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The Tongue River Bison Jump (24RB2135): The Technological Organization of Late Prehistoric Period Hunter-Gatherers in Southeastern Montana

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THE TONGUE RIVER BISON JUMP (24RB2135):

THE TECHNOLOGICAL ORGANIZATION OF LATE PREHISTORIC PERIOD

HUNTER-GATHERERS IN SOUTHEASTERN MONTANA

By

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Bison hunting has long been recognized as a key element of the lifeways of American Indians of the Northwestern Plains. Bison served as an integral component for food, shelter, tools, and clothing. It is no surprise that the importance bison hunting, as a socioeconomic institution, is revealed in the archaeological record of this region. A study of the material culture, most often lithic tools, found at prehistoric bison kills and processing sites allows archaeologists to draw inferences about the technology associated with the procurement of such vital animals. An investigation of bison jump, trap or pound lithic assemblage can provide the opportunity to infer the organization of lithic technology associated with communal bison procurement on the Northwestern Plains.

The Tongue River Bison Jump (24RB2135) is located in southeastern Rosebud County in southeastern Montana. Due to the low number of previously recorded and tested communal bison procurement sites in the area, investigating this site offered a chance to better understand the social and technological organization of bison procurement in a poorly understood region.

This study of the organization of lithic technology is divided into two components: 1) a quantitative typological classification of the tools, and analysis of the debitage; 2) a qualitative comparison of the lithic assemblage with lithic assemblages from other known bison kill sites in a defined geographical study area.

The results of this analysis illustrate that the people operating the Tongue River Bison Jump used a generalized biface/core technology to make hunting and butchering tools. Tools reflect an efficient mixture of informal expedient flakes and formalized tools, such as projectile points and scrapers, to complete the task. The tools are predominantly made of porcellanite, a local raw material, but non-local raw materials from as far away as the Big Horn Mountains was observed. This assemblage also may reflect a collector-type social organization where local raw materials were heavily utilized and logistical forays to distant locations where finished tools made of high-quality raw materials were manufactured and transported.

Acknowledgements

I would like to thank my committee for seeing this project come to fruition: Dr. Anna M. Prentiss, Dr. Douglas H. MacDonald and Dr. Jeffrey A. Gritzner. Many thanks go to Carl Davis, one of the best archaeologists I have ever had the opportunity to work for, for putting the much needed wind back into my sails in getting this thesis accomplished. I am more than indebted to you. I would also like to thank those who participated in the 2005 University of Montana field school for their superb data collection and for their suffering through the relentless weather extremes of southeastern Montana. I want to extend thanks to Dave Clark for his help with the analysis and for answering my many formatting questions. And finally, thanks go to Joey (RIP), Johnny, Dee Dee (RIP), and Marky Ramone for never giving up.

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CHAPTER 1

INTRODUCTION

Bison hunting has long been recognized as a key element of the lifeways of American Indians of the Northwestern Plains (Frison 1978, 1991; Lowie 1935; Strong 1933, 1940; Verbicky-Todd 1984). Bison served as an integral component in Plains Indian livelihood for food, shelter, tools, and clothing. It is no surprise that the importance bison hunting, as a socioeconomic institution, is revealed in the archaeological record of this region. A study of the material culture, most often lithic tools, found at prehistoric bison kills and processing sites allows archaeologists to draw inferences about the technology associated with the procurement of such vital animals. An investigation of bison jump, trap or pound lithic assemblages can provide the opportunity to infer the organization of lithic technology associated with communal bison procurement on the Northwestern Plains.

The Tongue River Bison Jump

Currently, 300 previously recorded bison jumps, traps, and pounds are located in the state of Montana (Montana State Historic Preservation Office, records 2006). The Tongue River Bison Jump (24RB2135), hereafter referred to as TRBJ, is located in southeastern Rosebud County (Figures 1.1 & 1.2). The site lies to the southeast of the community of Lame Deer and southwest of the town of Ashland on the Northern Cheyenne Indian Reservation. It is located in the Tongue River watershed and lies less.

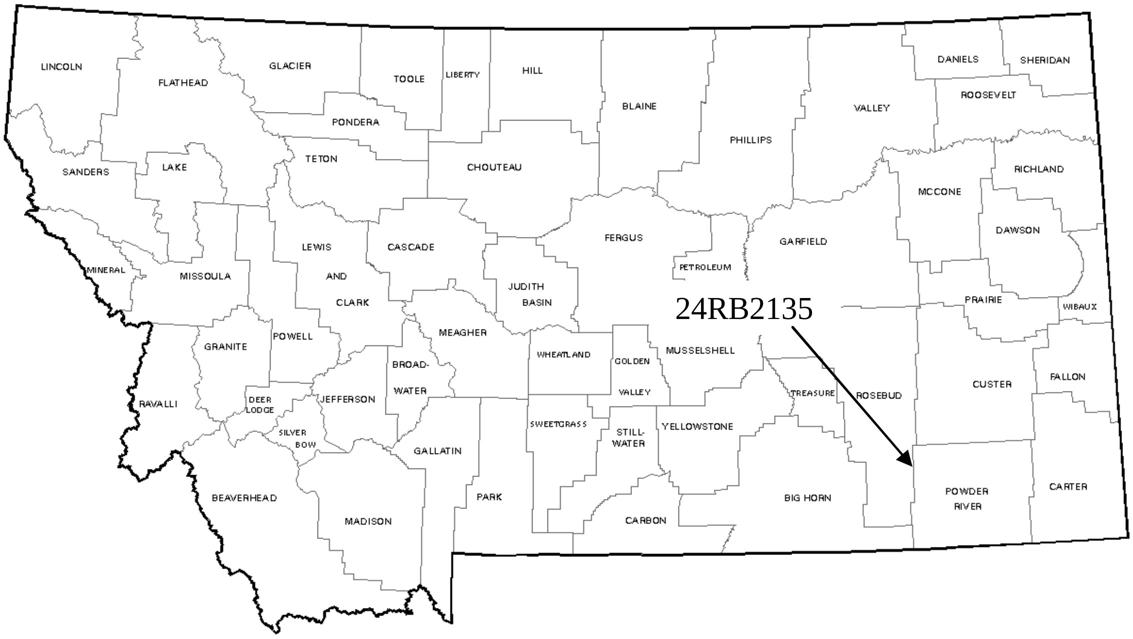

Figure 1.1

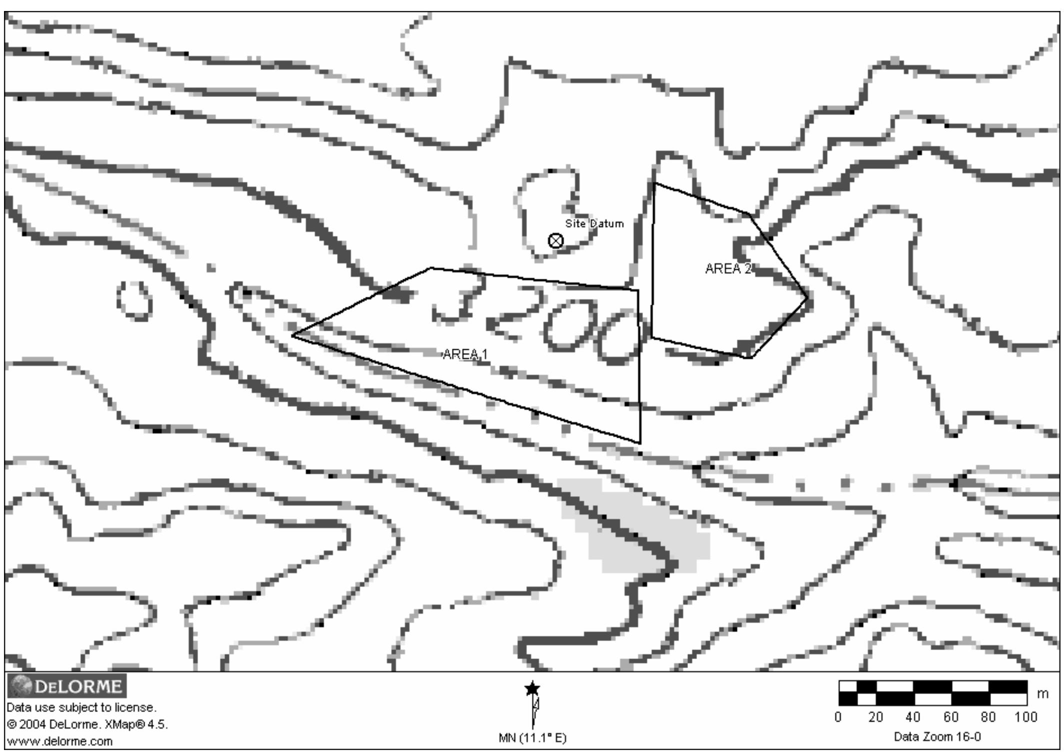

Figure 1.2

than 2 miles west of the Tongue River, which is part of the Yellowstone River drainage system The site has been known for a long time and has been the scene of considerable artifact collecting and looting. Recently, the Northern Cheyenne tribe took a vested interest in stopping this destruction. Over the summer of 2005, the University of Montana (UM) was invited to hold a field school at TRBJ in conjunction with the Northern Cheyenne, Crow, and Blackfoot tribes. Its purpose was to test excavate the site, to determine its integrity and value, and eligibility for listing on the National Register of Historic Places. In addition, owing to the low number of previously recorded and tested communal bison procurement sites in southeastern Montana, investigating offered a chance to better understand the social and technological organization of bison procurement in a poorly understood region of the Northwestern Plains. This information is an important building block for archaeologists working in the area and offers the opportunity to gain more understanding of bison procurement.

Early reconnaissance by the University of Montana field crew observed bone and diagnostic projectile points eroding out of the slope of a low bench near a sandstone cliff face. Two distinct styles of projectile points were recorded including a finely worked corner-notched Pelican Lake projectile point and a smaller, less finely worked side-notched projectile point typical of the Late Prehistoric period. TRBJ potentially spans some three thousand years of prehistory (Frison 1978; Greiser 1981; Kehoe 1966; Mulloy 1958). Two samples collected from bone bed contexts were submitted for Accelerator Mass Spectrometer (AMS) bone collagen dating, which produced two dates of 2820±160 (NSF-Arizona AMS Laboratory AA67537) and 900±45 (NSF-Arizona AMS Laboratory

AA67538) years BP reaffirming temporal associations (Hughes 1995; Prentiss et al. 2007).

The site included two distinct areas: Area 1 contained the bone bed, while Area 2, located just east of Area 1, contained a dense scatter of lithic material on the surface (Figure 1.2). To test Area 1, seven units were systematically placed in conjunction with a grid system tied into a site datum. Area 1 was tested in order to determine the depth, extent, and integrity of the bone deposit, as well as the condition of the bone. Excavation was completed in one-meter-square units by 10 cm levels. All of the bone was mapped in situ, along with diagnostic lithic materials.

Area 2 was sampled in a different manner than Area 1. Owing to the dense scatter of lithic materials on the surface of Area 2, four five-meter-square samples were collected from the ground surface. At the conclusion of the surface collection, a one meter square test unit was excavated within the five meter square. Excavation was performed to test for the presence of an intact subsurface occupation floor and to determine the integrity of the deposit. Excavation was completed in a similar fashion as that in Area 1.

A total of 20,359 bones were recovered from the bone bed at TRBJ and categorized as *Bison bison*, large, medium, small mammals, and unidentifiable fragments. No taxons were attributed to the bones classified as large, medium and small mammals. Faunal analysis indicated that 2,405 bones were identified as belonging to the *Bison bison* taxon. However, over 17,000 bones were either unidentifiable or categorized as a large mammal. This was largely owing to the poor condition of the bone. A minimum number of individuals (MNI) of 15 *Bison bison*, 4 large mammals, 7 medium mammals, and 3 small mammals were identified in the faunal assemblage (Prentiss et al. 2007). The bison remains ranged in age from fetal (1 identifiable element) to 8 years, with a high frequency of 4-5 year old animals represented. Element frequencies indicated that high utility items, such as femurs and humeri, were removed from the site while low utility items such as the ribs, vertebrae, and phalanges were left behind (Prentiss et al. 2007). This is also supported with cut mark data on elements that would have been articulated with high utility items indicating selective butchery behavior (Binford 1978; Speth 1983). No determination of sex was performed.

The lithic materials collected in this study were used to infer behavior as it relates to the technology used in the procurement and processing of bison. Specifically, this study has two main goals: 1) to determine how the people who operated TRBJ organized their technology and what it says about their behavior in terms of subsistence strategy, time constraints, social organization, and mobility; and 2) to compare the TRBJ lithic assemblage with a sampling of other bison kill lithic assemblages in order to demonstrate any apparent variation in Late Prehistoric technological organization. The tools were classified on the basis of design and function. The debitage were analyzed in order to determine the type(s) of reduction that took place. The combination of analyses of both tools and debitage will offer a more holistic understanding of behavior than if each were looked at separately.

The TRBJ lithics from Area 1 and Area 2 were combined and treated as a single sample to limit ambiguity for two reasons: because TRBJ is a specific type of site (bison kill) the processing of bison likely occurred in both locations and directly related. To separate the assemblage by area, then, would be meaningless. In addition, because of the very small sample of lithics recovered from TRBJ, particularly from Area 1, the likelihood of observing aberrant patterns was increased. In an attempt to curb this, the areas were combined to strengthen any potential patterns by analyzing all of the lithics in the assemblage as a whole.

Technological Organization

The study of how prehistoric peoples made and used stone tools has long been of interest to archaeologists (e.g. Cushing 1895; Holmes 1891; Warren 1914). Arguably, lithics have been recovered from nearly every archeological context and constitute the most common artifact component at archaeological sites (Andrefsky 1998). Anthropologically, focusing a study on lithics has many benefits. At the broadest level, detailed analyses of lithics helps to determine how people solved problems related to subsistence and survival. The transport, production, and use of lithic implements help archaeologists understand the technological organization of specific groups. At a most fundamental level, it further allows a direct glimpse into prehistoric behavior as it relates to communal bison procurement and processing. In sum, a comprehensive analysis of lithics from this archaeological deposit as well as a qualitative and quantitative comparison of lithics from other local bison kill sites, can help us better understand the technological organization of Late Prehistoric Period bison hunting societies.

Technological organization is the study of the manufacture, use, maintenance, and discard of tools as adaptive strategies for survival (Nelson 1991). This also includes the procurement, extraction, and transportation of the raw materials needed for their manufacture and maintenance. These strategies are dynamic and influenced by social and economic variables, as well as, the physical environment (Binford 1973, 1978, 1979; Nelson 1991).

A number of influential studies have been published concerning theoretical problems and the analytical methods used that have become the basis for inquiries into the organization of lithic technology. Several archaeologists have been interested in the role technology played in the human relationship to past environmental conditions (Andrefsky 1994; Bamforth 1986; Binford 1977, 1979, 1980, 2001; Bleed 1986; Kelly 1988; Shott 1986; Torrence 1983). The crux of this approach hinges upon human behavior as an adaptive response to ecological conditions including availability and distribution of resources, predictability, and mobility. Many problems and variables focused on cost (Bleed 1986), as well as energy and efficiency (Torrence 1983) where optimal return would have been favored (e.g. Winterhalder and Smith 1981). This approach assumes that small-scale hunter-gatherers solved problems of subsistence in the most efficient and utilitarian manner, and the interplay between humans and the environment accounts for the variability in stone tool design and function.

Thesis Layout

The remainder of this thesis is organized into six additional chapters and three appendices. Chapter 2 is an environmental description including a discussion of the paleoenvironmental sequence for the Northwestern Plains. Chapter 3 is a cultural chronology as it relates to southeastern Montana. Chapter 4, as mentioned earlier, explicitly describes the theoretical approach and research design of the TRBJ lithic analysis. Chapters 5 and 6 describe the methods and results of the analysis. Chapter 5 presents the TRBJ tool and debitage assemblages, while Chapter 6 presents the comparative analysis with other bison kill sites. Chapter 7 is a discussion of the organization of Late Prehistoric Period lithic technology and includes closing remarks. Appendices I and II present all of the raw data from the analysis. Data from the tool assemblage can be found in Appendix I and the debitage assemblage can be found in Appendix II. Appendix III contains the key for the data.

CHAPTER 2

ENVIRONMENTAL SETTING

The Great Plains encompass a vast region and cover a substantial portion of North America. On the north, it is bounded by the Aspen Parklands of Alberta, Saskatchewan, and Manitoba, Canada. The eastern boundary is formed by a woodland region extending from Manitoba to east Texas. The southern boundary is the southern extent of the Llano Estacado in west-central Texas. The western boundary is typically considered to be the Rocky Mountain front.

The Plains contain a diverse array of land features despite its seeming homogeneity (Bamforth 1988; Kay 1998; Osborn and Kornfeld 2003; Wedel 1961). The region consists of uplands, canyons, playas, escarpments, and dune fields that are surrounded by a sea of grasslands. The Llano Estacado of Texas, the Sands Hills of western Nebraska, the Black Hills of western South Dakota and eastern Wyoming, the Big Horn Mountains of northern Wyoming and southern Montana, the Killdeer Mountains of North Dakota, and the Little Rocky Mountains of northwestern Montana break up the landscape into a patchy environment (Osborn and Kornfeld 2003). Numerous drainages and forests add to the patchiness. Large rivers such as the Assiniboine, Yellowstone, Missouri, Platte, Arkansas, Canadian, and Pecos drain east into the Mississippi River watershed. Forested mountainous areas, such as the Black Hills, The Little Rocky Mountains, and Bears Paw Mountains offer shade and cover from the almost continuous wind. However, for the most part, the Great Plains of North America are a land of sun, wind, and grass (Wedel 1961). Rainfall varies considerably, which in turn, affects vegetation. The western portion of the Plains is referred to as shortgrass prairie. It grades into tallgrass prairies at the 100th Meridian, matching the western boundary of Oklahoma, excluding the panhandle. In addition to Oklahoma, it splits North Dakota, South Dakota, Nebraska, Kansas, and Texas. The 100th Meridian also approximates the 2000 foot contour line as the Great Plains rise and one approaches the Rockies. It is also where rainfall is abundant enough to support the tallgrasses common in the east (Wedel 1961).

The northern Plains, as described by Reeves (1983), encompass the northern most Great Plains from the Pine Ridge Escarpment in southern South Dakota and northwestern Nebraska to the Continental Divide in Montana, Wyoming, and Colorado to the woodlands of Minnesota and Iowa. To delineate this area further, and of particular interest to this study, the Northwestern Plains are described as encompassing most of Wyoming and Montana, southern Alberta and southwestern Saskatchewan, and the far western portions of the Dakotas, covering an area of over 200,000 square miles (Frison 1978). Mulloy (1958) refers to the area of the Northwestern Plains as the Missouri Plateau. The area is depicted as a series of broadly-terraced river valleys, interstream uplands imperfectly peneplained and locally dissected into badlands, high interstream areas widely alluvaited by coalescing alluvial fans or flood plains, and glaciated areas of any combination of these environments (Mulloy 1958:10).

The Northwestern Plains currently contain a diversity of patchy environments and vegetation determined by moisture and elevation (Bamforth 1988; Beyers et al. 2003). Because of limited rainfall, the area is considered to be semiarid with the majority of the precipitation occurring in the spring and fall (Frison 1978; Reher 1978). Drier environments contain silver sagebrush (*Artemesia cana*), prickly pear (*Opuntia humifasa*), and Rocky Mountain juniper (*Juniperus scopulorum*). Moister environments include chokecherry (*Prunus virginiana*) and eastern cottonwood (*Populus deltoides*). Low-lying areas consist of predominantly shortgrass prairie with abundant bunch grasses such as big bluestem (*Andropogon gerardi*), blue grama (*Bouteloua gracilis*), various wheatgrasses (e.g. *Elymus smithii*), and Idaho fescue (*Festuca idahoensis*). Higher elevations are home to coniferous forests including such species as lodgepole pine (*Pinus contorta*), ponderosa pine (*Pinus ponderosa*), and douglas-fir (*Pseudotsuga menziseii*).

TRBJ lies 2 miles east of the Tongue River which flows northward into the Yellowstone River and finally into the Missouri River near the Montana-North Dakota border. The physical setting of TRBJ is situated at the eastern end of a small “Y” shaped east-west running drainage valley just prior to an abrupt bottlenecking (Figure 1.2). Its elevation is just over 3200 feet (975m) above mean sea level. The site is located on the northern side of the drainage valley. Directly to the north of the bone bed is an abrupt cliff of sandstone rising 30 to 40 feet (9-12m). Opposite, a large terraced bluff rises, making up the south side of the drainage. Soils present at the site are part of the Cambeth Series and are described as shallow and well-drained sedimentary soils (Soil Survey Staff 1996).

Site vegetation is typical for the northwestern Plains with various shortgrasses, juniper, and willow surrounding the site. Common species include western and thickspike wheatgrass (*Elytragia dasystachya*), little bluestem (S*chizachryium scoparium*), needle-and-thread grass (*Stipa comata*), bluebunch wheatgrass (*Elytrigia spicata*), prairie junegrass (*Koeleria pyramidata*), threadleaf sedge (*Carex filifolia*), silver sagebrush

(*Artemesia cana*), blue grama, skunkbrush (*Rhus trilobata*), native legumes, and western snowberry (*Symphoricarpos occidentalis*). Forests of ponderosa and lodgepole pine are located approximately one mile (1.6km) from the site.

The climate of the Tongue River valley is semi-arid with average yearly rainfall at 15.72 inches (45cm). The Tongue River Bison Jump is located in a land of temperature extremes. Temperatures can range from a winter low of -38º F to a summer high of 105º F. The area hosts between 115 and 130 frost-free days making agriculture impossible.

Paleoenvironment

Late Holocene paleoclimatic periods are presented here in order to understand past environments during the periods of TRBJ occupation. Pielou (1991:8-9) describes a cyclical pattern of warming and cooling, known as the Milankovitch cycle, whereby oscillating periods of climate change are related to solar fluctuations depending on latitude. At a large scale, glacial periods generally result in the advance of mountain glaciers, an increase in moisture, and increases in the contrast between summer and winter temperatures. Interglacial periods generally produce the opposite effect; warming and decreased moisture levels, retreat of glaciers, and decreased seasonal temperature extremes.

Two major climatic oscillations occurred over the last two thousand years in North America: the Little Climatic Optimum (1850-650 BP) and the Little Ice Age (650 BP- 150 BP) (Pielou 1991:305-310; Prentiss and Chatters 2003). These two periods varied in time and duration according to region, which suggests that the overall impact was not as dramatic as, say, the Pleistocene/Holocene transition (Pielou 1991:305).

During the Little Climatic Optimum, temperatures warmed and moisture generally decreased, leaving landscapes patchy. This is followed and contrasted by The Little Ice Age where temperatures decreased and moisture generally increased. Lake sediments and pollen samples collected show much regional climatic variation (e.g. Fritz et al 2000; Loso et al 2006). Climatic variation in prehistory undoubtedly influenced the utilization of landscapes in the Northwestern Plains. As a consequence, bison herd populations most likely congregated and dispersed as environmental conditions changed (Bamforth 1988).

CHAPTER 3

CULTURAL CHRONOLOGY

A chronology expresses a series of events, values, or attributes and places them in continual order creating an overview of change across time characterizing the stages of development. A cultural chronology is placing cultural manifestations along a continuum based on the archaeological evidence, such as projectile point morphology, typically substantiated by the use of absolute dates (Foor 1985). The classificatory scheme, or method, is credited to W.C. McKearn's work in the 1930s in the Midwest (McKearn 1939; Stoltman 1978). A cultural chronology frames the setting and is used as a backdrop for discussion.

For the Northwestern Plains, Mulloy (1958) offered the first real classificatory scheme developed from the excavations at Pictograph Cave. The chronological periods are based largely upon projectile point forms placing them in distinct horizons. Expanding on Mulloy's work, Frison (1978; 1991) adapted the chronology and modified the scale of analysis to incorporate unique groups of artifacts representing cultural complexes (Foor 1985; Frison 1991). Reeves (1983) also used this framework, but focused upon the Middle and Late Archaic periods as they relate to bison hunting from excavations at Head-Smashed-In in southwestern Alberta. Various localized chronologies have been published (e.g. Deaver and Deaver 1988; Greiser 1981), but Frison's is the most widely used today and will be used here, supplemented with local information where appropriate.

It is widely accepted that the first people to occupy the Northwestern Plains at the termination of the Pleistocene were Paleoindian groups beginning about 11,500 years ago (Frison 1991). Paleoindian groups were highly nomadic hunter-gatherers with a finely developed biface production technology resulting in well-made lanceolate and stemmed projectile points. These types of projectile points are often found in association with Late-Pleistocene mega-fauna. Early Paleoindian groups often left behind large, exquisitely manufactured, fluted projectile points now recognized as Clovis and Folsom types. This bifacial tool technology was organized in such a manner that is was extraordinarily efficient and often served more than one function (Bleed 1986; Kelly 1988; Kelly and Todd 1988). Other Paleoindian groups used a similar, but unfluted, projectile point technology now recognized as Goshen and Midland types (Frison 1991). Over time, lanceolate forms gave way to a wider variety of projectile points presently recognized by the names Agate Basin, Hell Gap, Alberta, and Eden types. As the Holocene began warming up, Paleoindian groups continued to hunt now extinct bison as well as a majority of other modern day species. Paleoindian sites contain a limited number of formalized tool types and reflect a preference for high-quality often non-local lithic toolstone emphasizing a subsistence strategy operating in large geographical areas. Hunting technology during this time centers upon the thrusting spear in combination with the atlatl and dart, as evidenced by the sturdy, large sized projectile points.

Few Paleoindian sites are currently identified near the Tongue River Bison Jump (24RB2135). The Mill Iron site (24CT30) is a bison kill site and associated campsite where Goshen projectile points were found in association with now-extinct species of bison (Frison 1991, 1996). Another well-known site is Mummy Cave (48PA201) in northwestern Wyoming (Frison 1991; McCracken et al. 1978). Although not exclusively a Paleoindian site or bison kill, this deeply stratified archaeological site spans nearly the entire established Northwestern Plains chronology, beginning with the Late Paleoindian Foothills-Mountain complex and extending to the Late Prehistoric Period (Frison 1991).

The Paleoindian Period is followed by the Archaic Period extending from (8000 BP to 2000 BP) (Frison 1991). This long time period is divided into three sub-periods based largely on changing projectile point morphologies. Projectile points indicate that subsistence practices were still dominated by hunting and gathering. However, entire lithic assemblages suggest a shift toward less group mobility for a few different reasons. First, ground stone implements make an appearance and are often large and cumbersome, not something that would willingly be carried from location to location by small-scale hunter-gatherers. Second, collecting and processing plant resources takes a considerable amount of time indicating that people were staying at locations longer than previously. This suggests that logistical mobility was declining and dependence on the knowledge of predictable resources (i.e. growing seasons, yield, bison activity, etc.) was accumulating to the point where groups no longer had to completely relocate when resources were finished.

Continuing from Paleoindian times, hunting technology during the Archaic Period centers on the use of the atlatl and dart. The atlatl and dart combination was a highly sophisticated multi-component weapon system. The dart comprises a wooden mainshaft with one end hollowed out for the insertion of a wooden foreshaft tipped with a small stemmed or notched triangular projectile point. The delivery is made from the atlatl, an ergonomic extension of the arm extending several feet, adding several times the velocity.

One advantage of the weapon was the chance to quickly reload and refire at a target. Another advantage was that it allowed the hunter to remain at a considerable distance from his prey.

Regardless of the efficiency of the atlatl and dart, it is not until the close of the Archaic Period that we see an increase in communal bison kill sites. Communal efforts to kill large numbers of bison not only suggest an increase in the number of available bison, but also new developments in social organization. Many communal bison kill sites have materialized dating to the Middle to Late Archaic Periods suggesting increased populations of both bison and humans in the Northwestern Plains after 3500 BP (Deaver and Deaver 1988; Frison 1991).

The availability of bison herds eventually led to a specialization in bison hunting. A prominent cultural manifestation represented by small side-notched, basally-indented projectile points is named Oxbow, based on the Oxbow Dam type site in southern Saskatchewan (Deaver and Deaver 1988; Frison 1991). Oxbow suggests an increasing reliance upon bison and open-prairie living around 5500 BP, near the termination of the Early Archaic Period. Oxbow site faunal assemblages are not diverse. Instead, their subsistence strategy was based upon the predation of bison and, in the case of the Sun River site (24CA74) near Great Falls, pronghorn antelope, another prominent open-prairie animal (Deaver and Deaver 1988; Greiser et al. 1983).

The Middle Archaic Period (5000 BP to 3000 BP) on the Northwestern Plains is represented by several distinct cultural complexes. McKean Complex was defined at the McKean type site in northeastern Wyoming (Frison 1991; Mulloy 1954). It has since been a thorn in the side of archaeologists because of the number of sites containing projectile point variants found in co-association with one another. Projectile points such as Duncan, Hanna, McKean Lanceolate, and Mallory may represent distinct groups operating within the same time frame and geographical area. Conversely, it has been argued that Duncan and Hanna are a single form, while McKean Lanceolate and Mallory are separate types and that all were used within the framework of a multiple weapon system (atlatl/dart and thrusting spear) used by Middle Archaic hunters (Davis and Keyser 1999).

The Middle Archaic Period is not well understood in the Northwestern Plains. There are almost no Middle Archaic period bison kills with characteristic McKean complex points, such as Duncan or Hanna, found in association with large bone beds. Instead, faunal assemblages at McKean sites were broader based and included a diverse array of species (Deaver and Deaver 1988; Frison 1991).

New projectile point forms appear across the Northwestern Plains during the Late Archaic Period (3000 BP to 2000 BP) (Frison 1991). Arguably, the most widespread is Pelican Lake, characterized by wide, open corner-notched and finely made projectile points of varying sizes. Wettlaufer defined the complex through his excavations at the Mortlatch site in southern Saskatchewan (Deaver and Deaver 1988). Pelican Lake bison kill sites are prominent in Montana and include the Ayers-Frazier Bison Trap (24PE30), Koepke Kill (24GF270), and the Seline Site (24DW250) (Deaver and Deaver1988; Frison 1991). Pelican Lake peoples were not the first to invent bison jumping but some of the locations that they chose were used repeatedly, and often more intensively, over time.

Yonkee projectile points are another type recognized at Late Archaic sites in southeastern Montana. Yonkee projectile points are described as having a large, corner-notched morphology that include as characteristic, shallow basal notch. Yonkee projectile points have been found in association with bison at several locations in southeastern Montana, including the Powers-Yonkee type site (24PR5) (Beckes and Keyser 1983). The Powers-Yonkee bison kill site is located in the pine breaks of the Powder River along with several other bison kill sites that date to the same age. The Kobold Site (24BH406) is a stratified, communal bison jump that has a large Yonkee component in the lowest levels (Deaver and Deaver 1988; Frison 1970b; 1991).

Another cultural complex operating during the Late Archaic to the Late Prehistoric Period transition is known from sites with projectile points that are characterized by open, side-notches usually twice as broad as they are deep, and a convex shaped blade known as Besant (Deaver and Deaver 1988). These points vary somewhat in morphology from Pelican Lake. A basic adaptation of Besant peoples was a high degree of specialization in communal bison hunting techniques, such as jumping. On the other hand, there are documented cases for Besant sites to reflect a diverse faunal assemblage. To many authors (i.e. Frison 1991), Besant represents the climax of communal bison hunting. Besant projectile points are generally regarded as dart points. Besant sites vary in location, apparently the result of varying behavior, depending upon subsistence activity. Open plains Besant sites tend to be bison kills, while the foothills and forests contain a more diverse array of faunal remains. Besant also marks the appearance of burial mounds on the eastern periphery of the Northwestern Plains. Burial mounds, common to the Eastern Woodlands, indicate a shift in social organization and mobility whereby much effort was expended on the interment of certain individuals. In addition, it also may indicate a migration of people, or at the least new ideas, from the Eastern Woodlands.

The Late Prehistoric Period (1500 BP to 300 BP) marks the introduction of the bow and arrow technology. This time period also marks the advent of very large communal bison kill sites, where hundreds of animals were taken at sites like Wardell (48SU3301) in southwestern Wyoming (Frison 1991), the Glenrock site (48CO304), also in Wyoming (Frison 1970a), Ulm Pishkun (24CA1012) in central Montana, and Head-Smashed-In (DkPj-1) in southwestern Alberta (Reeves 1978). In short, large scale bison procurement characterizes the Late Prehistoric Period.

The new bow and arrow technology became widespread very quickly. To accommodate hafting projectile points to a narrower arrow shaft there was a drastic reduction in projectile point size. The bow and arrow was a very effective weapon that allowed the hunter to remain hidden and strike prey from a greater distance than ever before. In addition, it arguably allowed more accuracy and the opportunity to hit large prey with several arrows in a very short time compared to an atlatl/dart system.

Wide variation in side- and corner-notched projectile point morphology during the Late Prehistoric Period has been described in the literature (Frison 1991; Kehoe 1966, Mulloy 1958). Kehoe (1966) recognized several distinct Late Prehistoric projectile point types with numerous sub-varieties for the Northwestern Plains. Avonlea (Kehoe and McCorquedale 1961) is the name given to a thin, finely-worked projectile point with small v- or u- shaped side-notches placed low at near the base (Kehoe 1966:829). Variants of the Avonlea type are Gull Lake, Carmichael Wide-eared, and Timber Ridge Sharp-eared, which all exhibit very similar attributes. Dates for Avonlea range from AD

200 to AD 1100 (Morlan 1988). Early Avonlea dates generally come from sites in the Canadian provinces of Alberta, Saskatchewan and Manitoba, while later dates occur in southeastern Montana. Excavations at the Benson's Butte site (24BH1726), located in the Powder River drainage, support this assertion. Dates range from AD 732 to AD 1011 further suggesting that Avonlea, as a horizon marker, spread southward during Late Prehistoric times (Davis 1982; Fredlund 1979).

Other Late Prehistoric projectile points recognized on the Northwestern Plains are the Prairie/Plains types as originally defined by Mulloy (1958) and, more thoroughly, by Kehoe (1966). There has been much debate as to whether there can be any separation into discreet types (e.g. Foor 1988). This is beyond the topic of this thesis. Rather, for the purpose of the current study, the Plains/Prairie type will be referred to as Late Prehistoric Side-Notched projectile points (LPSN) and are distinguished from the Avonlea type. Many, certainly not all, of the LPSN projectile points appear to be less finely-worked and hastily made (Frison 1991).

Several important Late Prehistoric Period sites are located in southeastern Montana. The upper levels of the Kobold Site (24BH406) produced more than 200 LPSN projectile points mostly made of local porcellanite (Frison 1970b; 1991). The Foss-Thomas site, located near the town of Decker, MT, also produced large numbers of LPSN projectile points in associated with the bone bed of a bison jump. The site has been linked to the Crow Indians (Fry 1971; Greiser 1981). More Late Prehistoric Period bison kill sites will be discussed in later chapters.

In summary, the cultural chronology of the Northwestern Plains, and specifically to southeastern Montana, spans a long and diverse prehistory. Unfortunately, despite the amount of CRM survey and testing work done for energy-related projects on both public and private lands, the archaeological record of southeastern Montana is still very much poorly understood considering all of the information coming from neighboring Wyoming. Still, one thing remains abundantly clear: prehistoric peoples have over time shown a continuous use of bison as a resource.

CHAPTER 4

THEORETICAL APPROACH & RESEARCH DESIGN

An introduction to and discussion of technological organization is provided in order to establish the frame of reference for the TRBJ lithic assemblage. Extensive work has been published in this realm (e.g. Nelson 1991). This chapter establishes justifications for the methods presented in the next chapter. This is followed by an explanation of the study objectives, how they will be accomplished, and analytical expectations.

Technological organization is a rational, planned, problem-solving strategy undertaken by human groups to ensure viable access to resources that entails a range of tactics for design, transport, and use of stone tools (Ammerman and Feldman 1974; Andrefsky 1994, 1998; Bamforth 1986; Binford 1977, 1978, 1979, 1980, 2001; Bleed 1986; Nelson 1991; Odell 2003; Parry and Kelly 1987; Kelly 1983, 1988; Shott 1986). A study of technological organization seeks to elucidate what types of problem-solving strategies, as manifested in lithic tools and debitage, occurred at an archaeological site and explain how this fits into a larger socioeconomic context for purposes of inferring behavior.

Several approaches are used in the study of technological organization depending on the particular goal of the research (see Nelson 1991). The approach used here constructs a frame of reference to answer some basic questions regarding Late Prehistoric Period human behavior on the Northwestern Plains. Hunter-gatherers seek appropriate solutions to the basic problems of survival- obtaining food, shelter, and other resources.

The core of this approach emphasizes that technology reflects human decisions within a variable environment where optimization of effort will pay off (Torrence 1983). In other words, technology is expected to be cost-effective and efficient. Environmental conditions may affect decisions (and efficiencies) to some degree, depending upon patchiness and accessibility of resources, including toolstone (Andrefsky 1994; Bamforth 1986; Chatters 1987). In addition, social variables, such as group organization, may also affect behavior and decisions (Binford 1973, 1977, 1978, 1979, 1980, 2001; Shott 1986). Lithic technology, then, represents a physical marker of a variety of human decisions for coping with the environment (Binford 1979, 1980; Kelly 1988; Torrence 1983). Choices are responses to the problems of subsistence, answered by the appropriate technologies where the highest payoff was chosen and reflected in tool design and assemblage structure.

Subsistence strategies and settlement systems, which are inextricably linked, would have an impact upon the types of technological strategies employed by hunter-gatherers. Binford (1973, 1977, 1978, 1979, 1980, 2001) introduced the concepts of forager versus collector subsistence strategies and the impact that group mobility had on technological choices and behaviors. Groups that residentially moved from resource to resource, called foragers, are differentiated from collectors, or groups that resided in one location for extended periods of time and transported resources back to a base camp (Binford 1980). Foragers "mapped on" to resources, relocating once resources were depleted, and placed themselves in appropriate locations seasonally. Collectors were able to stay in locations longer by utilizing small task groups to gather resources. Therefore, collector residential mobility was lower than that of foragers. Differences in technology between the two mobility patterns reflected a range of preparedness. Foragers, operating within a varying range of environments and gathering on an encounter basis, organized their technology to accommodate a wide range of tasks. Collector task groups, operating in a more specific environment with a target task, organized their technology to meet a narrower range of tasks. Technology, then, reflected varying degrees of forager or collector subsistence strategies and mobility (Bamforth 1986; Binford 1973, 1978, 1979, 1980, 2001; Bleed 1986; Kelly 1983, 1988; Parry and Kelly 1987; Shott 1986). These concepts are not mutually exclusive, and a group may operate under a forager mode for part of the year and a collector mode during another (Chatters 1987). Tool design, then, reflected site activities (i.e. behavior) that took place as a suitable solution to the problems of subsistence bound by a group's mobility. Lithic assemblage structure, including tools and debitage, can provide insight into the type of subsistence strategy employed by a group of people.

This theoretical approach takes the view that technology varies by site location, settlement system, and corresponding mobility patterns (Binford 1978, 1979, 1980). Planning and anticipation played a significant role in the design, transport, use, and discard of tools and toolkits to perform the needed tasks associated with different mobility regimes (Nelson 1991:58). To put it another way, mobile hunter-gatherers do different things at different locations related to their mobility and their toolkits reflect this variation (Kelly 1988).

Maintainability, flexibility, versatility, and reliability are also important concepts in the study of the organization of lithic technology (Bleed 1986; Kelly 1988; Kelly and Todd 1986; Nelson 1991; Shott 1986). Maintainability refers to a technology that is made to work well in a variety of differing circumstances. A maintainable technology may be serial, where design anticipates an order of future tasks, or it may be modular, where in order for continued use a new component must be added. Flexibility refers to the ability to reshape a tool for a desired need. Flexible tool design can allow the user to reshape the tool for a variety of different tasks. Versatility refers to a generalization of tool form to meet many needs of the user without changing form. A versatile tool maintains an overall similar shape with little reduction but has widespread uses. Reliability is a tool that is “overdesigned” to always function when needed. These concepts have been used by archaeologists to explain types of technological organization and, ultimately, choices and behavior.

The analytical concepts of expediency and curation have also been used to describe types of lithic technology in terms of time investment in production and transport (Bamforth 1986; Binford 1978, 1979, 1980; Kuhn 1994). Expedient technologies involve situational production, use, and discard. Raw material is often readily available and tools reflect a design whereby minimal effort was expended in their manufacture. This is contrasted with curated technologies, a strategy whereby raw materials were prepared in anticipation of future conditions and conservation of the material was often practiced. Curated technologies are reflected by transportable cores or late-stage bifaces (Binford 1979, 1980; Bleed 1986; Kelly 1988; Kelly and Todd 1988). When the cost of transporting curated gear (e.g. cores or bifaces) exceeds the benefit, or when readily available raw material is close at hand, expedient tools will often be preferred (Andrefsky 1994; Bamforth 1986; Binford 1979, 1980; Nelson 1991, Torrence 1983). Some have suggested that expedient technologies are often associated with decreased mobility and increased sedentism (Binford 1977, 1978, 1979, 1980; Cowan 1999; Parry and Kelly 1987; Shott 1986).

The broad goal of this thesis is to infer human behavior from lithic data. But, this is a complex problem. As archaeologists, we infer past behaviors from material remains using a systematic approach to reveal patterns in archaeological assemblages (Binford 1962). This is done primarily through classification of artifacts. Classification is used in all forms of scientific inquiry to organize things into more manageable units for description and analysis. Comparison of the variation within and between classes of artifacts leads to an inquiry of probable causes that reflect prehistoric human behavior.

The analysis of the tools and debitage from TRBJ is broadly tailored toward two main analytical goals. The first is to determine how the people who operated TRBJ organized their lithic technology and determine their behavior in terms of subsistence strategy, time constraints, and mobility. The second goal is to compare the TRBJ lithic assemblage to other bison kill lithic assemblages to demonstrate variation in Late Prehistoric technological organization in relation to bison hunting. Combined, the analysis seeks to increase our understanding of how prehistoric Native American Indian groups utilized the landscape in southeastern Montana during the Late Prehistoric Period.

This analysis will be framed using the Binfordian forager/collector dichotomy. It has been recognized that during the Late Prehistoric Period on the Northwestern Plains groups benefited from what was probably a collector-like economic strategy (Binford 1980; Frison 1991). If so, the technological organization of the group operating TRBJ should reflect logistical mobility with the presence of task-specific tools. Variation in assemblage diversity, measured as formal to informal tool ratios and raw material diversity, can provide insight to address these goals. Because TRBJ reflects a specific task (killing and processing bison), the expectation is for low formal tool diversity and prominent use of expedient flake tools (Binford 1979, 1980, 2001; Chatters 1987; Parry and Kelly 1987; Shott 1986). Curated gear should be limited to items needed for the bison kill (projectile points and bifaces) and made of predominantly non-local or high quality local raw materials. This should be complemented by a notable proportion of expedient flake tools made from local raw materials used in butchering bison.

As mentioned earlier, a portion of the study is debitage analysis to demonstrate the amount and degree of lithic reduction. This is important for strengthening inferences about behavior because reduction has been correlated to types of technological organization (Cowan 1999). If the people using TRBJ operated within a collector-like system, we should expect to see curated raw materials, primarily in the form of finished tools and decorticated bifaces, reduced by maintenance flaking. Local raw materials should indicate some initial reduction and minimal resharpening flakes.

A classification scheme was designed for the analysis of the TRBJ tools and debitage to address questions posed that were generated by these analytical and theoretical concerns. The classification scheme organizes the lithic artifact assemblage into classes in order to examine variation within the lithic assemblage itself, and to compare it with other bison kill lithic assemblages. Some basic questions regarding classification of the tools were: What types of tools are present? What do the tool classes indicate about performing the task of bison procurement? What types of tools are curated? What types of raw materials are present? Are there any expedient tools? Tool classes are described by raw material type, richness and diversity. In addition, a comparison of formal tools to informal tools aids in understanding of lithic technological organization.

There are many techniques of debitage analysis (see Andrefsky 1998 or Odell 2003). Four techniques are utilized for the purposes of this study. Two techniques are typological in nature and two are aggregate. A typological approach classifies each flake into discrete types based on one or more morphological characteristics (Andrefsky 1998:111). Measuring the amount of remaining cortex (Andrefsky 1998) and fracture initiation (Cotterell and Kamminga 1987) are both typological approaches. An aggregate approach lumps flakes together by some uniform criteria and then analyzes and compares frequencies (Andrefsky 1998:126). Examples of these aggregate approaches are raw material type and flake size (Ahler 1982; Stahl and Dunn 1982). These analytical techniques are useful for identifying lithic reduction, refurbishment, and discard, and will aid in demonstrating what types of tools, in what forms, were present at TRBJ. Primary reduction is indicated by the presence of large, cone initiated, primary cortex flakes while tool maintenance should show patterns of small, bend initiated, tertiary cortex flakes.

Some questions generated about the technological organization of the people who operated TRBJ are: what does the assemblage say about the economy of the Late Prehistoric Period in southeastern Montana? What does the assemblage say in terms of group mobility? What variation is there in Late Prehistoric bison hunting behavior as evidenced from the comparison of the TRBJ lithic assemblage to that of others? Is the TRBJ lithic assemblage considered typical? How was the technology at other bison kill sites organized? How and why did it vary?

In summary, the interpretation of the TRBJ lithic assemblage data through the use of the Binfordian forager/collector dichotomy will allow insight into technological organization. Study methods are described in more detail in following chapters. The goals of the analysis, along with expectations and some generated questions, are clearly stated and seek to test the implications of a collector-like social organization. Variation in Late Prehistoric behavior on the Northwestern Plains will also be addressed through the comparison of the TRBJ lithic assemblage to other assemblages.

CHAPTER 5

ANALYSIS OF TRBJ LITHICS

As stated in Chapter 4, a major goal of this study is to examine Late Prehistoric behavior in southeastern Montana through analysis of the TRBJ lithic assemblage. To accomplish this, the study is comprised of two basic methodologies: 1) a classification of the tools; and 2) sorting of the debitage. The analysis will be performed in order to determine how the people who operated TRBJ organized their technology, and what it says about their behavior in terms of subsistence strategy, time constraints, and mobility. In addition, to look for variation in bison jump lithic assemblages, a comparison of the TRBJ lithic assemblage with lithic assemblages from other known bison kill sites is undertaken in Chapter 6 in order to demonstrate any apparent variation in Late Prehistoric Period technological organization.

Methods

For the analysis of the TRBJ lithic assemblage, tools were first divided into formal and informal categories. Each tool type is explicitly defined with attention paid to specific morphological attributes that were measured. The debitage was organized by two primary methods of sorting: attribute analysis and mass analysis. Each method is explicitly defined below.

Raw Material Identification

During lithic analysis, raw materials were identified by their macroscopic physical characteristics such as color, texture, and comparative knowledge (e.g. Tom Foor, personal communication) as defined in published studies of the Tongue River area. (e.g. Beckes and Keyser 1983; Fredlund 1976; Frison 1991; Greiser 1981). The raw materials in the TRBJ lithic assemblage are presented in Table 5.1 below. Raw material source locations are helpful in order to understand tool transport, use, and discard patterns. Local raw materials are defined as those found within five miles (8 km) of the immediate site area and that can be obtained easily in the Tongue River drainage less than two miles (3.2 km) to the east. Non-local and transported raw materials include all others beyond this range. Porcellanite, whose origin is derived from burnt coal bed seams across southeastern Montana, is the most common raw material due to its local origin (Fredlund 1976; Frison 1991). Other local raw materials include chalcedony, silicified lignite (also referred to as lignite and of coal burn origin [Fredlund 1976]), quartzite, and basalt. Non-local raw materials include chert, most likely from the Madison Formation in the Big Horn Mountains of northern Wyoming and southern Montana, and obsidian. The obsidian artifacts have been sourced to determine their exact origins by using energy dispersive x-ray fluorescence (edxrf) data for trace element concentrations and found to match that found at Obsidian Cliff in Yellowstone National Park in northwestern Wyoming (Hughes 1995; see Prentiss et al 2007).

Table 5.1. Toolstone Source Locations.

Raw Material	Local/ Non-local	Nearest Source	Distance m(km)	Direction	Reference
porcellanite	local	site vicinity/ Tongue River Valley	<2(3.2)	ubiquitous/east	Beckes and Keyser 1983; Fredlund 1976; Greiser 1981
chert	non-local	Big Horn Mtns.	>100(161)	south	Frison 1991
chalcedony	local	Tongue River Valley	< 2(3.2)	east	Beckes and Keyser 1983; Greiser 1981
obsidian	non-local	Obsidian Cliff	>100(161)	southwest	Hughes 1995; Prentiss et al. 2007
lignite	local	site vicinity/ Tongue River Valley	< 2(3.2)	ubiquitous/east	Beckes and Keyser 1983; Greiser 1981
quartzite	local	Tongue River Valley /Northern Rocky Mountains	<2(3.2)	east/south	Frison 1991; Greiser 1981
basalt	local	Tongue River Valley	<2(3.2)	east	Beckes and Keyser 1983; Fredlund 1976; Greiser 1981

Table 5.2. Quantative Composition Estimates for Obsidian Samples from TRBJ.

Catalog Number	Zn	Ga	Rb	Sr	Y	Zr	Nb	Ba	Ti	Mn	Fe_2O_3	Fe/Mn Ratio	Obsidian Source
2	nm	nm	221 ±4	7 ±3	77 ±3	167 ±4	42 ±3	nm	nm	nm	nm	65	Obsidian Cliff, WY
3	nm	nm	338 ±4	7 ±3	77 ±3	170 ±4	46 ±3	nm	nm	nm	nm	67	Obsidian Cliff, WY
37	nm	nm	226 ±4	5 ±3	77 ±3	169 ±4	42 ±3	nm	nm	nm	nm	70	Obsidian Cliff, WY
655	nm	nm	253 ±4	6 ±3	82 ±3	168 ±4	45 ±3	nm	nm	nm	nm	64	Obsidian Cliff, WY
656	nm	nm	238 ±4	6 ±3	80 ±3	174 ±4	44 ±3	nm	nm	nm	nm	65	Obsidian Cliff, WY
977	nm	nm	245 ±4	7 ±3	79 ±3	163 ±4	42 ±3	nm	nm	nm	nm	67	Obsidian Cliff, WY

Classification of Tools

A tool is defined as a lithic object with recognizable modification or characterization that differentiates it from waste by the presence of edge retouch, shaping, or evidence of use (Andrefsky 1998). All other lithics are considered waste or debitage. Tools are divided into two broad classes. Formalized tools are defined as those where a considerable amount of time and effort was expended in its production to obtain a desired shape or outline (Andrefsky 1998:30). This class of tools includes projectile points, scrapers, bifaces, knives, *pièces esquillées*, and other shaped tools. Informal tools, often referred to as expedient tools (Binford 1979), are those where relatively minimal time and effort was invested in their manufacture and are unstandardized and casual in shape (Andrefsky 1998:213). Common to this class are various flake tools and cores.

Measurements of tools included size, types of retouch flaking, presence of use-wear, edge angle, and weight. Each tool was sized into defined categories, with the exception of projectile points, with each size category being exponentially larger than the preceding one (Prentiss 1998). The categories are: extra small (<.639 cm^2), small (.64-3.99 cm^2), medium (4-15.99 cm^2), and large (16-63.99 cm^2). Each projectile point was measured and explained more fully below.

Retouch flaking of tool margins was used to thin, straighten, sharpen, smooth or alter a tool to improve its regularity in shape (Crabtree 1972:89). The types of retouch were recorded for all tools including whether it was unifacial or bifacial. Abrupt and invasive retouch flaking refers to a how far into the tool the flaking extends. Abrupt retouch generally describes shallow flaking while invasive retouch generally describes flaking that often passed over the center of the tool face (Odell 2003:108).

All tools were placed under a microscope at 50x magnification in order to look for the presence of use-wear. Use-wear indicates tool motion and provides a fairly accurate indication of what material the tool was used to work (Semenov 1964). Striations are microscopic scratches on the tool surface that are visible on the working edge. These are recorded as perpendicular, oblique or parallel. The presence or absence of rounding and polishing was also recorded. Rounding is the result of grinding the tool edge away through use. Polishing is rounding and smoothing. It is often macroscopically visible and indicative of the types of material on which the tool was used such as bone, wood, or hides. Polish usually extends onto the face(s) of a tool, giving it a characteristic shine (e.g. Semenov 1964; Keeley 1980).

The edge angle is the convergence of two planes or surfaces of a tool. Edge angles were measured with a goniometer taken from the spine plane at 3-5mm back from the edge. Because of the unevenness of stone tool working edges, at least three different places along the edge were selected and measured equidistant from the distal and proximal ends. The mean of the angles was calculated and provided as the tool's edge angle. In the event that a tool had more than one working edge, an angle was given for each.

Finally, tool weight was measured for all tools. All weights were measured on an Ohaus 700/800 Series triple beam scale and recorded in grams. The weights of complete projectile points are sometimes helpful in classification. All of the raw data for this assemblage are presented in Appendices I-III.

Formal Tools

Projectile Points A projectile point is a formalized tool type that has a characteristic shape that includes a hafting element, base, blade, and tip. Typical outline shapes include triangular, ovoid, lanceolate, and leaf-shaped. Hafting elements can be stemmed, corner or side-notched, but some styles are absent of both. They are almost always greater in length than width and typically thin in cross-section with invasive pressure flaking patterns extending inward from the lateral margins. Fine pressure flaking patterns as described by Crabtree (1972:87) are parallel, oblique, collateral, and random. Projectile points are organized into an established typology (Kehoe 1966; Mulloy 1958; Foor 1985, 1988; Frison 1978; 1991). Measurements were taken on all intact elements and include: maximum length, maximum width, maximum thickness, basal width, neck width, and blade length (Andrefsky 1998:179). In addition, weight and edge angle were also measured.

Scrapers A scraper is a formalized flake tool that is beveled through unifacial pressure flaking to produce a robust and often steep working edge. The edge is typically angled from 70º-90º (Andrefsky 1998:193; Crabtree 1972:60). They are often classified as end- or sidescrapers depending upon the location of the working edge. As the name implies, endscrapers exhibit abrupt flaking and use-wear on the end while sidescrapers exhibit invasive flaking and use on the side edges. They are often thick tools which were meant to be utilized with a fair amount of force. Each scraper was observed for use-wear. The location of use-wear determined if the tool functioned as an end- or side-scraper. Utilization took the form of polishing, rounding, striations, and microscopic flaking, depending upon what material the tool was used on and in what manner.

Bifaces A biface is a formalized tool that is made either from a flake or is the end result of a reduced core (Kelly 1988). One could spend a career defining bifaces, so for the sake of brevity, the definition of a biface used here is a piece flaked on both ventral and dorsal surfaces to form a single edge outlining the entire object (Andrefsky 1998:172; Crabtree 1972:38). It has been demonstrated that bifaces can be produced in a series of stages, whereby the width:thickness ratio decreases as one moves in the direction of later stages (e.g. Callahan 1979). Production stages range from a thick flake blank (Stage 1), to a very thin preform (Stage 4).

Pièces Esquillées *Pièces esquillées* are formalized tool types that, as described by Hayden (1980:2), are generally formed on flakes with invasive retouch flaking at both ends. The flaking extends down only a portion of the ventral or dorsal surface, giving it a wedge-shape in cross-section. They can be mistaken for bipolar cores. However, the primary difference is that *pièces esquillées* show evidence of the ventral flake surface that is still partially intact. There is typically crushing on both ends owing to its utilization as a wedge.

Perforators A perforator is a formal tool that can be described as a flake with two edges that converge to form a point. The edges are often shaped by abrupt unifacial flaking to make a suitable tip for perforating. A perforator may have very minimal retouch owing to the unaltered flake shape. Conversely, evidence of extensive retouch to shape a suitable tip is not uncommon. Perforators in this assemblage are considered formal tools on account of extensive sharpening.

Informal Tools

Retouched and Utilized Flake Tools Retouched flakes are informal tools that exhibit abrupt to invasive unifacial or bifacial retouch flaking along one or more margins. The flakes were retouched in order to give the flake a suitable cutting edge for a desired slicing cutting, or scraping task. They exhibit no diagnostic flaking and typically minimal energy was expended in their manufacture. Instead, flake tools retain many of the original flake attributes, such as an unaltered ventral or dorsal surface, a striking platform, or a termination (Andrefsky 1998:77). Margins may be modified, but often the retouch is very minimal. The flake shape is most likely chosen by the user for a specific (and probably expedient) task.

Once the flakes were utilized, the working edge became altered. Evidence for use takes the form of polishing, rounding, striations, and microscopic flaking depending upon the targeted material and manner of use.

Cores Cores are tools that have, by the creation of striking platforms, undergone episodes of reduction to remove flakes. Crabtree (1972:54) described a core as a mass of material that that has a desired shape in order to drive off flakes of a predictable shape. Although there are many different types of cores, two types are recognized in the TRBJ lithic assemblage. On multidirectional cores, the primary flake removals originate from more than one direction, and often cross previous flake scars (Andrefsky 1998; Crabtree 1972:78; Odell 2003:63). Bipolar cores are the result of a specific reduction technique where the desired piece was set upon an anvil and struck from above. This produced a characteristic flake where observable crushing is evident on both proximal and distal ends (Binford and Quimby 1963; Hayden 1980:3; Odell 2003:61).

Diversity

To measure diversity of raw material use at TRBJ, Shannon's Diversity Index was used to compare between tool classes. A ratio was first calculated for each tool class as:

r/R*
r=number of specific raw materials per each tool class
R*= total number of raw materials present in tool assemblage

This ratio is critical to the calculation of the diversity. The values were then used in the following calculation of raw material diversity. The formula is:

$$\Sigma(r/R)\log(r/R)$$

r= number of specific raw materials per tool class
R= total number of tools in each class made of specific raw material

The values will range from 0-1, with 0 being no diversity and 1 being the most possible diversity. To put it another way, 0 means that all tools making up the tool class are made of the same raw material, while 1 means that each tool in the tool class is made up of a different raw material. What this measure seeks to expose is the range of variation in raw material selection for each type of tool.

Classification of Debitage

Debitage analysis is a useful component of lithic analysis, as it can indicate types of technology present at a site, even if no corresponding tools were recovered (Andrefsky 1998:110; Cowan 1999; Kelly 1988). It can also be used to aid in distinguishing between core reduction and tool production behavior (e.g. Carr and Bradbury 2001; Sullivan and Rozen 1985). The role of debitage analysis in deciphering technological organization in this study is aimed at demonstrating variation in reduction through the use of three analytical methods. The methods, introduced in Chapter 4, are typological and aggregate in design. By employing multiple lines of evidence ambiguity will be limited. The debitage was described according to raw material, size, cortex amount, and fracture initiation.

Cortex Amount Cortex amount is the coverage of observable cortex remaining on a flake. Each flake was described by using the triple cortex typology (Andrefsky 1998:111). Primary flakes have a fully cortical dorsal surface (100%); secondary flakes have anywhere from 1-99% cortex; and tertiary flakes exhibit no (0%) cortex. By measuring flake cortex, the degree of previous reduction can be inferred. It can also give an overall indication of the lithic reduction at TRBJ, and in what form raw materials were introduced to the site (e.g. Dibble et al. 2005).

Size Each flake was sized in the same manner as tools, using the same criteria for extra small, small, medium, and large sizes previously described. Measuring debitage size offers an indication on raw material nodule size. In addition, flake size was also used to distinguish between early versus late stages of reduction (Ahler 1989; Stahle and Dunn 1982). The measurement of flake size was used to give an estimate of objective piece size represented by the TRBJ debitage assemblage. Variation in flake size can also give an indication whether biface reduction or core reduction has taken place at the site (Andrefsky 1998: 131; Patterson 1990).

Fracture Initiation Fracture initiation occurs in three forms: cone, bend and wedge initiations. Because of the mechanical properties of flakable raw materials, Hertzian characteristics apply and result in a pronounced bulb of percussion from cone initiation. A hammer of a greater hardness than the objective piece needs to be used in order to achieve enough pressure to initiate a cone (Cotterell and Kamminga 1987:686). A cone initiated flake is often the result of hard hammer load application. If the hammer is not as hard as the objective piece, or struck at an oblique angle in relation to the objective piece edge, a bend initiation will occur. A bend initiation will occur at the closest flaw to impact in the raw material, starting at 90º from the platform surface, and bending to travel almost parallel to the face and final termination (Cotterell and Kamminga 1987:690). This gives the ventral platform edge a characteristic lip. A bend initiated flake is the result of a soft hammer application. A wedge initiation occurs most commonly with bipolar flaking owing to impact far from the edge of the objective piece (Cotterell and Kamminga 1987:689). A wedge initiated flake may have a sheared bulb of percussion and evidence of load application on both ends of the flake. All flakes with intact platforms were examined and, using the typology of initiation described above, were recorded. Platform initiation helps to support inferences in regard to what type of hammer was used in lithic reduction and, to some extent, the goal of overall reduction.

RESULTS

The results of the analysis of the TRBJ lithic assemblage are comprised of tool descriptions and debitage analysis. More specifically, analyses on tool assemblage richness and diversity, formal to informal tool ratios, tool class ratios by raw material, and raw material distribution are given. Analyses of the debitage included raw material distribution, cortex amount, size, and fracture initiation. These analyses were performed in order to answer questions regarding the technological organization outlined in Chapter 4.

Tool Descriptions

The TRBJ tool assemblage is comprised of 66 tools classified into 14 discreet types. Table 5.3 highlights the tool typology. Each tool type is shown by frequencies and raw material type. What follows is a description of the results of tool analysis. Some tool types have been combined. For more complete data on all the tools see Appendix I.

Projectile Points and Fragments Projectile points are the most frequent tool type and include two distinct morphological types accepted in Northwestern Plains typologies (Frison 1978; Kehoe 1966; Mulloy 1958). A single corner-notched Pelican Lake-type projectile point was recovered from the ground surface on the west end of the site. It is made of porcellanite and is absent the tip.

Table 5.3. TRBJ Tool Typology.

	Tool Types	Porcellanite		Chalcedony		Chert		Obsidian		Lignite		
		n	**%**	***n***	**%**	***n***	**%**	***n***	**%**	***n***	**%**	*Total (n)*
Formal Tools	LPSN Projectile Point	8	57	1	7	3	22	0	0	2	14	*14*
	Pelican Lake Projectile Point	1	100	0	0	0	0	0	0	0	0	*1*
	Projectile Point Fragment	3	43	2	29	1	14	1	14	0	0	*7*
	Knife Fragment	1	33	0	0	1	33	1	33	0	0	*3*
	Bifacial Tool Fragment	1	100	0	0	0	0	0	0	0	0	*1*
	Perforator	1	100	0	0	0	0	0	0	0	0	*1*
	Endscraper	0	0	0	0	3	100	0	0	0	0	*3*
	Unifacial Tool Fragment	1	50	0	0	0	0	0	0	1	50	*2*
	Multi-functional Tool	1	100	0	0	0	0	0	0	0	0	*1*
	Pièces Esquillées	2	67	0	0	1	33	0	0	0	0	*3*
Informal Tools	Multidirectional Core	10	91	0	0	1	100	0	0	0	0	*11*
	Bipolar Core	10	91	0	0	0	0	0	0	1	9	*11*
	Retouched Flake	3	60	0	0	1	17	1	17	0	0	*5*
	Retouched and Utilized Flake	3	100	0	0	0	0	0	0	0	0	*3*
	Total	*45*	*67*	*3*	*5*	*11*	*17*	*3*	*5*	*4*	*6*	***66***

Raw Material

Of the 14 LPSN specimens collected, two are complete, and show no evidence of fracturing. Both points are made of porcellanite (see Table 5.4 below for the metric dimensions of the complete projectile points). The remaining 12 projectile points retained enough characteristics to be recognized as LPSN projectile points but were too incomplete for metric comparison. Many points have missing tips but some show broken bases. Tables 5.4 and 5.5 give dimensional characteristics and statistics.

Projectile point fragments that could not be recognized as belonging to a particular morphological projectile point type, owing to missing diagnostic characteristics, are combined into one tool type. Table 5.6 highlights the metric characteristics of the fragments. These thin, bifacially flaked, fragments are also represented in significant numbers (*n*=7). They are found only in association with the bone bed. The seven specimens comprise tips and midsections. It is suggested that they

Table 5.4. LPSN Projectile Point Dimensions.

Catalog Number	Raw Material	Complete?	Length (mm)	Width (mm)	Thickness (mm)	Basal Width (mm)	Neck Width (mm)	Blade Length (mm)	Edge Angle (º)	Weight (g)
5	porcellanite	y	24.46	13.66	4.61	13.16	7.64	18.30	31	1.30
9	porcellanite	n	0	12.77	2.92	0	7.60	0	27	0.91
10	porcellanite	n	0	11.92	3.10	0	8.34	0	33	0.55
17	porcellanite	n	0	14.27	3.14	0	9.16	0	25	1.37
18	chert	n	0	13.58	3.39	13.54	8.46	0	28	1.05
20	porcellanite	n	0	0	2.53	13.99	8.06	0	30	0.15
21	lignite	n	0	13.89	4.12	13.54	9.56	0	34	0.98
22	porcellanite	n	0	14.04	3.94	14.05	7.63	0	32	1.43
24	chert	n	13.28	0	3.29	0	0	9.86	35	0.49
25	lignite	n	0	16.59	3.54	15.88	9.54	0	31	1.65
29	chert	n	0	0	4.23	8.77	5.06	0	43	0.63
31	porcellanite	y	21.28	14.37	3.80	11.97	6.98	19.96	30	1.14
53	porcellanite	n	0	0	3.92	14.82	12.78	0	33	0.90
59	chalcedony	n	16.59	12.28	3.44	0	8.47	0	28	0.50

Table 5.5. Descriptive Statistics for Projectile Point Dimensions (mm).

Dimension	Mean	Median	Std. Dev.
length	18.90	18.94	4.95
width	13.73	13.78	1.31
thickness	3.57	3.49	0.57
basal width	13.30	13.54	2.01
neck width	8.41	8.34	1.77
blade length	16.04	18.30	5.42
edge angle	31.43	31.00	4.36
weight	0.93	0.95	0.43

Table 5.6. Non-Diagnostic Projectile Point Fragment Dimensions.

Catalog Number	Raw Material	Portion	Size	Width (mm)	Thickness (mm)	Edge Angle (º)	Weight (g)
2	obsidian	mid	xs	14.68	3.06	28	0.28
7	porcellanite	mid	xs	0	3.04	34	0.38
8	porcellanite	tip	xs	0	3.29	33	0.35
15	porcellanite	mid	xs	0	3.26	27	0.50
16	chalcedony	mid	sm	14.26	3.52	33	0.93
19	chalcedony	mid	sm	0	3.01	26	0.89
30	chert	tip	xs	0	3.86	32	0.60

are also the fragments of LPSN type projectile points, rather than belonging the Pelican Lake type. This is based upon the size of the fragments, which is very close to that of diagnostic points, and the co-association with other LPSN projectile points provenienced within the bison bone bed. Table 5.7 presents statistical data for comparison.

Table 5.7. Descriptive Statistics for Non-Diagnostic Projectile Point Fragments (mm).

Dimension	Mean	Median	Std. Dev.
width	14.47	-	-
thickness	3.29	3.26	0.31
edge angle	30.43	32.00	3.31
weight	0.56	0.50	0.26

<u>Cores</u> The second most common type of tool is cores highlighted in Table 5.8 below. The two different types of cores are represented in similar frequency patterns. Multidirectional cores show ten made of porcellanite while one is made of chert. Mean core weight, as presented in Table 5.9, is 55.53g. Bipolar cores show ten made of porcellanite and one made of lignite with a mean core weight of 33.03g. The cores were predominantly recovered from the area next to the bone bed and not the bone bed itself. Only one of each type of core was recovered from the bone bed.

Table 5.8. Descriptive Information for Cores.

Multidirectional Cores				Bipolar Cores			
Catalog Number	Raw Material	Size	Weight (g)	Catalog Number	Raw Material	Size	Weight (g)
13	porcellanite	med	64.5	14	porcellanite	med	29.9
40	porcellanite	med	57	47	porcellanite	med	66.2
41	porcellanite	med	59.1	54	porcellanite	med	59.4
42	porcellanite	lrg	95.1	55	porcellanite	med	37.8
43	porcellanite	med	55.7	56	porcellanite	med	35.8
44	porcellanite	med	30.6	57	porcellanite	med	40.8
45	porcellanite	med	22.1	61	porcellanite	med	34.8
48	porcellanite	lrg	135.8	65	porcellanite	sm	5.8
58	chert	med	14.9	66	porcellanite	med	16.6
63	porcellanite	med	28.4	67	lignite	med	19.4
69	porcellanite	med	47.6	68	porcellanite	med	16.8

Table 5.9. Descriptive Statistics for Core Weight (g).

Core Type	Mean	Median	Std. Dev.
multidirectional	55.53	55.70	35.06
bipolar	33.03	34.80	18.33

Knife Fragments Three knife fragments are present in the TRBJ tool assemblage. The three knife fragments are thin, bifacially flaked fragments made of porcellanite, obsidian, and chert and are presented in Table 5.10 below. They are differentiated from biface tools by their small size and finished pressure flaking along the margins. The obsidian knife fragment shows evidence of use in the form of edge rounding. The chert and porcellanite show no evidence of use-wear. All fragments are small and well-flaked suggesting a considerable effort in manufacture. No complete knives were present in the TRBJ lithic assemblage.

Table 5.10. Descriptive Information for Knife Fragments.

Catalog Number	Raw Material	Size	Edge Angle (º)	Use Wear?	Use Wear Type
37	obsidian	sm	40	y	rounding
62	chert	sm	28	n	-
70	porcellanite	sm	32	n	-

Flake Tools Eight flake tools are classified into two discreet categories based upon evidence of retouch and utilization, presented in Table 5.11 below. Retouching is present in order to resharpen or shape a flake margin. One category of retouched flake tools shows only retouch and no evidence of utilization. Other flake tools showing evidence of both retouch and evidence of utilization are separated. Retouched flake tools (n=5) are made of porcellanite, obsidian, and chert. Retouched and utilized flake tools (n=3) are made solely from porcellanite. The retouched and utilized flake tools show evidence of retouch prior to use. This suggests that they were discarded after they became dull.

Table 5.11. Descriptive Information for Flake Tools.

Catalog Number	Raw Material	Size	Retouch Type	Edge Angle (º)	Use Wear?	Use Wear Type
3	obsidian	med	unifacial/bifacial	33	n	-
27	porcellanite	sm	unifacial	20	n	-
32	porcellanite	sm	unifacial	20	n	-
39	chert	sm	unifacial	42	n	-
50	porcellanite	sm	unifacial	27	n	-
12	porcellanite	med	unifacial	37	y	rounding
28	porcellanite	med	unifacial	65	y	rounding and polishing
38	porcellanite	sm	unifacial	61	y	rounding

Endscrapers and Uniface Fragments The three scraping tools, classified as endscrapers, are made of chert. The endscrapers were unifacially flaked and are presented in Table 5.12. Table 5.13 offers some statistical information regarding endscraper and uniface fragment edge angle. One endscraper is complete and shows evidence of use wear in the form of rounding while another, longitudinally fractured, exhibits crushing. A second complete endscraper shows no evidence of use-wear. Two other unifacial tool fragments, made of silicified lignite and porcellanite, were also recovered. However, it was not possible to classify these fragments with certainty as functional scrapers. They both exhibit abrupt unifacial flaking but no evidence of use wear was observed.

Table 5.12. Descriptive Information for Endscrapers and Uniface Fragments.

Catalog Number	Tool Type	Raw Material	Complete?	Size	Edge Angle (º)	Retouch?	Retouch Type	Use Wear?	Use Wear Type
4	endscraper	chert	y	sm	52	y	unifacial	y	rounding
23	fragment	lignite	n	sm	37	n	-	n	-
26	endscraper	chert	y	sm	75	n	-	n	-
52	endscraper	chert	n	sm	49	y	unifacial	y	crushing
60	fragment	porcellanite	n	sm	42	n	-	n	-

Table 5.13. Descriptive Statistics for Edge Angle (º).

Tool Type	Mean	Median	Std. Dev.
endscraper	58.67	52	14.22
unifacial tool fragment	39.5	39.5	3.54

Miscellaneous Tools Other miscellaneous tool data are present in Table 5.14. The TRBJ lithic assemblage included a unique type of tool and a perforator. The tool is made of porcellanite and shows invasive bifacial flaking and unifacial flaking. It is key-shaped in outline with one end unifacially flaked, presumably for scraping, and another edge bifacially flaked probably for cutting. This fragment is more robust in cross-section and differs from other flaked formal tools. The fragment is fractured on two edges. The tool cannot be classified as any specific type and is simply referred to as a multifunctional tool.

A single perforator is present that exhibits a denticulate measuring 50º. It was shaped by unifacially flaking a small, thin, tertiary flake of porcellanite to create a tip for puncturing. The area of retouch is confined to a small portion of the tip. Use-wear is present in the form of rounding. Many flake scars are also present on the tool's dorsal surface.

Table 5.14. Descriptive Information for Miscellaneous Tools.

Catalog Number	Tool Type	Raw Material	Size	Edge Angle (º)	Use Wear?	Use Wear Type	Weight (g)
33	multifunctional tool	porcellanite	med	47/62	n	-	26.7
35	perforator	porcellanite	sm	60	y	rounding	3.4

Raw Material Distribution of Tools

The raw material distribution of the TRBJ tools is presented in Table 5.15 and Figure 5.1 below. Porcellanite is the most abundant type of raw material used for all tools. Every single tool type has at least one specimen made from porcellanite. Table 5.16

below illustrates the primary use of each raw material. The primary use was reached by a combination of the number of tools made from each raw material and what percentage it comprises within each tool type. The objective of the table is to illustrate a range of variation in raw material use at TRBJ.

Chert is the second most frequent tool stone. Tools made of chert include endscrapers, projectile point fragments, retouched flakes, and *Pièces esquillées*. Silicified lignite occurs in a notable frequency. Two LPSN projectile points, a unifacial tool fragment, and a bipolar core are made of silicified lignite. Chalcedony and obsidian are not well represented raw materials in the tool assemblage. Chalcedony was used to produce LPSN projectile points. Obsidian was used to manufacture projectile points and knives. There are no TRBJ tools made of quartzite or basalt

Table 5.15. Raw Material Distribution of Tools.

Raw Material	***n***	**%**
porcellanite	45	67
chalcedony	3	5
chert	11	17
obsidian	3	5
lignite	4	6
Total	*66*	*100*

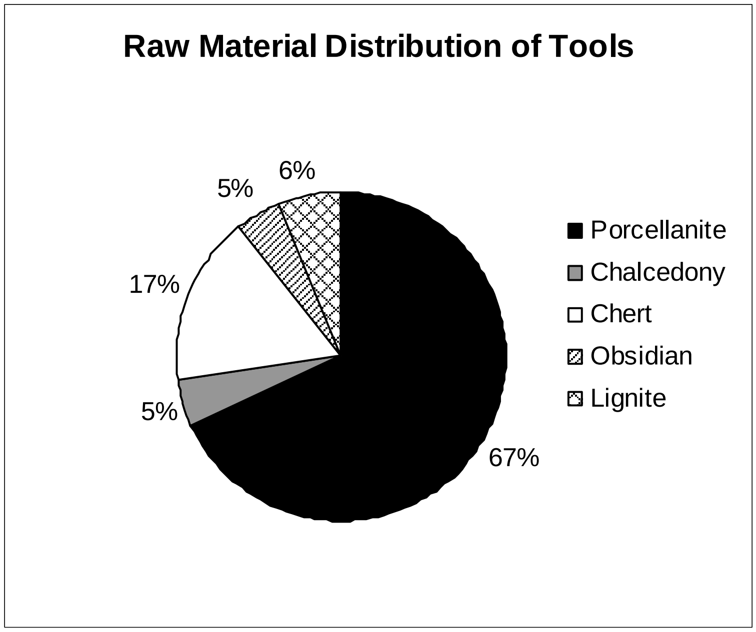

Figure 5.1

Table 5.16. Estimated Primary Use of Raw Materials.

Raw Material	%	Primary Use (Tool Type)	Largest *n* of Tool Type	% of Tool Type
Porcellanite	67	multidirectional core	11	100
Chert	17	endscraper	3	100
Chalcedony	5	projectile point (frag.)	2	25
Obsidian	5	knife	1	33
Lignite	6	projectile point	2	15

Raw Material Diversity

Table 5.17 below shows the raw material diversity in the TRBJ tool assemblage. Each tool type is shown as a percentage of the assemblage, the number of raw materials making up each tool class (richness), and finally a figure of calculated diversity. LPSN projectile points (including fragments) show the highest degree of diversity of raw materials. The 14 diagnostic projectile points are made from four different raw materials, giving a diversity value of 0.508. The pattern is also visible in the non-diagnostic projectile point fragments. The multi-directional cores and bipolar cores show the lowest diversity with both types made of two types of raw materials and each showing a diversity value of 0.132. Knife fragments also show a relatively high degree of diversity with a value of 0.477 and a richness of three. Unexpectedly, retouched flakes show relatively high value of diversity at 0.412 and a richness of three. This is contrasted with a low diversity value for utilized flakes at zero with a richness of one. This method helps demonstrate differential utilization and preference of raw materials per tool type.

TABLE 5.17. Raw Material Diversity in Tool Types.

Tool Type	Frequency	Percentage	Richness	Diversity
LPSN Projectile Point	14	21.2	4	0.508
Pelican Lake Projectile Point	1	1.5	1	0
Projectile Point Fragment	7	10.6	4	0.526
Retouched Flake	5	7.7	3	0.412
Retouched And Utilized Flake	3	4.5	1	0
Endscraper	3	4.5	1	0
Perforator	1	1.5	1	0
Multifunctional Tool	1	1.5	1	0
Knife Fragment	3	4.5	3	0.477
Bifacial Tool Fragment	1	1.5	1	0
Unifacial Tool Fragment	2	3.0	2	0.301
Multi-Directional Core	11	16.7	2	0.132
Bipolar Core	11	16.7	2	0.132
Pièces Esquillées	3	4.5	2	0.276
Total	*66*	*100*		

Tool Ratios

A comparison of formal to informal tools demonstrates the variable use of curated or expedient technologies. The TRBJ assemblage has 36 formal tools and 30 informal tools giving a ratio of 1.20, as presented in Table 5.18 below. This number indicates only slightly more formal tools are present at the site than informal tools.

In terms of raw material distribution, porcellanite comprises 50% of formal tool types and 90% of informal tool types. Porcellanite shows a ratio of 0.67:1, which also supports the assertion that porcellanite was utilized in a more expedient fashion. Chert makes up 28% of the formal tool classes while obsidian and lignite are less than 10%. A ratio value for chalcedony could not be calculated owing to the absence of any informal tool types. Tool ratios for chert, obsidian, and lignite all show utilization for more formal tools than informal tools. Chert and obsidian are both non-local raw materials, while lignite is a local raw material. This data indicates that finished, transported tools of non-local raw materials were at TRBJ. In addition, with this data in mind it becomes clearer that informal expedient tools and cores are made from a narrow range of raw materials (mainly porcellanite) while formal and curated tools are made from a wider range of raw materials.

Table 5.18. Formal:informal Tool Ratios.

Raw Material	**Formal Tools**		**Informal Tools**		**Ratio (*x*:1)**
	n	**%**	***n***	**%**	
porcellanite	18	50	27	90	0.67
chert	10	28	1	3.3	10
chalcedony	3	8	0	0	-
obsidian	2	6	1	3.3	2
lignite	3	8	1	3.3	3
Total	*36*	*100*	*30*	*100*	*1.20*

<u>Debitage Analysis</u>

The results of the TRBJ debitage analysis are explained below. The TRBJ lithic debitage assemblage consists of a total of 1114 flakes made from seven different raw material types. What follows is a description of the debitage analysis by raw material distribution, cortex amount, size, and platform initiation.

Raw Material Distribution of Lithic Debitage Table 5.19 and Figure 5.2 below illustrate the distribution of raw material. Porcellanite dominates the assemblage at 944 (85%) flakes, followed by chalcedony with 136 (12%) flakes; chert with 19 (1.7%) flakes; basalt and obsidian each with five (0.5%) flakes; quartzite with three (0.3%) flakes, and silicified lignite with two (0.1%) flakes. It is clear that porcellanite debitage in the TRBJ lithic assemblage overwhelms all the other raw material types. Porcellanite is a very abundant raw material in southeastern Montana. Other locally available raw material types include silicified lignite, quartzite, and basalt. Non-local raw material types are chert, obsidian, and possibly chalcedony, although there is evidence for some chalcedony nodules available in river drainage gravels throughout southeastern Montana (Fredlund 1976; Greiser 1981).

Porcellanite dominates the assemblage at 85%. A surprising change in the debitage raw material pattern from that of the tools is the strong showing of chalcedony debitage. Chalcedony only comprises 5% of the tool assemblage (see Figure 5.1). Conversely, there is a less than expected showing of chert debitage while comprising 15% of the tool assemblage. Basalt and quartzite are not present in the tool assemblage but make a small showing in the debitage.

Table 5.19. Raw Material Distribution of Debitage.

Raw Material	*n*	%
porcellanite	944	85
chalcedony	136	12
chert	19	1.7
basalt	5	0.5
obsidian	5	0.5
quartzite	3	0.3
lignite	2	0.1
Total	*1114*	*100*

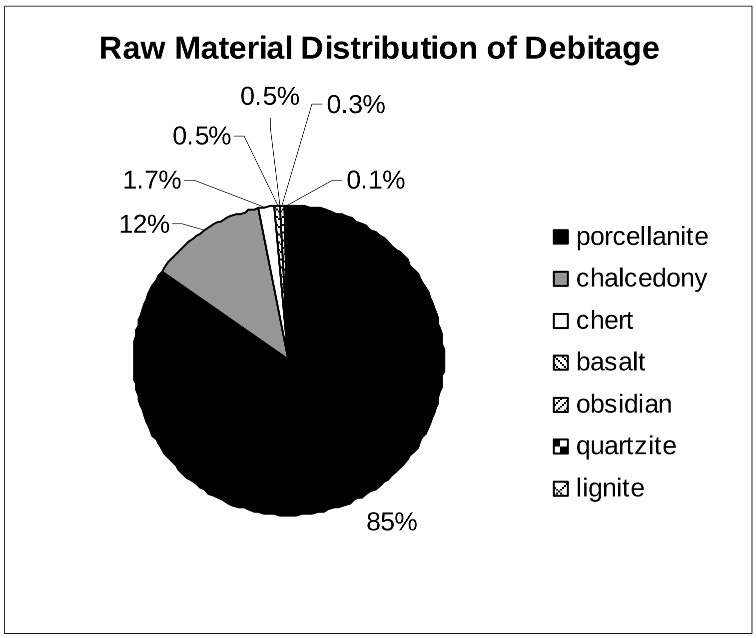

Figure 5.2

Cortex Amounts of Debitage The frequency of cortex for each raw material in the TRBJ debitage assemblage is presented in Figure 5.3. As a whole, tertiary cortex flakes comprise a significant portion of the TRBJ debitage assemblage. Table 5.20 below shows that 94% are tertiary flakes, 5% are secondary flakes, and 1% are primary flakes.

Cortex amounts vary by raw material type. Chalcedony, chert, and quartzite are completely dominated by tertiary cortex flakes. Silicified lignite shows 100% secondary cortex flakes. Basalt and obsidian each show 80% tertiary cortex and 20% secondary cortex flakes. Porcellanite shows the most variation with 93% tertiary cortex, 6% secondary cortex, and 1% primary cortex flakes.

Decortication of chalcedony, chert, and quartzite nodules did not take place at TRBJ. However, silicified lignite, basalt, obsidian, and porcellanite nodules were present at TRBJ with at least some cortex still present.

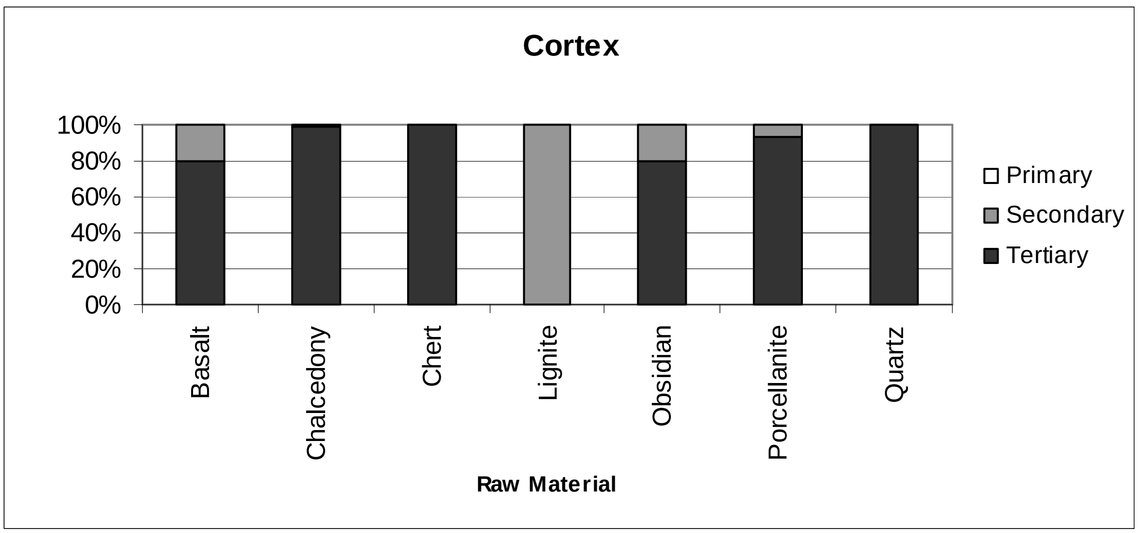

Figure 5.3

Table 5.20. Cortex Amounts of Debitage.

Raw Material	Primary		Secondary		Tertiary		*Total*	
	n	**%**	***n***	**%**	***n***	**%**	*n*	%
porcellanite	2	0.2	63	6.7	879	93.1	*944*	*100*
chalcedony	1	0.7	0	0	135	99.3	*136*	*100*
chert	0	0	0	0	19	100	*19*	*100*
basalt	0	0	1	20	4	80	*5*	*100*
obsidian	0	0	1	20	4	80	*5*	*100*
quartzite	0	0	0	0	3	100	*3*	*100*
lignite	0	0	2	100	0	0	*2*	*100*
Total	*3*	*0.3*	*67*	*6*	*1044*	*93.7*	*1114*	*100*

Debitage Size The classification of the TRBJ debitage assemblage by size grade is shown in Figure 5.4 and Table 5.21 below. Extra small flakes are the most abundant size grade and comprise 50% (*n*=562) of the debitage assemblage. Small flakes make up 37% (*n*=412) of the assemblage; medium flakes comprises 12% (*n*=138) of the assemblage, and large flakes make up a mere 1% (*n*=2) of the flake total. In a generalized sense, this reflects the nature of lithic reduction with lots of small flakes produced in all stages of reduction.

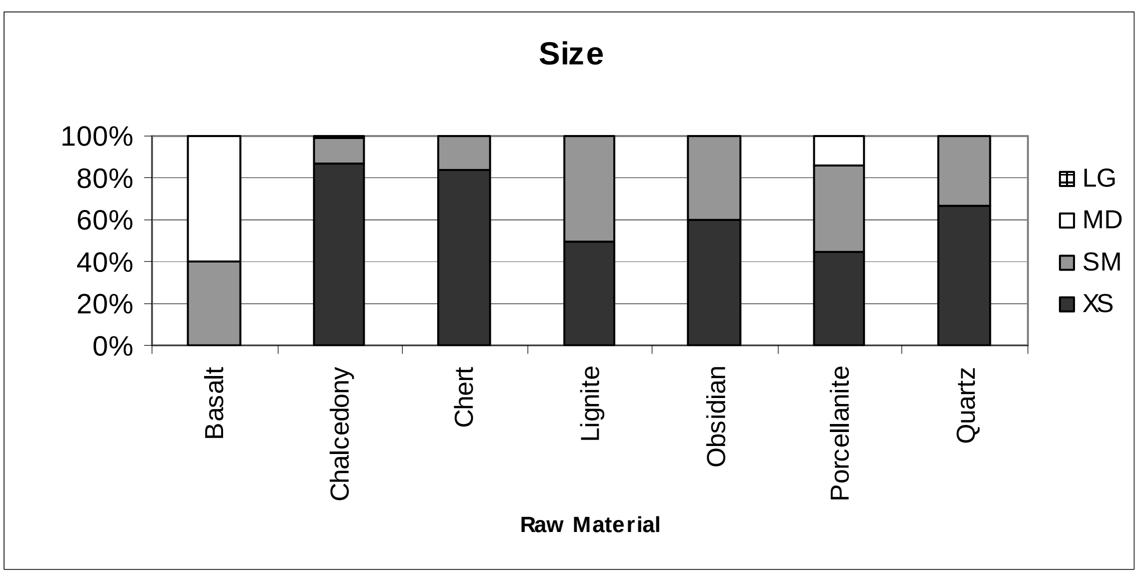

Figure 5.4

Size varies by raw material type. Basalt shows 40% small and 60% medium size flakes. Chalcedony shows 87% extra small flakes, 12% small flakes and 1% medium size flakes. Chert shows 85% extra small and 15% small size flakes. Silicified lignite is split 50-50 between extra small and small flake sizes. Obsidian exhibits 60% extra small and 40% small flake sizes. Quartzite exhibits 66% extra small and 33% small flake sizes. Porcellanite shows 44% extra small, 41% small, 14% medium, and 1% large flake sizes. Chert, chalcedony, obsidian, and quartzite show more extra small and small flake sizes suggesting that very small nodules were present at TRBJ. This is contrasted by basalt, porcellanite, and silicified lignite showing larger flake sizes present, suggesting somewhat larger nodules were present. Porcellanite shows the greatest degree of size variation and chert shows the smallest.

Table 5.21. Flake Size.

Raw Material	**Large**		**Medium**		**Small**		**Extra Small**		*Total*	
	n	**%**	***n***	**%**	***n***	**%**	***n***	**%**	***n***	**%**
porcellanite	2	0.2	124	13.2	386	41.9	422	44.7	*944*	*100*
chalcedony	0	0	1	0.7	17	12.5	118	86.8	*136*	*100*
chert	0	0	0	0	3	15.8	16	84.2	*19*	*100*
basalt	0	0	3	60	2	40	0	0	*5*	*100*
obsidian	0	0	0	0	2	40	3	60	*5*	*100*
quartzite	0	0	0	0	1	33.3	2	66.7	*3*	*100*
lignite	0	0	0	0	1	50	1	50	*2*	*100*
Total	*2*	*0.1*	*138*	*12.3*	*414*	*37.2*	*562*	*50.4*	*1114*	*100*

<u>Fracture Initiation</u> The results of the fracture initiation are presented in Figure 5.5 and Table 5.22. Of the 1114 pieces of debitage, only 320 (29%) flakes had intact and discernable striking platforms. Consequently, obsidian flakes are excluded from this method. Overall, flakes with cone initiation comprise 53% (*n*=171) of the assemblage.

Flakes with a bend initiation comprise 46% (*n*=146) and wedge initiations comprise 1% (*n*=3) of the assemblage.

Fracture initiation varies by raw material type. Cone initiation is the most common in basalt (67%), quartzite and silicified lignite (100%), and porcellanite (58%) flakes. Bend initiation is the most frequent among chalcedony (68%) and chert (85%). Also notable, porcellanite shows 41% bend initiation flakes. Wedge initiation flakes are rare and found only in 1% of the porcellanite debitage.

The results of the fracture initiation analysis are not as telling as flake size or cortex amount owing to cone and bend initiation flakes present in close amounts. There is, however, variation in platform initiation by raw materials. Porcellanite shows the most variation with cone, bend, and wedge initiated flakes present. Other raw materials, such as silicified lignite and obsidian, show little variation in platform initiation. Chert and chalcedony also show limited variation in platform initiation. The results may be a product of the abundance of the raw materials at TRBJ whereby porcellanite was reduced by hard-hammer free-hand percussion as well as soft-hammer percussion. Materials such as chalcedony and chert were reduced more with a soft-hammer, indicating that earlier stages of reduction took place somewhere else, and later stages took place at TRBJ.

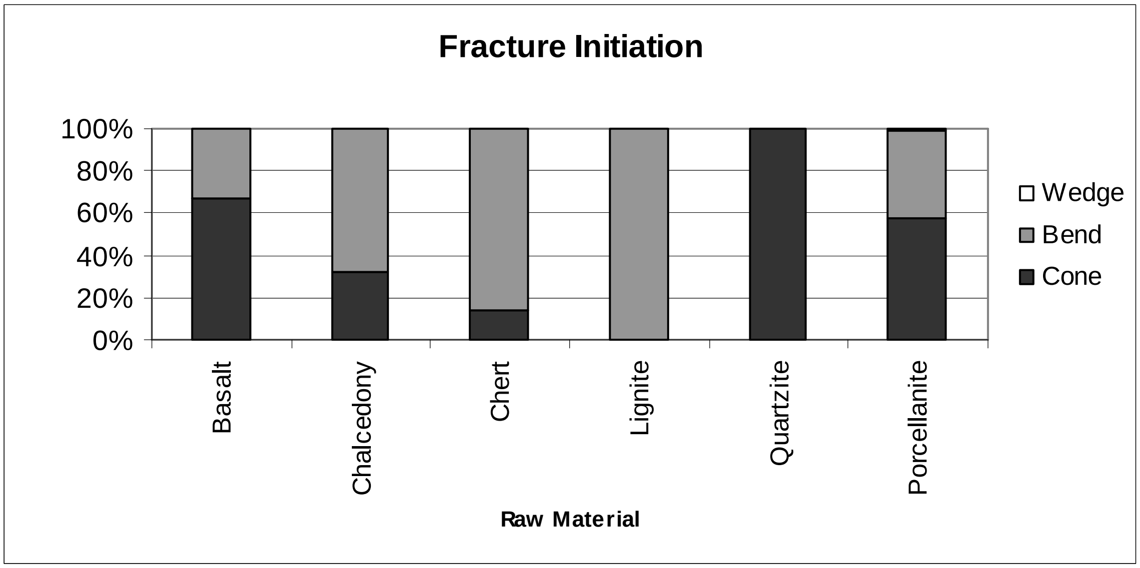

Figure 5.5

Table 5.22. Fracture Initiation.

Raw Material	Cone		Bend		Wedge		*Total*	
	n	**%**	**n**	**%**	**n**	**%**	***n***	**%**
porcellanite	153	57.5	110	41.4	3	1.1	*266*	*100*
chalcedony	13	31.7	28	68.3	0	0	*41*	*100*
chert	1	14.3	6	85.7	0	0	*7*	*100*
basalt	2	66.7	1	33.3	0	0	*3*	*100*
obsidian	0	0	0	0	0	0	*0*	-
quartzite	2	100	0	0	0	0	*2*	*100*
lignite	0	0	1	100	0	0	*1*	*100*
Total	*171*	*53*	*146*	*46*	*3*	*1*	*320*	*100*

Summary

The methods and results of the analysis of the TRBJ lithic assemblage offer some conclusions consistent with the expectations introduced in Chapter 5. These results and their implications are more fully discussed in Chapter 7.

Several patterns emerge from the analysis. Tool frequencies show slightly more formal tool types (*n*=36) than informal tool types (*n*=30). Formal tools are dominated by projectile points (*n*=14) and informal tools are dominated by multidirectional and bipolar cores both present in the same frequencies (*n*=11). Surprisingly, expedient flake tools, both retouched and retouched and utilized, are present in low numbers (*n*=8). Other processing tools, such as bifaces, knives, and scrapers are also present in low numbers (see Table 5.3).

Another pattern to emerge from the data points toward the widespread use of porcellanite. Porcellanite comprises 85% of the debitage and 67% of the tools. The use of porcellanite, reflected in both formal and informal tools, as represented in more tool types than any other raw material. This is most likely because of its local abundance (Andrefsky 1994). Interestingly enough, endscrapers are the only tool type to show no specimens made of porcellanite (see Table 5.3).

In terms of tool use and discard, projectile points are the most discarded tool, as evidenced not only by complete points (n=14), but by the number of incomplete points and fragments as well (n=7). Other discarded and broken curated tools include scrapers (*n*=3) and knives (*n*=3). This result tells a little about the cost, in terms of curated gear, of killing a sizeable herd of bison. In addition, many bipolar (*n*=11) and multidirectional (*n*=11) cores were left behind. Both types of cores are made primarily of porcellanite (see Table 5.3) and may be more a reflection of its relative abundance around TRBJ. In short, tool use and discard reveals a notable degree of formal tools dropping out of the technological system at this location.

A notable percentage of curated gear, mostly in the form of projectile points, scrapers, etc., was made of non-local raw materials including chert known to occur in the Big Horn Mountains and obsidian from the Yellowstone Park area, both a considerable distance from TRBJ (see Tables 5.1 and 5.2). This implies a mobility pattern whereby groups were moving from the Big Horn Mountains and Yellowstone Plateau and bringing curated gear with them into southeastern Montana. Likewise, the abundance of high-quality porcellanite (and bison) in southeastern Montana probably made the area a residential destination for part of the year.

A notable absence from the assemblage is bifaces. The presence of a single biface made of porcellanite may indicate that transported raw material supplies had diminished to the point of near exhaustion and were not altogether present at TRBJ. Transported bifaces would have acted as cores and/or tools for driving flakes off and would have ultimately been reduced down to a point where the owner either had to shape the biface into something usable or discard it (Kelly 1988). Another explanation is that bifaces were not discarded at TRBJ and were transported away from the site. This would certainly explain the near absence as well as some flakes of non-local raw material showing cortex. However, Table 5.8 indicates that there was a chert core recovered.

Lithic reduction at TRBJ points toward the maintaining and resharpening of finished tools. This is supported by the recovery of predominantly small, decorticated debitage that appears to have been part of the later stages of reduction. This also points toward a large amount of resharpening of tools taking place, which should not be surprising considering the activity performed at the site- processing bison. However, some flakes exhibiting cortex are present, albeit in very low numbers (*n*=3 or 0.3%

[Table 5.20]). This suggests that at least some raw materials passed though the site that were not in the form of finished tools.

Finally, the amount of bipolar reduction, as seen by the recovery of cores and limited debitage, indicates that some degree of limitation was placed upon the activity of processing bison. Using bipolar reduction is thought of as the result of a shortage of raw material, time, or even both factors. Judging by the quantity of porcellanite present at the site raw material constraints were not a factor for the use of that raw material. However, time constraints in processing the bison may have been. This is strengthened when one considers the seasonality, presented in Chapter 1, of late winter/early spring and the erratic weather patterns in the Northwestern Plains. A possible explanation could be that the group had to process the bison very quickly in order to move on to avoid changing weather.

The following chapter will compare these results to that of other bison kill sites in southeastern Montana in order to address questions regarding variation in Late Prehistoric behavior.

CHAPTER 6

COMPARATIVE ANALYSIS

This chapter compares the TRBJ lithic assemblage to other bison kill lithic assemblages. The regional comparison highlights the range of variation in lithic technological organization at TRBJ and other bison kill sites. Can a comparative analysis indicate any factors that may have influenced technological organization such as seasonality, raw material access, or work requirements?

The TRBJ lithic assemblage was compared with other bison kill site lithic assemblages in a defined geographical study area. The study area encompasses the Tongue River and Powder River drainages in five Montana counties of Rosebud, Big Horn, Treasure, Custer, and Powder River. This area covers a large section of southeastern Montana and thus offered settings for a variety of bison kill sites. This interassemblage comparison focus is on the commonality and variability of the lithic assemblages.

The geographical study area comprises the Pine Parklands region of southeastern Montana. This includes the Tongue River and Powder River drainages, which are tributaries of the Yellowstone River. The study area is dissected in all directions by natural land features, including the Big Horn and Pryor Mountains to the south-southwest, the Absaroka and Beartooth Mountains to the West, the Yellowstone River to the north, and the open rolling prairies to the east. Bison kill sites occurring outside of the Pine Parklands area likely represent a rather different ecological adaptation. For this reason, no bison kill sites from central Montana, Wyoming, the Canadian Plains or the eastern prairies are used for the comparative analysis.

To begin with, a file search was performed at the Montana State Historic Preservation Office to locate all previously recorded bison kill sites in the study area. Once all bison kill sites were identified, the focus shifted to test excavated bison kill sites, and their respective findings were reviewed. The descriptive attributes characterizing the site and lithic assemblages were systematically recorded, as described below.

Raw material distribution percentages for all tools and debitage, as presented, were calculated in order to describe the variation observed between the TRBJ and other lithic assemblages. Patterns in the distributions will bring about behavioral inferences drawn from raw material preferences observed in the assemblage. In addition, it will allow variation to be addressed for the raw material selection of formal versus informal tools

The ratios of formal to informal tools were also calculated. Comparisons of formal to informal tool ratios allow for inferences concerning tool curation (Binford 1979). For example, if people are spending much time and energy creating formal tools, the ratio of formal to informal tools would be expected to be quite high. In addition, when raw material is taken into consideration in light of these ratios, matters of planning depth and mobility can be explored (Andrefsky 1994; Bamforth 1986; Bleed 1986; Ingbar 1994).

Methods

Tools

A comparison of the TRBJ tool assemblage to that of others is offered. Not all tool classes will be compared owing to discrepancies in typologies. However, three general classes of formal tools and two general classes of informal tools were found compatible in the comparison. These tool types will give a fairly clear indication of the variation in technological organization. They will be primarily compared in terms of tool frequencies and raw material distributions. Descriptions of the tool classes is offered below and based upon the same definitions as previously stated in Chapter 5.

Formal Tools

A comparison of the variation in formal tools, as defined in Chapter 5, will aid in demonstrating where the TRBJ assemblage fits into a larger context of other Late Prehistoric bison kill sites. The definitions below are meant to justify the comparative analysis.

Projectile Points A comparison of projectile point dimensions (average length, average width and average thickness) from the various lithic assemblages can reveal the range of variation of morphology of LPSN. Although vast LPSN variation has been previously noted in this report, more data, specifically from bison kill contexts may show a patterning yet to be well-documented or understood. Refurbishment of LPSN projectile points can also be addressed. In addition, an emphasis is placed upon the lithology of the projectile points. Differences in raw material selection for LPSN projectile point manufacture are addressed.

Bifaces Bifaces are an integral component for butchering of bison and offer additional data with regard to how TRBJ compares to other known bison kill sites in the study area. Bifaces often have a high utility value and can often be made from non-local raw materials and used as tools or cores (Kelly 1988). The lithology of bifaces as a tool type, then, can convey information on the transport of raw materials to the site.

Scrapers Scrapers are tools that are also used for comparison. They occur in two forms: endscrapers and sidescrapers. An endscraper has its bevel on one end, unlike a sidescraper, that is beveled on one side. The lithology of scrapers conveys useful information about the transport of raw materials to the site. In addition, scrapers can give an indication of variability in site function.

Informal Tools

Flake Tools and Cores Informal tools, such as expedient flake tools, are compared in terms of raw material distribution. The presence of retouched flakes gives some indication of the amount of energy expended in processing bison. In addition, raw material cores will be compared to give an indication of what types are present. Variation in the frequencies of multidirectional and bipolar cores will be addressed. As stated above, a comparison of the ratios of formal to informal tools allows for comparison in raw material utilization patterns and expediency of technology used to process bison.

Debitage

Debitage is compared to that of TRBJ. Comparisons of debitage analyses show variation in the type of lithic reduction at the site. Interassemblage variation in the reduction of raw materials can be a meaningful measurement in raw material use. For example, it may be the case that debitage is recovered from a site without any tools of the same raw material. A comparison of variation in debitage helps to measure the type of reduction strategy employed at each site

Results

This analysis compares the TRBJ lithic assemblage with other known bison kill sites in the area. Tables 6.1 through 6.7 highlight the tool comparisons and Tables 6.9 and 6.10 highlight the debitage comparison. Table 6.1 below illustrates the number of previously recorded bison kill sites in the study area. Currently, a total of 32 recorded bison kill sites are on record. Of these 32, only five have been sufficiently investigated to provide comparative data. These five sites include: the Sly Bison Kill (24RB267) (Steere 1980); BLM Bison Trap (24RB1021) (Ekland 1974); Kobold IV (24BH406) (Frison 1970b); Eagle Pit Bison Jump (24BH1729) (Fredlund 1981); and the Sam Lei Bison Trap (24PR1032) (Beckes and Keyser 1983; McLean 1976). Table 6.2 presents the lithic assemblage data from the five sites. Please keep in mind that in some cases comparative data are lacking because little was recovered and/or the reporting is deficient. Tables 6.3 through 6.7 offer a listing of tool types cross tabulated with raw material.

The Sly Bison Kill (24RB267) is located in Rosebud County near the town of Colstrip, MT, about 30 miles (48km) to the northwest of TRBJ. As part of Western Energy's coal bed development, the site was tested in 1979. It is a bison trap in a large wash with an associated processing area. The bone bed contained at least 12 individual animals. Recovered lithics include 51 LPSN projectile points, 209 butchering tools, and a large quantity of debitage (Steere 1980). Not all tool types were looked at for this comparison. Four radiocarbon samples produced dates of 1620 ± 200 BP, 1600 ± 100 BP, 1410 ± 50 BP, and 1210 ± 120 BP (Steere 1980). Steere (1980) suggested that the site was a winter kill. Table 6.1 below presents the raw material types and identifiable source locations for the Sly Bison Kill lithic assemblage.

Table 6.1. Raw Materials and Source Locations for The Sly Bison Kill Site (24RB267).

Raw Material	Local/ Non-local	Nearest Source	Distance m(km)	Direction	Reference
porcellanite	local	site vicinity	0(0)	-	D. Fredlund 1976; Steere 1980
Yellowstone agate	local	Yellowstone/Tongue River drainages	30(48)/ 18(29)	north/east	Steere 1980
brown agate	local	Yellowstone/Tongue River drainages	30(48)/ 18(29)	north/east	Clayton et al. 1970; Steere 1980
phosphoria	non-local	Big Horn Mtns.	>100(160)	southwest	Frison 1991; Steere 1980
quartzite	local	site vicinity	0(0)	-	Frison 1991; Steere 1980
silicified sediments	local	Yellowstone/Tongue River drainage	30(48)/ 18(29)	north/east	Ahler 1975; Steere 1980
uncertain cherts/ chalcedonies	non-local	Pryor Mtns./ Big Horn Mtns.	>125(200)/ >100(160)	southwest	L. Fredlund 1979; Steere 1980

The BLM Bison Trap (24RB1021) is also located in Rosebud County, about 26 miles (42km) to the northwest of TRBJ, also near the town of Colstrip, MT, and not far from the Sly Bison Kill site (24RB267). The site was investigated as part of the Peabody Coal Company mine expansion. The site is positioned in a small depression or "swale" near a sandstone precipice. Remains of at least 43 bison were recovered from testing within the bone bed (Ekland 1974). The lithic assemblage included 24 LPSN projectile points, scrapers, biface choppers, blades, and several utilized flake tools. No dates are reported and wintertime use for the site was suggested. Table 6.2 below presents the raw material types and identifiable source locations for the BLM Bison Trap (24RB1021). In the case of jasper, its provenance is considered possibly non-local owing to its volcanic geological formation.

Table 6.2. Raw Materials and Source Locations for the BLM Bison Trap (24RB1021).

Raw Material	Local/ Non-local	Nearest Source	Distance m(km)	Direction	Reference
porcellanite	local	site vicinity	0(0)	-	Eckland 1974; Fredlund 1976;
chert	non-local	Big Horn Mtns.?	>100(160)	southwest	Frison 1991
agate	local	Yellowstone/Tongue River drainages	30(48)/ 18(29)	north/east	Eckland 1974
quartzite	local	site vicinity	0(0)	-	Eckland 1974; Frison 1991
jasper	non-local?	Big Horn Mtns.?	>100(160)	southwest	Eckland 1974
basalt	local	Yellowstone/Tongue River drainages	30(48)/ 18(29)	north/east	Eckland 1974

The Kobold site (24BH406) is located in Big Horn County near the head of Rosebud Creek, about 34 miles (55km) southwest of TRBJ near Decker, MT. The site, excavated in 1968, has an extensive bone deposit containing the remains of at least 17 animals. It is situated in an arroyo at the base of a sandstone cliff. Although evidence for occupation at the site extends as far back as 3500 to 4000 BP based upon projectile point styles, Level IV is a Late Prehistoric Period component that produced 220 LPSN projectile points, knives, scrapers, cores, retouched flakes, and a quantity of debitage (Frison 1970b). A single obsidian hydration date of AD 1033 was obtained for the Late Prehistoric component. Faunal remains from this component show a minimum number of 17 bison. They also indicated that the kill operation took place in late summer to early fall. Table 6.3 below presents the raw material types and identifiable source locations for Kobold IV (24BH406).

Table 6.3. Raw Materials and Source Locations for Kobold IV (24BH406).

Raw Material	Local/ Non-local	Nearest Source	Distance m(km)	Direction	Reference
porcellanite	local	site vicinity	0(0)	-	Fredlund 1976; Frison 1970b;
chert	non-local	Big Horn Mtns.?	>50(80)	southwest	Frison 1970b, 1991
quartzite	local	site vicinity	0(0)	-	Frison 1970b, 1991
obsidian	non-local	Yellowstone NP?	>160(257)	west	Frison 1970b; Hughes 1995

The Eagle Pit Bison Jump (24BH1729) is located in Big Horn County near the town of Decker, MT (L. Fredlund 1981). It is located about 35 miles (56km) to the southwest of TRBJ and situated on an upland bench that divides two drainages. The site was test excavated as part of the Young's Creek Mine development in 1980. Excavations in the bone bed deposit indicated less than 12 animals were present. The lithic assemblage includes 3 LPSN projectile points, 2 scrapers, and sparse debitage. No dates have been reported for the site, although a summer kill operation was reported.

Table 6.4. Raw Materials and Source Locations for Eagle Pit Bison Trap (24BH1729).

Raw Material	Local/ Non-local	Nearest Source	Distance m(km)	Direction	Reference
porcellanite	local	site vicinity	0(0)	-	Fredlund 1976; Fredlund 1981
chert	non-local	Big Horn Mtns.?	>30(48)	west	Fredlund 1981; Frison 1991
quartzite	local	site vicinity	0(0)	-	Fredlund 1981; Frison 1991

The Sam Lei Bison Trap (24PR1032) is located in the Custer National Forest about 35 miles (56km) to the southeast of TRBJ in the Powder River drainage. The site was tested in 1975 and produced a small lithic assemblage of 10 LPSN projectile points, a retouched flake, and a multidirectional core (Beckes and Keyser 1983; Mclean 1976). The site is situated on a bank of a small tributary drainage near a steep slope. The bone bed indicates a small, mass bison kill of at least 13 animals. Possible winter seasonality was suggested. Also, a single radiocarbon date of 310 ± 110 BP was reported (McLean 1976). Unfortunately no mention of raw material types is found in the site report. One can only assume that porcellanite is dominant, but nothing is reported.

Table 6.5. Summary of Previously Recorded Bison Kill Sites in Big Horn (BH), Carter (CT), Custer (CU)*, Prairie (PE), Powder River (PR), Rosebud (RB), and Treasure (TE)* Counties, Southeastern Montana.

Site Number	Site Name	Site Type	Time Period	Owner/Manager	Tested	Reference
24BH216		jump	undetermined	BIA (Crow)	No	
24BH261	Grapevine Creek Buffalo Jumps	jump	historic	BIA (Crow)	No	Conner 1964
24BH262	Grapevine Creek Buffalo Jumps	jump	undetermined	BIA (Crow)	No	Conner 1964
24BH263	Grapevine Creek Buffalo Jumps	jump	undetermined	BIA (Crow)	No	Conner 1964
24BH264	Grapevine Creek Buffalo Jumps	jump	undetermined	BIA (Crow)	No	Conner 1964
24BH406	Kobold Site	jump	Middle Prehistoric/ Late Prehistoric	private	Yes	Frison 1970
24BH798		jump	undetermined	no data	No	
24BH801		jump	undetermined	no data	No	
24BH1001	Foss-Thomas	jump	Late Prehistoric	DOE	Yes	Fry 1971
24BH1050		jump	undetermined	DOE	No	
24BH1729	Eagle Pit Bison Jump Site	jump	Late Prehistoric	DOE	Yes	Fredlund 1981
24BH1920		jump	undetermined	BIA	No	
24BH2562		jump	Late Prehistoric	BIA	No	
24BH2613		jump	undetermined	private	No	
24CT95		jump	undetermined	private	No	
24CT1004		jump	undetermined	private	No	
24PE30	Ayers-Frazier	pound	Middle Prehistoric	BLM	Yes	Clark and Wilson 1981
24PE84		jump	undetermined	no data	No	
24PR5	Powers-Yonkee	pound	Middle Prehistoric/ Late Prehistoric	private	Yes	Bentzen 1962; Bump 1987
24PR186		jump	undetermined	private	No	
24PR762		pound	Middle Prehistoric	private	No	
24PR1032	Sam Lei Bison Kill	pound	Late Prehistoric	FS	Yes	Mclean 1976; Beckes and Keyser 1981
24PR1227		jump	undetermined	FS	No	
24PR2273		jump	undetermined	private	No	
24RB255		pound	undetermined	private	No	
24RB299		pound	Late Prehistoric	private	No	
24RB267	Sly Bison Kill	pound	Late Prehistoric	private	Yes	Steere 1980
24RB825		pound	Late Prehistoric	BLM	No	
24RB1021	BLM Bison Trap	trap	Late Prehistoric	private	Yes	Ekland 1974
24RB1121		jump	undetermined	FS	No	
24RB2052		jump	undetermined	private	No	
24RB2135	Tongue River Bison Jump	trap	Late Prehistoric	BIA (N. Cheyenne)	Yes	Prentiss et al. 2007

***No Previously Recorded Bison Kill Sites**

Table 6.6. Late Prehistoric Bison Kill Sites Used for Comparison.

Site	Kill Type	Setting	Bison MNI	Seasonality	^{14}C Dates (Years BP)	Other Dates	Total *n* Tools	Total *n* Debitage
Tongue River Bison Jump (24RB2135)	trap	valley	15	late winter/ early spring	2820±160 900±45	NA	66	1114
Sly Bison Kill (24RB267)	pound	pine breaks	12	winter	1620±200 1600±100 1410±50 1210±120	NA	260	8921
BLM Bison Trap (24RB102)	trap	swale	43	winter	NA	NA	38	NA
Kobold IV (24PR406)	jump	upland	17	late summer/ fall	NA	AD 1033	281	NA
Eagle Pit Bison Jump (24BH1729)	jump	upland bench	12	summer	NA	NA	16	51
Sam Lei Bison Trap (24PR1032)	pound	upland swale	13	late fall/ early winter	310±110	NA	12	NA

Table 6.7 Projectile Point Comparison.

Site	*n*	Mean Length (mm)	Mean Width (mm)	Mean Thickness (mm)	Lithology		
					Raw Material	*n*	%
Tongue River Bison Jump (24RB2135)	14	18.9	13.7	3.6	porcellanite chalcedony lignite	8 4 2	57 29 14
Sly Bison Kill (24RB267)	51	18.8	11.9	2.9	porcellanite agate phosphoria silicified sed. chert/chalced.	33 7 3 4 4	65 15 6 7 7
BLM Bison Trap (24RB102)	24	26.6	15.0	2.9	porcellanite chert agate jasper quartzite	17 3 2 1 1	71 13 8 4 4
Kobold IV (24PR406)	220	NA	NA	NA	porcellanite quartzite chert obsidian	101 66 47 6	46 30 21 3
Eagle Pit Bison Jump (24BH1729)	3	NA	NA	NA	chert quartzite	2 1	67 33
Sam Lei Bison Trap (24PR1032)	10	24.2	16.1	NA	NA	NA	NA

Table 6.8. Biface Comparison.

Site	*n*	Lithology		
		Raw Material	***n***	**%**
Tongue River Bison Jump (24RB2135)	1	porcellanite	1	100
Sly Bison Kill (24RB267)	10	porcellanite agate silicified sed. chert/chalced.	2 5 2 1	20 50 20 10
BLM Bison Trap (24RB102)	2	agate	2	100
Kobold IV (24PR406)	28	porcellanite quartzite chert	14 11 3	50 39 11
Eagle Pit Bison Jump (24BH1729)	0	NA	NA	NA
Sam Lei Bison Trap (24PR1032)	0	NA	NA	NA

Table 6.9 Expedient Flake Tool Comparison.

Site	*n*	Lithology		
		Raw Material	***n***	**%**
Tongue River Bison Jump (24RB2135)	8	porcellanite chert obsidian	6 1 1	74 8 8
Sly Bison Kill (24RB267)	0	NA	NA	NA
BLM Bison Trap (24RB102)	6	porcellanite	6	100
Kobold IV (24PR406)	26	porcellanite quartzite chert obsidian	14 9 2 1	54 35 8 3
Eagle Pit Bison Jump (24BH1729)	0	NA	NA	NA
Sam Lei Bison Trap (24PR1032)	0	NA	NA	NA

Table 6.10. Scraper Comparison.

Site	Endscraper *n*	Lithology			Sidescraper *n*	Lithology		
		Raw Material	*n*	%		Raw Material	*n*	%
Tongue River Bison Jump (24RB2135)	3	chert	3	100	0	NA	NA	NA
Sly Bison Kill (24RB267)	34	porcellanite agate phosphoria silcified sed. chert/chalced.	11 4 4 1 14	32 12 12 3 41	0	NA	NA	NA
BLM Bison Trap (24RB102)	2	porcellanite basalt	1 1	50 50	4	porcellanite	4	100
Kobold IV (24PR406)	3	chert	3	100	0	NA	NA	NA
Eagle Pit Bison Jump (24BH1729)	0	NA	NA	NA	2	quartzite	2	100
Sam Lei Bison Trap (24PR1032)	0	NA	NA	NA	0	NA	NA	NA

Table 6.11. Raw Material Core Comparison.

Site	Multi-directional *n*	Lithology			Bipolar *n*	Lithology		
		Raw Material	*n*	%		Raw Material	*n*	%
Tongue River Bison Jump (24RB2135)	11	porcellanite chert	10 1	91 9	11	porcellanite lignite	10 1	91 9
Sly Bison Kill (24RB267)	50	NA	NA	NA	0	NA	NA	NA
BLM Bison Trap (24RB102)	0	NA	NA	NA	0	NA	NA	NA
Kobold IV (24PR406)	4	porcellanite	4	100	0	NA	NA	NA
Eagle Pit Bison Jump (24BH1729)	0	NA	NA	NA	0	NA	NA	NA
Sam Lei Bison Trap (24PR1032)	1	NA	NA	NA	0	NA	NA	NA

Tool Assemblage Comparisons

Raw data cross tabulated by raw material types for the tool assemblages of the five comparative sites are presented in Figures 6.7 through 6.11 above. In addition, a graphic comparison of the tool assemblages is also presented in Figure 6.1 below. Because of their numbers skewing results the 220 projectile points in the Kobold IV assemblage are not included in Figure 6.1. This was done in order to make the tool patterning from the other sites more visible. Projectile points and debitage comparisons are addressed separately and discussed in the sections below.

As a whole, all the assemblages contain a majority of tool types made of similar local raw materials. Porcellanite is commonly used along with quartzite, agate, and other cryptocrystalline varieties of local origin. This is supplemented with a notable frequency of chert, possibly of non-local origin, and obsidian. The assemblages appear to fit the pattern seen in the TRBJ lithic assemblage and indicate that people were traveling through southeastern Montana transporting cherts, and in some cases obsidian, into the area in the form of finished tools, bifaces, and/or cores.

In comparing the tool assemblages a few identifiable patterns emerge worth mentioning. In Table 6.8 the Eagle Pit Bison Trap and the Sam Lei Bison Trap both show an absence of bifaces in the assemblage. TRBJ shows a single biface fragment. However, Kobold IV, the BLM Bison Trap, and the Sly Bison Kill site show the presence of many bifaces. These bifaces are primarily made from local raw materials with the exception of three chert bifaces in the Kobold IV assemblage.

When expedient flake tools are compared between the six sites the presence of obsidian is notable. Table 6.9 shows that, although porcellanite is the dominant raw material in the assemblages showing this tool types (TRBJ, BLM Bison Trap, and Kobold IV), there is a noteworthy presence of non-local raw materials of chert and obsidian. In fact, outside of the presence of quartzite in the Kobold IV assemblage, the pattern is nearly identical.

Table 6.10 illustrates the raw material distribution of endscrapers and sidescrapers. The Sly Bison Kill site has many more scrapers present than any other site (*n*=34). The raw materials exhibit a narrow range of variation of almost exclusively local raw materials. This is contrasted with TRBJ and Kobold IV where the scrapers are all made of chert. Other sites show no scrapers in their assemblages.

When cores are looked at a similar pattern emerges as that of bifaces with even less variation in raw material types. Table 6.11 highlights the results. TRBJ and Kobold IV show the cores exclusively made of porcellanite and lignite. Unfortunately, raw material type is not reported for Sly Bison Kill and Sam Lei Bison Kill. The BLM Bison Trap and Eagle Pit Bison Trap show no cores in the assemblage.

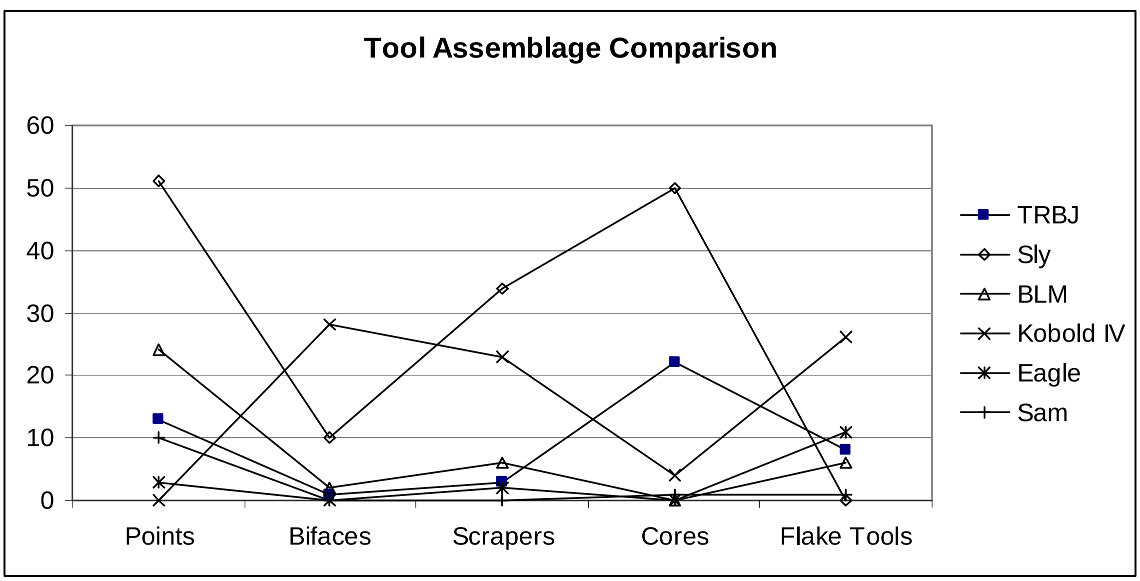

Figure 6.1

Drawing from Tables 6.7-6.11 and Figure 6.1 above, a comparison of the formal to informal tools also shows differences among the bison kill samples. Table 6.8 below illustrates the results. The Eagle Pit Bison Trap (24BH1729) is the only site to show more informal tools giving a ratio if less than one. In fact, Fredlund (1981) recognized the paucity of shaped or patterned tools in the analysis. No explanation was offered as to the reason for the pattern. One explanation that can be offered upon the basis of this comparative analysis is the seasonality of the site compared to the other sites. Eagle Pit Bison Trap is the only one of the six sites to show a summer seasonality. It may be that during the summer the group using the site had less formal tools owing to raw materials readily obtained from the frost-free ground. The group did not have a need to curate bifaces or other tools and prepare for the next move. Instead, they were moving less owing to summer weather and perhaps the presence of other faunal species in the area required a more generalized and informal tool kit for encounters.

The other five sites, including TRBJ, all show more formal tools in their assemblages. These are most commonly represented by projectile points and scrapers. At the Kobold IV site, the ratio is heavily skewed by the number of LPSN projectile points in the assemblage (Frison 1970b). This is also the case, although to a much lesser degree, for the Sam Lei Bison Trap (McLean 1976) and the BLM Bison Trap (Ekland 1974). Despite apparently small sample sizes compared to Kobold IV, the sites indicate a use of more formal tools including projectile points, bifaces, and scrapers.

Again, a look at the seasonality of the five sites indicates that they all fall within a range of fall to early spring, or the absence of the hottest months of the year. People may have been located at large campsites during the colder months and collecting bison for subsistence. Traveling during these seasons when weather can be very unpredictable in southeastern Montana makes a strong case for gearing up with tools and curated gear for the task. This may help explain the use of more formal tools

Table 6.12: Formal:informal Tool Ratios.

Site	Formal Tools	Informal Tools	Ratio
Tongue River Bison Jump (24RB2135)	36	30	1.20
Sly Bison Kill (24RB267)	157	153	1.03
BLM Bison Trap (24RB102)	32	6	5.33
Kobold IV (24PR406)	251	26	9.65
Eagle Pit Bison Trap (24BH1729)	5	11	0.45
Sam Lei Bison Trap (24PR1032)	10	1	10.00

Projectile Point Comparison Projectile point size variation is another comparative measure that reflects tool use behavior at bison kill sites. Table 6.7 above and Figure 6.2 below demonstrate the range of variation in projectile point morphology from three of the comparative sites where dimensions could be attained. Metric projectile point data from the Kobold IV site and the Eagle Pit Bison Trap site are not available. LPSN projectile points from TRBJ fit within a range of variation in comparison with the other bison kill sites. The projectile points are smaller in length and width than Sam Lei Bison Trap and BLM Bison Trap, but larger than the Sly Bison Kill.

Small points may indicate raw material constraints were present. This can be supported by the seasonality of the sites. The seasonality for all four sites (Figure 6.2) centers around winter, a time when raw materials would have been scarcer than in warmer seasons. It is also a time when mobility would have been reduced owing to weather.

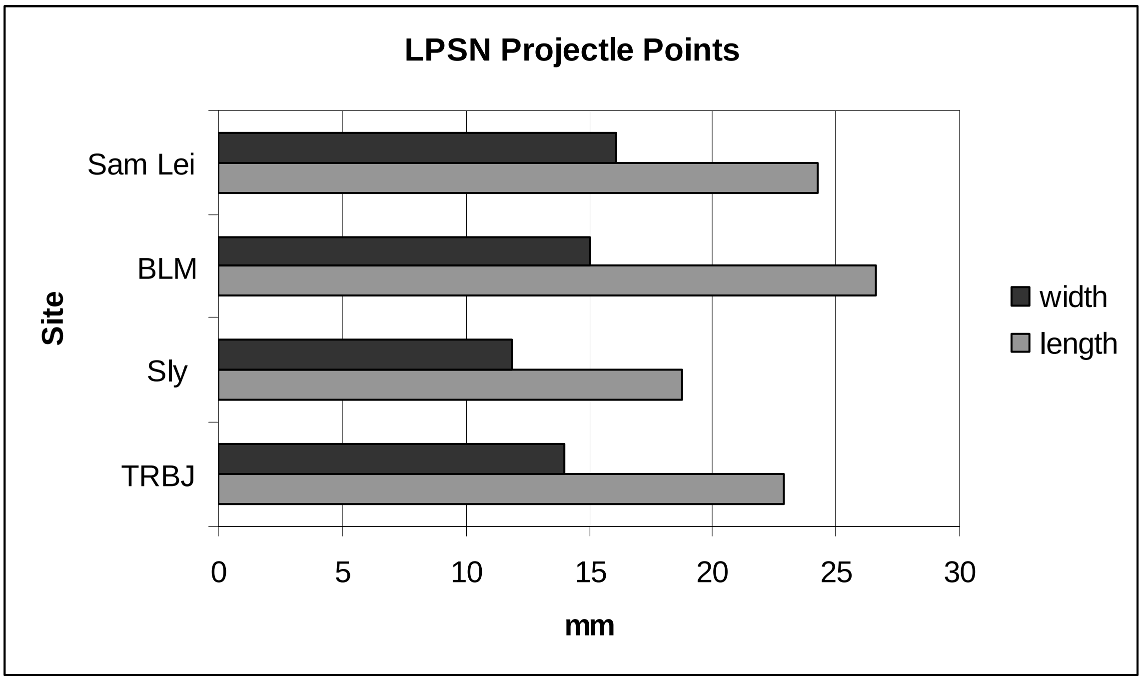

Figure 6.2

Raw material use for projectile points is reported for four of the five comparative sites (Figure 6.7). The Eagle Pit Bison Trap shows no points made of porcellanite, which seems to stand out against the other sites where porcellanite is frequently used. In fact, chert (possibly of non-local origin) makes up two-thirds of the projectile points in the Eagle Pit Bison Trap assemblage and no porcellanite is reported. This pattern is in contrast with that of the other sites in which predominantly local raw materials were used, mostly porcellanite, with the addition of a few non-local varieties. Again, perhaps the seasonality of Eagle Pit Bison Trap can help explain the dissimilarity.

Debitage Comparison

Comparisons of lithic debitage assemblages is another way to elucidate the organization of lithic technology and behavior related to bison kill operations in the study area. However, of the five sample sites, only the Sly Bison Kill site (24RB267) has been thoroughly analyzed and useful for this analysis.

Table 6.9 below is adapted from the analysis of the Sly Bison Kill site debitage assemblage (for complete definitions of debitage classes see Steere 1980:243-247,252). The site contained 8921 pieces of debitage. The debitage is classified using a technological approach, whereby flakes are grouped by some attribute(s) (Andrefsky 1998:118). Porcellanite is the most common raw material type. Retouch/Sharpening flakes are the most common type of flake. Surprisingly, a significant number of decortication flakes are present, comprising 22% of debitage, indicating that some initial reduction has taken place at the site. According to Steere (1980), the Sly Bison Kill debitage represents a full range of reduction, including at least some tool production, and maintenance along with resharpening of existing tools.

Table 6.13. The Sly Bison Kill Site (24RB267) Debitage.

Flake Type	POR	YSA	BA	PH	QTZ	SS	UNC	TNP	*Total*
Decortication	128	4	18	1	7	15	24	69	*197*
Bipolar	1	0	2	1	0	1	4	8	*9*
Primary Reduction	689	19	17	0	34	43	31	144	*833*
Shatter	436	7	11	0	2	4	1	25	*461*
Secondary Reduction	537	26	51	4	7	56	39	183	*720*
Hinged Platform	92	5	25	4	1	20	17	72	*164*
Retouch/Sharpening	3580	526	333	135	23	303	406	1726	*5306*
Broken/Uncertain	948	22	41	7	29	125	59	285	*1233*
Total	*6411*	*609*	*498*	*152*	*103*	*567*	*581*	*2510*	*8921*

Key: POR=Porcellanite; YSA=Yellowstone Agate; BA=Brown Agate; PH=Phosphoria; QTZ=Quartz; SS=Silicified Sediments; UNC=Uncertain Cherts & Chalcedonies; TNP=Total Non-Porcellanite (Steere 1980).

Table 6.14. TRBJ Debitage Size and Cortex Amounts.

		Size				
		XS	**SM**	**MED**	**LG**	*Total*
porcellanite	primary	1	0	1	0	*2*
	secondary	2	33	27	0	*62*
	tertiary	418	351	101	2	*796*
chalcedony	primary	0	1	0	0	*1*
	secondary	0	0	0	0	*0*
	tertiary	118	16	1	0	*135*
chert	primary	0	0	0	0	*0*
	secondary	0	0	0	0	*0*
	tertiary	9	1	7	0	*19*
basalt	primary	0	0	0	0	*0*
	secondary	0	0	1	0	*1*
	tertiary	0	2	2	0	*4*
obsidian	primary	0	0	0	0	*0*
	secondary	0	1	0	0	*1*
	tertiary	3	1	0	0	*4*
quartzite	primary	0	0	0	0	*0*
	secondary	0	0	0	0	*0*
	tertiary	2	1	0	0	*3*
lignite	primary	0	0	0	0	*0*
	secondary	1	0	0	0	*1*
	tertiary	0	0	0	0	*0*
	Total	*562*	*414*	*138*	*2*	*1114*

These data contrast with the TRBJ debitage assemblage (Table 6.14). The TRBJ debitage is characterized by extra small and small tertiary flakes. Very few pieces of debitage in the assemblage show evidence of initial reduction (>1%). Instead, based upon this small sample, the debitage assemblage apparently reflects tool maintenance and resharpening.

Both the Sly Bison Kill and the TRBJ debitage assemblages show minimal evidence of bipolar reduction. About 1% of the porcellanite flakes in the TRBJ debitage show wedge initiations, often the results of bipolar reduction (Figure 5.4). The Sly Bison Kill assemblage contains only nine flakes (0.1%) that indicate bipolar reduction (Steere 1980). This result is not surprising given the availability of local raw materials. However, it suggests that time constraints in processing bison may have played a role. Bipolar reduction is an expedient technique performed to quickly get the most suitable edges from a piece of raw material by bashing an objective piece apart.

<u>Raw Material Distributions of Debitage</u> The raw material distribution of the Sly Bison Kill site lithic debitage is shown in Figure 6.3 and Table 6.15 below. Porcellanite is the most common raw material type. But, it is apparent that other raw materials also played a prominent role.

Similar to the TRBJ raw material distribution (see Figure 5.2), cherts and chalcedonies are present in large quantities. It is unclear why these raw materials are combined together, because local chert sources are not common in southeastern Montana. However, chalcedonies are known to occur in the river gravels. Phosphoria is a distinctive chert found in nodular outcrops in the Big Horn Mountains to the south. However, it has been known to occur in the Tertiary gravels along the Yellowstone River (Steere 1980). A material classified as Tongue River Silicified Sediments (TRSS), as described by Ahler (1975), also forms a significant portion of the debitage assemblage. It is a local raw material found in the Tongue and Powder River drainages. Brown agate, Yellowstone agate, and probably quartzite were also available from these drainages (Steere 1980). Quartzite, a ubiquitous raw material throughout the northern Rocky Mountains, is present in small amounts.

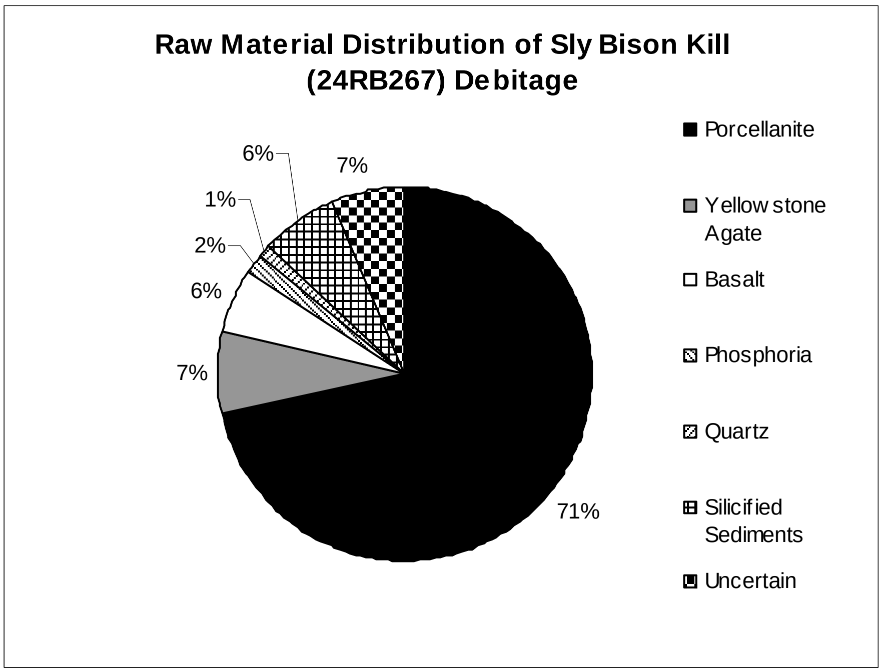

Figure 6.3

Table 6.15. Raw Material Distribution of Sly Bison Kill (24RB267) Debitage.

Raw Material	*n*	%
porcellanite	6411	71
Yellowstone agate	609	7
basalt	498	6
phosphoria	152	2
quartz	103	1
silicified sediments	576	6
uncertain cherts/chalcedonies	581	7
Total	*8921*	*100*

In sum, the Sly Bison Kill site debitage raw material distribution shows a preference for mostly locally available raw materials. However, raw materials apparently from sources in the Big Horn Mountains of southeastern Montana and northern Wyoming are also present in the assemblage. These data correspond fairly well with the debitage raw material types present in the TRBJ assemblage. The TRBJ debitage also shows the predominant usage of locally available raw materials, as well as non-local raw materials from the Big Horn Mountains. However, a noteworthy absence in the Sly Bison Kill assemblage is obsidian. It is present in small proportion in the TRBJ lithic assemblage. This obsidian has been sourced to Obsidian Cliff in Yellowstone National Park (see Table 5.2) (Hughes 1995; Prentiss et al. 2007).

Summary

The methods and results of the comparative analysis between TRBJ and five other bison kill sites illustrated some variation present in the organization of Late Prehistoric technology. Implications of these results will be more fully discussed in the following chapter.

All sites show a similar pattern of tool assemblages in which projectile points, knives, scrapers, and expedient flake tools are the major tool classes. Cores, although not a tool per se, are also relatively common. This pattern indicates that a narrow range of activities took place, as to be expected in limited activity contexts like this.

Porcellanite is heavily utilized in the assemblages. Fredlund (1981:459) notes that porcellanite was the most common lithic material in the Eagle Pit Bison Trap assemblage. Interestingly, no tools were recovered in those studies that were made of porcellanite (See

Table 6.2). TRBJ also shows a heavy use of porcellanite. Frison (1970b:11) notes a similar pattern, with many tools made from porcellanite. One explanation of the variation in porcellanite use may be that groups were more conservative with non-local raw materials, and because of the large quantity of available porcellanite, used it for a variety of purposes (Andrefsky 1994, 1998). The use of porcellanite, being readily abundant in southeastern Montana, placed no restraints on waste. This is evidenced by both the TRBJ and Sly Bison Kill debitage assemblages.

Variation in the technological organization, as evidenced by the debitage comparison of these sites, indicates some variation in reduction behaviors. The Sly Bison Kill site indicates that at least some early stage reduction was performed. This is a contrasting pattern to TRBJ where transported nodules of decorticated raw material point towards late-stage reduction. This contrasting observation indicates that a wider range of reduction activities took place at the Sly Bison Kill site. It may be that the Sly Bison Kill site is positioned closer than TRBJ to a raw material source or perhaps situated farther from a base camp where the people using the site needed to replenish supplies in the time surrounding the kill.

CHAPTER 7

DISCUSSION & CONCLUSIONS

This chapter discusses the results of the quantitative and comparative lithic analyses within the context of the theoretical frame of reference presented in Chapter 4. The discussion attempts to tackle hypothesized issues expected to occur within a collector-like socioeconomic and resource procurement system. Some general observations and conclusions regarding the organization of lithic technology during the Late Prehistoric Period in southeastern Montana are then offered.

The TRBJ Lithic Assemblage

In a broad sense, the TRBJ tools signify use for a specific task: killing and butchering bison. This assemblage was organized with an arrangement of transported finished tools supplemented with the use of an expedient flake/generalized core technology. Variation in the tool classes by raw material was evident, and will be further discussed below.

As a whole, the assemblage represents maximum maintainability, specifically flexibility, by demonstrating that the toolkit was organized with reshaping tools in mind to meet a variety of needs. This is evidenced by the debitage flake types present (See Tables 5.20-5.22). This is also evident when the comparison to other bison kill sites is considered. A basic toolkit comprised of a narrow range of tool types made for efficient task completion. Versatility and reliability were not overriding design factors of this assemblage. Based on the amount of resharpening flakes in the debitage assemblage a notable amount of reshaping took place at TRBJ. Therefore to refer to the tool assemblage as versatile, or maintained in a generalized tool form to meet a variety of needs, doesn't seem to fit well. In addition, no tools stood out as "overdesigned" either.

The LPSN projectile points were made from flakes shaped by pressure flaking along the margins. It has been suggested that LPSN projectile point manufacture occurred in a series of stages from an "expanding flake" (Fredlund 1979:77). This hypothesis is supported by the lithic assemblages from several Late Prehistoric Period habitation sites in the Pine Parklands region including Benson's Butte (24BH1726) (Fredlund 1979), Coyote House (24PR601) (Davis et al. 1994), and the Highwalker site (24PR627) (Keyser and Davis 1981). Site investigations identified the manufacturing sequence of LPSN projectile points. First, an expanding flake was struck from a core. This expanding flake was then worked into a small, thin, triangular perform, then a side-notched projectile point, using pressure flaking.

Based upon this investigation, this manufacturing technique was not wholly restricted to campsites. The Sly Bison Kill site (24RB267) includes 32 projectile point performs in the lithic assemblage (Steere 1980:252, 259). No such tool types were recognized in the TRBJ assemblage. This illustrates a practice that may not have been a regular activity at all bison kill sites, but perhaps practiced on those close to a raw material source. The TRBJ projectile point assemblage, then, varies from this production sequence and indicates that no formal projectile point manufacture took place. However, it may be the case that some points were created with greater haste. The flaking on projectile points in the TRBJ assemblage is very rough. The finished projectile points are often irregular in outline with portions of the original flake removal still visible. Margins often show irregular flaking, especially on the points made from porcellanite. This observation suggests several possible interpretations. First, time constraints may not have allowed for the quality or refined workmanship of shaping a point into a thin preform, notching it, and hafting it. People who were in a hurry to make projectile points in anticipation of an imminent bison kill operation apparently did not take the time to work a flake into shape. Instead, a knapper hastily shaped the margins of flakes driven from cores and the discreet perform stage was bypassed. Points would have been manufactured and hafted quickly. This interpretation stresses the notion of quantity over quality for the completion of a task.

A second interpretation of the poor shape of the projectile points is that some TRBJ projectile points were at the end of their use cycle and, resharpened to the point of exhaustion, then entering the archaeological record when discarded. The mean length (18.9mm) and width (13.7mm) of the TRBJ LPSN points seem short and fat in terms of a blade that has been resharpened many times. In addition, the fact that there were only two complete LPSN projectile points out of 14 diagnostic and eight fragments suggests that killing bison was quite demanding on heavily used points. The recovered debitage at TRBJ also supports the occurrence of resharpening as demonstrated by a majority of extra small, tertiary flakes. Of course, the flakes also could have been removed from resharpening other butchering tools, but the lack of bifaces in other stages of reduction indicates that the people were sharpening a majority of finished tools.

Finally, the need to finely work a projectile point into shape dropped out of necessity during the Late Prehistoric Period. As long as points were sufficiently sharp to penetrate the thick bison hide, there was no need to work them into a fine symmetrical shape. Still, the occurrence of a few finely-worked LPSN projectile points, some of non-local raw materials, and fragments indicates that the behavior did not go unpracticed. In short, the overall pattern of bison kill projectile point assemblages suggests that the manufacturing of points quickly and haphazardly for use in combination with well-made and sometimes curated ones took place. This inference raises questions regarding the amount of personal gear that people were able to carry and what they chose to carry to TRBJ.

Other tools in the TRBJ lithic assemblage functioned in the butchering and processing of bison. The disarticulation of bison would have required the use of many sharp edges, as well as the need for constant tool resharpening (e.g. Frison 1989). Again, this assertion is well-supported by the recovered TRBJ debitage assemblage. In addition, some expedient flake tools were manufactured on site for bison processing. It is likely that more hands were needed than available formal tools (i.e. bifaces or knives) to process the bison. Verbicky-Todd (1984) reports of the amount of labor needed to process a communal bison kill. And in fact, the TRBJ assemblage is absent of bifaces that could have acted as butchering tools. This may have prompted the quick manufacture of a few sharp edges from bipolar reduction as seen in the numbers of porcellanite cores on site. This would have allowed enough tools for the people butchering the bison (Verbicky-Todd 1984:50-51).

Time constraints may also have played a role inhibiting the manufacture of formally shaped tools and the manufacture of suitable and expedient cutting edges was the result. Certainly, the presence of numerous flake cores in the assemblages is indicative of the manufacture of expedient flake tools. This too speaks to the degree of planning depth by the people using TRBJ. Knowing that there was plenty of porcellanite on hand made the transport of a narrow range of finished tools possible. Other constraints may have been the season. TRBJ has been interpreted as a late winter/early spring kill (Prentiss et al. 2007). Due to snow cover and/or frost, this could have forced the group to conserve toolstone (mostly porcellanite) by using bipolar reduction.

Pièces esquillées is a tool type in the TRBJ assemblage. These could have functioned as wedges for splitting bone for the extraction of marrow. The TRBJ faunal assemblage was a late winter/early spring operation containing an MNI of 15 bison (Prentiss et al. 2007). The use of *pièces esquillées* to break apart bone for much needed calories during the lingering cold weather in southeastern Montana is not hard to imagine. *Pièces esquillées* are not well-recognized in other bison kill assemblages. For example, Frison (1970b:22) reports the presence of choppers and exhausted cores that appear to fit the definition and appearance of *pièces esquillées*.

In summary, the TRBJ lithic assemblage represents a generalized core/biface technology used for the specific purpose of killing and butchering bison. Cores were used to produce expedient flakes for immediate use. Formal tools, in the form of transported and maintained tools underwent some episodes of resharpening at the site. Tool diversity is predictably low, highlighting the site's narrow range of function in a larger socioeconomic realm. The lithic debitage also indicates a narrow range of reduction strategies focused on tool maintenance and refurbishment. Although, initial lithic reduction cannot be wholly dismissed as evidenced by a small showing of early to middle stages of reduction in the debitage assemblage (see Table 5.20), the manufacture of projectile points and other tools probably took place at some other location. Manufactured tools were then brought to the site.

Raw Material Use at TRBJ

Raw material frequencies at TRBJ indicate a heavy reliance upon local raw materials. The TRBJ assemblage, as well as other bison kill sites in the sample, show the intense use of porcellanite, chalcedonies, and silicified lignite, all found in the gravels of the Tongue, Powder, and Yellowstone river drainages. However, a notable amount of non-local raw materials from the Big Horn Mountains and Obsidian Cliff were also obtained and used predominantly in the form of finished tools by the time they were transported to TRBJ. However, the obsidian in the TRBJ assemblage shows a flake exhibiting cortex, suggesting that a nodule was present at the site that was not fully reduced. Whether this was present as a core or biface is unknown.

Raw material quality can affect how they were used by prehistoric groups (Andrefsky 1994). Andrefsky (1994) maintains a distinction between poor-quality raw materials that tended to be manufactured into informal tools, and high-quality raw materials that were used to produce more formalized tool types. However, when high quality raw materials are found in abundance, they were used to manufacture both informal and formal tools. This seems to be the case with the TRBJ lithic assemblage. The use of local porcellanite, and to an extent chalcedony, fits this concept of organization well. Both raw materials occur throughout southeastern Montana, a region that is rich in high quality raw materials. The TRBJ tool assemblage indicates that people used the abundant porcellanite to make both formal and informal tools, including LPSN projectile points, knives, and other formalized tools, as well as expedient flake tools from cores. However, this is contrasted with endscrapers, a formal tool type that was made exclusively of chert. Frison (1970b) reports a similar pattern of endscraper raw material preference in the Kobold IV tool assemblage. It would appear that the scraping edge of porcellanite, and other local raw materials, was found inadequate for this rigorous purpose. Chert, a more tenacious raw material, apparently held an edge more suitable for scraping activities. People, then, were selecting chert for its edge maintaining properties, and were transporting it from great distances. They were therefore regarded as highly useful items worth maintaining as personal curated gear (Binford 1977, 1979, 1980).

Porcellanite was used in a manner suggesting that conservation of the raw material was not really an issue. The debitage, dominated by 85% porcellanite (Figure 5.2), supports the view that a variable range of reduction took place, albeit somewhat limited. Reduction of porcellanite nodules shows variation in cortex amounts and size that is not as pronounced in the other raw materials, particularly the non-local varieties. Other bison kill sites in the area also show a similar pattern of porcellanite use (e.g. Frison 1970b, Steer 1980). The range of variation in tool and flake types present in the TRBJ lithic assemblage show that, with the abundant availability of porcellanite, people were quick to use it to serve a variety of purposes.

In terms of tool expediency, the presence of flake tools in the TRBJ sample (Table 5.3) demonstrates that they provided a suitable expedient edge for butchering bison. Utilized flakes of porcellanite, chert, and obsidian show that some transported tools were present at TRBJ. In addition, one non-local raw material core is present made of chert. This suggests two things: the TRBJ locality represents a point at which porcellanite (among other local raw materials) was acquired on annual cyclical rounds (e.g. Ingbar 1994); or people conserved the less-abundant high quality raw materials, such as chert and obsidian, for other purposes. In short, the use of non-local raw materials for the manufacture of expedient tools may have been too costly to occur.

The raw material use at TRBJ illustrates several things about the organization of lithic technology. First, the abundance of porcellanite suggests that minimal cost was associated in terms of its use. Waste was not highly regarded and was simply left at the site. The range of variation in porcellanite debitage indicates that a variable range of nodule sizes were selected. It also indicates that nodules were bashed apart to get at a suitable flake for use, which may speak of the quality of some nodules of the raw material. This is contrasted with the low frequency of non-local raw materials from previously manufactured and transported tool types. From the TRBJ lithic assemblage it is clear that non-local raw materials simply were not present in significant quantities at the site. This suggests that people were transporting finished tools to the site as curated personal gear and that many of them were likely curated beyond the site.

Some exhausted tools made of high quality, non-local lithic raw materials were observed in the assemblage including broken projectile points, scrapers, and chert and obsidian debitage. The non-local raw material debitage points to a reduction strategy whereby tools were maintained and exhausted or broken tools discarded. In addition, projectile points show a wide range of raw material diversity (see Table 5.17). Projectile points are formalized and curated tools that would have been transported from site to site as personal hunting equipment. They are curated gear made of raw materials collected from distant locations and transported to TRBJ in anticipation of use to kill bison.

Group Mobility and Subsistence Strategy

The TRBJ lithic assemblage offers several insights about the mobility of the people who operated the kill site. The non-local raw materials were apparently acquired from a considerable distance. This would have been accomplished in several ways; 1) logistical forays for acquisition; 2) opportunistic collection embedded in other activities and; 3) trade with other groups. As introduced in Chapter 4, Binford (1979, 1980) described different types of subsistence strategies that are linked to group mobility. Under the forager concept, the group moves often to the desired resource(s). Once the distance to available resources reached a threshold and it becomes too costly to stay put, they move residences to another resource-rich area. Under logistical mobility, small groups “map on” to resources and move out from an established base camp to gather resources. Because all of the resources in the immediate area were not instantly used they were able to stay at locations longer. This dichotomy has become known as forager versus collector models (Binford 1979, 1980). Foragers move to a large area and schedule events so they are near particular resources at the right time of year. Collectors, using a similar strategy, but operating from seasonal base camps, send out small logistical groups to gather the resources. According to these models, collectors are less residentially mobile than foragers because they operate within a socioeconomic system whereby resources were constantly being replenished by task groups traveling in a larger area. Subsistence practices, then, would entail sending out a small group to hunt and return with what they could carry. Only the highest utility parts would have been taken because they provided the most, or best, meat for the cost of acquisition. The TRBJ faunal assemblage supports this by showing the presence of mostly low utility items and the absence of high utility items (Prentiss et al 2007). This is collector-like behavior.

Lending support to this inference is that TRBJ lacks some defining characteristics that would be expected at a short-term residential forager camp such as associated hearths, storage pits, and/or tipi rings. This is further illustrated by the presence of large campsites near the area. There are numerous large campsites in southeastern Montana that date to the Late Prehistoric Period. Benson's Butte (24BH1726), located just across the Tongue River from TRBJ, shows a faunal assemblage rich in high utility bison parts as well as other large mammals (Fredlund 1979:178-181). The Coyote House site (24PR601), located on the Custer National Forest (NF) also across the Tongue River from TRBJ, shows a faunal assemblage rich in the long bones of large game including bison (Davis et al. 1994:37-38). The Highwalker site (24PR627), also located in the Custer NF, contained the remains of at least four butchered bison (Beckes and Keyser 1981:292). These sites suggest that long-term occupation was possible for at least some lengthy portion of the year and were likely collector base camps (Frison 1978, 1991; Greiser 1981). Resources would have been collected by small logistically organized task groups, whether it was bison or toolstone, initially processed in the field and brought back to the base camp for further processing and/or consumption. It follows then, that TRBJ may represent a specific subsistence function in a collector-type socioeconomic system. The tool diversity is low, there is the presence of a small amount of non-local resources in a relatively narrow range of tools and flakes, and the faunal analysis shows that high utility items have been carted off. Interestingly, the non-local lithic raw materials present at the base camps are very similar to TRBJ (chert and obsidian) and it has been suggested that they were obtained from great distances such as the Big Horn Mountains or the Teton Mountains (Beckes and Keyser 1981:292; Fredlund 1979:40). This may have been performed through logistical forays for high quality toolstone into the Big Horn Mountains, the Yellowstone Plateau (Obsidian Cliff), and other areas.

A final thought on the mobility of the people who used TRBJ is that, although they may have sent groups as far away as parts of northern Wyoming, the lithic assemblage at TRBJ may also lend credibility to the notion of a reduced range of mobility. The exhausted porcellanite points may indicate the cyclical movement of people through the area at extended time intervals effectively making curated tools from local raw materials. This may also help explain why no bifaces were present at TRBJ. Because of the sheer abundance of porcellanite in southeastern Montana there was no real need to transport a porcellanite biface around. And, since the people already had finished tools (bifaces?) of non-local varieties with them it makes sense that TRBJ would be absent of them.

Conclusions

Late Prehistoric hunter-gatherers living on the Northwestern Plains depended heavily upon bison for subsistence. As demonstrated, the organization of lithic technology during the Late Prehistoric Period emphasizes a collector-like subsistence strategy, as seen from TRBJ. The technology used for the killing and butchering of the bison reflects a technological organization in which a limited range of functionally formalized tools are coupled with the use of expedient flake tools to accomplish the task.

Group mobility, in the form of logistical forays to acquire high quality tool stone, reached as far away as the Big Horn Mountains and Obsidian Cliff in modern day Yellowstone National Park. This may have been embedded in other activities of a collector social organization. The use of local raw materials, most notably porcellanite, to manufacture expedient flake tools, as well as some formalized tools such as projectile points, suggests that the abundance of the raw material offered a low cost for use and discard.

The manufacture of new tools does not seem to be an activity associated with bison procurement at TRBJ, at least in any large quantities. Instead, sharpening and refurbishment of tools, as exemplified by the debitage found in association with the bison bone bed, suggests that finished tools and decorticated nodules passed though the site. Raw material use suggests that porcellanite was fashioned into an array of tool types and that non-local materials passed through the site predominantly in the form of finished tools.

Hunter-gatherers operating in the Northwestern Plains left behind a very faint footprint for archaeologists. In the case of TRBJ, the testing of the site helped to further define the role of technology used by Late Prehistoric groups and add to the sparse published data from southeastern Montana.

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APPENDIX I

RAW DATA: TOOLS

Cat #	Area	Square	Sub-sq	Level	Raw Material	Color	Tool Type	Size	Max Length	Max Width	Max Thick	Basal Width	Neck Width	Blade Length	Weight	Edge Angle
1	1	-	0	surface	p	5r2/2	plpp	-	28.37	18.54	4.43	16.44	11.92	0	2.14	30
2	1	-	0	surface	o	5yr2.5/1	ppf	xs	0	14.68	3.06	0	0	0	0.28	28
3	1	-	0	surface	o	5yr2.5/1	rtf	med	0	0	0	0	0	0	1.93	33
4	1	-	0	surface	c	10r2.5/2	es	sm	0	0	0	0	0	0	5.3	52
5	1	a	24	2	p	5yr6/2	lpsn	-	24.46	13.66	4.61	13.16	7.64	18.3	1.3	31
6	1	a	24	2	p	5yr6/1	btf	xs	0	0	0	0	0	0	0.28	31
7	1	a	24	2	p	5yr5/1	ppf	xs	0	0	3.04	0	0	0	0.38	34
8	1	a	24	2	p	5r2/2	ppf	xs	0	0	0	0	0	0	0.35	33
9	1	b	21	2	p	5yr6/3	lpsn	-	0	12.77	2.92	0	7.6	0	0.91	27
10	1	c	5	2	p	5yr3/2	lpsn	xs	0	11.92	3.1	0	8.34	0	0.55	33
12	1	d	19	2	p	5yr6/2	rtuf	med	0	0	0	0	0	0	6.72	38
13	1	d	19	2	p	5yr3/1	mc	med	0	0	0	0	0	0	64.48	0
14	1	d	19	2	p	5yr3/1	bpc	med	0	0	0	0	0	0	29.92	0
15	1	d	19	2	p	5yr3/1	ppf	sm	0	0	0	0	0	0	0.5	27
16	1	d	19	2	ch	2.5yr3/2	ppf	xs	0	14.26	3.52	0	0	0	0.93	33
17	1	d	19	2	p	5yr6/1	lpsn	-	0	14.27	3.14	0	9.16	0	1.37	25
18	1	d	19	2	c	2.5yr2.5/4	lpsn	-	0	13.58	3.39	13.54	8.46	0	1.05	28
19	1	d	19	2	ch	2.5yr3/2	ppf	sm	0	0	3.01	0	0	0	0.89	16
20	1	e	21	2	p	5yr3/1	ppf	xs	0	0	2.53	13.99	8.06	0	0.15	30
21	1	e	21	2	l	5yr2.5/1	lpsn	-	0	13.89	4.12	13.54	9.56	0	0.98	34
22	1	f	22	2	p	5yr4/1	lpsn	-	0	4.04	3.94	14.05	7.63	0	1.43	32
23	1	g	5	2	l	5yr3/1	utf	sm	0	0	0	0	0	0	1.4	37
24	1	g	5	2	c	5yr4/6	lpsn	xs	13.28	0	3.29	0	0	9.86	0.49	35
25	1	g	5	2	l	5yr5/1	lpsn	-	0	16.59	3.54	15.88	9.54	0	1.65	31
26	1	g	5	2	c	10r3/3	es	sm	0	0	0	0	0	0	8.6	75
27	1	g	5	2	p	5yr5/1	rtf	sm	0	0	0	0	0	0	1.92	20
28	1	g	5	2	p	5yr6/2	rtuf	med	0	0	0	0	0	0	12.24	65
29	1	g	5	2	c	5yr4/2	lpsn	xs	0	0	4.23	8.77	5.06	0	0.63	43
30	1	g	5	2	c	5yr5/2	ppf	xs	0	0	3.86	0	0	0	0.6	32
31	1	g	5	2	p	5yr6/2	lpsn	-	21.28	14.37	3.8	11.97	6.98	19.96	1.14	30
32	1	g	5	2	p	5r2/2	rtf	sm	0	0	0	0	0	0	4.69	70

Cat. #	Area	Square	Sub-sq.	Level	Raw Material	Color	Tool Type	Size	Max Length	Max Width	Max Thick	Basal Width	Neck Width	Blade Length	Weight	Edge Angle
33	2	a	0	surface	p	5r2/2	mft	med	0	0	0	0	0	0	26.7	47
34	2	a	0	surface	c	5yr4/1	pe	med	0	0	0	0	0	0	13.98	52
35	2	a	0	surface	p	5r2/2	p	sm	0	0	0	0	0	0	3.4	60
37	2	a	0	surface	o	5yr2.5/1	kf	sm	0	0	0	0	0	0	1.2	40
38	2	a	0	surface	p	5yr5/2	rtuf	sm	0	0	0	0	0	0	1.52	61
39	2	a	0	surface	c	5yr5/1	rtf	sm	0	0	0	0	0	0	1.3	42
40	2	a	0	surface	p	5yr5/1	mc	med	0	0	0	0	0	0	57	0
41	2	a	0	surface	p	5yr6/2	mc	med	0	0	0	0	0	0	59.1	0
42	2	a	0	surface	p	5r2/2	mc	lrg	0	0	0	0	0	0	91.5	0
43	2	a	0	surface	p	5yr6/3	mc	med	0	0	0	0	0	0	55.7	0
44	2	a	0	surface	p	5r2/2	mc	med	0	0	0	0	0	0	30.63	0
45	2	a	0	surface	p	5yr6/3	mc	med	0	0	0	0	0	0	22.1	0
47	2	a	0	surface	p	5yr6/2	bpc	med	0	0	0	0	0	0	66.2	0
48	2	a	0	surface	p	5yr6/3	mc	lrg	0	0	0	0	0	0	135.8	0
49	2	a	0	surface	p	5yr6/2	pe	med	0	0	0	0	0	0	14.6	0
50	2	a	0	surface	p	5r2/2	rtf	sm	0	0	0	0	0	0	1.3	0
51	2	a	21	1	p	5r2/2	pe	med	0	0	0	0	0	0	23.4	0
52	2	a	21	1	c	5yr5/4	es	sm	0	0	0	0	0	0	3.8	49
53	2	a	21	1	p	5yr4/1	lpsn	-	0	0	3.92	14.82	12.78	0	0.9	33
54	2	b	0	surface	p	5r2/2	bc	med	0	0	0	0	0	0	59.4	0
55	2	b	0	surface	p	5r2/2	bc	med	0	0	0	0	0	0	37.8	0
56	2	b	0	surface	p	5yr4/1	bc	med	0	0	0	0	0	0	35.8	0
57	2	b	0	surface	p	5yr4/1	bc	med	0	0	0	0	0	0	40.8	0
58	2	b	0	surface	c	5yr4/1	mc	med	0	0	0	0	0	0	14.9	0
59	2	b	0	surface	ch	2.5yr3/2	lpsn	-	16.59	12.28	3.44	0	8.47	0	0.5	28
60	2	b	0	surface	p	5r2/2	utf	sm	0	0	0	0	0	0	4	42
61	2	b	0	surface	p	5r2/2	bc	med	0	0	0	0	0	0	34.8	0
62	2	b	0	surface	c	5yr8/2	kf	sm	0	0	0	0	0	0	0.6	28
63	2	b	0	surface	p	5yr4/1	mc	med	0	0	0	0	0	0	28.4	0
65	2	b	0	surface	p	5r2/2	bc	sm	0	0	0	0	0	0	5.8	0
66	2	b	0	surface	p	5r2/2	bc	med	0	0	0	0	0	0	16.6	0

Cat. #	Area	Square	Sub-sq.	Level	Raw Material	Color	Tool Type	Size	Max Length	Max Width	Max Thick	Basal Width	Neck Width	Blade Length	Weight	Edge Angle
67	2	b	0	surface	l	5yr2.5/1	bc	med	0	0	0	0	0	0	19.4	0
68	2	b	5	1	p	5yr4/2	bc	med	0	0	0	0	0	0	16.8	0
69	2	d	0	surface	p	5yr6/2	mc	med	0	0	0	0	0	0	47.6	0
70	2	d	0	surface	p	5yr7/2	kf	sm	0	0	0	0	0	0	1.4	32

APPENDIX II

RAW DATA: DEBITAGE

Cat #	Area	Square	Sub sq	Level	Raw Material	Color	Cortex	Size	Comple-teness	Platform Width	Platform Thickness	Platform Facets	Initit-iation	Term-ination
1	1	a	24	1	p	10yr3/1	t	xs	s	0	0	0	c	-
2	1	a	24	1	p	7.5yr5/2	t	sm	m/d	0	0	0	-	-
3	1	a	24	1	p	2.5yr3/2	t	xs	p	1.62	0.86	3	b	-
4	1	a	24	2	p	10yr3/2	t	sm	p	3.52	1.38	2	c	-
5	1	a	24	2	c	10yr3/2	t	xs	p	3.1	0.74	1	b	-
6	1	a	24	2	p	10yr3/1	t	xs	no	0	0	0	-	-
7	1	a	24	3	p	7.5yr5/2	t	sm	m/d	0	0	0	-	-
8	1	a	24	3	p	7.5yr5/2	t	sm	m/d	0	0	0	-	-
9	1	a	24	3	p	7.5yr5/0	t	xs	m/d	0	0	0	-	-
10	1	a	24	3	p	7.5yr5/0	t	sm	p	10.52	2.56	2	b	-
11	1	a	24	3	p	2.5yr3/2	t	med	c	29.68	12.02	>3	b	f
12	1	a	24	4	p	10yr3/4	t	xs	c	6.62	2.82	2	c	f
15	1	b	21	1	p	10yr2/2	t	sm	m/d	0	0	0	-	-
16	1	b	21	2	p	2.5r3/2	t	med	s	0	0	0	w	a
17	1	b	21	2	p	7.5r5/2	t	xs	p	2.78	1.1	1	c	-
18	1	b	21	3	p	10yr2/2	t	xs	p	2.24	0.74	1	b	-
20	1	b	21	3	p	7.5yr5/2	t	sm	p	4.28	1.68	3	c	-
29	1	c	5	1	c	10r3/1	t	xs	c	1.92	1.76	>3	c	f
30	1	c	5	1	p	7.5yr3/2	t	xs	m/d	0	0	0	-	-
31	1	c	5	1	p	5yr6/4	t	sm	m/d	0	0	0	-	-
32	1	c	5	2	p	7.5yr5/2	t	sm	m/d	0	0	0	-	-
33	1	c	5	3	p	7.5yr5/2	t	sm	m/d	0	0	0	-	-
34	1	c	5	3	p	7.5yr5/2	s	med	no	0	0	0	-	-
35	1	c	5	3	ch	5yr4/6	t	xs	m/d	0	0	0	-	-
36	1	c	5	3	p	7.5yr5/0	t	xs	s	0	0	0	b	-
37	1	c	5	3	ch	5yr4/6	t	xs	m/d	0	0	0	-	-
40	1	d	1	1	p	2.5yr5/10	t	med	c	26.68	6.48	1	b	f
42	1	d	1	2	p	7.5yr6/2	t	xs	m/d	0	0	0	-	-
43	1	d	1	2	c	2.5yr8/0	t	med	c	4.78	2.24	>3	b	s
44	1	d	1	3	p	2.5yr3/4	t	sm	m/d	0	0	0	-	-
45	1	d	1	3	p	7.5yr5/2	t	sm	m/d	0	0	0	-	-

Cat #	Area	Square	Sub sq	Level	Raw Material	Color	Cortex	Size	Comple-teness	Platform Width	Platform Thickness	Platform Facets	Initit-iation	Term-ination
46	1	d	1	4	c	10yr3/2	t	sm	m/d	0	0	0	-	-
47	1	d	1	4	p	2.5r3/4	t	med	m/d	0	0	0	-	-
48	1	d	1	4	c	10yr3/2	t	xs	c	2.94	1.03	>3	c	f
49	1	d	1	4	c	10yr3/2	t	xs	s	0	0	0	c	-
50	1	d	1	4	c	10yr3/2	t	xs	m/d	0	0	0	-	-
51	1	d	1	4	p	7.5yr5/2	t	xs	m/d	0	0	0	-	-
52	1	d	1	4	ch	10r3/8	t	xs	p	1.74	0.72	0	b	-
53	1	d	1	4	p	7.5yr5/2	t	xs	m/d	0	0	0	-	-
54	1	d	1	4	p	2.5r3/4	t	sm	p	10.32	3.74	>3	c	-
55	1	d	1	4	p	2.5r3/4	t	sm	p	9.08	3.01	2	b	-
56	1	d	1	4	p	7.5yr5/2	t	xs	p	5.38	1.82	2	b	-
57	1	d	1	4	p	2.5r3/4	t	sm	p	9.59	5.84	>3	b	-
58	1	d	1	4	p	10yr3/2	s	med	c	11.94	1.98	>3	c	f
59	1	d	1	4	p	7.5yr5/2	t	xs	c	2.42	0.92	2	c	f
60	1	d	1	4	p	2.5yr3/4	t	sm	p	14.62	1.62	2	c	-
61	1	d	1	4	p	2.5yr3/4	t	sm	m/d	0	0	-	-	-
62	1	d	1	4	p	2.5yr3/4	s	sm	p	8.56	1.94	>3	c	-
63	1	d	1	4	p	7.5yr5/2	t	sm	m/d	0	0	0	-	-
64	1	d	1	4	p	2.5yr3/4	t	sm	c	11.82	1.51	1	b	f
65	1	d	1	4	p	7.5yr5/2	t	xs	p	6.57	3.78	1	b	-
66	1	d	1	4	p	10yr3/1	t	xs	p	5.32	1.33	1	b	-
67	1	d	1	4	c	10yr3/2	t	xs	m/d	0	0	0	-	-
68	1	d	1	4	p	5r2/2	t	sm	p	7.28	2.01	1	c	-
69	1	d	1	4	p	7.5yr5/0	t	xs	m/d	0	0	0	-	-
70	1	d	1	4	p	5r2/2	t	sm	m/d	0	0	0	-	-
71	1	d	1	4	p	5r2/2	t	xs	m/d	0	0	0	-	-
72	1	d	1	4	p	5r2/2	t	sm	m/d	0	0	0	-	-
73	1	d	1	4	p	5r2/2	t	sm	c	12.5	5.28	1	b	f
74	1	d	1	4	p	5r2/2	t	sm	c	4.14	1.68	1	c	f
75	1	d	1	4	p	5r2/2	t	xs	c	3.74	0.82	1	b	f
76	1	d	1	4	p	5r2/2	t	sm	m/d	0	0	0	-	-

Cat #	Area	Square	Sub sq	Level	Raw Material	Color	Cortex	Size	Comple-teness	Platform Width	Platform Thickness	Platform Facets	Initit-iation	Term-ination
77	1	d	1	4	p	5r2/2	t	xs	m/d	0	0	0	-	-
78	1	d	1	4	p	5r2/2	t	xs	m/d	0	0	0	-	-
79	1	d	1	4	p	5r2/2	t	sm	m/d	0	0	0	-	-
80	1	d	1	4	p	5r2/2	t	xs	m/d	0	0	0	-	-
81	1	d	1	4	p	5r2/2	t	xs	m/d	0	0	0	-	-
82	1	d	1	4	p	5r2/2	t	xs	m/d	0	0	0	-	-
83	1	d	1	4	p	5r2/2	t	xs	m/d	0	0	0	-	-
84	1	d	1	4	p	5r2/2	t	xs	c	2.62	0.96	1	b	f
85	1	d	1	4	p	5r2/2	t	xs	m/d	0	0	0	-	-
86	1	d	1	4	ch	5yr8/1	t	xs	p	3.12	1.22	1	b	-
87	1	d	1	4	p	5r2/2	t	xs	m/d	0	0	0	-	-
88	1	d	1	4	p	5yr6/1	t	xs	p	5.38	0.32	1	b	-
92	1	d	1	5	c	7.5yr5/2	t	xs	m/d	0	0	0	-	-
93	1	d	1	5	p	7.5yr6/2	t	xs	m/d	0	0	0	-	-
94	1	d	1	5	p	5r2/2	t	xs	m/d	0	0	0	-	-
95	1	d	1	5	p	5r2/2	t	xs	m/d	0	0	0	-	-
96	1	d	1	5	p	5r2/2	t	sm	m/d	0	0	0	-	-
97	1	d	1	5	c	5yr4/3	t	sm	c	8.34	2.78	>3	c	f
100	1	e	21	2	c	5yr4/3	p	sm	m/d	0	0	0	-	-
101	1	e	21	4	p	7.5yr5/2	t	med	m/d	0	0	0	-	-
102	1	e	21	4	p	7.5yr5/2	s	med	m/d	0	0	0	-	-
103	1	e	21	4	p	7.5yr5/2	s	med	m/d	0	0	0	-	-
104	1	e	21	4	p	7.5yr5/2	s	sm	p	7.1	1.74	1	c	-
105	1	e	21	4	ch	5yr6/4	t	sm	m/d	0	0	0	-	-
109	1	f	22	1	c	10yr5/8	t	sm	m/d	0	0	0	-	-
110	1	f	22	1	c	5yr8/1	t	xs	m/d	0	0	0	-	-
111	1	f	22	1	p	5yr5/1	t	xs	c	2.22	0.88	2	b	f
112	1	f	22	1	p	7.5yr5/2	t	sm	m/d	0	0	0	-	-
113	1	f	22	2	p	7.5yr5/2	s	sm	m/d	0	0	0	-	-
114	1	f	22	5	p	7.5yr5/2	t	sm	m/d	0	0	0	-	-
118	1	g	5	2	p	7.5yr3/0	s	med	c	8.62	2.42	>3	c	f

Cat #	Area	Square	Sub sq	Level	Raw Material	Color	Cortex	Size	Comple-teness	Platform Width	Platform Thickness	Platform Facets	Initit-iation	Term-ination
119	1	g	5	2	c	10yr3/3	t	xs	c	3.86	1.98	>3	c	f
122	1	g	5	3	p	5yr5/1	t	sm	m/d	0	0	0	-	-
123	1	g	5	3	p	5r2/2	t	xs	m/d	0	0	0	-	-
124	1	g	5	3	p	5r2/2	t	xs	p	3.99	1.16	>3	b	-
125	1	g	5	3	p	5r2/2	t	xs	m/d	0	0	0	-	-
126	1	g	5	3	p	7.5yr6/2	t	sm	m/d	0	0	0	-	-
127	1	g	5	3	p	5r2/2	t	sm	s	0	0	0	c	-
128	1	g	5	4	ch	10rp5/2	t	xs	m/d	0	0	0	-	-
129	1	g	5	4	ch	10rp5/2	t	xs	m/d	0	0	0	-	-
130	1	g	5	4	ch	10rp5/2	t	xs	m/d	0	0	0	-	-
131	1	g	5	5	p	5r2/2	t	xs	p	4.08	1.49	1	b	-
132	1	g	5	5	p	5r2/2	s	xs	p	5.49	1.6	>3	c	-
133	1	g	5	6	p	5r2/2	t	sm	m/d	0	0	0	-	-
134	1	g	5	4	p	5r2/2	s	med	m/d	0	0	0	-	-
135	1	g	5	4	p	5r2/2	s	med	c	27.38	12.6	>3	c	f
136	1	g	5	6	p	5r2/2	t	sm	m/d	0	0	0	-	-
144	2	a	0	0	p	7.5yr5/2	s	sm	m/d	0	0	0	-	-
145	2	a	0	0	p	5r2/2	t	sm	m/d	0	0	0	-	-
146	2	a	0	0	p	5yr6/1	t	sm	m/d	0	0	0	-	-
147	2	a	0	0	p	5yr6/1	t	med	m/d	0	0	0	-	-
148	2	a	0	0	p	5yr6/2	t	med	p	9.68	4.42	2	b	-
149	2	a	0	0	p	5yr5/1	t	med	m/d	0	0	0	-	-
150	2	a	0	0	p	5yr6/2	t	sm	m/d	0	0	0	-	-
151	2	a	0	0	p	5r2/2	t	med	p	18.42	6.62	>3	b	-
152	2	a	0	0	p	5yr6/2	t	sm	m/d	0	0	0	-	-
153	2	a	0	0	p	5yr6/1	t	med	m/d	0	0	0	-	-
154	2	a	0	0	p	5r2/2	t	med	p	19.46	3.58	>3	b	-
155	2	a	0	0	p	5r2/2	t	med	c	7.56	1.89	1	b	f
156	2	a	0	0	p	5yr6/2	t	sm	m/d	0	0	0	-	-
157	2	a	0	0	p	5yr7/2	t	sm	p	6.18	2.98	>3	b	-
158	2	a	0	0	p	5yr5/2	t	sm	m/d	0	0	0	-	-

Cat #	Area	Square	Sub sq	Level	Raw Material	Color	Cortex	Size	Comple-teness	Platform Width	Platform Thickness	Platform Facets	Initit-iation	Term-ination
159	2	a	0	0	p	5yr6/2	t	sm	c	16.42	4.04	>3	c	f
160	2	a	0	0	p	5yr6/2	s	sm	m/d	0	0	0	-	-
161	2	a	0	0	p	5yr6/2	t	sm	m/d	0	0	0	-	-
162	2	a	0	0	c	5yr4/3	t	sm	p	6.56	2.88	>3	c	-
163	2	a	0	0	c	5yr4/3	t	sm	m/d	0	0	0	-	-
164	2	a	0	0	c	5yr4/3	t	sm	m/d	0	0	0	-	-
165	2	a	0	0	p	5r2/2	t	sm	m/d	0	0	0	-	-
166	2	a	0	0	p	5yr6/1	t	sm	p	3.86	2.7	>3	c	-
167	2	a	0	0	c	5yr8/1	t	xs	m/d	0	0	0	-	-
168	2	a	0	0	c	5yr8/1	t	xs	m/d	0	0	0	-	-
169	2	a	0	0	p	2.5yr5/0	t	sm	p	13.32	2.97	1	b	-
170	2	a	0	0	p	5yr7/2	t	sm	c	2.75	1.22	1	c	f
171	2	a	0	0	p	5yr6/2	t	med	m/d	0	0	0	-	-
172	2	a	0	0	p	5r2/2	s	sm	p	24.42	5.96	>3	b	-
173	2	a	0	0	p	5yr7/2	t	sm	s	0	0	0	b	-
174	2	a	0	0	p	2.5yr3/0	t	sm	p	1.89	1.42	1	c	-
175	2	a	0	0	p	5yr5/1	s	med	s	0	0	0	b	-
176	2	a	0	0	p	5yr4/1	t	med	p	6.39	2.1	1	b	-
177	2	a	0	0	p	5yr3/1	t	med	m/d	0	0	0	-	-
178	2	a	0	0	p	5r2/2	t	sm	m/d	0	0	0	-	-
179	2	a	0	0	p	5r2/2	t	sm	m/d	0	0	0	-	-
180	2	a	0	0	p	5yr6/1	t	sm	c	4.56	1.42	1	b	s
181	2	a	0	0	p	5yr6/1	t	sm	p	4.72	1.2	1	b	-
182	2	a	0	0	p	5yr6/1	t	sm	m/d	0	0	0	-	-
183	2	a	0	0	p	5r2/2	t	sm	p	8.34	2.38	>3	c	-
184	2	a	0	0	p	5yr6/1	t	sm	m/d	0	0	0	-	-
185	2	a	0	0	p	5r2/2	s	sm	m/d	0	0	0	-	-
186	2	a	0	0	p	5yr6/1	t	sm	m/d	0	0	0	-	-
187	2	a	0	0	p	5yr6/1	t	sm	s	0	0	0	c	-
188	2	a	0	0	p	5yr4/1	t	sm	m/d	0	0	0	-	-
189	2	a	0	0	p	5r2/2	t	med	m/d	0	0	0	-	-

Cat #	Area	Square	Sub sq	Level	Raw Material	Color	Cortex	Size	Comple-teness	Platform Width	Platform Thickness	Platform Facets	Initit-iation	Term-ination
190	2	a	0	0	p	5yr6/1	t	med	m/d	0	0	0	-	-
191	2	a	0	0	p	5yr6/1	s	med	m/d	0	0	0	-	-
192	2	a	0	0	b	5yr2.5/1	t	med	m/d	0	0	0	-	-
193	2	a	0	0	p	5yr6/1	s	med	m/d	0	0	0	-	-
194	2	a	0	0	p	5yr6/1	t	sm	p	5.44	1.86	1	c	-
195	2	a	0	0	p	5yr6/1	t	xs	m/d	0	0	0	-	-
196	2	a	0	0	b	5yr2.5/1	t	med	m/d	0	0	0	-	-
197	2	a	0	0	p	5r2/2	t	med	p	16.3	5.12	2	c	-
199	2	a	0	0	p	5yr3/1	t	med	m/d	0	0	0	-	-
200	2	a	0	0	p	5r2/2	t	med	m/d	0	0	0	-	-
201	2	a	0	0	p	5yr6/2	t	lg	p	59.98	20.06	1	c	-
202	2	a	0	0	p	5r2/2	t	sm	m/d	0	0	0	-	-
203	2	a	0	0	p	5r2/2	t	med	m/d	0	0	0	-	-
204	2	a	0	0	p	5r2/2	t	med	p	12.72	7.64	0	-	-
205	2	a	0	0	p	5yr6/1	t	sm	p	13.7	4.19	>3	b	-
206	2	a	0	0	p	5yr6/1	t	sm	m/d	0	0	0	-	-
207	2	a	0	0	p	5yr6/2	t	sm	m/d	0	0	0	-	-
208	2	a	0	0	p	5yr5/1	t	sm	m/d	0	0	0	-	-
209	2	a	0	0	p	5yr4/1	t	med	m/d	0	0	0	-	-
210	2	a	0	0	p	2.5yr4/0	s	med	s	4	1.98	1	c	-
211	2	a	0	0	p	5yr3/1	t	sm	m/d	0	0	0	-	-
212	2	a	0	0	p	5yr6/1	t	sm	m/d	0	0	0	-	-
213	2	a	0	0	p	5yr6/1	t	sm	p	2.98	1.5	1	c	-
214	2	a	0	0	p	5yr6/1	t	sm	m/d	0	0	0	-	-
215	2	a	0	0	p	5yr3/1	t	sm	m/d	0	0	0	-	-
216	2	a	0	0	p	7.5yr3/0	t	sm	m/d	0	0	0	-	-
217	2	a	0	0	p	5yr5/1	t	sm	m/d	0	0	0	-	-
218	2	a	0	0	p	5yr5/1	t	xs	m/d	0	0	0	-	-
219	2	a	0	0	p	5yr6/1	t	xs	m/d	0	0	0	-	-
220	2	a	0	0	p	5yr6/1	t	sm	m/d	0	0	0	-	-
221	2	a	0	0	p	5yr5/1	t	sm	m/d	0	0	0	-	-

Cat #	Area	Square	Sub sq	Level	Raw Material	Color	Cortex	Size	Comple-teness	Platform Width	Platform Thickness	Platform Facets	Initit-iation	Term-ination
222	2	a	0	0	p	5yr5/1	t	sm	m/d	0	0	0	-	-
223	2	a	0	0	p	5yr5/1	s	sm	p	5.84	1.76	1	b	-
224	2	a	0	0	p	5yr4/1	t	sm	m/d	0	0	0	-	-
225	2	a	0	0	p	5yr6/1	s	sm	m/d	0	0	0	-	-
226	2	a	0	0	p	5yr4/1	s	sm	m/d	0	0	0	-	-
227	2	a	0	0	p	5yr4/1	t	sm	m/d	0	0	0	-	-
228	2	a	0	0	p	5yr6/1	t	sm	m/d	0	0	0	-	-
229	2	a	0	0	p	5yr3/1	t	sm	m/d	0	0	0	-	-
230	2	a	0	0	p	5yr4/1	s	sm	m/d	0	0	0	-	-
231	2	a	0	0	p	5yr4/1	t	sm	m/d	0	0	0	-	-
232	2	a	0	0	p	5yr5/1	s	sm	p	2.28	0.84	>3	c	-
233	2	a	0	0	p	5yr5/1	t	sm	m/d	0	0	0	-	-
234	2	a	0	0	p	5yr5/1	t	sm	m/d	0	0	0	-	-
235	2	a	0	0	p	5yr6/1	s	sm	p	7.14	3.13	>3	c	-
236	2	a	0	0	p	5yr6/1	t	xs	p	4.62	2.18	>3	b	-
237	2	a	0	0	p	5yr4/1	t	med	m/d	0	0	0	-	-
238	2	a	0	0	p	5r2/2	t	med	m/d	0	0	0	-	-
239	2	a	0	0	p	5yr4/1	s	med	m/d	0	0	0	-	-
240	2	a	0	0	p	5r2/2	t	xs	m/d	0	0	0	-	-
241	2	a	0	0	p	5r2/2	t	sm	m/d	0	0	0	-	-
242	2	a	0	0	p	5yr6/1	t	xs	m/d	0	0	0	-	-
243	2	a	0	0	p	5yr6/2	t	med	s	0	0	0	c	-
244	2	a	0	0	p	5r2/2	t	sm	m/d	0	0	0	-	-
245	2	a	0	0	p	5yr4/1	t	sm	m/d	0	0	0	-	-
246	2	a	0	0	p	5r2/2	s	sm	m/d	0	0	0	-	-
247	2	a	0	0	p	5yr5/1	t	med	p	16.56	7.6	1	c	-
248	2	a	0	0	p	5yr4/1	t	sm	m/d	0	0	0	-	-
249	2	a	0	0	p	5yr5/1	t	sm	p	12.16	2.92	>3	c	-
250	2	a	0	0	p	5yr4/1	t	sm	m/d	0	0	0	-	-
251	2	a	0	0	p	5yr5/1	t	med	p	4.38	2.88	1	c	-
252	2	a	0	0	p	5yr5/1	t	med	m/d	0	0	0	-	-

Cat #	Area	Square	Sub sq	Level	Raw Material	Color	Cortex	Size	Comple-teness	Platform Width	Platform Thickness	Platform Facets	Initit-iation	Term-ination
253	2	a	0	0	p	5r2/2	t	sm	m/d	0	0	0	-	-
254	2	a	0	0	p	5yr5/1	t	sm	m/d	0	0	0	-	-
255	2	a	0	0	p	5yr5/1	t	sm	m/d	0	0	0	-	-
256	2	a	0	0	p	5yr4/1	t	sm	m/d	0	0	0	-	-
257	2	a	0	0	p	5yr4/1	t	sm	m/d	0	0	0	-	-
258	2	a	0	0	p	5yr3/1	t	sm	m/d	0	0	0	-	-
259	2	a	0	0	p	5yr5/1	t	sm	m/d	0	0	0	-	-
260	2	a	0	0	p	5yr4/1	t	med	p	9.88	3.52	>3	c	-
261	2	a	0	0	p	5yr6/1	t	xs	m/d	0	0	0	-	-
262	2	a	0	0	p	5yr5/1	t	xs	c	5.38	2.21	1	c	f
263	2	a	0	0	p	5yr5/1	t	sm	m/d	0	0	0	-	-
264	2	a	0	0	p	7.5yr4/0	t	sm	m/d	0	0	0	-	-
265	2	a	0	0	p	7.5yr4/0	t	xs	m/d	0	0	0	-	-
266	2	a	0	0	p	5r2/2	t	med	c	9.22	4.38	1	c	h
267	2	a	0	0	p	2.5yr3/2	t	xs	m/d	0	0	0	-	-
268	2	a	0	0	p	5r2/2	t	xs	m/d	0	0	0	-	-
269	2	a	0	0	p	5yr6/1	t	sm	m/d	0	0	0	-	-
270	2	a	0	0	p	5yr5/1	t	sm	m/d	0	0	0	-	-
271	2	a	0	0	p	5yr3/1	t	sm	m/d	0	0	0	-	-
272	2	a	0	0	p	5yr6/1	t	xs	m/d	0	0	0	-	-
273	2	a	0	0	p	5yr5/1	t	sm	m/d	0	0	0	-	-
274	2	a	0	0	p	5yr4/1	t	sm	p	14.59	4.04	>3	b	-
275	2	a	0	0	p	7.5yr7/2	t	xs	m/d	0	0	0	-	-
276	2	a	0	0	p	5yr5/1	t	sm	m/d	0	0	0	-	-
277	2	a	0	0	p	5yr5/1	t	med	c	16.21	6.7	>3	c	h
278	2	a	0	0	p	5yr5/1	t	sm	m/d	0	0	0	-	-
279	2	a	0	0	p	5yr5/1	t	xs	m/d	0	0	0	-	-
280	2	a	0	0	p	10r3/2	t	sm	p	3.56	2.12	1	b	-
281	2	a	0	0	p	10r3/2	t	xs	m/d	0	0	0	-	-
282	2	a	0	0	p	5yr6/1	t	xs	p	1.48	0.62	1	b	-
283	2	a	0	0	p	5yr6/2	t	med	m/d	0	0	0	-	-

Cat #	Area	Square	Sub sq	Level	Raw Material	Color	Cortex	Size	Comple-teness	Platform Width	Platform Thickness	Platform Facets	Initit-iation	Term-ination
284	2	a	0	0	p	5yr5/1	t	med	m/d	0	0	0	-	-
285	2	a	0	0	p	5yr5/1	t	xs	m/d	0	0	0	-	-
286	2	a	0	0	p	5r2/2	t	sm	m/d	0	0	0	-	-
287	2	a	0	0	p	5yr6/2	t	med	p	7.06	3.54	2	c	-
288	2	a	0	0	p	5yr6/1	t	sm	p	2.08	0.89	1	b	-
289	2	a	0	0	p	5yr5/1	t	sm	m/d	0	0	0	-	-
290	2	a	0	0	p	5yr5/1	t	xs	m/d	0	0	0	-	-
291	2	a	0	0	p	5yr5/1	t	sm	p	20	6.42	>3	b	-
292	2	a	0	0	p	5yr7/2	t	med	m/d	0	0	0	-	-
293	2	a	0	0	p	5r2/2	t	sm	m/d	0	0	0	-	-
294	2	a	0	0	p	5yr6/1	t	xs	m/d	0	0	0	-	-
295	2	a	0	0	p	5yr6/1	t	sm	m/d	0	0	0	-	-
296	2	a	0	0	p	5yr6/1	t	xs	m/d	0	0	0	-	-
297	2	a	0	0	p	5yr5/1	t	sm	m/d	0	0	0	-	-
298	2	a	0	0	p	5r2/2	t	sm	m/d	0	0	0	-	-
299	2	a	0	0	p	5yr6/2	t	sm	p	4.74	1.03	1	b	-
300	2	a	0	0	p	5yr4/1	t	xs	m/d	0	0	0	-	-
301	2	a	0	0	p	5yr5/1	t	xs	m/d	0	0	0	-	-
302	2	a	0	0	p	5yr6/1	t	xs	m/d	0	0	0	-	-
303	2	a	0	0	p	5r2/2	t	med	p	25.72	10.62	1	b	-
304	2	a	0	0	p	5yr6/2	t	med	m/d	0	0	0	-	-
305	2	a	0	0	p	5yr5/2	t	sm	m/d	0	0	0	-	-
306	2	a	0	0	p	5yr6/2	t	sm	m/d	0	0	0	-	-
307	2	a	0	0	p	5yr6/1	t	sm	m/d	0	0	0	-	-
308	2	a	0	0	p	5yr3/1	t	sm	m/d	0	0	0	-	-
309	2	a	0	0	p	5yr5/1	t	sm	m/d	0	0	0	-	-
310	2	a	0	0	p	7.5yr5/2	t	sm	m/d	0	0	0	-	-
311	2	a	0	0	p	5yr6/2	t	sm	m/d	0	0	0	-	-
312	2	a	0	0	p	5yr6/2	t	xs	m/d	0	0	0	-	-
313	2	a	0	0	p	7.5yr5/2	t	sm	m/d	0	0	0	-	-
314	2	a	0	0	b	5yr2.5/1	t	sm	c	3.27	1.39	1	c	f

Cat #	Area	Square	Sub sq	Level	Raw Material	Color	Cortex	Size	Comple-teness	Platform Width	Platform Thickness	Platform Facets	Initit-iation	Term-ination
315	2	a	0	0	p	5yr4/1	t	med	p	2.74	1.6	>3	c	-
316	2	a	0	0	p	5yr5/1	t	sm	m/d	0	0	0	-	-
317	2	a	0	0	p	5yr4/1	t	sm	p	4.8	2	1	c	-
318	2	a	0	0	p	5yr4/1	t	xs	m/d	0	0	0	-	-
319	2	a	0	0	p	5yr5/2	t	med	m/d	0	0	0	-	-
320	2	a	0	0	p	5yr3/1	t	med	m/d	0	0	0	-	-
321	2	a	0	0	p	5yr4/1	t	xs	m/d	0	0	0	-	-
322	2	a	0	0	p	5yr5/1	t	xs	m/d	0	0	0	-	-
323	2	a	0	0	p	5yr6/1	t	sm	m/d	0	0	-	-	-
324	2	a	0	0	p	5r2/2	t	sm	p	8.68	3.38	1	c	-
325	2	a	0	0	p	5yr6/1	t	xs	m/d	0	0	0	-	-
326	2	a	0	0	p	2.5yr5/1	t	xs	m/d	0	0	0	-	-
327	2	a	0	0	p	5r2/2	t	med	p	5.69	2.08	2	c	-
328	2	a	0	0	p	5r2/2	t	sm	m/d	0	0	0	-	-
329	2	a	0	0	p	5r2/2	t	sm	m/d	0	0	0	-	-
330	2	a	0	0	p	5yr6/1	t	sm	p	9.88	3.5	1	c	-
331	2	a	0	0	p	5yr5/1	t	xs	c	5.22	0.92	1	c	f
332	2	a	0	0	p	5yr4/1	t	med	p	12.08	40.24	>3	c	-
333	2	a	0	0	p	5yr6/2	t	sm	p	6.06	2.92	1	c	-
334	2	a	0	0	p	5r2/2	s	med	p	20.78	11.94	1	c	-
335	2	a	0	0	p	5yr3/1	t	xs	m/d	0	0	0	-	-
336	2	a	0	0	p	2.5yr4/0	t	xs	m/d	0	0	0	-	-
337	2	a	0	0	p	5r2/2	t	xs	p	0.8	0.62	1	c	-
338	2	a	0	0	p	5yr6/2	t	xs	m/d	0	0	0	-	-
339	2	a	0	0	p	5yr3/1	t	xs	m/d	0	0	0	-	-
340	2	a	0	0	p	5yr6/2	t	sm	p	14.63	4.86	1	b	-
341	2	a	0	0	b	5yr2.5/1	s	med	p	13.92	3.42	1	c	-
342	2	a	0	0	p	5yr6/1	s	sm	p	4.42	2.99	1	b	
343	2	a	0	0	p	5r2/2	t	xs	m/d	0	0	0	-	-
344	2	a	0	0	p	5yr4/1	t	xs	m/d	0	0	0	-	-
345	2	a	0	0	p	5yr4/1	t	sm	m/d	0	0	0	-	-

Cat #	Area	Square	Sub sq	Level	Raw Material	Color	Cortex	Size	Comple-teness	Platform Width	Platform Thickness	Platform Facets	Initit-iation	Term-ination
346	2	a	0	0	p	5yr4/1	t	xs	p	5.26	1.24	1	c	-
347	2	a	0	0	p	2.5yr5/0	t	sm	m/d	0	0	0	-	-
348	2	a	0	0	p	5yr5/1	t	sm	m/d	0	0	0	-	-
349	2	a	0	0	p	5yr5/1	t	xs	m/d	0	0	0	-	-
350	2	a	0	0	p	5yr5/1	t	xs	m/d	0	0	0	-	-
351	2	a	0	0	p	5yr5/1	t	sm	m/d	0	0	0	-	-
352	2	a	0	0	p	2.5r3/4	t	xs	m/d	0	0	0	-	-
353	2	a	0	0	b	5yr2.5/1	t	sm	p	5.08	1.7	2	b	-
354	2	a	0	0	p	5yr6/2	t	sm	m/d	0	0	0	-	-
355	2	a	0	0	p	5yr3/1	t	sm	m/d	0	0	0	-	-
356	2	a	0	0	p	5yr4/1	t	sm	m/d	0	0	0	-	-
357	2	a	0	0	p	5yr5/1	t	xs	m/d	0	0	0	-	-
358	2	a	0	0	p	5r2/2	t	xs	p	1.68	0.96	1	b	-
359	2	a	0	0	p	10r3/4	t	xs	m/d	0	0	0	-	-
360	2	a	0	0	p	5yr5/1	t	xs	m/d	0	0	0	-	-
361	2	a	0	0	p	5yr6/1	t	xs	m/d	0	0	0	-	-
362	2	a	0	0	p	5yr6/1	t	xs	m/d	0	0	0	-	-
363	2	a	0	0	p	5yr6/1	t	xs	m/d	0	0	0	-	-
364	2	a	0	0	p	5yr6/1	t	xs	m/d	0	0	0	-	-
365	2	a	25	1	p	5yr6/1	t	sm	m/d	0	0	0	-	-
366	2	a	25	1	p	5yr6/1	s	med	c	6.61	3.46	>3	c	f
367	2	a	25	1	p	5yr5/1	t	sm	p	8.73	2.72	1	b	-
368	2	a	25	1	p	5yr5/1	t	xs	m/d	0	0	0	-	-
369	2	a	25	1	p	5yr6/1	t	sm	m/d	0	0	0	-	-
370	2	a	25	1	p	5yr6/1	t	sm	m/d	0	0	0	-	-
371	2	a	25	1	p	5yr4/1	t	sm	p	7.81	1.7	>3	c	-
372	2	a	25	1	p	5yr5/1	t	med	p	22.17	5.49	1	b	-
373	2	a	25	1	p	5yr4/1	t	sm	m/d	0	0	0	-	-
374	2	a	25	1	p	5yr5/1	t	med	m/d	0	0	0	-	-
375	2	a	25	1	p	5yr5/1	t	sm	m/d	0	0	0	-	-
376	2	a	25	1	p	5yr5/1	t	sm	m/d	0	0	0	-	-

Cat #	Area	Square	Sub sq	Level	Raw Material	Color	Cortex	Size	Comple-teness	Platform Width	Platform Thickness	Platform Facets	Initit-iation	Term-ination
377	2	a	25	1	p	5yr7/2	t	sm	p	13.5	4.49	>3	b	-
378	2	a	25	1	c	2.5r3/4	t	xs	m/d	0	0	0	-	-
379	2	a	25	1	c	2.5yr6/2	t	sm	m/d	0	0	0	-	-
380	2	a	25	1	p	5yr5/2	t	sm	m/d	0	0	0	-	-
381	2	a	25	1	p	5yr5/1	t	sm	m/d	0	0	0	-	-
382	2	a	25	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
383	2	a	25	1	p	2.5yr4/0	t	sm	p	5.58	2.01	1	c	-
384	2	a	25	1	p	2.5yr3/0	t	sm	m/d	0	0	0	-	-
385	2	a	25	1	p	2.5yr3/0	t	sm	m/d	0	0	0	-	-
386	2	a	25	1	p	2.5yr6/0	t	sm	m/d	0	0	0	-	-
387	2	a	25	1	c	2.5yr6/2	t	xs	m/d	0	0	0	-	-
388	2	a	25	1	c	2.5yr6/2	t	xs	p	3.8	1.18	1	c	-
389	2	a	25	1	p	7.5yr5/2	t	xs	c	2.59	0.59	1	c	f
390	2	a	25	1	p	5yr5/1	t	sm	m/d	0	0	0	-	-
391	2	a	25	1	p	5yr3/1	t	sm	m/d	0	0	0	-	-
392	2	a	25	1	p	5yr6/2	t	xs	m/d	0	0	0	-	-
393	2	a	25	1	p	5yr5/1	t	sm	m/d	0	0	0	-	-
394	2	a	25	1	p	5yr4/1	t	sm	m/d	0	0	0	-	-
395	2	a	25	1	p	2.5yr5/0	t	sm	m/d	0	0	0	-	-
396	2	a	25	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
397	2	a	25	1	c	2.5yr6/2	t	xs	m/d	0	0	0	-	-
398	2	a	25	1	p	5yr4/1	s	xs	m/d	0	0	0	-	-
399	2	a	25	1	p	2.5yr3/4	t	xs	p	6.04	1.52	3	b	-
400	2	a	25	1	p	5yr5/1	t	xs	p	2.77	0.46	>3	b	-
401	2	a	25	1	p	5yr4/1	t	sm	m/d	0	0	0	-	-
402	2	a	25	1	p	5r2/2	t	sm	c	6.69	3.42	2	b	f
403	2	a	25	1	p	2.5yr4/0	t	xs	p	7.14	1.86	1	b	-
404	2	a	25	1	p	2.5yr4/0	t	xs	p	7.5	1.34	>3	c	-
405	2	a	25	1	p	7.5yr5/2	t	xs	c	4.26	1.4	1	c	f
406	2	a	25	1	p	5yr4/1	t	xs	m/d	0	0	0	-	-
407	2	a	25	1	p	2.5yr4/0	t	sm	m/d	0	0	0	-	-

Cat #	Area	Square	Sub sq	Level	Raw Material	Color	Cortex	Size	Comple-teness	Platform Width	Platform Thickness	Platform Facets	Initit-iation	Term-ination
408	2	a	25	1	p	2.5yr4/0	t	xs	m/d	0	0	0	-	-
409	2	a	25	1	p	5yr5/2	t	xs	m/d	0	0	0	-	-
410	2	a	25	1	p	2.5yr4/0	t	sm	p	4.92	1.31	1	b	-
411	2	a	25	1	p	2.5yr4/0	t	xs	m/d	0	0	0	-	-
412	2	a	25	1	p	5yr4/1	t	sm	m/d	0	0	0	-	-
413	2	a	25	1	p	5yr5/1	t	sm	m/d	0	0	0	-	-
414	2	a	25	1	p	5yr6/2	t	sm	p	4.81	3.12	1	b	-
415	2	a	25	1	p	5yr5/1	t	sm	p	7.5	1.78	1	c	-
416	2	a	25	1	p	5yr5/1	t	sm	m/d	0	0	0	-	-
417	2	a	25	1	p	7.5yr3/0	t	sm	m/d	0	0	0	-	-
418	2	a	25	1	p	5r2/2	t	sm	m/d	0	0	0	-	-
419	2	a	25	1	p	5yr6/2	t	xs	p	2.27	0.73	1	c	-
420	2	a	25	1	p	5yr6/2	t	xs	c	4.08	1.38	1	c	f
421	2	a	25	1	p	5yr6/2	t	xs	p	3.78	0.97	1	b	f
422	2	a	25	1	p	5yr4/1	t	sm	m/d	0	0	0	-	-
423	2	a	25	1	p	5yr4/1	t	xs	m/d	0	0	0	-	-
424	2	a	25	1	p	10yr5/1	t	xs	m/d	0	0	0	-	-
425	2	a	25	1	p	5yr6/2	t	xs	m/d	0	0	0	-	-
426	2	a	25	1	p	10yr5/1	t	xs	m/d	0	0	0	-	-
427	2	a	25	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
428	2	a	25	1	p	5yr6/2	t	xs	p	2.64	0.75	1	b	-
429	2	a	25	1	p	7.5yr5/2	t	xs	m/d	0	0	0	-	-
430	2	a	25	1	c	2.5yr6/2	t	xs	p	3.12	1.16	1	b	-
431	2	a	25	1	c	2.5yr6/2	t	xs	m/d	0	0	0	-	-
432	2	a	25	1	c	5yr8/1	t	xs	m/d	0	0	0	-	-
433	2	a	25	1	p	5yr6/2	t	xs	m/d	0	0	0	-	-
434	2	a	25	1	p	5yr3/1	t	xs	c	2.92	0.88	1	c	f
435	2	a	25	1	p	5yr3/1	t	xs	m/d	0	0	0	-	-
436	2	a	25	1	p	10yr5/1	t	xs	p	4.29	1.18	1	b	-
437	2	a	25	1	p	5yr6/2	t	xs	m/d	0	0	0	-	-
438	2	a	25	1	p	5yr6/2	t	xs	m/d	0	0	0	-	-

Cat #	Area	Square	Sub sq	Level	Raw Material	Color	Cortex	Size	Comple-teness	Platform Width	Platform Thickness	Platform Facets	Initit-iation	Term-ination
439	2	a	25	1	p	5yr5/1	t	xs	p	2.36	1.04	1	c	-
440	2	a	25	1	p	2.5yr4/0	t	xs	m/d	0	0	0	-	-
441	2	a	25	1	p	7.5yr5/2	t	xs	m/d	0	0	0	-	-
442	2	a	25	1	p	5r2/2	t	xs	p	2.58	0.72	1	c	-
443	2	a	25	1	p	5yr6/2	t	xs	m/d	0	0	0	-	-
444	2	a	25	1	p	5yr5/1	t	xs	m/d	0	0	0	-	-
445	2	a	25	1	p	2.5yr4/0	t	xs	m/d	0	0	0	-	-
446	2	a	25	1	p	5yr6/2	t	xs	m/d	0	0	0	-	-
447	2	a	25	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
448	2	a	25	1	p	5yr5/1	t	xs	m/d	0	0	0	-	-
449	2	a	25	1	p	5yr5/1	t	xs	c	5.31	0.76	1	b	f
450	2	a	25	1	p	5yr5/1	t	xs	m/d	0	0	0	-	-
451	2	a	25	1	p	5yr5/1	t	xs	m/d	0	0	0	-	-
452	2	a	25	1	p	5yr6/2	t	xs	m/d	0	0	0	-	-
453	2	a	25	1	p	5yr6/1	t	xs	m/d	0	0	0	-	-
454	2	a	25	1	p	5yr6/1	t	xs	m/d	0	0	0	-	-
455	2	a	25	1	p	5yr5/2	t	xs	m/d	0	0	0	-	-
456	2	a	25	1	p	5yr6/1	p	med	s	0	0	0	w	a
457	2	b	0	0	p	5yr5/1	t	med	p	19.09	3.51	1	b	-
458	2	b	0	0	p	5r2/2	t	med	c	12.78	6.4	1	b	h
459	2	b	0	0	p	5yr2.5/1	t	med	m/d	0	0	0	-	-
460	2	b	0	0	p	5yr6/1	t	med	m/d	0	0	0	-	-
461	2	b	0	0	p	5r2/2	t	med	m/d	0	0	0	-	-
462	2	b	0	0	p	5r2/2	s	med	m/d	0	0	0	-	-
463	2	b	0	0	p	5r2/2	t	sm	c	12.59	4.69	3	b	s
464	2	b	0	0	p	2.5yr5/0	t	sm	m/d	0	0	0	-	-
465	2	b	0	0	p	2.5yr4/0	t	sm	m/d	0	0	0	-	-
466	2	b	0	0	p	2.5yr3/0	t	sm	m/d	0	0	0	-	-
467	2	b	0	0	p	5r2/2	t	sm	p	4.87	1.57	>3	c	-
468	2	b	0	0	p	5yr5/1	t	sm	m/d	0	0	0	-	-
469	2	b	0	0	p	5r2/2	t	med	m/d	0	0	0	-	-

Cat #	Area	Square	Sub sq	Level	Raw Material	Color	Cortex	Size	Comple-teness	Platform Width	Platform Thickness	Platform Facets	Initit-iation	Term-ination
470	2	b	0	0	c	10yr3/1	t	sm	m/d	0	0	0	-	-
471	2	b	0	0	p	5r2/2	t	med	c	7.38	5.6	1	b	f
472	2	b	0	0	p	5r2/2	t	med	m/d	0	0	0	-	-
473	2	b	0	0	p	5r2/2	t	med	s	0	0	0	c	h
474	2	b	0	0	p	5yr5/2	t	med	s	0	0	0	b	f
475	2	b	0	0	p	5r2/2	s	sm	m/d	0	0	0	-	-
476	2	b	0	0	p	5yr5/1	t	med	p	34.69	9.57	>3	b	-
477	2	b	0	0	p	5yr5/1	t	med	c	8.52	4.62	1	c	f
478	2	b	0	0	p	5r2/2	t	med	m/d	0	0	0	-	-
479	2	b	0	0	p	5r2/2	t	sm	m/d	0	0	0	-	-
480	2	b	0	0	p	5r2/2	t	sm	p	5.26	1.1	1	c	-
481	2	b	0	0	p	5yr6/2	t	med	p	21.58	10.24	>3	b	-
482	2	b	0	0	p	5r2/2	s	sm	m/d	0	0	0	-	-
483	2	b	0	0	p	5yr5/1	t	sm	p	12.88	3.89	1	c	-
484	2	b	0	0	p	5yr5/1	t	med	p	10.92	4.27	1	c	-
485	2	b	0	0	p	5r2/2	t	med	m/d	0	0	0	-	-
486	2	b	0	0	p	5yr4/1	t	med	m/d	0	0	0	-	-
487	2	b	0	0	p	5yr5/1	t	med	m/d	0	0	0	-	-
488	2	b	0	0	p	5yr5/1	t	med	m/d	0	0	0	-	-
489	2	b	0	0	p	5r2/2	t	sm	m/d	0	0	0	-	-
490	2	b	0	0	p	5yr3/1	t	sm	m/d	0	0	0	-	-
491	2	b	0	0	c	5yr8/1	t	sm	c	6.28	1.56	1	b	f
492	2	b	0	0	c	5yr8/1	t	xs	p	9.58	2.94	>3	b	-
493	2	b	0	0	p	5yr4/1	t	xs	c	2.32	1.14	1	c	s
494	2	b	0	0	p	5r2/2	t	sm	m/d	0	0	0	-	-
495	2	b	0	0	p	5yr5/1	t	sm	c	13.41	3.61	1	c	f
496	2	b	0	0	p	5yr3/1	t	sm	m/d	0	0	0	-	-
497	2	b	0	0	p	5yr3/1	t	sm	m/d	0	0	0	-	-
498	2	b	0	0	p	5yr6/2	t	sm	c	14.04	5.7	1	c	f
499	2	b	0	0	p	5r2/2	t	med	m/d	0	0	0	-	-
500	2	b	0	0	p	5yr6/1	t	med	m/d	0	0	0	-	-

Cat #	Area	Square	Sub sq	Level	Raw Material	Color	Cortex	Size	Comple-teness	Platform Width	Platform Thickness	Platform Facets	Initit-iation	Term-ination
501	2	b	0	0	p	5yr5/1	t	med	m/d	0	0	0	-	-
502	2	b	0	0	p	5r2/2	t	sm	c	5.02	1.68	1	b	s
503	2	b	0	0	p	5r2/2	t	sm	p	10.59	2.16	>3	c	-
504	2	b	0	0	p	5r2/2	t	med	m/d	0	0	0	-	-
505	2	b	0	0	p	5r2/2	t	sm	m/d	0	0	0	-	-
506	2	b	0	0	p	5yr7/2	t	xs	p	4.86	3.11	1	c	-
507	2	b	0	0	p	5yr2.5/1	s	med	p	43.68	17.17	1	c	-
508	2	b	0	0	p	10yr6/1	t	xs	p	2.04	0.89	1	c	-
509	2	b	0	0	p	5yr5/1	t	sm	m/d	0	0	0	-	-
510	2	b	0	0	p	5yr5/1	t	sm	p	4.99	1.91	>3	b	-
511	2	b	0	0	p	5r2/2	t	sm	p	21.72	9.11	>3	b	-
512	2	b	0	0	p	5yr6/2	t	med	m/d	0	0	0	-	-
513	2	b	0	0	p	5r2/2	t	sm	m/d	0	0	0	-	-
514	2	b	0	0	p	5yr3/1	t	sm	m/d	0	0	0	-	-
515	2	b	0	0	p	5yr5/1	s	med	m/d	0	0	0	-	-
517	2	b	0	0	p	5yr5/1	t	med	p	7.79	5.79	1	c	-
518	2	b	0	0	p	5yr6/2	t	med	p	39.06	7.24	>3	b	-
519	2	b	0	0	p	5yr5/1	s	s	p	36.08	11.99	>3	c	-
520	2	b	0	0	p	5yr6/2	t	med	c	20.14	12.12	>3	c	o
521	2	b	0	0	p	5r2/2	t	sm	m/d	0	0	0	-	-
522	2	b	0	0	p	5yr4/1	t	med	p	17.4	5.76	1	c	-
523	2	b	0	0	p	5yr3/1	t	sm	m/d	0	0	0	-	-
524	2	b	0	0	p	5yr2.5/1	t	sm	m/d	0	0	0	-	-
525	2	b	0	0	p	5r2/2	t	sm	m/d	0	0	0	-	-
526	2	b	0	0	p	5r2/2	t	sm	m/d	0	0	0	-	-
527	2	b	0	0	p	5yr6/2	t	sm	s	0	0	0	c	-
528	2	b	0	0	p	5r2/2	t	sm	p	5.63	2.87	1	b	-
529	2	b	0	0	p	5yr6/1	t	med	p	17.33	7.4	>3	w	a
530	2	b	0	0	p	5yr6/1	s	sm	p	20.75	8.54	1	c	-
531	2	b	0	0	p	5yr6/2	s	med	m/d	0	0	0	-	-
532	2	b	0	0	p	5r2/2	s	med	p	9.78	5.42	>3	c	-

Cat #	Area	Square	Sub sq	Level	Raw Material	Color	Cortex	Size	Comple-teness	Platform Width	Platform Thickness	Platform Facets	Initit-iation	Term-ination
533	2	b	0	0	p	5yr6/2	t	med	m/d	0	0	0	-	-
534	2	b	0	0	q	5yr6/2	t	sm	m/d	0	0	0	-	-
535	2	b	0	0	p	5yr2.5/1	t	sm	p	15.39	5.81	1	c	-
536	2	b	0	0	p	5yr2.5/1	t	med	c	7.13	3.78	1	c	f
537	2	b	0	0	p	5yr5/1	s	med	no	0	0	0	-	-
539	2	b	0	0	p	5yr3/1	t	sm	m/d	0	0	0	-	-
540	2	b	0	0	p	5r2/2	t	med	m/d	0	0	0	-	-
541	2	b	0	0	p	5r2/2	t	sm	no	0	0	0	-	-
542	2	b	0	0	p	5r2/2	t	sm	m/d	0	0	0	-	-
543	2	b	0	0	p	5yr2.5/1	t	sm	m/d	0	0	0	-	-
544	2	b	0	0	p	5r2/2	t	sm	m/d	0	0	0	-	-
545	2	b	0	0	p	5yr4/1	c	sm	m/d	0	0	0	-	-
546	2	b	0	0	p	5yr5/1	t	sm	m/d	0	0	0	-	-
547	2	b	0	0	p	5yr6/1	t	sm	m/d	0	0	0	-	-
548	2	b	0	0	p	5yr4/1	t	sm	no	0	0	0	-	-
550	2	b	0	0	p	5yr3/1	t	sm	m/d	0	0	0	-	-
551	2	b	0	0	p	5r2/2	s	med	c	20.26	0.12	2	c	f
552	2	b	0	0	p	5r2/2	t	sm	s	0	0	0	c	f
553	2	b	0	0	p	5yr3/1	t	sm	c	8.46	2.31	2	b	h
554	2	b	0	0	p	5yr3/1	t	xs	c	11.09	2.58	1	c	f
555	2	b	0	0	p	5yr3/1	t	sm	m/d	0	0	0	-	-
556	2	b	0	0	p	5yr6/1	s	med	p	7.19	6.27	1	c	-
557	2	b	0	0	p	5yr5/1	t	med	m/d	0	0	0	-	-
558	2	b	0	0	p	5yr6//2	t	med	p	41.78	18.76	>3	c	-
559	2	b	0	0	p	10yr6/1	t	sm	m/d	0	0	0	-	-
560	2	b	0	0	p	5yr6/1	t	sm	m/d	0	0	0	-	-
561	2	b	0	0	p	5yr4/1	t	xs	m/d	0	0	0	-	-
562	2	b	0	0	p	5r2/2	t	xs	m/d	0	0	0	-	-
563	2	b	0	0	p	5yr3/1	t	med	p	19.53	7.6	2	c	-
564	2	b	0	0	p	5yr5/1	t	sm	m/d	0	0	0	-	-
565	2	b	0	0	p	5yr6/1	t	sm	m/d	0	0	0	-	-

Cat #	Area	Square	Sub sq	Level	Raw Material	Color	Cortex	Size	Comple-teness	Platform Width	Platform Thickness	Platform Facets	Initit-iation	Term-ination
566	2	b	0	0	p	2.5yr4/0	t	xs	m/d	0	0	0	-	-
567	2	b	0	0	p	5yr6/1	t	xs	m/d	0	0	0	-	-
568	2	b	0	0	p	5yr7/1	t	sm	m/d	0	0	0	-	-
569	2	b	0	0	p	5yr6/1	t	sm	c	6	2.16	1	c	s
570	2	b	0	0	p	5yr6/1	t	sm	no	0	0	0	-	-
571	2	b	0	0	p	5yr6/1	t	sm	no	0	0	0	-	-
572	2	b	0	0	p	5yr6/1	t	sm	m/d	0	0	0	-	-
573	2	b	0	0	p	5r2/2	t	sm	m/d	0	0	0	-	-
574	2	b	0	0	p	5yr6/2	t	sm	p	10.92	2.84	1	c	-
575	2	b	0	0	p	5yr6/2	s	med	m/d	0	0	0	-	-
576	2	b	0	0	p	5yr6/1	t	med	no	0	0	0	-	-
577	2	b	0	0	p	5yr2.5/1	t	sm	m/d	0	0	0	-	-
578	2	b	0	0	p	5yr5/1	t	sm	p	6.11	3.94	3	c	-
579	2	b	0	0	p	5yr4/1	t	sm	p	10.77	3.25	1	b	-
580	2	b	0	0	p	5yr5/1	t	xs	m/d	0	0	0	-	-
581	2	b	0	0	p	5yr6/1	t	xs	m/d	0	0	0	-	-
582	2	b	0	0	p	5yr5/1	t	sm	c	7.07	2.98	1	b	f
583	2	b	0	0	p	5yr6/2	t	sm	p	9.56	1.64	1	b	-
584	2	b	0	0	p	5yr6/2	t	med	m/d	0	0	0	-	-
585	2	b	0	0	p	5yr3/1	t	med	m/d	0	0	0	-	-
586	2	b	0	0	p	5r2/2	t	xs	m/d	0	0	0	-	-
587	2	b	0	0	p	5yr5/1	t	xs	m/d	0	0	0	-	-
588	2	b	0	0	p	5r2/2	t	sm	no	0	0	0	-	-
589	2	b	0	0	p	5yr5/1	t	xs	m/d	0	0	0	-	-
590	2	b	0	0	p	5yr4/1	t	sm	m/d	0	0	0	-	-
591	2	b	0	0	p	2.5yr4/0	t	xs	m/d	0	0	0	-	-
592	2	b	0	0	p	5yr5/1	t	med	p	45.72	30.88	1	c	-
593	2	b	0	0	p	5yr4/1	t	med	m/d	0	0	0	-	-
595	2	b	0	0	p	5yr6/2	t	sm	s	0	0	0	c	f
596	2	b	0	0	p	5yr6/1	t	med	m/d	0	0	0	-	-
597	2	b	0	0	p	5r2/2	t	xs	p	5.21	0.84	1	b	-

Cat #	Area	Square	Sub sq	Level	Raw Material	Color	Cortex	Size	Comple-teness	Platform Width	Platform Thickness	Platform Facets	Initit-iation	Term-ination
598	2	b	0	0	p	5yr2.5/1	s	sm	m/d	0	0	0	-	-
599	2	b	0	0	p	5yr4/1	s	med	p	11.74	6.78	>3	c	-
600	2	b	0	0	p	5yr6/2	t	med	m/d	0	0	0	-	-
601	2	b	0	0	p	5yr6/1	s	sm	no	0	0	0	-	-
602	2	b	0	0	p	5yr6/1	t	med	no	0	0	0	-	-
603	2	b	0	0	p	5r2/2	t	med	no	0	0	0	-	-
604	2	b	0	0	p	5r2/2	t	sm	m/d	0	0	0	-	-
605	2	b	0	0	p	5r2/2	t	med	no	0	0	0	-	-
606	2	b	0	0	p	5yr2.5/1	t	sm	no	0	0	0	-	-
607	2	b	0	0	p	5yr5/1	t	sm	no	0	0	0	-	-
609	2	b	0	0	p	5yr6/2	t	med	m/d	0	0	0	-	-
610	2	b	0	0	p	5r2/2	t	med	c	10.8	4.3	1	b	f
611	2	b	0	0	p	5r2/2	t	med	m/d	0	0	0	-	-
612	2	b	0	0	p	5yr5/1	t	med	m/d	0	0	0	-	-
613	2	b	0	0	p	5yr6/2	t	sm	m/d	0	0	0	-	-
614	2	b	0	0	c	0	t	xs	m/d	0	0	0	-	-
615	2	b	0	0	c	0	t	xs	m/d	0	0	0	-	-
616	2	b	0	0	c	5yr8/1	t	xs	m/d	0	0	0	-	-
617	2	b	0	0	c	5yr8/1	t	xs	p	2.72	0.68	1	b	-
618	2	b	0	0	p	5yr5/2	t	xs	m/d	0	0	0	-	-
619	2	b	0	0	p	2.5yr5/0	t	xs	m/d	0	0	0	-	-
620	2	b	0	0	p	5yr6/1	t	xs	m/d	0	0	0	-	-
621	2	b	0	0	p	5yr7/1	t	xs	m/d	0	0	0	-	-
622	2	b	0	0	p	5yr6/1	t	xs	m/d	0	0	0	-	-
623	2	b	0	0	p	5yr6/2	t	xs	m/d	0	0	0	-	-
624	2	b	0	0	p	5r2/2	t	xs	m/d	0	0	0	-	-
625	2	b	0	0	p	5yr6/1	t	xs	m/d	0	0	0	-	-
626	2	b	0	0	p	5yr6/1	t	xs	m/d	0	0	0	-	-
627	2	b	0	0	p	5yr6/1	t	xs	m/d	0	0	0	-	-
628	2	b	0	0	p	5yr6/1	t	xs	p	2.06	0.5	1	b	-
629	2	b	0	0	p	5r2/2	t	xs	p	7.79	0.99	1	c	-

Cat #	Area	Square	Sub sq	Level	Raw Material	Color	Cortex	Size	Comple-teness	Platform Width	Platform Thickness	Platform Facets	Initit-iation	Term-ination
630	2	b	0	0	p	5yr7/1	t	xs	p	4.84	0.6	1	c	-
631	2	b	0	0	p	5yr5/1	t	xs	m/d	0	0	0	-	-
632	2	b	0	0	p	5yr6/1	t	xs	m/d	0	0	0	-	-
633	2	b	0	0	p	5yr6/2	t	xs	m/d	0	0	0	-	-
634	2	b	0	0	p	5yr6/2	p	xs	m/d	0	0	0	-	-
635	2	b	0	0	p	5yr6/1	t	xs	m/d	0	0	0	-	-
636	2	b	0	0	p	5yr6/1	t	xs	m/d	0	0	0	-	-
637	2	b	0	0	o	5yr2.5/1	t	xs	m/d	0	0	0	-	-
638	2	b	0	0	o	5yr2.5/1	t	xs	m/d	0	0	0	-	-
639	2	b	0	0	p	5yr6/2	t	xs	m/d	0	0	0	-	-
640	2	b	0	0	p	5r2/2	t	xs	m/d	0	0	0	-	-
641	2	b	0	0	p	5yr6/2	t	xs	p	1.3	0.29	1	b	-
642	2	b	0	0	p	5yr4/1	t	xs	m/d	0	0	0	-	-
643	2	b	0	0	p	5yr6/2	t	xs	p	2.16	0.98	1	b	-
644	2	b	5	1	p	5r2/2	s	med	p	37.44	11.96	2	c	-
645	2	b	5	1	p	5yr6/2	s	sm	m/d	0	0	0	-	-
646	2	b	5	1	p	5r2/2	t	xs	p	2.16	0.94	1	c	-
647	2	b	5	1	p	5r2/2	t	sm	p	20.24	6.24	>3	b	-
648	2	b	5	1	p	5yr5/2	t	xs	m/d	0	0	0	-	-
649	2	b	5	1	p	5yr5/2	t	sm	m/d	0	0	0	-	-
650	2	b	5	1	p	2.5yr3/0	t	xs	m/d	0	0	0	-	-
651	2	b	5	1	c	5yr3/1	t	xs	m/d	0	0	0	-	-
652	2	b	5	1	p	5yr6/1	s	sm	c	6.48	3.45	1	b	h
653	2	b	5	1	c	5yr6/4	t	sm	m/d	0	0	0	-	-
654	2	b	5	1	p	5yr4/1	t	sm	m/d	0	0	0	-	-
655	2	b	5	1	o	5yr2.5/1	t	sm	p	5.3	1.74	1	c	-
656	2	b	5	1	o	5yr2.5/1	s	sm	p	10.86	4.4	1	c	-
657	2	b	5	1	p	5r2/2	s	med	m/d	0	0	0	-	-
658	2	b	5	1	p	5r2/2	t	sm	m/d	0	0	0	-	-
659	2	b	5	1	p	5yr5/2	t	med	p	18.84	8.72	1	c	-
660	2	b	5	1	c	5yr3/2	t	sm	s	0	0	0	b	-

Cat #	Area	Square	Sub sq	Level	Raw Material	Color	Cortex	Size	Comple-teness	Platform Width	Platform Thickness	Platform Facets	Initit-iation	Term-ination
661	2	b	5	1	c	0	t	sm	m/d	0	0	0	-	-
662	2	b	5	1	ch	5yr8/1	t	sm	m/d	0	0	0	-	-
663	2	b	5	1	p	5yr6/2	t	sm	p	30.56	6.16	>3	c	-
664	2	b	5	1	p	5yr6/2	t	sm	m/d	0	0	0	-	-
665	2	b	5	1	p	5r2/2	t	sm	m/d	0	0	0	-	-
666	2	b	5	1	p	5yr5/1	t	sm	m/d	0	0	0	-	-
667	2	b	5	1	p	5yr3/1	t	sm	no	0	0	0	-	-
668	2	b	5	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
669	2	b	5	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
670	2	b	5	1	p	5yr7/2	t	xs	m/d	0	0	0	-	-
671	2	b	5	1	p	5yr6/2	t	xs	m/d	0	0	0	-	-
672	2	b	5	1	p	5yr6/2	t	sm	m/d	0	0	0	-	-
673	2	b	5	1	p	5yr6/2	t	sm	m/d	0	0	0	-	-
674	2	b	5	1	p	5r2/2	t	sm	no	0	0	0	-	-
675	2	b	5	1	p	5yr6/2	s	sm	m/d	0	0	0	-	-
676	2	b	5	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
677	2	b	5	1	p	5yr4/1	t	sm	m/d	0	0	0	-	-
678	2	b	5	1	p	5r2/2	t	sm	m/d	0	0	0	-	-
679	2	b	5	1	p	5yr5/1	t	sm	no	0	0	0	-	-
680	2	b	5	1	p	5yr6/1	t	sm	m/d	0	0	0	-	-
681	2	b	5	1	p	5r2/2	t	sm	m/d	0	0	0	-	-
682	2	b	5	1	p	5yr4/1	s	sm	m/d	0	0	0	-	-
683	2	b	5	1	p	5r2/2	t	sm	m/d	0	0	0	-	-
684	2	b	5	1	p	5yr4/1	t	sm	m/d	0	0	0	-	-
685	2	b	5	1	p	5yr4/1	t	xs	m/d	0	0	0	-	-
686	2	b	5	1	p	5yr5/1	s	sm	p	9.04	3.46	1	b	-
687	2	b	5	1	p	5yr6/1	t	xs	c	6.32	2.32	1	c	f
688	2	b	5	1	p	5r2/2	t	xs	p	3.22	1.06	1	c	-
689	2	b	5	1	p	5yr3/1	t	xs	m/d	0	0	0	-	-
690	2	b	5	1	p	5yr6/2	t	sm	m/d	0	0	0	-	-
691	2	b	5	1	p	5r2/2	t	sm	m/d	0	0	0	-	-

Cat #	Area	Square	Sub sq	Level	Raw Material	Color	Cortex	Size	Comple-teness	Platform Width	Platform Thickness	Platform Facets	Initit-iation	Term-ination
692	2	b	5	1	p	5r2/2	t	sm	m/d	0	0	0	-	-
693	2	b	5	1	p	5yr5/1	t	sm	p	12.5	4.67	1	b	-
694	2	b	5	1	p	5r2/2	t	sm	no	0	0	0	-	-
695	2	b	5	1	ch	5yr8/1	t	xs	c	5.69	2.04	1	b	f
696	2	b	5	1	p	5r2/2	t	sm	c	9.44	3.06	1	c	s
697	2	b	5	1	p	5yr3/1	t	sm	m/d	0	0	0	-	-
698	2	b	5	1	p	5yr5/1	t	sm	m/d	0	0	0	-	-
699	2	b	5	1	p	5yr5/2	t	sm	m/d	0	0	0	-	-
700	2	b	5	1	p	5yr3/1	t	xs	m/d	0	0	0	-	-
701	2	b	5	1	p	5yr4/1	t	xs	m/d	0	0	0	-	-
702	2	b	5	1	c	10r4/6	t	xs	m/d	0	0	0	-	-
703	2	b	5	1	p	5r2/2	t	sm	s	0	0	0	b	-
704	2	b	5	1	p	5yr3/1	t	xs	m/d	0	0	0	-	-
705	2	b	5	1	p	5yr6/2	t	sm	p	10.06	2.82	1	c	-
706	2	b	5	1	c	5yr3/4	t	sm	m/d	0	0	0	-	-
707	2	b	5	1	p	5yr3/1	t	sm	m/d	0	0	0	-	-
708	2	b	5	1	p	5r2/2	t	sm	p	9.56	5.38	>3	b	-
709	2	b	5	1	p	5yr4/1	t	sm	m/d	0	0	0	-	-
710	2	b	5	1	p	5yr3/1	t	xs	m/d	0	0	0	-	-
711	2	b	5	1	p	7.5yr4/0	t	xs	m/d	0	0	0	-	-
712	2	b	5	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
713	2	b	5	1	p	7.5yr4/0	t	xs	m/d	0	0	0	-	-
714	2	b	5	1	p	5yr6/2	t	xs	m/d	0	0	0	-	-
715	2	b	5	1	c	5yr4/4	t	xs	c	3.68	0.58	1	b	f
716	2	b	5	1	c	5yr4/4	t	xs	m/d	0	0	0	-	-
717	2	b	5	1	p	5yr4/1	t	sm	no	0	0	0	-	-
718	2	b	5	1	p	5yr6/2	t	sm	m/d	0	0	0	-	-
719	2	b	5	1	p	5yr6/2	t	sm	m/d	0	0	0	-	-
720	2	b	5	1	p	5r2/2	t	xs	no	0	0	0	-	-
721	2	b	5	1	p	5yr4/1	t	sm	m/d	0	0	0	-	-
722	2	b	5	1	p	5r2/2	t	xs	m/d	0	0	0	-	-

Cat #	Area	Square	Sub sq	Level	Raw Material	Color	Cortex	Size	Comple-teness	Platform Width	Platform Thickness	Platform Facets	Initit-iation	Term-ination
723	2	b	5	1	p	5r2/2	t	sm	p	16.18	6.82	>3	c	-
724	2	b	5	1	p	5yr6/1	t	sm	m/d	0	0	0	-	-
725	2	b	5	1	p	5yr6/2	t	sm	m/d	0	0	0	-	-
726	2	b	5	1	p	5yr6/1	t	xs	p	4.04	0.86	1	c	-
727	2	b	5	1	p	2.5yr5/2	t	xs	m/d	0	0	0	-	-
729	2	b	5	1	p	5yr6/2	t	med	m/d	0	0	0	-	-
730	2	b	5	1	p	5yr4/1	t	sm	c	5.46	1.36	1	c	f
731	2	b	5	1	p	5yr5/1	t	sm	m/d	0	0	0	-	-
732	2	b	5	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
733	2	b	5	1	p	5r2/2	t	xs	no	0	0	0	-	-
734	2	b	5	1	p	5r2/2	t	xs	no	0	0	0	-	-
735	2	b	5	1	p	5yr5/1	t	sm	m/d	0	0	0	-	-
736	2	b	5	1	p	7.5yr5/2	t	xs	m/d	0	0	0	-	-
737	2	b	5	1	p	5yr5/1	t	sm	no	0	0	0	-	-
738	2	b	5	1	p	5yr4/1	t	xs	m/d	0	0	0	-	-
739	2	b	5	1	p	5yr5/1	t	xs	m/d	0	0	0	-	-
740	2	b	5	1	p	5yr6/2	t	xs	m/d	0	0	0	-	-
741	2	b	5	1	p	5yr4/1	t	xs	m/d	0	0	0	-	-
742	2	b	5	1	p	5yr6/2	t	xs	m/d	0	0	0	-	-
743	2	b	5	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
744	2	b	5	1	p	5yr4/1	t	sm	m/d	0	0	0	-	-
745	2	b	5	1	p	5yr5/1	t	xs	m/d	0	0	0	-	-
746	2	b	5	1	p	5yr5/1	t	xs	m/d	0	0	0	-	-
747	2	b	5	1	p	5yr5/1	t	sm	m/d	0	0	0	-	-
748	2	b	5	1	p	5r2/2	t	sm	m/d	0	0	0	-	-
749	2	b	5	1	p	5yr4/1	t	sm	m/d	0	0	0	-	-
750	2	b	5	1	p	5r2/2	t	xs	p	2.07	0.88	1	c	-
751	2	b	5	1	p	5yr6/2	s	sm	m/d	0	0	0	-	-
752	2	b	5	1	p	5yr5/1	t	sm	m/d	0	0	0	-	-
753	2	b	5	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
754	2	b	5	1	p	5r2/2	t	sm	m/d	0	0	0	-	-

Cat #	Area	Square	Sub sq	Level	Raw Material	Color	Cortex	Size	Comple-teness	Platform Width	Platform Thickness	Platform Facets	Initit-iation	Term-ination
755	2	b	5	1	p	5yr3/1	t	xs	m/d	0	0	0	-	-
756	2	b	5	1	p	5r2/2	t	sm	m/d	0	0	0	-	-
757	2	b	5	1	p	5r2/2	t	sm	m/d	0	0	0	-	-
758	2	b	5	1	p	5yr6/7	t	sm	p	15.9	7.18	3	b	-
759	2	b	5	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
760	2	b	5	1	p	5r2/2	t	sm	m/d	0	0	0	-	-
761	2	b	5	1	p	10yr6/1	t	xs	m/d	0	0	0	-	-
762	2	b	5	1	p	5yr4/1	t	xs	m/d	0	0	0	-	-
763	2	b	5	1	p	5yr3/1	t	xs	c	8.41	0.91	1	c	h
764	2	b	5	1	p	5yr6/2	t	xs	m/d	0	0	0	-	-
765	2	b	5	1	p	5yr6/2	t	sm	no	0	0	0	-	-
766	2	b	5	1	p	5r2/2	t	sm	m/d	0	0	0	-	-
767	2	b	5	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
768	2	b	5	1	p	5yr6/2	t	xs	p	4.08	1.42	1	b	-
769	2	b	5	1	p	5yr5/1	t	xs	m/d	0	0	0	-	-
770	2	b	5	1	p	5yr3/1	t	xs	m/d	0	0	0	-	-
771	2	b	5	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
772	2	b	5	1	p	5yr4/1	t	xs	m/d	0	0	0	-	-
773	2	b	5	1	p	5yr6/2	t	xs	m/d	0	0	0	-	-
774	2	b	5	1	p	5yr3/1	t	xs	m/d	0	0	0	-	-
775	2	b	5	1	p	7.5yr7/2	t	xs	m/d	0	0	0	-	-
776	2	b	5	1	p	5yr6/2	t	xs	m/d	0	0	0	-	-
777	2	b	5	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
778	2	b	5	1	p	5yr3/1	t	xs	no	0	0	0	-	-
779	2	b	5	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
780	2	b	5	1	p	5r2/2	t	sm	m/d	0	0	0	-	-
781	2	b	5	1	p	5yr3/1	t	xs	p	4.32	1.38	1	b	-
782	2	b	5	1	c	5r2/2	t	sm	m/d	0	0	0	-	-
783	2	b	5	1	c	5yr5/3	t	xs	m/d	0	0	0	-	-
784	2	b	5	1	c	5yr6/4	t	xs	m/d	0	0	0	-	-
785	2	b	5	1	c	5yr6/4	t	xs	m/d	0	0	0	-	-

Cat #	Area	Square	Sub sq	Level	Raw Material	Color	Cortex	Size	Comple-teness	Platform Width	Platform Thickness	Platform Facets	Initit-iation	Term-ination
786	2	b	5	1	c	5yr6/4	t	xs	m/d	0	0	0	-	-
787	2	b	5	1	c	5yr7/2	t	xs	m/d	0	0	0	-	-
788	2	b	5	1	c	5yr7/2	t	xs	m/d	0	0	0	-	-
789	2	b	5	1	c	5yr3/3	t	xs	m/d	0	0	0	-	-
790	2	b	5	1	c	5yr4/4	t	xs	m/d	0	0	0	-	-
791	2	b	5	1	c	5yr6/4	t	xs	m/d	0	0	0	-	-
792	2	b	5	1	q	5yr4/4	t	xs	m/d	0	0	0	-	-
793	2	b	5	1	c	5r2/2	t	xs	m/d	0	0	0	-	-
794	2	b	5	1	c	5r2/2	t	xs	m/d	0	0	0	-	-
795	2	b	5	1	ch	5yr5/2	t	xs	m/d	0	0	0	-	-
796	2	b	5	1	c	5yr4/1	t	xs	m/d	0	0	0	-	-
797	2	b	5	1	ch	5yr8/1	t	xs	m/d	0	0	0	-	-
798	2	b	5	1	ch	5yr5/2	t	xs	m/d	0	0	0	-	-
799	2	b	5	1	c	5r2/2	t	xs	m/d	0	0	0	-	-
800	2	b	5	1	ch	5yr5/2	t	xs	p	3.06	0.97	1	c	-
801	2	b	5	1	c	5r2/2	t	xs	c	3.02	0.89	1	b	f
802	2	b	5	1	ch	7.5yr8/0	t	xs	p	6.87	1.97	1	b	-
803	2	b	5	1	p	5yr5/1	t	sm	m/d	0	0	0	-	-
804	2	b	5	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
805	2	b	5	1	p	5yr3/1	t	xs	no	0	0	0	-	-
806	2	b	5	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
807	2	b	5	1	p	5yr5/2	t	xs	m/d	0	0	0	-	-
808	2	b	5	1	p	5yr3/1	t	xs	p	1.87	1.03	1	c	-
809	2	b	5	1	p	5yr5/1	t	xs	m/d	0	0	0	-	-
810	2	b	5	1	p	5yr3/1	t	xs	m/d	0	0	0	-	-
811	2	b	5	1	p	5yr6/2	t	xs	c	2.9	0.96	1	b	h
812	2	b	5	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
813	2	b	5	1	p	5yr3/1	t	xs	p	2.38	0.71	1	b	-
814	2	b	5	1	p	5yr2.5/1	t	xs	m/d	0	0	0	-	-
815	2	b	5	1	p	5yr5/1	t	xs	m/d	0	0	0	-	-
816	2	b	5	1	p	5yr5/2	t	xs	m/d	0	0	0	-	-

Cat #	Area	Square	Sub sq	Level	Raw Material	Color	Cortex	Size	Comple-teness	Platform Width	Platform Thickness	Platform Facets	Initit-iation	Term-ination
817	2	b	5	1	p	5yr5/2	t	xs	m/d	0	0	0	-	-
818	2	b	5	1	p	5yr3/1	t	xs	m/d	0	0	0	-	-
819	2	b	5	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
820	2	b	5	1	p	10yr5/1	t	xs	m/d	0	0	0	-	-
821	2	b	5	1	p	5yr5/1	t	xs	p	3.16	0.79	1	c	-
822	2	b	5	1	p	7.5yr5/2	t	xs	p	2.98	0.76	1	c	-
823	2	b	5	1	p	5yr2.5/1	t	xs	m/d	0	0	0	-	-
824	2	b	5	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
825	2	b	5	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
826	2	b	5	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
827	2	b	5	1	q	5yr6/3	t	xs	m/d	0	0	0	-	-
828	2	b	5	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
829	2	b	5	1	p	5yr6/2	t	xs	no	0	0	0	-	-
830	2	b	5	1	p	5r2/2	t	xs	p	4.46	2.08	1	c	-
831	2	b	5	1	p	5r2/2	t	xs	p	7.44	1.27	3	c	-
832	2	b	5	1	p	5r2/2	t	xs	p	4.89	1.49	1	c	-
833	2	b	5	1	p	5yr3/1	t	xs	m/d	0	0	0	-	-
834	2	b	5	1	p	5yr3/1	t	xs	c	9.93	3.89	>3	c	f
835	2	b	5	1	p	5yr6/2	t	xs	m/d	0	0	0	-	-
836	2	b	5	1	p	5yr4/1	t	xs	m/d	0	0	0	-	-
837	2	b	5	1	p	10yr5/1	t	xs	c	3.46	0.8	1	b	f
838	2	b	5	1	c	5r2/2	t	xs	m/d	0	0	0	-	-
839	2	b	5	1	p	5yr6/1	t	xs	m/d	0	0	0	-	-
840	2	b	5	1	p	5yr5/2	t	med	p	15.33	7.07	1	c	-
841	2	b	5	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
842	2	b	5	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
843	2	b	5	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
844	2	b	5	1	p	2.5yr5/0	t	xs	m/d	0	0	0	-	-
845	2	b	5	1	p	5yr3/1	t	xs	m/d	0	0	0	-	-
846	2	b	5	1	p	5yr4/1	t	xs	m/d	0	0	0	-	-
847	2	b	5	1	p	2.5yr6/2	t	xs	p	4.59	0.99	>3	b	-

Cat #	Area	Square	Sub sq	Level	Raw Material	Color	Cortex	Size	Comple-teness	Platform Width	Platform Thickness	Platform Facets	Initit-iation	Term-ination
848	2	b	5	1	p	5yr4/1	t	xs	m/d	0	0	0	-	-
849	2	b	5	1	p	5r2/2	t	xs	p	6.04	1.54	2	c	-
850	2	b	5	1	p	7.5yr6/2	t	xs	p	6.44	0.62	1	c	-
851	2	b	5	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
852	2	b	5	1	p	5yr3/1	t	xs	m/d	0	0	0	-	-
853	2	b	5	1	p	5r2/2	t	xs	c	3.08	0.72	1	b	f
854	2	b	5	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
855	2	b	5	1	p	10yr5/1	t	xs	m/d	0	0	0	-	-
856	2	b	5	1	p	5yr6/1	t	xs	m/d	0	0	0	-	-
857	2	b	5	1	p	2.5yr3/0	t	xs	m/d	0	0	0	-	-
858	2	b	5	1	p	5yr6/2	t	xs	m/d	0	0	0	-	-
859	2	b	5	1	p	5yr5/2	t	xs	m/d	0	0	0	-	-
860	2	b	5	1	p	5yr5/1	t	xs	m/d	0	0	0	-	-
861	2	b	5	1	p	5yr4/1	t	xs	m/d	0	0	0	-	-
862	2	b	5	1	p	5yr6/2	t	xs	no	0	0	0	-	-
863	2	b	5	1	p	5yr4/1	t	xs	m/d	0	0	0	-	-
864	2	b	5	1	p	5yr3/1	t	xs	m/d	0	0	0	-	-
865	2	b	5	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
866	2	b	5	1	p	5yr6/2	t	xs	m/d	0	0	0	-	-
867	2	b	5	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
868	2	b	5	1	p	5yr4/1	t	xs	m/d	0	0	0	-	-
869	2	b	5	1	l	5yr4/4	s	xs	m/d	0	0	0	-	-
870	2	b	5	1	p	5yr3/1	t	xs	m/d	0	0	0	-	-
871	2	b	5	1	p	2.5yr3/0	t	xs	m/d	0	0	0	-	-
872	2	b	5	1	p	5yr6/1	t	xs	m/d	0	0	0	-	-
873	2	b	5	1	p	5yr5/1	t	xs	m/d	0	0	0	-	-
874	2	b	5	1	p	5r2/2	t	xs	no	0	0	0	-	-
875	2	b	5	1	p	5yr4/1	t	xs	m/d	0	0	0	-	-
876	2	b	5	1	p	5yr6/2	t	xs	m/d	0	0	0	-	-
877	2	b	5	1	p	5yr5/1	t	xs	m/d	0	0	0	-	-
878	2	b	5	1	ch	5yr7/2	t	xs	m/d	0	0	0	-	-

Cat #	Area	Square	Sub sq	Level	Raw Material	Color	Cortex	Size	Comple-teness	Platform Width	Platform Thickness	Platform Facets	Initit-iation	Term-ination
879	2	b	5	1	p	5yr4/1	t	xs	m/d	0	0	0	-	-
880	2	b	5	1	c	5r2/2	t	xs	m/d	0	0	0	-	-
881	2	b	5	1	p	5yr4/1	t	xs	m/d	0	0	0	-	-
882	2	b	5	1	p	5yr3/1	t	xs	m/d	0	0	0	-	-
883	2	b	5	1	p	5r2/2	t	xs	p	3.56	1.18	1	b	-
884	2	b	5	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
885	2	b	5	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
886	2	b	5	1	p	5yr4/1	t	xs	m/d	0	0	0	-	-
887	2	b	5	1	p	5yr5/2	t	xs	m/d	0	0	0	-	-
888	2	b	5	1	p	7.5yr5/2	t	xs	m/d	0	0	0	-	-
889	2	b	5	1	p	5yr5/1	t	xs	m/d	0	0	0	-	-
890	2	b	5	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
891	2	b	5	1	p	2.5yr3/0	t	xs	m/d	0	0	0	-	-
892	2	b	5	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
893	2	b	5	1	p	5pb3/1	t	xs	m/d	0	0	0	-	-
894	2	b	5	1	p	10r4/4	t	xs	m/d	0	0	0	-	-
895	2	b	5	1	p	5yr6/1	t	xs	p	3.93	0.56	1	b	-
896	2	b	5	1	p	5yr3/1	t	xs	m/d	0	0	0	-	-
897	2	b	5	1	p	5yr3/1	t	xs	p	3.61	1.52	1	b	-
898	2	b	5	1	p	7.5yr5/2	t	xs	m/d	0	0	0	-	-
899	2	b	5	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
900	2	b	5	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
901	2	b	5	1	p	5yr4/1	t	xs	m/d	0	0	0	-	-
902	2	b	5	1	p	5yr3/1	t	xs	s	0	0	0	b	-
903	2	b	5	1	p	5yr6/1	t	xs	m/d	0	0	0	-	-
904	2	b	5	1	p	5yr3/1	t	xs	m/d	0	0	0	-	-
905	2	b	5	1	p	5yr5/1	t	xs	m/d	0	0	0	-	-
906	2	b	5	1	p	5yr4/1	t	xs	m/d	0	0	0	-	-
907	2	b	5	1	p	5yr6/2	t	xs	p	4.82	0.92	1	c	-
908	2	b	5	1	p	5yr3/1	t	xs	m/d	0	0	0	-	-
909	2	b	5	1	p	7.5yr6/2	t	xs	m/d	0	0	0	-	-

Cat #	Area	Square	Sub sq	Level	Raw Material	Color	Cortex	Size	Comple-teness	Platform Width	Platform Thickness	Platform Facets	Initit-iation	Term-ination
910	2	b	5	1	p	5yr4/1	t	xs	m/d	0	0	0	-	-
911	2	b	5	1	p	7.5yr4/0	t	xs	m/d	0	0	0	-	-
912	2	b	5	1	p	5yr4/1	t	xs	m/d	0	0	0	-	-
913	2	b	5	1	p	2.5yr3/0	t	xs	m/d	0	0	0	-	-
914	2	b	5	1	p	5yr5/2	t	xs	m/d	0	0	0	-	-
915	2	b	5	1	p	5yr3/1	t	xs	m/d	0	0	0	-	-
916	2	b	5	1	p	5yr6/2	t	xs	m/d	0	0	0	-	-
917	2	b	5	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
918	2	b	5	1	p	5yr6/2	t	xs	m/d	0	0	0	-	-
919	2	b	5	1	p	5r2/2	t	xs	c	1.92	0.5	1	b	f
920	2	b	5	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
921	2	b	5	1	p	5yr5/1	t	xs	m/d	0	0	0	-	-
922	2	b	5	1	p	5yr6/2	t	xs	m/d	0	0	0	-	-
923	2	b	5	1	p	5yr3/1	t	xs	m/d	0	0	0	-	-
924	2	b	5	1	p	5yr5/1	t	xs	m/d	0	0	0	-	-
925	2	b	5	1	p	2.5yr3/0	t	xs	m/d	0	0	0	-	-
926	2	b	5	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
927	2	b	5	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
928	2	b	5	1	p	2.5yr4/0	t	xs	m/d	0	0	0	-	-
929	2	b	5	1	p	7.5yr5/2	t	xs	m/d	0	0	0	-	-
930	2	b	5	1	p	5yr5/1	t	xs	m/d	0	0	0	-	-
931	2	b	5	1	p	5yr3/1	t	xs	m/d	0	0	0	-	-
932	2	b	5	1	p	5yr3/1	t	xs	m/d	0	0	0	-	-
933	2	b	5	1	p	7.5yr5/2	t	xs	m/d	0	0	0	-	-
934	2	b	5	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
935	2	b	5	1	p	5yr6/2	t	xs	m/d	0	0	0	-	-
936	2	b	5	1	p	5yr6/2	t	xs	c	3.71	0.86	1	b	f
937	2	b	5	1	p	5yr6/2	t	xs	p	4.04	0.64	1	c	-
938	2	b	5	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
939	2	b	5	1	p	5yr3/1	t	xs	m/d	0	0	0	-	-
940	2	b	5	1	p	5yr3/1	t	xs	m/d	0	0	0	-	-

Cat #	Area	Square	Sub sq	Level	Raw Material	Color	Cortex	Size	Comple-teness	Platform Width	Platform Thickness	Platform Facets	Initit-iation	Term-ination
941	2	b	5	1	p	5yr6/2	t	xs	s	0	0	0	c	s
942	2	b	5	1	p	5yr5/1	t	xs	c	2.2	1.19	1	b	f
943	2	b	5	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
944	2	b	5	1	p	5yr6/1	t	xs	no	0	0	0	-	-
945	2	b	5	1	p	7.5yr4/0	t	xs	m/d	0	0	0	-	-
946	2	b	5	1	p	5yr5/1	t	xs	no	0	0	0	-	-
947	2	b	5	1	p	5yr6/1	t	xs	p	3.4	1.41	1	c	-
948	2	b	5	1	c	10r3/6	t	xs	c	2.62	0.52	1	b	f
949	2	c	0	0	p	5yr7/3	t	sm	m/d	0	0	0	-	-
950	2	c	0	0	p	5yr4/1	t	sm	c	5.56	1	>3	c	o
951	2	c	0	0	p	5yr4/1	t	sm	m/d	0	0	0	-	-
952	2	c	1	1	p	7.5yr5/2	t	sm	m/d	0	0	0	-	-
953	2	c	1	1	p	5yr7/2	t	sm	m/d	0	0	0	-	-
954	2	c	1	1	p	5yr6/1	t	xs	no	0	0	0	-	-
955	2	c	1	1	p	5yr5/1	t	sm	m/d	0	0	0	-	-
956	2	c	1	1	p	5yr4/1	t	sm	c	10.18	3.93	1	c	f
957	2	c	1	1	p	5yr4/3	s	sm	m/d	0	0	0	-	-
958	2	c	1	1	p	5yr5/1	t	sm	m/d	0	0	0	-	-
959	2	c	1	1	p	5yr5/1	t	sm	m/d	0	0	0	-	-
960	2	c	1	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
961	2	c	1	1	p	5yr5/1	t	xs	m/d	0	0	0	-	-
962	2	c	1	1	p	5yr7/2	t	sm	m/d	0	0	0	-	-
963	2	c	1	1	p	5yr3/1	t	xs	m/d	0	0	0	-	-
964	2	c	1	1	p	5yr8/2	t	xs	m/d	0	0	0	-	-
965	2	c	1	1	p	5yr4/1	t	xs	m/d	0	0	0	-	-
966	2	c	1	1	ch	5yr8/1	t	sm	p	2.38	0.89	1	b	-
967	2	c	1	1	c	5yr3/3	t	xs	m/d	0	0	0	-	-
968	2	c	1	1	c	5yr3/3	t	sm	p	6.02	2.12	1	b	-
969	2	d	0	0	p	5yr3/1	t	med	p	20.56	6.46	1	c	-
970	2	d	0	0	p	5yr5/1	t	sm	m/d	0	0	0	-	-
971	2	d	0	0	p	5r2/2	t	sm	m/d	0	0	0	-	-

Cat #	Area	Square	Sub sq	Level	Raw Material	Color	Cortex	Size	Comple-teness	Platform Width	Platform Thickness	Platform Facets	Initit-iation	Term-ination
972	2	d	0	0	p	5r2/2	t	sm	no	0	0	0	-	-
973	2	d	0	0	p	5yr3/1	t	med	c	20.14	4.84	>3	c	f
974	2	d	0	0	p	5yr4/1	t	xs	m/d	0	0	0	-	-
975	2	d	0	0	p	5yr5/1	t	sm	m/d	0	0	0	-	-
976	2	d	0	0	p	5yr7/2	t	lg	p	28.38	10.48	>3	c	-
977	2	d	1	1	o	5yr2.5/1	t	xs	no	0	0	0	-	-
978	2	d	1	1	p	5yr3/1	t	sm	no	0	0	0	-	-
979	2	d	1	1	p	5yr5/1	t	med	c	25.32	4.24	2	c	f
980	2	d	1	1	p	5yr5/1	t	sm	p	22.24	7.08	>3	c	-
981	2	d	1	1	p	5yr3/1	t	sm	p	14.14	1.52	2	c	-
982	2	d	1	1	p	5yr4/2	t	sm	c	9.85	3.32	>3	c	f
983	2	d	1	1	p	5yr6/1	t	sm	p	5.73	2.38	1	b	-
984	2	d	1	1	p	5r2/2	t	sm	p	10.56	4.98	1	b	-
985	2	d	1	1	p	5yr6/2	s	sm	c	10.09	2.5	1	c	h
986	2	d	1	1	p	5r2/2	t	sm	no	0	0	0	-	-
987	2	d	1	1	p	5yr5/1	t	sm	no	0	0	0	-	-
988	2	d	1	1	p	5yr6/2	t	sm	m/d	0	0	0	-	-
989	2	d	1	1	p	2.5yr6/2	t	sm	m/d	0	0	0	-	-
990	2	d	1	1	p	5yr4/1	t	sm	c	7.24	1.48	1	c	f
991	2	d	1	1	p	5yr5/1	t	sm	p	22.63	7.45	>3	c	-
992	2	d	1	1	p	7.5yr2/2	t	sm	m/d	0	0	0	-	-
993	2	d	1	1	p	5yr6/2	t	sm	m/d	0	0	0	-	-
994	2	d	1	1	p	5yr6/2	t	sm	c	8.61	4.76	2	b	f
995	2	d	1	1	p	5yr5/1	t	sm	m/d	0	0	0	-	-
996	2	d	1	1	p	5yr4/1	t	sm	m/d	0	0	0	-	-
997	2	d	1	1	p	5yr5/1	t	sm	p	1.66	0.71	1	c	-
998	2	d	1	1	p	5yr4/1	s	sm	p	5.55	1.82	1	c	-
999	2	d	1	1	p	10yr5/1	t	sm	m/d	0	0	0	-	-
1000	2	d	1	1	p	5yr4/3	t	sm	no	0	0	0	-	-
1001	2	d	1	1	p	5yr4/3	t	xs	m/d	0	0	0	-	-
1002	2	d	1	1	p	5yr5/1	t	sm	m/d	0	0	0	-	-

Cat #	Area	Square	Sub sq	Level	Raw Material	Color	Cortex	Size	Comple-teness	Platform Width	Platform Thickness	Platform Facets	Initit-iation	Term-ination
1003	2	d	1	1	p	5yr6/2	t	sm	p	8.58	3.12	1	c	-
1004	2	d	1	1	p	5yr7/2	t	sm	m/d	0	0	0	-	-
1005	2	d	1	1	p	5yr6/2	t	xs	m/d	0	0	0	-	-
1006	2	d	1	1	p	5yr5/1	t	sm	m/d	0	0	0	-	-
1007	2	d	1	1	p	5yr5/1	t	xs	p	2.21	0.79	1	b	-
1008	2	d	1	1	p	5yr6/2	s	sm	p	16.75	2.97	>3	c	-
1009	2	d	1	1	p	5yr4/1	s	sm	m/d	0	0	0	-	-
1010	2	d	1	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
1011	2	d	1	1	p	5yr4/4	t	sm	m/d	0	0	0	-	-
1012	2	d	1	1	p	5r2/2	t	sm	m/d	0	0	0	-	-
1013	2	d	1	1	p	7.5yr5/2	t	sm	m/d	0	0	0	-	-
1014	2	d	1	1	p	5yr5/1	t	sm	m/d	0	0	0	-	-
1015	2	d	1	1	p	5yr7/2	t	xs	m/d	0	0	0	-	-
1016	2	d	1	1	p	5yr6/2	t	xs	m/d	0	0	0	-	-
1017	2	d	1	1	p	5r2/2	t	sm	m/d	0	0	0	-	-
1018	2	d	1	1	p	5yr3/1	t	sm	p	7.08	2.73	1	c	-
1019	2	d	1	1	p	5r2/2	t	sm	p	5.5	1.76	1	c	-
1020	2	d	1	1	p	5yr5/1	t	xs	m/d	0	0	0	-	-
1021	2	d	1	1	p	5yr5/3	t	xs	no	0	0	0	-	-
1022	2	d	1	1	p	5yr6/1	t	xs	m/d	0	0	0	-	-
1023	2	d	1	1	p	5yr4/1	t	xs	m/d	0	0	0	-	-
1024	2	d	1	1	p	5yr5/1	t	xs	p	6.46	1.28	1	b	-
1025	2	d	1	1	p	5yr4/1	t	xs	c	3.14	1.27	1	c	f
1026	2	d	1	1	p	5yr6/2	t	xs	m/d	0	0	0	-	-
1027	2	d	1	1	p	5r2/2	t	xs	c	2.96	0.97	1	c	f
1028	2	d	1	1	p	5yr3/1	t	sm	m/d	0	0	0	-	-
1029	2	d	1	1	p	5yr4/1	t	sm	m/d	0	0	0	-	-
1030	2	d	1	1	p	5yr5/1	t	sm	p	7.83	2.97	1	c	-
1031	2	d	1	1	p	5r2/2	t	sm	no	0	0	0	-	-
1032	2	d	1	1	p	5yr5/1	t	xs	p	2.81	0.92	1	c	-
1033	2	d	1	1	p	5yr3/1	t	xs	p	1.69	1.4	1	b	-

Cat #	Area	Square	Sub sq	Level	Raw Material	Color	Cortex	Size	Comple-teness	Platform Width	Platform Thickness	Platform Facets	Initit-iation	Term-ination
1034	2	d	1	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
1035	2	d	1	1	ch	5yr7/1	t	xs	p	3.8	0.97	1	b	-
1036	2	d	1	1	p	5yr6/3	t	xs	m/d	0	0	0	-	-
1037	2	d	1	1	p	5yr5/1	t	xs	m/d	0	0	0	-	-
1038	2	d	1	1	p	5yr4/3	t	xs	m/d	0	0	0	-	-
1039	2	d	1	1	p	5yr6/2	t	xs	c	3.41	0.68	1	c	f
1040	2	d	1	1	p	5yr3/1	t	xs	m/d	0	0	0	-	-
1041	2	d	1	1	p	5yr5/1	t	xs	m/d	0	0	0	-	-
1042	2	d	1	1	p	5yr3/1	t	xs	c	2.5	0.99	1	b	f
1043	2	d	1	1	p	5yr6/2	t	xs	m/d	0	0	0	-	-
1044	2	d	1	1	p	5yr4/1	t	sm	m/d	0	0	0	-	-
1045	2	d	1	1	p	5yr5/1	t	xs	m/d	0	0	0	-	-
1046	2	d	1	1	p	5yr6/2	t	xs	m/d	0	0	0	-	-
1047	2	d	1	1	p	5yr6/2	t	xs	m/d	0	0	0	-	-
1048	2	d	1	1	p	5yr6/2	t	xs	m/d	0	0	0	-	-
1049	2	d	1	1	p	2.5yr6/2	t	xs	m/d	0	0	0	-	-
1050	2	d	1	1	p	5yr6/2	t	xs	m/d	0	0	0	-	-
1051	2	d	1	1	p	5yr5/1	t	xs	c	3.08	0.88	1	b	f
1052	2	d	1	1	p	5yr5/1	t	xs	m/d	0	0	0	-	-
1053	2	d	1	1	p	5yr6/2	t	xs	m/d	0	0	0	-	-
1054	2	d	1	1	p	5r2/2	t	xs	m/d	0	0	0	-	-
1055	2	d	1	1	ch	5yr6/2	t	xs	m/d	0	0	0	-	-
1056	2	d	1	1	c	5yr8/2	t	xs	m/d	0	0	0	-	-
1057	2	d	1	1	c	5yr8/2	t	xs	m/d	0	0	0	-	-
1058	2	d	1	1	c	5yr8/2	t	xs	m/d	0	0	0	-	-
1059	2	d	1	1	c	5yr3/3	t	xs	c	3.74	1.34	1	b	f
1060	2	d	1	1	c	5yr3/4	t	xs	p	5.17	1.28	1	b	-
1061	2	d	1	1	c	5yr3/4	t	xs	m/d	0	0	0	-	-
1062	2	d	1	1	c	5yr3/4	t	xs	c	4.64	1.21	2	b	f
1063	2	d	1	1	c	5yr3/4	t	xs	m/d	0	0	0	-	-
1064	2	d	1	1	c	5yr3/4	t	xs	p	6.3	1.4	0	-	-

Cat #	Area	Square	Sub sq	Level	Raw Material	Color	Cortex	Size	Comple-teness	Platform Width	Platform Thickness	Platform Facets	Initit-iation	Term-ination
1065	2	d	1	1	c	5yr3/4	t	xs	m/d	0	0	0	-	-
1066	2	d	1	1	c	2.5yr6/4	t	xs	m/d	0	0	0	-	-
1067	2	d	1	1	c	2.5yr6/4	t	xs	p	5.42	1.04	>3	c	-
1068	2	d	1	1	c	2.5yr6/4	t	xs	s	0	0	0	c	f
1069	2	d	1	1	c	5yr7/2	t	xs	m/d	0	0	0	-	-
1070	2	d	1	1	c	5yr7/2	t	xs	m/d	0	0	0	-	-
1071	2	d	1	1	c	2.5yr3/4	t	xs	m/d	0	0	0	-	-
1072	2	d	1	1	c	5yr6/2	t	xs	m/d	0	0	0	-	-
1073	2	d	1	1	c	2.5yr4/4	t	xs	p	2.48	0.41	1	b	-
1074	2	d	1	1	c	5yr4/3	t	xs	m/d	0	0	0	-	-
1075	2	d	1	1	c	5yr3/3	t	xs	m/d	0	0	0	-	-
1076	2	d	1	1	c	2.5yr4/6	t	xs	m/d	0	0	0	-	-
1077	2	d	1	1	p	5yr3/1	t	xs	m/d	0	0	0	-	-
1078	2	d	1	1	c	5yr6/4	t	xs	m/d	0	0	0	-	-
1079	2	d	1	1	c	5yr3/3	t	xs	m/d	0	0	0	-	-
1080	2	d	1	1	c	5yr6/3	t	xs	m/d	0	0	0	-	-
1081	2	d	1	1	c	5yr5/3	t	xs	m/d	0	0	0	-	-
1082	2	d	1	1	c	5yr4/4	t	xs	p	3.54	1.24	>3	c	-
1083	2	d	1	1	c	5yr6/3	t	xs	p	3.24	1.47	>3	c	-
1084	2	d	1	1	c	5yr6/4	t	xs	m/d	0	0	0	-	-
1085	2	d	1	1	c	5yr4/4	t	xs	s	0	0	0	b	f
1086	2	d	1	1	c	5yr4/4	t	xs	m/d	0	0	0	-	-
1087	2	d	1	1	c	5yr7/1	t	xs	c	3.44	1.31	1	b	f
1088	2	d	1	1	c	5yr7/2	t	xs	m/d	0	0	0	-	-
1089	2	d	1	1	c	5yr6/2	t	xs	m/d	0	0	0	-	-
1090	2	d	1	1	c	5yr6/2	t	xs	m/d	0	0	0	-	-
1091	2	d	1	1	c	5yr6/3	t	xs	m/d	0	0	0	-	-
1092	2	d	1	1	c	5yr7/3	t	xs	m/d	0	0	0	-	-
1093	2	d	1	1	c	5yr7/2	t	xs	m/d	0	0	0	-	-
1094	2	d	1	1	c	5yr4/3	t	xs	m/d	0	0	0	-	-
1095	2	d	1	1	c	5yr3/4	t	xs	m/d	0	0	0	-	-

Cat #	Area	Square	Sub sq	Level	Raw Material	Color	Cortex	Size	Comple-teness	Platform Width	Platform Thickness	Platform Facets	Initit-iation	Term-ination
1096	2	d	1	1	c	5yr4/3	t	xs	m/d	0	0	0	-	-
1097	2	d	1	1	c	5yr5/3	t	xs	s	0	0	0	b	h
1098	2	d	1	1	c	5yr6/2	t	xs	m/d	0	0	0	-	-
1099	2	d	1	1	c	5yr6/2	t	xs	p	5.69	1.71	1	b	-
1100	2	d	1	1	c	5yr5/3	t	xs	m/d	0	0	0	-	-
1101	2	d	1	1	c	5yr5/4	t	xs	m/d	0	0	0	-	-
1102	2	d	1	1	c	5yr6/3	t	xs	c	3.96	0.63	1	b	f
1103	2	d	1	1	c	5yr6/3	t	xs	p	3.09	1.28	1	b	-
1104	2	d	1	1	c	5yr6/3	t	xs	m/d	0	0	0	-	-
1105	2	d	1	1	c	5yr6/2	t	xs	m/d	0	0	0	-	-
1106	2	d	1	2	c	5yr5/4	t	xs	m/d	0	0	0	-	-
1107	2	d	1	2	c	5yr4/4	t	sm	m/d	0	0	0	-	-
1108	2	d	1	2	c	5yr5/4	t	xs	c	3.66	1.23	>3	c	f
1109	2	d	1	2	c	5yr7/3	t	xs	c	6.06	1.52	>3	b	f
1110	2	d	1	2	c	5yr4/3	t	xs	m/d	0	0	0	-	-
1111	2	d	1	2	c	5yr4/2	t	xs	m/d	0	0	0	-	-
1112	2	d	1	2	c	5yr6/4	t	xs	m/d	0	0	0	-	-
1113	2	d	1	2	c	5yr5/4	t	xs	m/d	0	0	0	-	-
1114	2	d	1	2	c	5yr5/4	t	xs	p	5.1	2.74	1	b	-
1115	2	d	1	2	c	5yr4/4	t	xs	m/d	0	0	0	-	-
1116	2	d	1	2	c	5yr5/4	t	xs	m/d	0	0	0	-	-
1117	2	d	1	2	c	5yr4/4	t	xs	m/d	0	0	0	-	-
1118	2	d	1	2	c	5yr7/2	t	xs	m/d	0	0	0	-	-
1119	2	d	1	2	c	5yr6/4	t	xs	m/d	0	0	0	-	-
1120	2	d	1	2	c	5yr3/3	t	xs	p	3.31	1.13	1	b	-
1121	2	d	1	2	c	5yr6/4	t	xs	p	4.26	0.93	1	b	-
1122	2	d	1	2	c	5yr4/4	t	xs	p	2.78	0.65	1	b	-
1123	2	d	1	2	c	5yr4/3	t	xs	p	3.32	1.28	>3	c	-
1124	2	d	1	2	c	5yr4/4	t	xs	m/d	0	0	0	-	-
1125	2	d	1	2	c	5yr4/4	t	xs	m/d	0	0	0	-	-
1126	2	d	1	2	c	5yr7/2	t	xs	m/d	0	0	0	-	-

Cat #	Area	Square	Sub sq	Level	Raw Material	Color	Cortex	Size	Comple-teness	Platform Width	Platform Thickness	Platform Facets	Initit-iation	Term-ination
1127	2	d	1	2	c	5yr7/2	t	xs	m/d	0	0	0	-	-
1128	2	d	1	2	c	5yr7/2	t	xs	c	5.95	1.42	>3	b	f
1129	2	d	1	2	c	5yr7/2	t	xs	m/d	0	0	0	-	-
1130	2	d	1	2	c	5yr7/2	t	xs	p	2.83	1.48	>3	b	-
1131	2	d	1	2	p	5yr5/1	s	sm	m/d	0	0	0	-	-
1132	2	d	1	2	p	5yr6/1	s	med	no	0	0	0	-	-
1133	2	d	1	2	p	5yr4/1	t	med	m/d	0	0	0	-	-
1134	2	d	1	2	p	5yr6/2	t	sm	m/d	0	0	0	-	-
1135	2	d	1	2	p	5yr4/1	t	sm	c	4.99	2.69	>3	c	f
1136	2	d	1	2	p	5yr4/1	t	sm	m/d	0	0	0	-	-
1137	2	d	1	2	p	5yr4/3	t	sm	m/d	0	0	0	-	-
1138	2	d	1	2	p	5yr3/1	t	sm	m/d	0	0	0	-	-
1139	2	d	1	2	p	5yr4/1	t	xs	m/d	0	0	0	-	-
1140	2	d	1	2	p	5yr7/2	t	xs	m/d	0	0	0	-	-
1141	2	d	1	2	p	5yr6/2	t	xs	m/d	0	0	0	-	-
1142	2	d	1	2	p	5r2/2	t	xs	p	1.74	0.88	1	b	-
1143	2	d	1	2	p	5yr7/2	t	xs	m/d	0	0	0	-	-
1144	2	d	1	2	p	5yr3/1	t	xs	c	1.72	0.64	1	b	f
1145	2	d	1	2	p	5yr6/2	t	xs	m/d	0	0	0	-	-
1146	2	d	1	2	p	5r2/2	t	xs	m/d	0	0	0	-	-
1147	2	a	0	0	p	5yr6/3	s	med	p	18.72	7.02	2	b	-
1148	2	a	0	0	p	5yr6/2	t	med	c	15.68	5.02	1	c	f
1149	2	a	0	0	p	5r2/2	t	med	c	9.17	2.58	>3	c	f
1150	2	a	0	0	p	5yr4/1	t	sm	m/d	0	0	0	-	-
1151	2	a	0	0	p	5yr6/2	t	med	c	4.3	2.38	1	c	f
1152	2	a	0	0	p	5yr5/2	t	med	p	11.68	4.56	>3	c	-
1153	2	a	0	0	l	5yr2.5/1	s	sm	p	24.42	5.68	>3	b	-
1154	2	a	0	0	p	5yr6/2	t	sm	no	0	0	0	-	-
1155	2	d	1	1	p	5yr5/2	t	sm	m/d	0	0	0	-	-

APPENDIX III

RAW DATA KEY

Raw Material

p: porcellanite
o: obsidian
ch: chert
c: chalcedony
l: silicified lignite
b: basalt
q: quartzite

Tool Types

pnpp: Pelican Lake projectile point
ppf: projectile point fragment
lpsn: Late Prehistoric Side-notched projectile point
es: endscraper
rtf: retouched flake
btf: bifacial tool fragment
rtuf: retouched and utilized flake
mc: multidirectional core
bpc: bipolar core
utf: unifacial tool fragment
mft: multifunctional tool
pe: *pièces esquillées*
p: perforator
kf: knife fragment

Debitage

Cortex
p: primary
s: secondary
t: tertiary

Size
xs: extra small
sm: small
med: medium
lg: large

Completeness
c: complete flake
s: split flake
m/d: medial/distal fragment
p: proximal fragment
no: non-orientable fragment

Fracture Initiation
c: cone
b: bend
w: wedge

Fracture Termination
f: feather
s: step
a: axial
o: overshoot
h: hinge