	10	13	c.silt	black/black	N	10		3			8	4	7	2	2								3	6					5						Ilmen. Iron ore
41PS21	PVP094	26	5	15	15	c.silt	red-brown/ black	DD	5					8	6	5	2	1	2		6	6					3		4		5		1					
41PS21	PVP095	40	5	5	13	c.silt	black/black	X	5					5	9	8	4	3			3						2		5		4					2		

Table 1. Proportions of Rocks and Minerals in Batch 2. Petrographic Data, La Junta de los Rios, CBBS/SRSU by David Glen Robinson. All counts are proportions of a 200 point count. * = anisotropic paste (continued)

		Paste properties						Rocks and minerals																															
Site No.	sherd No.	Matrix	voids	silt fraction	PDI	med. Particle size	paste colors*	common Qtz	composite Qtz	chert	quartzite	vitr tuff	crys tuff	lith tuff	plagioclase	alkali feldspar	diorite	diabase	andesite	granite	gabbro	trachyte	trachy-basalt	trachy-andesite	rhyolite	neph. Syanite	long plag basalt	short plag basalt	basalt undiferen	ferric hematite	ferrous hematite	iron ore (var.)	olivine	muscovite	biotite	limestone/ micrite	calcite/ caliche	sandstone	miscellaneous
41PS21	PVP026	4	17.5	4	21	f. sand	gr-brown/ black	15	1			12		4.5		1			1	1	3	tr.		2					0.5	8.5			1.5						
41PS21	PVP027	5	11.5	21.5	13	f. sand	dk. Gr. gray/black	6				5.5			4.5		9	9.5							1.5				7.5		10				3.5				opalized chert-1 nepheline-4
41PS21	PVP028	10	7.5	5	16	f. sand	brownish-black/black	23.5		8		13.5	1.5		7.5	1.5						3.5			5.5				1.5		0.5		5.5	3	1				orthoclase-1.5
41PS21	PVP029	4.5	8	5	21	f. sand	gr-brown/ black*	8.5	1.5	3	4	1		6	4.5					0.5		4			2				6.5		12		2	7.5	2.5		1.5		nepheline-3.5
41PS21	PVP041	4	9	6	19	f. sand	gr. gray-black	6				7		6.5	5	tr.	10	10				0.5			6				8	8.5			2.5	4.5			2		pyroxene-1 nepheline-3
41PS21	PVP042	13.5	8	2	19	c. silt	black-black	17.5	2.5		5.5	15	5.5	5.5	1.5	0.5	1.5	0.5	1			8			1.5				1					4			0.5		nepheline-5
41PS21	PVP043	6.5	21	5	18	f. sand	gr. gray-black	15.5	1			7.5	3.5	1.5	3	1	4	7.5	1			3			2				14		7.5			0.5			0.5		
41PS21	PVP061	5.5	22.5	5	18	c.silt	dk. greenish-gray/ black	12.5	1.5	3.5	2	5		4	3	0.5	3	2.5				5			5.5				5		9.5			0.5					VRFs-4
41PS21	PVP062	21	10	2	15	med. Sand	dk. Gr. gray/black	20	1	2		14.5	5	2	3			1				3								8				5					sheared m. quartz-0.5
41PS21	PVP063	8	6.5	10	15	f. sand	black-black	10				1	0.5	2	5			7				4			3				15		12		3	5					
41PS21	PVP064	15	15	5	15	f. sand	black-black	20	3			10		3	4			3			0.5	2							6		7			2.5					glass-3 nepheline-1
41PS21	PVP065	11	3	5	17	f. sand	red-brown/ black	11				4	2	7	3		8	16	2			6							7.5		5			4			0.5		nepheline-4
41PS21	PVP067	14	3	2	14	med. Sand	black-black	8	1	3		3		18			15	3				3												5	1				nepheline-16
41PS21	PVP068	10	20	2	13	fine sand	black-black	8			5	4	8	16	2	2					1	8																	nepheline-5
41PS21	PVP069	5	5	5	14	med. Sand	black-black	5		8	12	15	3	10	3	5		1				8									6								nepheline-9
41PS21	PVP070	15	8	10	13	c. silt	greengray/ black	20				6	10	12	4			1											2	7.5			0.5	2					
41PS21	PVP071	4.5	20	2	15	f. sand	black-black	8	1	12	5	4	8	16	2	2					1	8																	nepheline-5
41PS21	PVP072	30	15	5	11	f. sand	black-black	11		7	9	5	2	4	4							3																	nepheline-5
41PS21	PVP080	19	20	2	10	f. sand	black-black	15	9	8		6		11	2			3				5																	
41PS21	PVP081	12	20	2	13	f. sand	black-black	12		6		2	1	8	4		5	7				6							3										nepheline-12

Table 1. Proportions of Rocks and Minerals in Batch 2. Petrographic Data, La Junta de los Rios, CBBS/SRSU by David Glen Robinson. All counts are proportions of a 200 point count. * = anisotropic paste (continued)

		Paste properties						Rocks and minerals																															
Site No.	sherd No.	Matrix	voids	silt fraction	PDI	med. Particle size	paste colors*	common Qtz	composite Qtz	chert	quartzite	vitr tuff	crys tuff	lith tuff	plagioclase	alkali feldspar	diorite	diabase	andesite	granite	gabbro	trachyte	trachybasalt	trachyandesite	rhyolite	neph. Syanite	long plag basalt	short plag basalt	basalt undiferen	ferric hematite	ferrous hematite	iron ore (var.)	olivine	muscovite	biotite	limestone/ micrite	calcite/ caliche	sandstone	miscellaneous
41PS21	PVP082	22	5	2	13	f. sand	gr. green-black	10		5		2	2	6	6		6	15											8		8								glass-3
41PS21	PVP083	19.5	10	10	14	f. sand	gr-brown/ black	11	1	10	3	5	4	6	11			3																5			0.5		glass-1
41PS21	PVP084	4.5	6	5	14	f. sand	black-black	10		2		3.5	1	6	12			15				6							17			8	6						glass-1
41PS21	PVP085	6.5	6	10	13	med. Sand	red-brown/ black	15		11	3	5	2	13	4							8									15		2						glass-0.5
41PS21	PVP086	20	10	10	12	c. silt	black-black	5		tr.		8	2	14	3			7				3							12										nepheline-6
41PS14	MNP001	4	15	2	19	f. sand	brown-gray/black	4	4	9	8	7		7	2			1				6			2				12	4						2		1	granophyre-5 nepheline-3 dolomite-2
41PS14	MNP002	24	10	10	14	med sand	black-black	10		8	10	5	0.5	5	4		1		5						5														nepheline-2 glass-0.5
41PS14	MNP003	10	16	20	13	c. silt	brown-brown	11			6	3		6				3	5										8		6			3			1		glass-2
41PS14	MNP004	6	15	15	11	f. sand	black-black	18	4	8		6	1	5	6																14		2						
41PS14	MNP005	16.5	5	5	16	f. sand	brown/ black	5		2	12	5	2	8			1	3				7			2				5	6				5					glass-0.5
41PS14	MNP006	12	20	5	10	med. Sand	black-black	25		10	5	3	1	12	5		2																						
41PS14	MNP007	8	7.5	7.5	13	c. silt	red-brown/ black	21		0.5	8	10	8	12	3		6	3				5							0.5										
41PS14	MNP008	9.5	9	10	16	c. silt	gr-brown/ black*	15		5	6	5	5	7	4		3	3	10										2		3		0.5	3					
41PS14	MNP009	19	5	10	13	f. sand	black-black	12				6	5	12	6		7	4							5				1					5			3		
41PS14	MNP010	17	9	10	13	f. sand	red-brown/ black	18		11		9	2	7	4	2	2	1											3								5		glass-tr.
41PS14	MNP011	22	5	10	12	f. sand	gr. green-black*	12		9		3	2	7			2	1							15				7					5					
41PS14	MNP012	16	5	12	11	f. sand	red-brown/ black	12				3	2	8	9		1					6							15					8			3		glass-0.5
41PS14	MNP013	20	2.5	2	15	med sand	dk. Gr. gray/black	5	1		15	9	2	8		2	1	3				15							5		0.5						1		
41PS14	MNP014	15.5	10	5	14	c. silt	red-black/ black	10		3	3	15	2	8	6	2									1						16								

Table 1. Proportions of Rocks and Minerals in Batch 2. Petrographic Data, La Junta de los Rios, CBBS/SRSU by David Glen Robinson. All counts are proportions of a 200 point count. * = anisotropic paste (continued)

		Paste properties						Rocks and minerals																															
Site No.	**sherd No.**	**Matrix**	**voids**	**silt fraction**	**PDI**	**med. Particle size**	**paste colors***	**common Qtz**	**composite Qtz**	**chert**	**quartzite**	**vitr tuff**	**crys tuff**	**lith tuff**	**plagioclase**	**alkali feldspar**	**diorite**	**diabase**	**andesite**	**granite**	**gabbro**	**trachyte**	**trachybasalt**	**trachyandesite**	**rhyolite**	**neph. Syanite**	**long plag basalt**	**short plag basalt**	**basalt undiferen**	**ferric hematite**	**ferrous hematite**	**iron ore (var.)**	**olivine**	**muscovite**	**biotite**	**limestone/ micrite**	**calcite/ caliche**	**sandstone**	**miscellaneous**
41PS14	MNP015	28	15	5	11	c. silt	red-brown/ black	20		16	4				4			2	2													2					2		orthopyroxene-0.5
41PS14	MNP016	25	20	10	13	med sand	black-black	7		4	2.5	4	6	7	3.5		2		1										2		5								
41PS14	MNP017	25	5	10	16	f. sand	red-black/ black	11		2	3	3	4.5	6	3.5			7											5				1.5	3	2		5		nepheline-3.5
41PS14	MNP018	27	5	5	13	f. sand	brownish-black/black	15			4.5	8	6	10.5	3		2	3.5														6.5			3				glass-1
41PS14	MNP019	17	15	10	19	med sand	black-black	10	1.5	6	6	4.5	0.5	3.5	4.5	2.5	2								1						2			3				0.5*	glass-1
41PS14	MNP020	4.5	5	10	19	f. sand	black-black	11	2	8	5	9	3	11	10	3	2								1				2		7		1.5		2				glass-2 nepheline-1
41PS14	MNP041	17	10	5	16	c. silt	dk green-ish-gray/ black	10	2.5	6.5	2.5	4	2.5	5.5				1				2							3		3					2	0.5	0.5*	
41PS14	MNP042	14.5	5	7.5	16	c. silt	black-black	12	0.5	12	11	7	8	8					0.5										4		3					3		0.5*	felsite-1 nepheline-2
41PS14	MNP043	16.5	5	10	13	c. silt	reddish-gray/black	5		10	13	6	4	19	4										4								0.5			1.5	1.5	tr.*	
41PS14	MNP044	20	5	7.5	14	c. silt	black-black	11	12		2	3.5	1.5	15.5	6.5						2	3.5								7.5					1		2		
41PS14	MNP045	17	2	10	14	c. silt	reddish-gray/black	8		12	10	12	8	6	2.5										2				2.5			3				2	3		

Table 1. Proportions of Rocks and Minerals in Batch 3. Petrographic Data, La Junta de los Rios, CBBS/SRSU by David Glen Robinson. All counts are proportions of a 200 point count. * = anisotropic paste (continued)

		Paste properties						Rocks and minerals																															
Site No.	sherd No.	Matrix	voids	silt fraction	PDI	med. Particle size	paste colors*	common Qtz	compos-ite Qtz	chert	quartz-ite	vitr tuff	crys tuff	lith tuff	plagio-clase	alkali feldspar	diorite	diabase	andesite	granite	gabbro	trachyte	trachy-basalt	trachy-andesite	rhyolite	neph. Syanite	long plag basalt	short plag basalt	basalt undif-feren	ferric hema-tite	ferrous hema-tite	iron ore (var.)	olivine	musco-vite	biotite	lime-stone/ micrite	calcite/ caliche	sand-stone	miscellaneous
41PS14	MNP046	30	20	2	7	f. sand	brown/ black	10.5		0.5				11															10					1					bone temper-25
41PS14	MNP047	29	15	3	12	f. sand	dk. red br/ black	12		7	5	3	6	12			3					3			1						1								
41PS14	MNP048	30	20	2	8	f. sand	brown/ black	10.5		0.5				1															10					1					bone temper-25
41PS14	MNP049	12.5	12.5	5	12	c. silt	black/black	12	3			15	8	12	2							7							6				2						glass-3
41PS14	MNP050	20	10	5	9	f. sand	black/black	1				15	15	20								7			3														nepheline-4
41PS14	MNP051	8	3.5	7	11	f. sand	dk. brown/ black	50				6	3	8		0.5						2.5			4					6.5									nepheline-1
41PS14	MNP061	30	40	1	10	f. sand	black/black	10				1	2	15											tr.									tr.		tr.			nepheline-1
41PS14	MNP062	30	10	7	9	f. sand	black/black	2.5					3			5	10	15				9.5							8										
41PS14	MNP063	26	5.5	5	8	c. silt	red-br/ black	15				17	9	11		5																7.5							
41PS14	MNP064	15	12	7	12	f. sand	black/black	8		12		10	4	8	8	4									3							6							nepheline-2
41PS14	MNP065	13.5	8	5	10	f. sand	black/black	12				8	7.5	15	10	8									2														glass-1
41PS14	MNP067	7.5	15	5	14	f.sand	black/black	20		5	2	10	7	15				5				2							3								1		volc. Qtz-1nephe-line-1.5
41PS14	MNP068	20	10	10	12	f. sand	black/black	15			6	15	6	8			2												3		3					1	1		
41PS14	MNP069	30	15	7	13	f. sand	black/black	5		5	4	3	5	12								5			2				4			1.5							VRFs-1.5
41PS14	MNP070	39	10	5	19	f. sand	black/black	5		1		5	5	7	4	1	1					3							1		3		tr.	1				3	nepheline-4 glass-2
41PS14	MNP071	45	15	5	11	f. sand	black/black	4				3	2	9	5	1						5			5														glass-1
41PS14	MNP072	37.5	10	10	13	f. sand	black/black	7			3	3	3	5	7							5			3							5	0.5					1	
41PS14	MNP073	21	20	15	12	f. sand	black/black	7			3	2	3	5	7							5							1			5	1						
41PS14	MNP074	35	10	7	15	f. sand	black/black	2			3	6	2	10	7	1						4							2					2			5		glass-3 ilmenite-1
41PS14	MNP075	13	5	10	13	med. sand	black/black					11	8	15	4	2		2				7							6		6							3	glass-3
41PS14	MNP076	19	10	10	15	f. sand	black/black	2				3	7	12		3		6				5			5				4			6					2	4	nepheline-2
41PS14	MNP077	28	10	5	11	f. sand	black/black	12			8	3	6	9								5			4				4									6	
41PS14	MNP078	32.5	5	7	13	f. sand	black/black	12	8		7	5	3	2	7	1	5	5				0.5																	
41PS14	MNP079	27	15	5	12	coarse silt	black/black	10		1	5	6	3	6		15						4									2						1		
41PS14	MNP080	58	3	2	12	c. silt	black/black	1			4	3	2	7	4			5				1							5										glass-3 volc qtz-1
41PS14	MNP081	50	3	2	13	c. silt	black/black	1			4	8	8	6	3			1				4							5								4		volc qtz-1

Table 1. Proportions of Rocks and Minerals in Batch 3. Petrographic Data, La Junta de los Rios, CBBS/SRSU by David Glen Robinson. All counts are proportions of a 200 point count. * = anisotropic paste (continued)

		Paste properties						Rocks and minerals																															
Site No.	sherd No.	Matrix	voids	silt fraction	PDI	med. Particle size	paste colors*	common Qtz	compos-ite Qtz	chert	quartz-ite	vitr tuff	crys tuff	lith tuff	plagio-clase	alkali feldspar	diorite	diabase	andesite	granite	gabbro	trachyte	trachy-basalt	trachy-andesite	rhyolite	neph. Syanite	long plag basalt	short plag basalt	basalt undif-feren	ferric hema-tite	ferrous hema-tite	iron ore (var.)	olivine	musco-vite	biotite	lime-stone/ micrite	calcite/ caliche	sand-stone	miscellaneous
41PS14	MNP082	15	15	7	11	f. sand	black/black	7	4		2	8	11	12	4			14																	1				
41PS14	MNP083	26	20	3	12	f. sand	black/black	15	5		4	4	2	6	5							5							4										nepheline-1
41PS14	MNP084	27.5	10	10	12	f. sand	black/black	9				10	7	6	5		3												5						3				nepheline-3 ilmen-ite-0.5
41PS14	MNP085	12.5	20	1	13	f. sand	black/black	12		1.5	4	7	4	8	8			2				6							7			2					5		
41PS14	MNP086	16	15	10	13	f. sand	black/black	7			3	8	7	11		4		3				3			8						2						3		
41PS14	MNP087	5	15	15	10	f. sand	black/black	10			8	8	8	15				5				3			8														
41PS14	MNP088	20	15	10	7	c. silt	black/black	6				12	11	20															8										
41PS14	MNP089	22.5	7	10	11	f. sand	black/black	3				15	12	12	3							4			7.5				4										glass-2
41PS14	MNP090	12	10	20	8	c. silt	black/black	20				5	6	12																		5						10	
41PS14	MNP091	21.5	7	10	10	c. silt	black/black	7		2		15	12	15				4				6																	felsite-0.5
41PS14	MNP092	15	7	10	12	f. sand	black/black	15		8		11	12	9				3											2								4		glass-2 dolomite-2
41PS14	MNP093	36	30	15	12	f. sand	red-br/ black	2				3	8	4				4				5			12														glass-5 caliche-3 calcite-5
41PS14	MNP094	10	10	5	10	f. sand	black/black	20				20	10	20																			1		1		1		glass-2
41PS14	MNP095	6	5	10	15	f. sand	black/black	15	5	6	5	8	4	12	5				1			3							5										glass-5
41PS14	MNP096	7	5	7	14	f. sand	green-gray/ gr. black	15			9	8	8	12				2											5			3		6			4		glass-7 dolomite-2
41PS14	MNP097	40	5	3	11	c. silt	black/black	14			9	10	4.5	9	3		1																	1					nepheline-0.5
41PS14	MNP098	21	3	7	9	c. silt	brown/ black	20		10		12	8	14	3																			2					
41PS14	MNP099	23	5	10	10	c. silt	black/black	15				6	8	12				5	3			10			3														
41PS14	MNP100	14	12	10	13	f. sand	black/black	13		2	4	6	7	12	6																	7							glass-3 nepheline 3
CH-E7-2	SBP001	21.5	10	10	11	f. sand	black/black	5			6	15	6	12	7	4															3		0.5						
CH-E7-2	SBP002	14	15	7	14	f. sand	red-br/ black	12	2	4		15	5	10							2	3							4	6									glass-tr. Chlorite-1
CH-E7-2	SBP003	6	10	5	15	f. sand	red-br/ black	10	5	7		15	12	9	2							4			3				3		3					3			
CH-E7-2	SBP004	3	15	5	11	f. sand	black/black	14	7	6	7	15	12	9		4																3							
CH-E7-2	SBP005	32	3	3	10	f. sand	black/black	10	10		8	10	8	8																						3	5		
CH-E7-2	SBP006	17	5	5	15	c. silt	black/black	12	8		7	8	8	6	3	2													2			4				3	4	6	

Table 2. Paste properties and characteristics in ceramic collection. Petrographic Data, La Junta de los Rios, CBBS/ SRSU. All figures are proportions of a 200 point count except PDI. * = anisotropic paste, tr. = trace

Site No.	Sherd No.	Matrix	Voids	Silt Fraction	PDI	Med. Particle size	Optical Paste Colors	Paste Group
41PS21	PVP001	9	12	7.5	19	fine sand	dk brown/ black	X
41PS21	PVP002	12.5	16.5	4.5	17	fine sand	black/black	A
41PS21	PVP003	7.5	12.5	7.5	24	med. Sand	black/black	Y
41PS21	PVP004	20	16.5	12.5	18	med. Sand	black/black	Y
41PS21	PVP005	2	6	1	16	med. Sand	black/black	A
41PS21	PVP006	7.5	12.5	9	18	fine sand	black/black	A
41PS21	PVP007	22.5	15	15.5	17	fine sand	blackish-red/ black	K
41PS21	PVP008	7.5	11.5	17.5	17	c. silt	black/black	K
41PS21	PVP009	6	12.5	12.5	18	c. silt	black/black	Y
41PS21	PVP010	4	16.5	tr.	17	med. Sand	black/black	O
41PS21	PVP011	17.5	12.5	27.5	16	c. silt	dk.gray/black	P
41PS21	PVP012	6.5	12.5	17	21	fine sand	red-black/black	NN
41PS21	PVP013	3.5	13	17.5	18	fine sand	red-black/black	U
41PS21	PVP014	6	17	5	18	med. Sand	black/black	L
41PS21	PVP015	4	17.5	7.5	24	fine sand	dk red-gray/ black	U
41PS21	PVP016	5.5	9	15.5	21	c. silt	black/black	AA
41PS21	PVP017	4.5	11.5	7.5	16	fine sand	black/black	X
41PS21	PVP018	4	18.5	3	17	med. Sand	green-brown/ black	V
41PS21	PVP019	10.5	17	21.5	16	c. silt	red-gray/black	BB
41PS21	PVP020	6.5	22	7.5	20	c. silt	dkgray-green/ black	V
41PS21	PVP021	7	20	6	17	fine sand	black/black	L
41PS21	PVP022	7	13.5	5.5	18	fine sand	black/black	L
41PS21	PVP023	13	10.5	14	21	fine sand	red-brown/ dk.gray	DD
41PS21	PVP024	4	10	15	18	fine sand	dk.gray/black	P
41PS21	PVP025	3.5	15.5	7	19	fine sand	red-gray/black	DD
41PS21	PVP026	4	17.5	4	21	f. sand	gr-brown/black	V
41PS21	PVP027	5	11.5	21.5	13	f. sand	dk. Gr.gray/ black	G
41PS21	PVP028	10	7.5	5	16	f. sand	brownish-black/black	G

Table 2. Paste properties and characteristics in ceramic collection. Petrographic Data, La Junta de los Rios, CBBS/SRSU. All figures are proportions of a 200 point count except PDI. * = anisotropic paste, tr. = trace (continued)

Site No.	Sherd No.	Matrix	Voids	Silt Fraction	PDI	Med. Particle size	Optical Paste Colors	Paste Group
41PS21	PVP029	4.5	8	5	21	f. sand	gr-brown/ black*	UU
41PS21	PVP041	4	9	6	19	f. sand	gr.gray-black	EE
41PS21	PVP042	13.5	8	2	19	c. silt	black-black	AA
41PS21	PVP043	6.5	21	5	18	f. sand	gr.gray-black	EE
41PS21	PVP061	5.5	22.5	5	18	c.silt	dk.green-ish-gray/black	G
41PS21	PVP062	21	10	2	15	med. Sand	dk. Gr.gray/ black	G
41PS21	PVP063	8	6.5	10	15	f. sand	black-black	A
41PS21	PVP064	15	15	5	15	f. sand	black-black	A
41PS21	PVP065	11	3	5	17	f. sand	red-brown/ black	DD
41PS21	PVP067	14	3	2	14	med. Sand	black-black	A
41PS21	PVP068	10	20	2	13	fine sand	black-black	O
41PS21	PVP069	5	5	5	14	med. Sand	black-black	K
41PS21	PVP070	15	8	10	13	c. silt	greengray/ black	G
41PS21	PVP071	4.5	20	2	15	f. sand	black-black	O
41PS21	PVP072	30	15	5	11	f. sand	black-black	O
41PS21	PVP080	19	20	2	10	f. sand	black-black	O
41PS21	PVP081	12	20	2	13	f. sand	black-black	O
41PS21	PVP082	22	5	2	13	f. sand	gr.green-black	V
41PS21	PVP083	19.5	10	10	14	f. sand	gr-brown/black	DD
41PS21	PVP084	4.5	6	5	14	f. sand	black-black	L
41PS21	PVP085	6.5	6	10	13	med. Sand	red-brown/ black	T
41PS21	PVP086	20	10	10	12	c. silt	black-black	K
41PS14	MNP001	4	15	2	19	f. sand	brow-gray/ black	CC
41PS14	MNP002	24	10	10	14	med sand	black-black	R
41PS14	MNP003	10	16	20	13	c. silt	brown-brown	JJ
41PS14	MNP004	6	15	15	11	f. sand	black-black	O
41PS14	MNP005	16.5	5	5	16	f. sand	brown/black	F
41PS14	MNP006	12	20	5	10	med. Sand	black-black	O

Table 2. Paste properties and characteristics in ceramic collection. Petrographic Data, La Junta de los Rios, CBBS/ SRSU. All figures are proportions of a 200 point count except PDI. * = anisotropic paste, tr. = trace (continued)

Site No.	Sherd No.	Matrix	Voids	Silt Fraction	PDI	Med. Particle size	Optical Paste Colors	Paste Group
41PS14	MNP007	8	7.5	7.5	13	c. silt	red-brown/ black	T
41PS14	MNP008	9.5	9	10	16	c. silt	gr-brown/ black-A	J
41PS14	MNP009	19	5	10	13	f. sand	black-black	AA
41PS14	MNP010	17	9	10	13	f. sand	red-brown/ black	BB
41PS14	MNP011	22	5	10	12	f. sand	gr.green- black-A	J
41PS14	MNP012	16	5	12	11	f. sand	red-brown/ black	DD
41PS14	MNP013	20	2.5	2	15	med sand	dk. Gr.gray/ black	EE
41PS14	MNP014	15.5	10	5	14	c. silt	re-black/black	U
41PS14	MNP015	28	15	5	11	c. silt	red-brown/ black	WW
41PS14	MNP016	25	20	10	13	med sand	black-black	O
41PS14	MNP017	25	5	10	16	f. sand	re-black/black	DD
41PS14	MNP018	27	5	5	13	f. sand	brown- ish-black/blak	A
41PS14	MNP019	17	15	10	19	med sand	black-black	H
41PS14	MNP020	4.5	5	10	19	f. sand	black-black	H
41PS14	MNP041	17	10	5	16	c. silt	dk green- ish-gray/black	EE
41PS14	MNP042	14.5	5	7.5	16	c. silt	black-black	Z
41PS14	MNP043	16.5	5	10	13	c. silt	reddish-gray/ black	BB
41PS14	MNP044	20	5	7.5	14	c. silt	black-black	AA
41PS14	MNP045	17	2	10	14	c. silt	reddish-gray/ black	BB
41PS14	MNP046	30	20	2	7	f. sand	brown/black	RR
41PS14	MNP047	29	15	3	12	f. sand	dk.red br/black	CC
41PS14	MNP048	30	20	2	8	f. sand	brown/black	RR
41PS14	MNP049	12.5	12.5	5	12	c. silt	black/black	M
41PS14	MNP050	20	10	5	9	f. sand	black/black	O

Table 2. Paste properties and characteristics in ceramic collection. Petrographic Data, La Junta de los Rios, CBBS/ SRSU. All figures are proportions of a 200 point count except PDI. * = anisotropic paste, tr. = trace (continued)

Site No.	Sherd No.	Matrix	Voids	Silt Fraction	PDI	Med. Particle size	Optical Paste Colors	Paste Group
41PS14	MNP051	8	3.5	7	11	f. sand	dk.brown/ black	K
41PS14	MNP061	30	40	1	10	f. sand	black/black	HH
41PS14	MNP062	30	10	7	9	f. sand	black/black	S
41PS14	MNP063	26	5.5	5	8	c. silt	red-br/black	T
41PS14	MNP064	15	12	7	12	f. sand	black/black	K
41PS14	MNP065	13.5	8	5	10	f. sand	black/black	L
41PS14	MNP067	7.5	15	5	14	f.sand	black/black	Z
41PS14	MNP068	20	10	10	12	f. sand	black/black	Z
41PS14	MNP069	30	15	7	13	f. sand	black/black	R
41PS14	MNP070	39	10	5	19	f. sand	black/black	C
41PS14	MNP071	45	15	5	11	f. sand	black/black	M
41PS14	MNP072	37.5	10	10	13	f. sand	black/black	K
41PS14	MNP073	21	20	15	12	f. sand	black/black	K
41PS14	MNP074	35	10	7	15	f. sand	black/black	AA
41PS14	MNP075	13	5	10	13	med. Sand	black/black	R
41PS14	MNP076	19	10	10	15	f. sand	black/black	Y
41PS14	MNP077	28	10	5	11	f. sand	black/black	M
41PS14	MNP078	32.5	5	7	13	f. sand	black/black	K
41PS14	MNP079	27	15	5	12	coarse silt	black/black	Z
41PS14	MNP080	58	3	2	12	c. silt	black/black	R
41PS14	MNP081	50	3	2	13	c. silt	black/black	Z
41PS14	MNP082	15	15	7	11	f. sand	black/black	A
41PS14	MNP083	26	20	3	12	f. sand	black/black	Q
41PS14	MNP084	27.5	10	10	12	f. sand	black/black	A
41PS14	MNP085	12.5	20	1	13	f. sand	black/black	Y
41PS14	MNP086	16	15	10	13	f. sand	black/black	Y
41PS14	MNP087	5	15	15	10	f. sand	black/black	K
41PS14	MNP088	20	15	10	7	c. silt	black/black	M
41PS14	MNP089	22.5	7	10	11	f. sand	black/black	K
41PS14	MNP090	12	10	20	8	c. silt	black/black	K
41PS14	MNP091	21.5	7	10	10	c. silt	black/black	M
41PS14	MNP092	15	7	10	12	f. sand	black/black	Z
41PS14	MNP093	36	30	15	12	f. sand	red-br/black	BB

Table 2. Paste properties and characteristics in ceramic collection. Petrographic Data, La Junta de los Rios, CBBS/ SRSU. All figures are proportions of a 200 point count except PDI. * = anisotropic paste, tr. = trace (continued)

Site No.	Sherd No.	Matrix	Voids	Silt Fraction	PDI	Med. Particle size	Optical Paste Colors	Paste Group
41PS14	MNP094	10	10	5	10	f. sand	black/black	TT
41PS14	MNP095	6	5	10	15	f. sand	black/black	Y
41PS14	MNP096	7	5	7	14	f. sand	green-gray/ gr.black	EE
41PS14	MNP097	40	5	3	11	c. silt	black/black	A
41PS14	MNP098	21	3	7	9	c. silt	brown/black	B
41PS14	MNP099	23	5	10	10	c. silt	black/black	K
41PS14	MNP100	14	12	10	13	f. sand	black/black	K
CH-E7-2	SBP001	21.5	10	10	11	f. sand	black/black	K
CH-E7-2	SBP002	14	15	7	14	f. sand	red-br/black	I
CH-E7-2	SBP003	6	10	5	15	f. sand	red-br/black	BB
CH-E7-2	SBP004	3	15	5	11	f. sand	black/black	K
CH-E7-2	SBP005	32	3	3	10	f. sand	black/black	Y
CH-E7-2	SBP006	17	5	5	15	c. silt	black/black	Y
CH-E7-2	SBP007	11	5	3	10	f. sand	black/black	N
CH-E7-2	SBP008	10	15	7	14	f. sand	red-brown/ black	BB
CH-E7-2	SBP009	11.5	27.5	5	16	f. sand	black/black	HH
CH-E7-2	SBP010	5	5	15	11	c. silt	black/black	K
CH-E7-2	SBP011	16.5	3	40	7	c. silt	red-black/black	E
CH-E7-2	SBP012	11	7	2	11	f. sand	black/black	A
CH-E7-2	SBP013	45	2	2	11	med. Sand	green-gr./black	EE
CH-E7-2	SBP014	20	15	5	9	f. sand	black/black	M
CH-E7-2	SBP015	10	10	15	12	c. silt	black/black	A
CH-E7-2	SBP016	6.5	10	5	15	f. sand	black/black	Z
CH-E7-2	SBP017	7	5	10	12	c. silt	black/black	Y
CH-E7-2	SBP018	15	3	10	10	f. sand	red-brown/ black	BB
CH-E7-2	SBP019	28	10	15	9	f. sand	black/black	X
CH-E7-2	SBP020	30	10	3	12	f. sand	black/black	K
CH-E7-2	SBP021	23.5	7	3	8	c. silt	black/black	Y
CH-E7-2	SBP022	9	7	15	9	c. silt	black/black	N
CH-E7-2	SBP023	8	20	3	8	med. Sand	black/black	M
CH-E7-2	SBP024	7	5	15	8	f. sand	black/black	K
CH-E7-2	SBP025	38	7	10	11	c. silt	black/black	X

Table 2. Paste properties and characteristics in ceramic collection. Petrographic Data, La Junta de los Rios, CBBS/SRSU. All figures are proportions of a 200 point count except PDI. * = anisotropic paste, tr. = trace (continued)

Site No.	Sherd No.	Matrix	Voids	Silt Fraction	PDI	Med. Particle size	Optical Paste Colors	Paste Group
CH-E7-2	SBP026	25	5	5	8	c. silt	black/black	B
CH-E7-2	SBP027	23	10	15	8	f. sand	black/black	B
CH-E7-2	SBP028	14	10	5	9	f. sand	black/black	Z
CH-E7-2	SBP029	12	15	7	13	f. sand	black/black	N
CH-E7-2	SBP030	10	8	5	11	f. sand	black/black	K
CH-E7-2	SBP031	5	15	10	12	f. sand	black/black	AA
CH-E7-2	SBP032	18	10	5	10	f. sand	black/black	R
CH-E7-2	SBP033	18	5	15	8	f. sand	black/black	M
CH-E7-2	SBP034	18	10	10	8	f. sand	black/black	K
CH-E7-2	SBP035	13	15	5	9	f. sand	gr.-black/black	V
CH-E7-2	SBP036	8	20	20	11	c. silt	black/black	AA
CH-E7-2	SBP037	27	2	10	12	c. silt	black/black	K
CH-E7-2	SBP038	13	15	10	12	f. sand	black/black	A
CH-E7-2	SBP039	12	5	2	11	f. sand	black/black	Y
CH-E7-2	SBP040	11.5	5	7	12	f. sand	black/black	A
CH-E7-2	SBP041	36.5	7	5	10	f. sand	gr.-black/black	EE
CH-E7-2	SBP042	27	12	7	10	c. silt	black/black	M
CH-E7-2	SBP043	13	20	10	10	f. sand	black/black	K
CH-E7-2	SBP044	21	5	10	12	c. silt	black/black	K
CH-E7-2	SBP045	24	10	15	9	c. silt	black/black	M
CH-E7-2	SBP046	27	10	3	11	c. silt	red-brown/ black	BB
CH-E7-2	SBP051	10	10	10	16	c. silt	black/black	AA
CH-E7-2	SBP052	10	15	15	13	c. silt	black/black	A
CH-E7-2	SBP053	31	5	10	12	c. silt	black/black	K
CH-E7-2	SBP054	37	3	3	13	med. Sand	black/black	DD
CH-E7-2	SBP055	18	10	10	11	f. sand	black/black	Z
CH-E7-2	SBP056	16	7	7	14	c. silt	black/black	X
CH-E7-2	SBP057	32	10	5	12	f. sand	black/black	L
CH-E7-2	SBP058	31	5	7	10	c. silt	black/black	B
CH-E7-2	SBP061	26.5	8.5	5	19	c. silt	black/black	AA
CH-E7-2	SBP062	35	7	3	14	f. sand	black/black	A
CH-E7-2	SBP063	33.5	3	12	13	c. silt	black/black	K
CH-E7-2	SBP064	25	3	7	14	c. silt	yellow-gray/ black	II

Table 2. Paste properties and characteristics in ceramic collection. Petrographic Data, La Junta de los Rios, CBBS/SRSU. All figures are proportions of a 200 point count except PDI. * = anisotropic paste, tr. = trace (continued)

Site No.	Sherd No.	Matrix	Voids	Silt Fraction	PDI	Med. Particle size	Optical Paste Colors	Paste Group
CH-E7-2	SBP065	31	7	3	10	med. Sand	black/black	QQ
41PS16	KBP001	23	15	10	11	c. silt	black/black	K
41PS16	KBP002	30	15	10	12	f. sand	yellow-brown/ black	II
41PS16	KBP003	17	15	15	12	f. sand	black/black	A
41PS16	KBP004	12.5	5	20	13	c. silt	red-gray/black	U
41PS16	KBP005	9.5	5	30	14	c. silt	red-brown/ black	DD
41PS16	KBP006	17	15	2	12	med. Sand	black/black	GG
41PS16	KBP007	14	15	3	8	f. sand	black/black	N
41PS16	KBP008	24	15	7	13	f. sand	black/black	X
41PS16	KBP009	36	10	5	12	f. sand	Dk.gray brown/black	OO
41PS16	KBP010	20	5	15	10	c. silt	red-brown/ black	T
41PS16	KBP011	10.5	15	20	15	f. sand	red-brown/ black	NN
41PS16	KBP012	15.5	10	10	18	f. sand	yellow-brown/ black	II
41PS16	KBP013	33.5	7	5	14	f. sand	red-brown/ black	BB
41PS16	KBP014	30	10	10	12	f. sand	black/black	X
41PS16	KBP015	24	10	15	14	c. silt	black/black	LL
41PS16	KBP016	30	15	15	12	c. silt	black/black	N
41PS16	KBP017	27	10	10	8	f. sand	black/black	M
41PS16	KBP018	44	3	2	10	f. sand	red-gray/black	U
41PS16	KBP019	23	20	5	10	f. sand	red-gray/black	CC
41PS16	KBP020	13	25	10	9	f. sand	red-gray/black	T
41PS16	KBP021	33	10	5	14	f. sand	black/black	Z
41PS16	KBP022	32	7	5	11	c. silt	reddish-black/ black	BB
41PS16	KBP023	21.5	7	10	17	f. sand	black/black	X
41PS16	KBP024	43	5	3	15	f. sand	black/black	Y
41PS16	KBP025	34.5	2	15	14	c. silt	black/black	MM
41PS16	KBP026	29	5	5	14	f. sand	black/black	MM

Table 2. Paste properties and characteristics in ceramic collection. Petrographic Data, La Junta de los Rios, CBBS/ SRSU. All figures are proportions of a 200 point count except PDI. * = anisotropic paste, tr. = trace (continued)

Site No.	Sherd No.	Matrix	Voids	Silt Fraction	PDI	Med. Particle size	Optical Paste Colors	Paste Group
41PS16	KBP027	10	10	3	14	f. sand	red-brown/ black	NN
41PS16	KBP028	25.5	5	10	14	f. sand	black/black	A
41PS16	KBP029	26	10	10	11	c. silt	black/black	AA
41PS16	KBP030	62	7	3	9	f. sand	black/black	M
41PS16	KBP031	31	20	5	15	f. sand	reddish-black/ black	NN
41PS16	KBP032	33	5	10	11	c. silt	red-brown/ black	T
41PS16	KBP033	36	7	10	13	c. silt	black/black	MM
41PS16	KBP034	43	10	7	12	f. sand	black/black	MM
41PS16	KBP035	49	5	10	11	c. silt	black/black	X
41PS16	KBP036	37	2	25	12	c. silt	reddish-black/ black	D
41PS16	KBP037	34	10	10	12	c. silt	black/black	A
41PS16	KBP038	38	10	3	11	f. sand	black/black	AA
41PS16	KBP039	47	10	15	10	f. sand	red-brown/ black	T
41PS16	KBP040	45	5	5	13	f. sand	greenish gray/ black	FF
41PS16	KBP041	39	10	10	13	med. Sand	red-brown/ black	T
41PS16	KBP042	55	7	5	13	c. silt	red-gray/black	BB
41PS16	KBP043	18	10	7	11	f. sand	black/black	M
41PS16	KBP044	23	9	10	20	c. silt	greenish gray/ black	EE
41PS16	KBP045	44	5	7	13	f. sand	black/black	K
41PS16	KBP046	41	5	7	12	c. silt	red-brown/ black	BB
41PS16	KBP047	27	10	5	9	c. silt	black/black	Q
41PS16	KBP048	40	12	3	12	f. sand	red-brown/ black	BB
41PS16	KBP049	33	7	15	12	f. sand	red-brown/ black	BB
41PS16	KBP050	53	10	7	10	f. sand	red-brown/ black	CC

Table 2. Paste properties and characteristics in ceramic collection. Petrographic Data, La Junta de los Rios, CBBS/SRSU. All figures are proportions of a 200 point count except PDI. * = anisotropic paste, tr. = trace (continued)

Site No.	Sherd No.	Matrix	Voids	Silt Fraction	PDI	Med. Particle size	Optical Paste Colors	Paste Group
41PS16	KBP051	37	10	7	10	f. sand	black/black	N
41PS16	KBP052	22	7	5	14	f. sand	black/black	Z
41PS16	KBP053	17	15	5	13	f. sand	red-black/black	U
41PS16	KBP054	36.5	10	15	14	f. sand	gr./brown/ black	VV
41PS16	KBP055	27	7	5	10	c.silt	black/black	Y
41PS16	KBP056	28	10	3	11	f. sand	black/black	Z
41PS16	KBP057	31.5	20	7	13	f. sand	black/black	GG
41PS16	KBP058	47	5	5	10	f. sand	black/black	M
41PS16	KBP059	37	10	5	14	c.silt	red-brown/ black	NN
41PS16	KBP060	19	15	10	12	f. sand	gr./brown/ black	OO
41PS16	KBP061	40	10	10	12	f. sand	black/black	MM
41PS16	KBP062	39	3	5	14	f. sand	black/black	N
41PS16	KBP063	16	20	5	14	f. sand	black/black	A
41PS16	KBP064	22.5	15	4	14	c. silt	greenish gray/ black	EE
41PS16	KBP065	7	20	10	12	f. sand	black/black	X
41PS16	KBP066	53.5	10	5	12	c.silt	black/black	MM
41PS16	KBP067	66	3	3	13	c.silt	black/black	A
41PS16	KBP068	36	10	7	13	c.silt	gr./brown/ black-A	J
41PS16	KBP069	33	7	7	12	c.silt	gr./brown/ black	EE
41PS16	KBP070	35	15	3	9	c.silt	black/black	MM
41PS16	KBP071	29	3	10	12	c.silt	red-brown/ black	NN
41PS16	KBP072	31.5	15	10	12	c.silt	black/black	K
41PS16	KBP073	38	3	20	14	c.silt	black/black	K
41PS16	KBP074	46	2	5	12	c.silt	gr./brown/ black	G
41PS16	KBP075	50	2	7	9	c.silt	red-brown/ black	T

Table 2. Paste properties and characteristics in ceramic collection. Petrographic Data, La Junta de los Rios, CBBS/ SRSU. All figures are proportions of a 200 point count except PDI. * = anisotropic paste, tr. = trace (continued)

Site No.	Sherd No.	Matrix	Voids	Silt Fraction	PDI	Med. Particle size	Optical Paste Colors	Paste Group
41PS16	KBP076	10	20	5	11	f. sand	black/black	K
41PS16	KBP077	42	10	5	12	f. sand	black/black	AA
41PS16	KBP078	30	15	7	12	f. sand	black/black	N
41PS16	KBP079	57	2	5	5	c.silt	red-black/black	KK
41PS16	KBP080	26	10	10	12	f. sand	yellow-brown/ black	PP
41PS14	MNP021	44	3	3	10	f. sand	black/black	Y
41PS14	MNP022	29	15	15	10	c.silt	black/black	X
41PS14	MNP023	51	3	10	9	f. sand	black/black	K
41PS14	MNP024	17	15	5	9	f. sand	red-brown/ black	BB
41PS14	MNP025	43	2	15	8	c.silt	black/black	N
41PS14	MNP026	34	1	15	8	c.silt	gr./brown/ black	W
41PS14	MNP027	51.5	2	5	10	med. Sand	gr./brown/ black	W
41PS14	MNP028	39	5	15	10	c.silt	red-black/black	BB
41PS14	MNP029	6	1	50	5	c.silt	red-black/black	SS
41PS14	MNP030	45	3	3	7	med. Sand	black/black	N
41PS21	PVP087	4	1	30	13	c.silt	gr./brown/ black	EE
41PS21	PVP088	36	5	25	13	c.silt	black/black	Y
41PS21	PVP089	39	15	2	12	med. Sand	gr./brown/ black	FF
41PS21	PVP090	11	3	35	12	c.silt	gr./brown/ black	FF
41PS21	PVP091	44	3	7	12	c.silt	black/black	AA
41PS21	PVP092	45	2	20	12	c.silt	gr./brown/ black	V
41PS21	PVP093	24	15	10	13	c.silt	black/black	N
41PS21	PVP094	26	5	15	15	c.silt	red-brown/ black	DD
41PS21	PVP095	40	5	5	13	c.silt	black/black	X

Table 3. Proportions of Rocks and Minerals in CBBS ceramics collection by David Glen Robinson. Proportions of a 200 point count. tr. = trace

		Rocks and minerals																													
sherd No.	**Paste Group**	**common Qtz**	**composite Qtz**	**chert**	**quartzite**	**sandstone**	**vitr tuff**	**crys tuff**	**lith tuff**	**glass**	**plagioclase**	**alkali feldspar**	**olivine**	**diorite**	**diabase**	**andesite**	**granite**	**gabbro**	**trachyte**	**rhyolite**	**nepheline**	**basalt**	**ferric hematite**	**ferrous hematite**	**iron ore (var.)**	**muscovite**	**biotite**	**limestone/ micrite**	**calcite/ caliche**	**mellilite**	**miscellaneous**
PVP001	X	10	3	0.5			2	1.5	6		7	2.5	1	5	9	1	0.5			0.5			8.5					4			egg case-0.5 clinopyroxene-0.5 nepheline syanite-1.5
PVP002	A	22	2.5	1			1	7	15.5		5.5	2.5	3				0.5						3				1				unk min-0.5
PVP003	Y	9	1.5	7		3	5.5	9.5	3		0.5	4			5	1	1		6			1	1.5					3.5			
PVP004	Y	11.5		1		0.5	1	0.5			5	1	3	0.5	23							1		0.5				1.5			pyroxenite-0.5 unk orange-1
PVP005	A	45.5	3.5	3			17.5	4	8		5		1		1		0.5					1		1.5			0.5				unk orange-0.5
PVP006	A	34.5	1	2.5		2	4	1	9		6	1.5	2		1		0.5					2		4.5			1.5				bone-0.5
PVP007	K	17	2	2		1	5	2	9		4.5	1			0.5	0.5	0.5							0.5							felsite-1 volc. Qtz-1
PVP008	K	19.5	2.5	3		1	19	15	5		5	1.5			1		0.5					2									felsite-1 myrmekite-0.5
PVP009	Y	15.5	1			0.5	1	3	1.5		3	6			27		0.5		2.5			3.5		4.5				2			volc. Qtz-0.5
PVP010	O	19.5				0.5	19	0.5			4.5	2			17.5			2.5	3	2	2	5.5	0.5								
PVP011	P	11	1	2			4.5	2	2.5			0.5	0.5				1		4			0.5		7							perovskite? 6 Leucite- 0.5
PVP012	NN	12.5	1	6.5		1	4.5	1	13.5		7.5	1			0.5	2			2.5		2.5	0.5		6			1			0.5	clinopyroxene-0.5 nepheline syanite-0.5
PVP013	U	9.5	1	2.5		0.5	4.5	2			5	0.5	0.5		22.5			0.5	0.5		5	3		8							clinopyroxene-0.5
PVP014	L	34.5	2.5	4		0.5	4.5	0.5	12.5		4.5	2	0.5		1.5				1						2						orthopyroxene-0.5
PVP015	U	24	1.5	8		1	15	2.5	4		3	0.5			2.5				1					5.5							basaltic tuff-2.5
PVP016	AA	27	15	7		4	4.5	2	2.5		1	0.5	1	0.5		2.5			1		0.5		0.5	7		4		2			unk orange-tr. Basaltic tuff-1
PVP017	X	31.5		2.5		8.5	5	3.5	6.5		1.5	0.5		2					10	1		2									basaltic tuff-1
PVP018	V	15.5	1.5	5			12	2	3.5		6.5			3		1			5.5		5	2.5		4							basaltic tuff-0.5 unk clastic-7
PVP019	BB	8				1	2		7		4		0.5	0.5	4			5	1		0.5		15.5						1.5		clinopyroxene-0.5
PVP020	V	8.5	1	1.5		2	8	6.5	15.5		0.5	0.5		0.5	1.5	1		1.5	8		1	1.5		5.5							unk clastic-2.5
PVP021	L	14.5		1.5			3	0.5	3		3.5	1	1.5	5	10				7.5	2	2	8.5		3.5							
PVP022	L	21	1	1			2	1	5.5		3.5	3	1.5	5.5	20				2.5	2	1	3									unk clastic-0.5
PVP023	DD	9.5	0.5	1			1.5	1.5	5.5		2	1	1.5	12.5	10				2	1	1.5	3		2.5		5.5			0.5		
PVP024	P	9.5		0.5		0.5	2	1	3		4	2	0.5	12.5	7				2	2.5	2	10.5			11.5						
PVP025	DD	19.5	1	12		1.5	4.5	2.5	16.5		0.5		0.5		2.5				5	1		2		4		0.5			0.5		spher. Qtz?-0.5
PVP026	V	15	1				12		4.5			1	1.5			1	1	3	2			0.5	8.5								
PVP027	G	6					5.5				4.5			9	9.5					1.5	4	7.5		10			3.5				opalized chert-1
PVP028	G	23.5		8			13.5	1.5			7.5	1.5	5.5						3.5	5.5		1.5		0.5		3	1				orthoclase-1.5
PVP029	UU	8.5	1.5	3	4		1		6		4.5		2				0.5		4	2	3.5	6.5		12		7.5	2.5		1.5		
PVP041	EE	6					7		6.5		5	tr.	2.5	10	10				0.5	6	3	8	8.5			4.5			2		pyroxene-1
PVP042	AA	17.5	2.5		5.5		15	5.5	5.5		1.5	0.5		1.5	0.5	1			8	1.5	5	1				4			0.5		
PVP043	EE	15.5	1				7.5	3.5	1.5		3	1		4	7.5	1			3	2		14		7.5		0.5			0.5		
PVP061	G	12.5	1.5	3.5	2		5		4		3	0.5		3	2.5				5	5.5		5		9.5		0.5					unk VRFs-4

Table 3. Proportions of Rocks and Minerals in CBBS ceramics collection by David Glen Robinson. Proportions of a 200 point count. tr. = trace (continued)

		Rocks and minerals																													
sherd No.	Paste Group	common Qtz	composite Qtz	chert	quartzite	sandstone	vitr tuff	crys tuff	lith tuff	glass	plagioclase	alkali feldspar	olivine	diorite	diabase	andesite	granite	gabbro	trachyte	rhyolite	nepheline	basalt	ferric hematite	ferrous hematite	iron ore (var.)	muscovite	biotite	limestone/ micrite	calcite/ caliche	mellilite	miscellaneous
PVP062	G	20	1	2			14.5	5	2		3				1				3				8			5					sheared m. quartz-0.5
PVP063	A	10					1	0.5	2		5		3		7				4	3		15		12		5					
PVP064	A	20	3				10		3	3	4				3			0.5	2		1	6		7		2.5					
PVP065	DD	11					4	2	7		3			8	16	2			6		4	7.5		5		4			0.5		
PVP067	A	8	1	3			3		18					15	3				3		16					5	1				
PVP068	O	8			5		4	8	16		2	2						1	8		5										
PVP069	K	5		8	12		15	3	10		3	5			1				8		9			6							
PVP070	G	20					6	10	12		4		0.5		1							2	7.5			2					
PVP071	O	8	1	12	5		4	8	16		2	2						1	8		5										
PVP072	O	11		7	9		5	2	4		4								3		5										
PVP080	O	15	9	8			6		11		2				3				5												
PVP081	O	12		6			2	1	8		4			5	7				6		12	3									
PVP082	V	10		5			2	2	6	3	6			6	15							8		8							
PVP083	DD	11	1	10	3		5	4	6	1	11				3											5			0.5		
PVP084	L	10		2			3.5	1	6	1	12		6		15				6			17			8						
PVP085	T	15		11	3		5	2	13	0.5	4		2						8					15							
PVP086	K	5		tr.			8	2	14		3				7				3		6	12									
MNP001	CC	4	4	9	8	1	7		7		2				1				6	2	3	12	4					2			granophyre-5 dolomite-2
MNP002	R	10		8	10		5	0.5	5	0.5	4			1		5				5	2										
MNP003	JJ	11			6		3		6	2					3	5						8		6		3			1		
MNP004	O	18	4	8			6	1	5		6		2											14							
MNP005	F	5		2	12		5	2	8	0.5				1	3				7	2		5	6			5					
MNP006	O	25		10	5		3	1	12		5			2																	
MNP007	T	21		0.5	8		10	8	12		3			6	3				5			0.5									
MNP008	J	15		5	6		5	5	7		4		0.5	3	3	10						2		3		3					
MNP009	AA	12					6	5	12		6			7	4					5		1				5			3		
MNP010	BB	18		11			9	2	7	tr.	4	2		2	1							3							5		
MNP011	J	12		9			3	2	7					2	1					15		7				5					
MNP012	DD	12					3	2	8	0.5	9			1					6			15				8			3		
MNP013	EE	5	1		15		9	2	8			2		1	3				15			5		0.5					1		
MNP014	U	10		3	3		15	2	8		6	2								1				16							
MNP015	WW	20		16	4						4				2	2									2				2		orthopyroxene-0.5
MNP016	O	7		4	2.5		4	6	7		3.5			2		1						2		5							

Table 3. Proportions of Rocks and Minerals in CBBS ceramics collection by David Glen Robinson. Proportions of a 200 point count. tr. = trace (continued)

		Rocks and minerals																															
sherd No.	**Paste Group**	**common Qtz**	**composite Qtz**	**chert**	**quartzite**	**sandstone**	**vitr tuff**	**crys tuff**	**lith tuff**	**glass**	**plagioclase**	**alkali feldspar**	**olivine**	**diorite**	**diabase**	**andesite**	**granite**	**gabbro**	**trachyte**	**rhyolite**	**nepheline**	**basalt**	**ferric hematite**	**ferrous hematite**	**iron ore (var.)**	**muscovite**	**biotite**	**limestone/ micrite**	**calcite/ caliche**	**mellilite**	**miscellaneous**
MNP017	DD	11		2	3		3	4.5	6		3.5		1.5		7						3.5	5				3	2		5		
MNP018	A	15			4.5		8	6	10.5	1	3			2	3.5										6.5		3				
MNP019	H	10	1.5	6	6	0.5	4.5	0.5	3.5	1	4.5	2.5		2						1				2		3					
MNP020	H	11	2	8	5		9	3	11	2	10	3	1.5	2						1	1	2		7			2				
MNP041	EE	10	2.5	6.5	2.5	0.5	4	2.5	5.5						1				2			3		3				2	0.5		
MNP042	Z	12	0.5	12	11	0.5	7	8	8							0.5					2	4		3				3			felsite-2
MNP043	BB	5		10	13	tr.	6	4	19		4		0.5							4								1.5	1.5		
MNP044	AA	11	12		2		3.5	1.5	15.5		6.5							2	3.5				7.5				1		2		
MNP045	BB	8		12	10		12	8	6		2.5									2		2.5			3			2	3		
MNP046	RR	10.5		0.5					11													10				1					bone temper-25
MNP047	CC	12		7	5		3	6	12					3					3	1				1							
MNP048	RR	10.5		0.5					1													10				1					bone temper-25
MNP049	M	12	3				15	8	12	3	2		2						7			6									
MNP050	O	1					15	15	20										7	3	4										
MNP051	K	50					6	3	8			0.5							2.5	4	1		6.5								
MNP061	HH	10					1	2	15											tr.	1					tr.		tr.			
MNP062	S	2.5						3				5		10	15				9.5			8									
MNP063	T	15					17	9	11			5													7.5						
MNP064	K	8		12			10	4	8		8	4								3	2				6						
MNP065	L	12					8	7.5	15	1	10	8								2											
MNP067	Z	20		5	2		10	7	15						5				2		1.5	3							1		volc. Qtz-1
MNP068	Z	15			6		15	6	8					2								3		3				1	1		
MNP069	R	5		5	4		3	5	12										5	2		4			1.5						unk VRFs-1.5
MNP070	C	5		1		3	5	5	7	2	4	1	tr.	1					3		4	1		3		1					
MNP071	M	4					3	2	9	1	5	1							5	5											
MNP072	K	7			3	1	3	3	5		7		0.5						5	3					5						
MNP073	K	7			3		2	3	5		7		1						5			1			5						
MNP074	AA	2			3		6	2	10	3	7	1							4			2				2			5		ilmenite-1
MNP075	R					3	11	8	15	3	4	2			2				7			6		6							
MNP076	Y	2				4	3	7	12			3			6				5	5	2	4			6				2		
MNP077	M	12			8	6	3	6	9										5	4		4									
MNP078	K	12	8		7		5	3	2		7	1		5	5				0.5												
MNP079	Z	10		1	5		6	3	6			15							4					2					1		

Table 3. Proportions of Rocks and Minerals in CBBS ceramics collection by David Glen Robinson. Proportions of a 200 point count. tr. = trace (continued)

		Rocks and minerals																															
sherd No.	Paste Group	common Qtz	composite Qtz	chert	quartzite	sandstone	vitr tuff	crys tuff	lith tuff	glass	plagioclase	alkali feldspar	olivine	diorite	diabase	andesite	granite	gabbro	trachyte	rhyolite	nepheline	basalt	ferric hematite	ferrous hematite	iron ore (var.)	muscovite	biotite	limestone/ micrite	calcite/ caliche	mellilite	miscellaneous
MNP080	R	1			4		3	2	7	3	4				5				1			5									volc qtz-1
MNP081	Z	1			4		8	8	6		3				1				4			5							4		volc qtz-1
MNP082	A	7	4		2		8	11	12		4				14												1				
MNP083	Q	15	5		4		4	2	6		5								5		1	4									
MNP084	A	9					10	7	6		5			3							3	5					3				ilmenite-0.5
MNP085	Y	12		1.5	4		7	4	8		8				2				6			7			2				5		
MNP086	Y	7			3		8	7	11			4			3				3	8				2					3		
MNP087	K	10			8		8	8	15						5				3	8											
MNP088	M	6					12	11	20													8									
MNP089	K	3					15	12	12	2	3								4	7.5		4									
MNP090	K	20				10	5	6	12																5						
MNP091	M	7		2			15	12	15						4				6												felsite-0.5
MNP092	Z	15		8			11	12	9	2					3							2							4		dolomite-2
MNP093	BB	2					3	8	4	5					4				5	12											calc-3 caliche-5
MNP094	TT	20					20	10	20	2			1														1		1		
MNP095	Y	15	5	6	5		8	4	12	5	5					1			3			5									
MNP096	EE	15			9		8	8	12	7					2							5			3	6			4		dolomite-2
MNP097	A	14			9		10	4.5	9		3			1							0.5					1					
MNP098	B	20		10			12	8	14		3															2					
MNP099	K	15					6	8	12						5	3			10	3											
MNP100	K	13		2	4		6	7	12	3	6										3				7						
SBP001	K	5			6		15	6	12		7	4	0.5											3							
SBP002	I	12	2	4			15	5	10	tr.								2	3			4	6								chlorite-1
SBP003	BB	10	5	7			15	12	9		2								4	3		3		3				3			
SBP004	K	14	7	6	7		15	12	9			4													3						
SBP005	Y	10	10		8		10	8	8																			3	5		
SBP006	Y	12	8		7	6	8	8	6		3	2										2			4			3	4		
SBP007	N	15		7	8		12	15	20																3						unk orange-1
SBP008	BB	8	3		8		10	10	16	1	1								2	2									7		
SBP009	HH	8		4			7	9	15	3	3										1					1	0.5	5	5		dolomite-5
SBP010	K	20		8	8	3	11	8	12	3	2																				
SBP011	E	10		5			20																			5	0.5				
SBP012	A	20	3	8	10		20	11			2			1													5				

Table 3. Proportions of Rocks and Minerals in CBBS ceramics collection by David Glen Robinson. Proportions of a 200 point count. tr. = trace (continued)

		Rocks and minerals																													
sherd No.	Paste Group	common Qtz	composite Qtz	chert	quartzite	sandstone	vitr tuff	crys tuff	lith tuff	glass	plagioclase	alkali feldspar	olivine	diorite	diabase	andesite	granite	gabbro	trachyte	rhyolite	nepheline	basalt	ferric hematite	ferrous hematite	iron ore (var.)	muscovite	biotite	limestone/ micrite	calcite/ caliche	mellilite	miscellaneous
SBP013	EE	5		2			10	5	2	5									5							5		5	10		
SBP014	M	10			6		15	15	10				1								3		tr.								
SBP015	A	5		5	10		15	6	9	2									9					2		2					
SBP016	Z	10		2	4	1	15	12	10			2	1						10									6	5		bone-0.5
SBP017	Y	10		7	10		20	8	10		1												2					5	5		
SBP018	BB	8			7		15	12	18											2								5	5		
SBP019	X	5		4	3		15	5	7		2		1															3	2		
SBP020	K	5		2	2	1	15	10	12		2								5				3								
SBP021	Y	10					20	15	20													0.5							1		
SBP022	N	5			2		20	15	20										4						3						
SBP023	M	6					20	20	20													2									volc. Quartz-1
SBP024	K	15		3			20	15	15										5												
SBP025	X	5				2	10	7	12		2								4									1	2		
SBP026	B	5					20	15	22																2		1				
SBP027	B	5			3		15	8	20																	1					
SBP028	Z	10			3		20	15	20													2							1		
SBP029	N	10	2		4		20	10	5						1				3	4		3			4						
SBP030	K	10		4	5	2	12	15	20										6			3									
SBP031	AA	10			5		18	15	12	3				3													3		1		
SBP032	R	4		3	4	2	20	12	18											4											
SBP033	M	5			5		15	17	19		1																				
SBP034	K	5			3		20	13	20																						granophyre-1
SBP035	V	5		10	3		20	12	15													2									
SBP036	AA	10				2	8	8	15	1												2				3			3		
SBP037	K	15		4	12		7	8	5				0.5			0.5			2						7						
SBP038	A	10		2	4	3	12	9	15													3		3			1				
SBP039	Y	12		4	2	6	18	14	16		2													6					1		
SBP040	A	12			5	3	20	15	12				0.5									3			5		1				
SBP041	EE	5			4		18	12	8																			2	2		felsite-0.5
SBP042	M	15		2	7		8	7	12													2									granophyre-1
SBP043	K	20		5		2	8	10	6										4			2									
SBP044	K	15		3	7	3	8	9	10						2				3			4									
SBP045	M	12	2		4		10	8	12										3												

Table 3. Proportions of Rocks and Minerals in CBBS ceramics collection by David Glen Robinson. Proportions of a 200 point count. tr. = trace (continued)

		Rocks and minerals																													
sherd No.	**Paste Group**	**common Qtz**	**composite Qtz**	**chert**	**quartzite**	**sandstone**	**vitr tuff**	**crys tuff**	**lith tuff**	**glass**	**plagioclase**	**alkali feldspar**	**olivine**	**diorite**	**diabase**	**andesite**	**granite**	**gabbro**	**trachyte**	**rhyolite**	**nepheline**	**basalt**	**ferric hematite**	**ferrous hematite**	**iron ore (var.)**	**muscovite**	**biotite**	**limestone/ micrite**	**calcite/ caliche**	**mellilite**	**miscellaneous**
SBP046	BB	7			4	3	15	12	9											2		5						3			
SBP051	AA	15		5	3		5	8	7			4	3		2							2		5		5	5		2		
SBP052	A	12		2	5		7	8	10	2	2			3	4											5					
SBP053	K	15		2	10		8	4	7			3							2	1											
SBP054	DD	10					8	4	10				3						4			2		3			3	5	5		
SBP055	Z	15		4			9	8	10					2								4						5	5		
SBP056	X	12		8			10	7	8		7			3	3								3	3			4		2		
SBP057	L	20		3	7	4	6	2	3										5			2									
SBP058	B	10			4		6	8	12		5								8							4					
SBP061	AA	17.5	0.5	3.5		1.5	14	4	3.5	0.5				2.5	0.5		2		2.5	2.5		tr.		1.5			0.5		3		
SBP062	A	10	3	4		2	4	6	8				1	3	3							9				2					
SBP063	K	5		2	7		4	9	8	4		3					0.5		6	3											
SBP064	II	10			3		8	7	8		3			2						3	2			10		5		4			
SBP065	QQ	4		2	2		8	9	5										4			4			25						
KBP001	K	8		5			8	7	8	3	4								5			4									
KBP002	II	8		2			6	4	8	4	5											3			2				3		
KBP003	A	8			5		5	3	7										7			3			5	5	5				
KBP004	U	5	2		8		12	6	15	0.5	3			2					6					3							
KBP005	DD	4					12	7	5		4								3			2	3	3		4			4		fossil snail-0.5
KBP006	GG	4		4			12	11	15												3	3		5				4	5		
KBP007	N	10					14	18	18		5														3						
KBP008	X	5		6			12	6	8			2		2					3			4						3	3		
KBP009	OO	8					8	7	5		2			3	5					4		2								5	
KBP010	T	15			12		3	5	10											3		9			3						
KBP011	NN	10		3			7	3	8	2										4		2	3	1					1	10	Qtz w/rutile-0.5
KBP012	II	8	2	5		2	10	8	10		1	0.5			1		1			6		1		4				2	3		
KBP013	BB	12	2	12			8	2	4		3	5					0.5		3			1							2		
KBP014	X	18		1			8	6	4				1						4	5								1	2		
KBP015	LL	5					7	6	5	3	1	8		3					5	4				3				1			
KBP016	N	5					8	3	8	4	2	1			4						2	3									
KBP017	M	10					10	10	10		8									5											
KBP018	U	44					10	8	11		6				3				3	5											
KBP019	CC	15		3	6		12	4	8										4									4			

Table 3. Proportions of Rocks and Minerals in CBBS ceramics collection by David Glen Robinson. Proportions of a 200 point count. tr. = trace (continued)

		Rocks and minerals																													
sherd No.	Paste Group	common Qtz	composite Qtz	chert	quartzite	sandstone	vitr tuff	crys tuff	lith tuff	glass	plagioclase	alkali feldspar	olivine	diorite	diabase	andesite	granite	gabbro	trachyte	rhyolite	nepheline	basalt	ferric hematite	ferrous hematite	iron ore (var.)	muscovite	biotite	limestone/ micrite	calcite/ caliche	mellilite	miscellaneous
KBP020	T	5			4		15	8	12											5				3							
KBP021	Z	4		4	3		8	4	12	3	1				2					2					4				5		
KBP022	BB	12		5	6		8	10	6											2								2	5		
KBP023	X	5					3	11	10		2	3	0.5	2	4				2	2		2	5					5	5		
KBP024	Y	10					4	7	5			3	4	3	4			2		1		2						2	2		
KBP025	MM	4			3		8	6	10		3				3					3	1	3			4					0.5	
KBP026	MM	8					10	7	9		2							1		6		4									
KBP027	NN	8					12	10	13	5	4									5		6			4		3		5	2	
KBP028	A	5			3	2	8	6	9		5		0.5						3		2	6				5					
KBP029	AA	8					8	10	7											2			3			3	10	3			
KBP030	M	5			2		5	7	3											3		3									
KBP031	NN	6					5	7	3	1			1		5				2	3		1						1	2	7	
KBP032	T	8					5	10	7		2				4					6		5			5						
KBP033	MM	15			2		4	5	3	3	1				4				3	5										2	
KBP034	MM	12				1	5	5	2						4						2	3					1			5	
KBP035	X	7				2	5	5	5	5					2													3	2		
KBP036	D	2					6	7	4	4					2						1	3	2			5					
KBP037	A	4				2	12	3	7	5				5						2		3				3					
KBP038	AA	8					4	5	3	2								10									12	2	3		
KBP039	T	5	1				3	3	4		2				6								4								
KBP040	FF	10		3		4	2	8	4		5											3			2				3		ilmenite-1
KBP041	T	8	2	1			10	2	4	2	4									1		4		3							
KBP042	BB	8		3			5	2	3											1	2			5				2			dolomite-1 fossil shell-1
KBP043	M	10		5	4		12	8	10		6				5							5									
KBP044	EE	13.5		1.5	2	1	16	3	2	5.5	0.5						1	0.5	1.5	3.5		3.5		7.5		1		2	6		
KBP045	K	10					5	5	5	2	4			1	3				4			3			2						
KBP046	BB	12				1	8	10	5						1				1			2		5					2		
KBP047	Q	10			3		13	15	10										4			3									
KBP048	BB	15					5	4	6		4				2				4					1				1	3		
KBP049	BB	5					10	4	2										2			4						5	6		oolites-4 dolomite-3
KBP050	CC	8	2			1	5	2	4															1					2		
KBP051	N	10				2	10	8	10	2												5		1							
KBP052	Z	12		5	6		15	8	5	3								1		5	2	2									dolomite-2

Table 3. Proportions of Rocks and Minerals in CBBS ceramics collection by David Glen Robinson. Proportions of a 200 point count. tr. = trace (continued)

		Rocks and minerals																													
sherd No.	Paste Group	common Qtz	composite Qtz	chert	quartzite	sandstone	vitr tuff	crys tuff	lith tuff	glass	plagioclase	alkali feldspar	olivine	diorite	diabase	andesite	granite	gabbro	trachyte	rhyolite	nepheline	basalt	ferric hematite	ferrous hematite	iron ore (var.)	muscovite	biotite	limestone/ micrite	calcite/ caliche	mellilite	miscellaneous
KBP053	U	10		6	5		8	10	6		1								3	4		2			8						
KBP054	VV	5		8	4		0.5				6			1			3	4				3		2			2		2		non-local
KBP055	Y	10			8		12	18	10											2											unk VRF-0.5 fossil shell-0.5-calc.
KBP056	Z	5			10		12	11	9		5										2			3				2			
KBP057	GG	5					12	10	3	3	2						2										1	2			dolomite-1 fossil-0.5-calc
KBP058	M	7		3			6	5	5	5							8														unk VRF-4
KBP059	NN	8					5	5	5	4	4	1					5			3		2							3	3	
KBP060	OO	10				4	8	8	6			3										2							4	6	unk VRF-5
KBP061	MM	10		5			6	4	3		4									5					5				1	1	
KBP062	N	5		3	3	3	2	7	12		4				2		1			8			3								
KBP063	A	10					4	8	9	4	2		1		4				2	8			5				2				
KBP064	EE	5		4			15	6	5		1								7	10					4	tr.		1			fossil-0.5 (ls. Oolitic)
KBP065	X	20					8	8	6	2					4					8							4		2		unk VRF-1
KBP066	MM	5		5			3	3	4			4									3	2		2						0.5	
KBP067	A	5			3		5	5	3	1	2		0.5									1		2		0.5					
KBP068	J	12		2	4		5	4	3	4				2						5		1	10			5					
KBP069	EE	5					8	6	7		4									5		2		6	Ilmen.-2		5		3		
KBP070	MM	8					10	7	8						2							2								10	
KBP071	NN	5					9	10	5		4	2								8		6			8					1	
KBP072	K	5	0.5				5	8	6						3					2		2	4		8						
KBP073	K	8	2	4	4		3	4	2	1		2		2	2							2									
KBP074	G	10					6	4	3		2				2					6		2			8		4				
KBP075	T	4					8	8	8											8		2		5							
KBP076	K	15		6			10	6	12		1									10		2		3							
KBP077	AA	10					5	7	4	1	2									5				3			2		4		
KBP078	N	10					8	7	6	2	2				2				3	6		2									
KBP079	KK	4					8	6	5						2							2						4	5		
KBP080	PP	10					8	4	8	2			2		3							3	4							10	
MNP021	Y	4					15	12	8	2										6	1								2		
MNP022	X	8					12	4	8						4						2								2		unk Orange-1
MNP023	K	6					6	7	8			2								5		2									
MNP024	BB	7					15	15	12		2														8				4		
MNP025	N	5					12	10	5											5			3								

Table 3. Proportions of Rocks and Minerals in CBBS ceramics collection by David Glen Robinson. Proportions of a 200 point count. tr. = trace (continued)

		Rocks and minerals																													
sherd No.	**Paste Group**	**common Qtz**	**composite Qtz**	**chert**	**quartzite**	**sandstone**	**vitr tuff**	**crys tuff**	**lith tuff**	**glass**	**plagioclase**	**alkali feldspar**	**olivine**	**diorite**	**diabase**	**andesite**	**granite**	**gabbro**	**trachyte**	**rhyolite**	**nepheline**	**basalt**	**ferric hematite**	**ferrous hematite**	**iron ore (var.)**	**muscovite**	**biotite**	**limestone/ micrite**	**calcite/ caliche**	**mellilite**	**miscellaneous**
MNP026	W	15			8		10	4	8																5						
MNP027	W	12					7	8	6			4								2	2										clinopyroxene-0.5
MNP028	BB	5					10	12	7		2										1	2						2			ls. Oolitic
MNP029	SS	1																								2					bone temper-40
MNP030	N	15	3				12	6	10																3						
PVP087	EE	8					10	7	5		2	5		6	5							7			5		3				
PVP088	Y	5	2				4	3	2		2			3	4							5			2				2		
PVP089	FF	8					5	6	4			2		6	4							5						2	2		
PVP090	FF	6					3	1	2					6	8					3		6		12					4		two pastes in sherd
PVP091	AA	12	4		5	4	4	3	2																7		2				
PVP092	V	6	2	1	8	1	5	1	3											3					3						
PVP093	N	10		3			8	4	7	2	2								3	6					5						Ilmen. Iron ore
PVP094	DD	5					8	6	5	2	1	2		6	6					3		4		5		1					
PVP095	X	5					5	9	8	4	3			3						2		5		4					2		

Table 4. Paste groups and distribution in select La Junta de los Ríos sites

Class	Paste Group/ Variant	No. of Sherds in Group	Site Name			
			Polvo	Millington	Kopenborger	San Bernardino
Mica-Present	A	21	6	4	5	6
	B	4		1		3
	C	1		1		
	D	1			1	
	E	1				1
	F	1		1		
	G	6	5		1	
	H	2		2		
	I	1				1
	J	3		2	1	
Mica-Absent	K	32	4	11	5	12
	L	6	4	1		1
	M	14		5	4	5
	N	11	1	2	5	3
	O	10	6	4		
	P	2	2			
	Q	2		1	1	
	R	5		4		1
	S	1		1		
	T	9	1	2	6	
	U	6	2	1	3	
	V	6	5			1
	W	2		2		
Carbonates	X	12	3	1	5	3
	Y	16	4	5	2	5
	Z	12		6	3	3
	AA	13	3	3	3	4
	BB	17	1	6	6	4
	CC	4		2	2	
	DD	9	5	2	1	1
	EE	11	3	3	3	2
	FF	3	2		1	
	GG	2			2	
	HH	2		1		1

Table 4. Paste groups and distribution in select La Junta de los Ríos sites (continued)

Class	Paste Group/ Variant	No. of Sherds in Group	Site Name			
			Polvo	Millington	Kopenborger	San Bernardino
Carbonates	II	3			2	1
	JJ	1		1		
	KK	1			1	
	LL	1			1	
Melilite	MM	7			7	
	NN	6	1		5	
	OO	2			2	
	PP	1			1	
	QQ	1				1
Bone Temper	RR	2		2		
	SS	1		1		
Nonlocal and Miscellaneous	TT	1		1		
	UU	1	1			
	VV	1			1	
	WW	1		1		

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